Assessing the Rational Unified Process against ISO/IEC15504-5: Information Technology – Software Process Assessment Part 5: An Assessment Model And Indicator Guidance.

Introduction

ISO/IEC 15504 specifies a framework for the assessment of software processes[1]. It has nine parts of which only two, Parts 2 and 3, are normative. It is expected that many fully realized assessment *models* will be able to be mapped to the reference model described in Part 2, equally, that many fully realized assessment *methods* will be compliant with Part 3. Part 5 of the standard is designated informative and contains an example assessment model that is compatible with the reference model in Part 2. Part 5 contains considerable detail that elaborates on the mandatory processes and defines associated base practices, work products, and management practices which are used to determine capability for each assessed process. While compliance to the particular detail of Part 5 is not made mandatory by the standard, it is supposed to be a compliant interpretation of Part 2, so it should be instructive to use it to calibrate the generic Rational Unified Process ™ .

[Please note that this assessment was done as time was available, over several months, during which time a new release of Part 5 became available to the author. In addition, what had been called the Rational Process was made prescriptive in the Rational Unified Process product. The assessment from ENG.7 onwards was done using these newer sources. The earlier part of this document uses some terminology such as Software Engineering Process Authority (SEPA) and Software Engineering Environment Authority (SEEA) that came from Walker Royce's Best Practices Seminar, which was used as input for the early part of this document. Royce's book, 'Software Project Management – A Unified Framework', discusses these concepts also. This terminology does not appear in the current Rational Unified Process product; it is evident from this assessment, that such concepts are needed to fill some gaps when Rational Unified Process is judged against 15504.]

The Assessment Framework of ISO/IEC15504

Unlike the SEI's CMM, this standard uses a two-dimensional model of capability against each of 29 processes. Because capability is assessable against each process, it is not a requirement that all be rated in a particular assessment. Thus it is possible to rate the Rational Unified Process only in those areas in which it is applicable and omit, for example, the "Operate software" process which will be enacted by the acquirer. The standard allocates the 29 processes to five process categories, which are:

- Customer-Supplier (CUS)[2]
- Engineering (ENG)
- Support (SUP)
- Management (MAN)

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[1] The relationship between 15504 and ISO 9000 is outlined in Appendix A.

[2] Note that in describing processes (CUS.1, CUS.2, etc), ISO/IEC 15504 has been quoted verbatim in this paper. Comments on the fulfillment of requirements by the Rational Unified Process are in a bold italic font.

- Organization (ORG)

Capability is rated for each process on a scale of 0 to 5, with 0 representing the lowest capability, labeled "incomplete", up to the highest capability at 5, labeled "optimizing". Each level is characterized by process attributes, common to all processes, the achievement of which determines whether an assessed process reaches that level. The process attributes themselves are rated on a four-point scale, as:

N   not achieved - there is no evidence of achievement of the attribute
P   partially achieved - there is some achievement of the attribute
L   largely achieved - there is significant achievement of the defined attribute
F   fully achieved – there is full achievement of the attribute.

To be rated at a particular process capability level, the process attributes at that level must be *largely* or *fully* achieved, and the process attributes for all lower levels must be *fully* achieved.

The Process Dimension

Each process is described in the standard with two sections, one containing a statement of the purpose of the process and its desired outcomes, and the other containing notes about the process and its relationship to ISO 12207.

Customer-Supplier Process Category (CUS)

This contains:

CUS.1   Acquire Software
CUS.2   Manage Customer Needs
CUS.3   Supply Software
CUS.4   Operate Software
CUS.5   Provide Customer Service

For example (extract from ISO 15504 follows):

CUS.1   Acquire Software

The purpose of the ***acquire software*** process is to obtain the product and/or service which will satisfy the need expressed by the customer. The acquisition process is enacted by the acquirer. The process begins with the identification of a customer need and ends with the acceptance of the product and/or service needed by the customer. As a result of successful implementation of the process

- a contract will be developed which clearly expresses the expectation, responsibilities, and liabilities of both the supplier and the customer;
- a product and/or service will be produced which satisfies the customer need;
- the acquisition will be managed so that specified constraints (e.g. such as cost, schedule and quality) are met.

Note – this process is identical in scope to the acquisition process, one of the primary life cycle processes in ISO 12207.

Engineering Process Category (ENG)

This contains:

ENG.1   Develop System Requirements and Design

ENG.2	Develop Software Requirements
ENG.3	Develop Software Design
ENG.4	Implement Software Design
ENG.5	Integrate and Test Software
ENG.6	Integrate and Test System
ENG.7	Maintain System and Software

Support Process Category (SUP)

This contains:

SUP.1	Develop Documentation
SUP.2	Perform Configuration Management
SUP.3	Perform Quality Assurance
SUP.4	Perform Work Product Verification
SUP.5	Perform Work Product Validation
SUP.6	Perform Joint Reviews
SUP.7	Perform Audits
SUP.8	Perform Problem Resolution

Management Process Category (MAN)

This contains:

MAN.1	Manage the Project
MAN.2	Manage Quality
MAN.3	Manage Risks
MAN.4	Manage Subcontractors

Organization Process Category

This contains:

ORG.1	Engineer the Business
ORG.2	Define the Process
ORG.3	Improve the Process
ORG.4	Provide Skilled Human Resources
ORG.5	Provide Software Engineering Infrastructure

The Capability Dimension

The model defines how each of the processes (CUS.1, CUS.2, etc.) shall be rated along a six-point capability scale ranging from incomplete at the bottom to optimizing at the top. The measure of capability is based on a set of nine process attributes (PA) which are common to all processes. The process attributes are used to establish whether a particular process has reached a certain level of capability by measuring each attribute on a four-point scale as described above.

Level 0: Incomplete Process

At this level, a process is not implemented fully or does not achieve its purpose. This level has no process attributes.

Level 1: Performed Process

At this level, the process achieves its purpose as defined in the standard. There is a single process attribute that can be examined to determine the degree of achievement of this level (quoted from the standard):

PA 1.1 Process Performance Attribute

"The extent to which the execution of the process uses a set of practices that are initiated and followed using identifiable input work products to produce identifiable output work products that are adequate to satisfy the purpose of the process."

Level 2: Managed Process

The *performed* process delivers work products of acceptable quality within defined timescales and resource needs. There are two PAs at this level:

PA 2.1 Performance Management Attribute

"The extent to which the execution of the process is managed to produce work products within stated time and resource requirements."

PA 2.2 Work Product Management Attribute

"The extent to which the execution of the process is managed to produce work products that are documented and controlled and that meet their functional and non-functional requirements, in line with the work product quality goals of the process."

Level 3: Established Process

At Level 3, the *managed* process is performed using a defined process based on good software engineering principles. There are two PAs at this level:

PA 3.1 Process Definition Attribute

"The extent to which the execution of the process uses a process definition based on a standard process, that enables the process to contribute to the defined business goals of the organization."

PA 3.2 Process Resource Attribute

"The extent to which the execution of the process uses suitable skilled human resources and process infrastructure effectively to contribute to the defined business goals of the organization."

Level 4: Predictable Process

At Level 4, the *established* process is performed consistently within defined control limits to achieve its goals. There are two PAs at this level:

PA 4.1 Process Measurement Attribute

"The extent to which the execution of the process is supported by goals and measures that are used to ensure that implementation of the process contributes to the achievement of the goals."

PA 4.2 Process Control Attribute

"The extent to which the execution of the process is controlled -- through the collection and analysis of measures to control and correct, where necessary, the performance of the process -- to reliably achieve the defined process goals."

Level 5: Optimizing Process

At this level, the *predictable* process optimizes its performance to meet current and future business needs and achieves repeatability in meeting its defined business goals. There are two PAs at this level:

PA 5.1 Process Change Attribute

"The extent to which changes to the definition, management, and performance of the process are controlled to better achieve the business goals of the organization."

PA 5.2 Continuous Improvement Attribute

"The extent to which changes to the process are identified and implemented to ensure continuous improvement in the fulfillment of the defined business goals of the organization."

Process Attribute Ratings

On the rating scale defined above, each process attribute (up to the highest capability level chosen for the assessment) is given a rating for each process instance that is assessed. The model admits the possibility of a process instance having a process attribute at a higher level of capability with a higher rating than one at a lower level, but the overall rating for the process instance will be at, or below, the lower level.

Additional Guidance in Part 5 of ISO 15504

Process Dimension

For each process identified in the reference part of the standard, Part 5 adds a set of base practices for the process, which further refine the description of process purpose, and a list of input and output work products and their characteristics. Together these are indicators of process performance. Evidence that the base practices are followed and the work products produced will typically result in the process being rated (at least) at level one.

Capability Dimension

For each process attribute specified in the reference model, Part 5 describes management practices that are indicators of achievement of the process attributes. Except at Level 1, where there is one PA and a single associated management practice, each PA has four associated management practices. Evidence of the effective use of these management practices is used to arrive at a rating for the performance attributes. Each management practice is characterized by attribute indicators covering:

- management practice performance characteristics that provide evidence that the practice is being performed;

- resource and infrastructure characteristics, the existence of which assists the performance of the practice and, by implication, without which the performance of the practice is much more difficult; and
- associated processes from the process dimension that support the management practice.

Mapping to the Rational Unified Process

The scope of the Rational Unified Process includes some discussion of management, customer interface, and organizational issues, but it has most detail on engineering and support. This generic assessment nevertheless attempts to cover all the processes defined in the standard and indicates on which issues the Rational Unified Process is silent.

Assessment of the Rational Unified Process

Capability Dimension

The use of particular base practices and the existence and characteristics of particular work products will determine whether Level 1 is achieved. This assessment will be specific to each process and is presented with the process in subsequent sections. The higher levels are not assessed here on a process-by-process basis because their achievement is too implementation specific. To elaborate this point: this assessment only reflects the *potential* of the Rational Unified Process to achieve a particular capability level. It will still be possible for an instance of the process to fail to reach that potential. At Level 1, the Rational Unified Process is prescriptive enough to be able to find clear mappings to most base practices and work products in Part 5 – where mappings do not clearly exist, the Rational Unified Process has been rated as ***not achieving*** Level 1 (***N***), that is, not having the potential, without augmentation, to reach Level 1. At higher levels of capability, the potential of the Rational Unified Process has been assessed overall, because, in the main, only guidelines are presented in the Rational Unified Process at these levels. An organization will therefore have to do more work to realize these levels of capability. Again, this assessment is couched in terms of the potential level of capability. So if, for example, the potential of the Rational Unified Process overall was assessed at Level 3, then an instance of *any* process (CUS.1, ENG.2, etc), which was individually assessed as fully achieving Level 1, could achieve Level 3.

Level 2: Managed Process

PA 2.1 Performance Management Attribute

The extent to which the execution of the process is managed to produce work products within stated time and resource requirements.
- In order to achieve this capability, a process needs to have time and resources requirements stated and produce work products within the stated requirements.

  Management Practice 2.1.1:
  Identify resource requirements to enable planning and tracking of the process.
  The Rational Unified Process requires the collection of a number of pragmatic metrics which are the means of assessing progress to date and the basis for cost and schedule estimation. Although the Rational Unified Process does not contain a sizing or estimation tool or method, it recommends the use of COCOMO 2.0 as a state-of-the-art example. The Rational Unified Process also mandates periodic status assessments when progress and risk are to be reviewed. The Rational Unified Process expects that project

planning and reporting tools will be used to construct a plan and report progress against it. The Rational Unified Process expects that planning practice and procedures will be captured in Organizational Policy and Procedures, on which all projects will base their performance.

Management Practice 2.1.2:

Plan the performance of the process by identifying the activities of the process and the allocated resources according to the requirements.

The Rational Unified Process defines a set of Work Breakdown Structures (WBS) to which the estimated effort and schedule should be allocated. This activity will occur as part of the construction of the Development Plan. The Development Plan – conforming to Organizational Policy - will also contain:

- ***elaboration of the development approach, methods and lifecycle;***
- ***details of the Software Development Environment (hardware, software, and other facilities);***
- ***a Risk Management Plan; and***
- ***references to applicable standards.***

Management Practice 2.1.3:

Implement the defined activities to achieve the purpose of the process.

This assessment of the generic Rational Unified Process cannot determine whether planned activities will be performed in a particular instance, however, the Rational Unified Process does define requirements for milestones and reviews which will allow implementation to be policed. The Rational Unified Process also recommends the use of automation to enact the process, "so doing the right, planned thing is automatic".

Management Practice 2.1.4:

Manage the execution of the activities to produce the work products within stated time and resource requirements.

The Rational Unified Process requires the collection of metrics which are used to track progress and emerging product quality. Both absolute values and trends in the metrics are captured and presented to management at least as often as the periodic status assessment. The Rational Unified Process also has rigorous Change Management as one of its key themes, so that once corrections are identified they can be tracked and closed. It is also one of the tasks of the Software Engineering Process Authority to ensure that Organizational Policy (with respect to process) is enforced and that, where necessary, the process is improved. The Rational Unified Process treats all key artifacts, plans, policy documents, standards, etc, as subject to change control. The Rational Unified Process is also built around demonstration against agreed evaluation criteria as a key mechanism of objective closure of tasks and iterations, as well as a significant risk reduction mechanism.

PA 2.2 Work Product Management Attribute

The extent to which the execution of the process is managed to produce work products that are documented and controlled and that meet their functional and non-functional requirements, in line with the work product goals of the process.

- In order to achieve this capability, a process needs to have stated functional and non-functional requirements, including integrity, for work products and to produce work products that fulfill the stated requirements.

> *Management Practice 2.2.1:*
>
> Identify requirements for the integrity and quality of the work products.
>
> ***The Rational Unified Process expects that Organizational Policy will dictate the overall strategy for quality management and identify acceptable standards which individual projects will employ. These will be made concrete in the Development Plan and in the Evaluation Criteria set for each iteration. Product integrity is addressed in the Rational Unified Process through its focus on rigorous change management and configuration control. The Rational Unified Process view is that quality engineering is an integral part of the development process, made real through the metrics program and demonstration as the primary means of assessment. Reviews, inspections, and the like are required by the Rational Unified Process but are regarded as secondary in their quality impact. The artifact set defined in the Rational Unified Process makes provision for definition of all types of requirements — functional, non-functional, and quality.***

> *Management Practice 2.2.2:*
>
> Identify the activities needed to achieve the integrity and quality requirements for work products.
>
> ***The Rational Unified Process requires the Development Plan to describe how configuration management and change control will be implemented. All quality-related activities will also be planned and captured in the Development Plan. As mentioned under MP 2.2.1, the Rational Unified Process uses demonstration (and use) of products, along with a quality metrics program, as the main means of achieving quality objectives.***

> *Management Practice 2.2.3:*
>
> Manage the configuration of work products to ensure their integrity.
>
> ***This Management Practice is the implementation of the integrity requirements of MP 2.2.2 and therefore could only be assessed in use. To assist in the implementation, the Rational Unified Process strongly recommends the use of automation for Configuration Management and Change Control.***

> *Management Practice 2.2.4:*
>
> Manage the quality of work products to ensure that the work products meet their functional and non-functional requirements.
>
> ***This Management Practice is the implementation of the quality requirements of MP 2.2.2 and therefore could only be assessed in use.***

Rating

It seems clear that the Rational Unified Process has the intrinsic capability to be deployed at Level 2: on the basis of the required management practices both *PA 2.1* and *PA 2.2* are *fully achieved.*

Level 3: Established Process

PA 3.1 Process Definition Attribute

The extent to which the execution of the process uses a process definition based on a standard process that enables the process to contribute to the defined business goals of the organization.

- In order to achieve this capability, a process needs to be executed according to a standard process definition that has been suitably tailored to the needs of the process instance. The standard process needs to be capable of supporting the stated business goals of the organization.

  Management Practice 3.1.1

  Identify the standard process definition from those available in the organization that is appropriate to the process purpose and the business goals of the organization.

  The Rational Unified Process requires an organization to define process standards in organizational policy and from these standards a particular project will construct process instances tailored to suit project-specific requirements. The Rational Unified Process defines the detailed process framework from which instances shall be constructed. This generic framework includes task descriptions, identification of workers, workflow, completion criteria, work products, metrics, and milestones. The Rational Unified Process does not contain any built-in values for productivity or metrics targets, or any detailed estimation guide for process components and activities. The use of tools to automate process performance is a recurring theme in the Rational Unified Process; Rational produces tools for documentation automation, process enactment, configuration and change management, requirements capture, and design and test automation. The Rational Unified Process is documented in paper and HTML form.

  Management Practice 3.1.2

  Tailor the standard process to obtain a defined process appropriate to the process context.

  The Rational Unified Process has detailed guidelines for process configuration and tailoring, in fact, process configuration is a required activity in process deployment. The guidelines include a rationale for decision-making for each of the process components.

  Management Practice 3.1.3

  Implement the defined process to achieve the process purpose consistently, and repeatably, and support the defined business goal of the organization.

  This practice is implementation-instance dependent and the Rational Unified Process does have associated training material. Having an HTML version makes the process accessible and permits integration with other tools.

  Management Practice 3.1.4

  Provide feedback into the standard process from experience of using the defined process.

  Again, the actualization of this practice will depend on the particular implementation; the Rational Unified Process emphasizes iterative development cycles, each of which concludes with an assessment based on cost/schedule and quality metrics. This assessment will consider both product and process implications for subsequent iterations. Results are captured in an Iteration Assessment artifact. It is the responsibility of the Project Manager and the Software Engineering Process Authority to ensure

9

that the results are analyzed and, where appropriate, fed back into Organizational Policy, and fed forward into the next iteration.

PA 3.2 Process Resource Attribute

The extent to which the execution of the process uses suitable skilled human resources and process infrastructure effectively to contribute to the defined business goals of the organization.

- In order to achieve this capability, a process needs to have adequate human resources and process infrastructure available that fulfill stated needs to execute the defined process.

  Management Practice 3.2.1

  Define the human resource competencies required to support the implementation of the defined process.

  The Rational Unified Process expects that a Development Plan will be created which contains a staffing plan that shows numbers, durations, and skills. This plan will be derived from the Organizational Policy's tailoring of the generic process to reflect the available skill base. The generic process also identifies workers and their responsibilities for each activity but is not explicit about the skills or experience required.

  Management Practice 3.2.2

  Define process infrastructure requirements to support the implementation of the defined process.

  The Rational Unified Process requires that a standard software engineering environment be established as part of organizational policy. The Rational Unified Process describes the characteristics of the minimum environment including the requirement that it provide access to the reusable assets of an organization. The Software Engineering Environment Authority is responsible for the implementation of the organization's engineering environment policy and for assisting Project Managers in setting up compliant environments for their projects. The Software Development Plan will document project specific requirements and deviations from the organizational standard. The detail of what is required to satisfy this practice is defined under the Rational Unified Process component 'Environment'.

  Management Practice 3.2.3

  Provide adequate skilled human resources meeting the defined competencies.

  This practice is in fulfillment of the plans produced in MP 3.2.1. The Rational Unified Process does not cover human resource selection and monitoring. The Rational Unified Process recognizes the need for training and has training materials covering process, methods, and tools.

  Management Practice 3.2.4

  Provide adequate process infrastructure according to the defined needs of the process.

  This practice is in fulfillment of the plans produced in MP 3.2.2. The Rational Unified Process requires that planning for the acquisition of a project Software Engineering Environment (SEE) be described in the Software Development Plan (SDP). This, along with all other plans, is subject to periodic status assessment. The Project Manager and then Software Engineering Environment Authority (SEEA) will decide if changes need to be made in the light of increased demand or changing technology. The

> ***Rational Unified Process covers infrastructure support generally but is not prescriptive about the day-to-day tracking and monitoring of SEE use.***

Rating

Some omissions from the Rational Unified Process (in areas it was not designed to cover) prevent full achievement of these attributes. *PA 3.1* and *PA 3.2* are therefore rated as *largely achieved*.

Consequently, according to the rating rules of ISO 15504, the highest rating that any of CUS.1, ENG.1, etc. can achieve under the Rational Unified Process, without addition, is Level 3: Established Process, even though some of the characteristics of Level 4 and Level 5 may be present.

Level 4: Predictable Process

PA 4.1 Process Measurement Attribute

The extent to which the execution of the process is supported by goals and measures that are used to ensure that implementation of the process contributes to the achievement of the goals.

- In order to achieve this capability, a process needs to have goals and associated measures defined that enable the execution of the process to be controlled to achieve the goals.

    Management Practice 4.1.1

    Define process goals and associated measures that support the business goals of the organization.

    The Rational Unified Process does not have predefined process goals but does define a set of pragmatic measures relevant to schedule, expenditure, and quality. However, goals will be set in a project context and will be related to the accomplishment of an iteration. Trends are deemed as, or more, important than absolute values. The Rational Unified Process does not specify the use of particular statistical process control techniques. The metrics specified by the Rational Unified Process are also (deliberately) focused on actual software product and less on the artifacts of the processes. The practice performance characteristics for MP 4.1.1 suggest a level of quantification detail and granularity that is not supported by the Rational Unified Process.

    Management Practice 4.1.2

    Provide adequate resources and infrastructure for data collection.

    The Rational Unified Process expects that the collection of metrics will be largely automated if it is to be effective. The Rational Unified Process does not describe in any detail additional infrastructure or resources for the level of detail intended at Level 4.

    Management Practice 4.1.3

    Collect the specified measurement data from the implementation of the defined process.

    This practice is the fulfillment of MP 4.1.1. Again, the focus in the Rational Unified Process is on the evaluation of the results of an iteration - the software - so there is a difference in emphasis.

    Management Practice 4.1.4

    Evaluate achievement of process goals by comparison of recorded measures.

The level of evaluation required by the Rational Unified Process is against the plan for each iteration. The granularity of assessment of goal achievement will be coarser.

PA 4.2 Process Control Attribute

The extent to which the execution of the process is controlled through the collection and analysis of measures to control and correct, where necessary, the performance of the process to reliably achieve the defined process goals.

- In order to achieve this capability, a process needs to gather and analyze process measures to ensure that the execution of the process is controlled to achieve the process goals.

   Management Practice 4.2.1

   Identify analysis and control techniques appropriate to the process context.

   *ial***The Rational Unified Process is not prescriptive at this level. The analysis recommended is of trends of metrics which mainly derive from software product rather than process artifacts.***

   Management Practice 4.2.2

   Provide adequate resources and infrastructure for analysis and process control.

   The kinds of analysis and corrective action required by the Rational Unified Process are within the capability of the Project Manager, Software Engineering Process Authority (SEPA), and the development team to perform. When appropriate, corrective actions will flow to the organizational level. The kinds of skills and techniques implied by the performance characteristics of MP 4.2.2 are not addressed by the Rational Unified Process.

   Management Practice 4.2.3

   Analyze available measures to identify process control parameters.

   This practice is the fulfillment of MP 4.2.1. The Rational Unified Process requires status and iteration assessments which would demonstrate that analysis and corrective action occurred at the level described in the comments against MP 4.2.1.

   Management Practice 4.2.4

   Identify deviations and take required control actions to maintain control of the process.

   See MP 4.2.3.

Rating

The Rational Unified Process covers some of the requirements of Level 4 but not at the level of detail or with the focus required by the standard. A rating of ***partially achieved*** is appropriate for ***PA 4.1*** and ***PA 4.2.***

Level 5: Optimizing Process

PA 5.1 Process Change Attribute

The extent to which changes to the definition, management and performance of the process are controlled better to achieve the business goals of the organization.

- In order to achieve this capability, a process will use a quantitative understanding of the process to identify and implement changes to the standard process definition to enable it to more effectively fulfill the process and business goals.

Management Practice 5.1.1

Identify and approve changes to the standard process definition on the basis of quantitative understanding of the process.

The Rational Unified Process has mechanisms (metrics, assessments, corrective action, and change management) which with the cooperation of project management and SEPA can lead to organizational process change. The SEPA is also tasked to keep up to date with technology changes, because these may also be a trigger for process change. However, the Rational Unified Process does not contain detail on some of the practice performance characteristics required by the guidelines in the standard. For example, the 'process of making process change' (and analyzing the consequences) is not described in any detail.

Management Practice 5.1.2

Provide adequate resources to effectively implement the approved changes in affected tailored processes.

This practice is in fulfillment of MP 5.1.1. The Rational Unified Process facilitates this by having a defined process and requiring change management.

Management Practice 5.1.3

Implement the approved changes to the affected tailored processes to achieve the expected outcome.

See MP 5.1.2.

Management Practice 5.1.4

Validate the effectiveness of process change on the basis of actual performance against the process and business goals.

The Rational Unified Process requires that process improvement be checked for ROI but offers no detail on how this is to be achieved. There is a granularity difference from what is required by MP 5.1.4.

PA 5.2 Continuous Improvement Attribute

The extent to which changes to the process are identified and implemented to ensure continuous improvement in the fulfillment of the defined business goals of the organization.

- In order to achieve this capability, a process will identify and implement improvements to the tailored process to improve process performance according to business goals and provide input to make changes to the standard process definition.

Management Practice 5.2.1

Identify improvement opportunities in a systematic and proactive manner to continuously improve the process.

Not addressed by the Rational Unified Process.

Management Practice 5.2.2

Establish an implementation strategy based on the identified opportunities to improve process performance according to business goals.

Not addressed by the Rational Unified Process.

Management Practice 5.2.3

Implement changes to selected areas of the tailored process according to the implementation strategy.

Not addressed by the Rational Unified Process.

Validate the effectiveness of process change on the basis of actual performance against process and business goals and feedback to the standard process definition.

> ***Not addressed by the Rational Unified Process.***

Rating

At Level 5, the Rational Unified Process has some of the characteristics required for PA 5.1 but nothing for PA 5.2, so will rate *partially achieved* for *PA 5.1* and *not achieved* for *PA 5.2.*

Customer Supplier Process Category (CUS)

CUS.1 Acquire Software

The purpose of the Acquire Software Process is to obtain the product and/or service which will satisfy the need expressed by the customer. The acquisition process is enacted by the acquirer. The process begins with the identification of a customer need and ends with the acceptance of the product and/or service needed by the customer. As a result of successful implementation of the process:

- a contract will be developed which clearly expresses the expectation, responsibilities, and liabilities of both the supplier and the customer;
- a product and/or service will be produced which satisfies the customer need;
- the acquisition will be managed so that specified constraints (e.g. such as cost, schedule and quality) are met.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer request	Product needs assessment	Vision, Business Case
Internal requirements	Product/service requirements	Vision
Supplier proposal response	Acquisition strategy/plan	Business Case
Supplier history record	Request for proposal	Derived from Business Case and Vision
Assessment/audit record	Analysis results	Not prescriptive at this level
Contract	Review records	Not prescriptive at this level
Analysis results	Contract	Technical content derived from Business Case, Vision and initial Development Plan
Acquisition strategy	Acceptance test strategy	Development Plan

Base Practices:

CUS.1.1 Identify the Need

Identify a need to acquire, develop, or enhance a software product.

Note: The need may be necessitated by a number of circumstances including business, regulatory, research, safety, or security.

> ***The Rational Unified Process identifies a process component called 'Management' which has a subprocess called 'Planning'. During the Inception Phase of the lifecycle, the Rational Unified Process requires the production of initial iterations of the Vision Document, the Business Case, and the Development Plan. In the Vision and Business Case, the need is elaborated.***

CUS.1.2 Define the Requirements

Identify the requirements for a system and/or software product that will satisfy the need for a new product and/or service.

Note: This definition of the requirements may be done completely or partially by the supplier. See ENG.1, Develop System Requirements and Design and ENG.2, Develop Software Requirements. Also see CUS.2, Manage Customer Needs. CUS.1 focuses on defining requirements when the software organization is acting as a customer. CUS.2 focuses on obtaining requirements when the software organization is acting as a supplier. The primary difference is one of perspective, depending on the role being performed.

> *The initial pass at defining (user/customer-oriented) requirements is done during the preparation of the Vision. Later as development iterations occur, the requirements will be refined. The Vision document is updated as necessary, but is expected to have stabilized by the end of the elaboration phase.*

CUS.1.3 Prepare the Acquisition Strategy

Prepare a strategy for the acquisition of the product.

Note: Refer to characteristics for Acquisition Strategy for details to be covered.

> *In the Rational Unified Process, this will occur during the preparation of the Business Case.*

CUS.1.4 Prepare Request for Proposal.

Prepare a request for proposal tender including acquisition requirements and project schedule.

> *The Rational Unified Process is not explicit about this activity.*

CUS.1.5 Select Software Product Supplier

Select a supplier for the acquired software product and/or service based on an evaluation of supplier proposals, capabilities and other factors which may be specific to the product.

> *The Rational Unified Process is not explicit about this activity.*

CUS.1.6 Determine Interfaces to Independent Agents and Subcontractors.

Determine the customer interfaces to independent agents involved in the conduct of the project, and any other parties, such as subcontractors, who will be involved in the work described in the contract, or whose work will impact its success, and document in the contract.

> *The Rational Unified Process is not explicit about this activity.*

CUS.1.7 Negotiate the Contract.

Negotiate a contract with the supplier.

> *The Rational Unified Process is not explicit about this activity.*

CUS.1.8 Support the Contractor.

Establish and provide the support required by the contractor.

Note: This support may be for example in the form of documentary inputs, provision of personnel to participate in activities such as validation of requirements or provision of facilities such as access to equipment interfacing to the equipment under development.

The Rational Unified Process is not explicit about this activity.

CUS.1.9 Accept the Supplied Product.
Establish and agree acceptance criteria and the means of evaluation to be used. Carry out the evaluation of the product or service against the agreed criteria.
Note: Acceptance of software products is usually on the basis of passing an agreed set of tests, but other criteria and methods of evaluation such as inspection or audit may be used. Acceptance evaluations may be by the customer, by the supplier (usually witnessed by the customer) or by a third party.

> ***The Rational Unified Process expects that the Development Plan will capture the agreed test approach so as to meet contractual requirements, including demonstration to the customer. Where a formal acceptance process (in addition to demonstrations or tests) is needed prior to handover, this can be covered in the Deployment Plan. The default approach in the Rational Unified Process is that each iteration will be demonstrated to the customer and assessed against evaluation criteria contained in the Iteration Plan.***

Capability Rating for CUS.1

Level 1: Performed Process
Given the scope of CUS.1, it is clear that the Rational Unified Process does not cover all the requirements of the standard explicitly – but it was not intended to do so. It will therefore rate a ***largely achieved (L)*** for ***PA 1.1,*** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***CUS.1*** is ***Level 1.***

CUS.2 Manage Customer Needs

The purpose of the manage customer needs process is to manage the gathering, processing, and tracking of ongoing customer needs and requirements throughout the operational life of the software; to establish a software requirements baseline which serves as the basis for the project's software work products, and activities; and to manage changes to this baseline. As a result of successful implementation of the process:

- clear and ongoing communication with the customer will be established;
- documented and agreed customer requirements will be defined, with managed changes;
- customer requirements will be established as a baseline for project use;
- a mechanism will be established for ongoing monitoring of customer needs;
- a mechanism will be established for ensuring that customers are easily able to determine the status and disposition of their requests.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer request Customer requirements Analysis results Risk analysis record Contract Change history Work breakdown structure	Customer request	Change request
	Market analysis	Not prescriptive at this level
	Communication mechanism	Not prescriptive at this level
	Review records	Not prescriptive at this level
	Product needs assessment	Vision, Business Case
	Customer support procedures	Expected to be covered in outline in Organizational Policy and instantiated in Development /Maintenance Plan but not prescribed separately.
	Commitment/agreements	Implicit but not prescribed

Customer requirements	Vision
Contract	Technical content in Business Case, Vision and Development Plan.
Change control record	The Rational Unified Process assumes that this will be part of an automated CM system (such as the one Rational supplies) and that it will be possible to navigate from change request to changes made to a baseline.
Change history	Again, this should be part of an automated CM system.
Project plan	Development Plan
Traceability record/mapping	The Rational Unified Process expects that fine-grain traceability will be handled automatically between the requirements, design, and implementation models. The iteration plan will reference evaluation criteria which will select scenarios for implementation and trace these and other non-functional requirements to Vision and Business Case. The iteration assessment will list use cases and scenarios implemented and trace tests to evaluation criteria.
Corrective actions	Change Request/Software Change Order and associated registers – these are expected to be part of an automated change/configuration management system.

Base Practices:

CUS.2.1 Obtain Customer Requirements and Requests.

Obtain customer requirements and requests through direct solicitation of customer and user input and through review of customer business proposals, target hardware environment, and other documents bearing on customer requirements.

> *The Rational Unified Process recommends a deep customer involvement in development, as part of composite teams, and in value-added Verification & Validation (V&V) using their own evaluation environments. The Rational Unified Process also requires assessments to be performed for each iteration, focusing on product functionality and quality, as well as regular status assessments focusing on project progress and other metrics. Customers will participate in both kinds of assessment. This level of exposure will give customers every opportunity to provide input into a project. The initial direction for a project will be set by the Vision Document and the Business Case, which will often form the basis of a contract.*

CUS.2.2 Agree on Requirements

Obtain agreement across teams on the customer's requirements, obtaining the appropriate sign-offs by representatives of all teams and other parties contractually bound to work to these requirements.

> *In the Rational Unified Process, all stakeholders are expected to participate in the elicitation and analysis of requirements. It is part of the conduct of formal reviews and assessments that all participants indicate their concurrence with the record of proceedings: achieving this concurrence is a major objective of the major milestone reviews. In the Iteration Readiness Review, a minor milestone, the customer and development organizations review the iteration plan and associated evaluation criteria so there is full and shared understanding of the goals for the next iteration. However, the Rational*

Unified Process is not specific about the detail and mechanisms for obtaining and signifying agreement.

CUS.2.3 Establish Customer Requirements Baseline
Document the customer's requirements and establish as a baseline for project use.

The Rational Unified Process places great emphasis on the change management of controlled baselines for all artifacts and product. The Vision Document is a customer-oriented artifact that stabilizes early. The development requirements artifacts are also baselined for change management, but not 'frozen', so they can accommodate the increasing understanding of the problem as iterations proceed.

CUS.2.4 Manage Customer Requirements Changes
Manage all changes made to the customer requirements to ensure those who are affected by the changes are able to assess the impact and risks, and initiate appropriate change control and mitigation actions.

The Rational Unified Process has a well-defined change management process in which a Change Control Board entity ensures that all stakeholders have the opportunity to provide input into the technical, project, and risk implications of a change.

CUS.2.5 Understand Customer Expectations
Review with customers and users their requirements and requests to better understand their needs and expectations.

The Rational Unified Process requires the involvement of customers and users in the development process and review process. By its iterative nature and focus on demonstration, the Rational Unified Process ensures a high degree of visibility and an objective assessment of software product, not simply requirements artifacts.

CUS.2.6 Keep Customers Informed
Keep customers informed about the status of and disposition of their requirements and requests.
Note: this may include joint meetings with the customer or formal communication to review the status for their requirements and requests; refer SUP.6, *Perform Joint Reviews.*

This is accomplished at several levels in the Rational Unified Process by having customers as a part of the development team, actively participating in review, V&V, and demonstration. The formal reporting of status would be done at the periodic status reviews.

Capability Rating for CUS.2

Level 1: Performed Process
The Rational Unified Process covers the important practices without significant omissions; this permits a rating of *fully achieved (F)* for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *CUS.2* is Level 3*.*

CUS.3 Supply Software

The purpose of the Supply Software process is to package, deliver, and install the software at the customer site; and to ensure that quality software is delivered as defined by the requirements. As a result of successful implementation of the process:

- requirements for packaging, delivering and installing the software will be determined;
- software will be packaged in a way that facilitates its efficient and effective installation and operation;
- quality software as defined by the requirements will be successfully delivered to the customer and installed in accordance with the identified requirements.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer requirements	Review records	Not prescriptive at this level
Analysis results	Contract	Technical content in Business Case, Vision and Development Plan
Contract		
Customer Documentation	Installation Plan	(part of) Deployment Plans
System	Installation Guide	Installation Artifacts, part of End-User Support Material
Acceptance Test Strategy/Plan		
	Release Notes	Release Notes, part of End-User Support Material
	Delivery Instructions	Not prescriptive at this level
	Installation Record	Not prescriptive at this level
	Packaging Record	Not prescriptive at this level
	Release Package	Not prescriptive at this level
	Delivery Record	Not prescriptive at this level
	Acceptance Record	Not prescriptive at this level
	Handling and Storage Guide	Not prescriptive at this level
	Test Results	Test Evaluation Report
	Contract Review Records	Not prescriptive at this level

Base Practices:

CUS.3.1 Review Before Contract Finalization
Review the contents of the contract prior to its finalization.

> *The Rational Unified Process would regard the contract as any other artifact – subject to review. The Rational Unified Process is not otherwise explicit about this activity.*

CUS.3.2 Negotiate Contract
Negotiate a contract with the customer.

> *The Rational Unified Process is not explicit about this activity.*

CUS.3.3 Determine Interfaces to Independent Agents and Subcontractors
Determine the supplier interfaces to independent agents involved in the conduct of the project, and any other parties, such as subcontractors, who will be involved in the work described in the contract, or whose work will impact its success, and document in the contract.

> *The Rational Unified Process strongly recommends that subcontractors should be working to a common Development Plan and that the characteristics of the relationship between contractor and subcontractor should be the same as the customer-contractor relationship. Otherwise, there is nothing explicit about this activity.*

CUS.3.4 Develop System or Software

Develop the system and/or software defined in the contract, so as to meet the requirements of the customer.

Note: this will involve invoking the relevant processes from the Engineering Process Category, and managing their implementation.

> ***The mapping to this activity is done against the relevant engineering processes.***

CUS.3.5 Review Development with Customer

Review technical aspects of the development on a regular basis with the customer.

Note: this may include joint meetings with the customer or formal communication to review the status for their requirements and requests; refer SUP.6, Perform Joint Reviews.

> ***The review process is integrated with the management and engineering processes and mapped with these. The Rational Unified Process also calls for Iteration Assessments where the iteration results are discussed.***

CUS.3.6 Provide Customer Feedback

Maintain communications with the customer, keeping them up to date with progress, costs and risks to successful completion.

Note: this practice is supplementary to CUS.3.5; it focuses on progress and risks, while the former practice is concerned with ensuring technical quality of the delivered product.

> ***The Rational Unified Process also calls for periodic Status Assessments where progress against plan, and risk management are discussed.***

CUS.3.7 Deliver and Install Software

Identify the requirements for delivery and successful installation of the software or system, and supply the product in a manner acceptable to the customer.

> ***The Rational Unified Process has a process component called Deployment which covers the activities of packaging, distribution, installation, and acceptance of software product.***

Capability Rating for CUS.3

Level 1: Performed Process

The Rational Unified Process largely covers the practices required for CUS.3, but there are sufficient omissions and lack of prescription in some areas to say that a rating of ***largely achieved (L)*** is appropriate for ***PA 1.1,*** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***CUS.3*** is Level 1**.**

CUS.4 Operate Software

The purpose of the Operate Software process is to support the correct and efficient operation of the software for the duration of its intended usage in its installed environment. As a result of successful implementation of the process:

- operational risks for the software introduction and operation will be identified and mitigated;
- the software will be operated in its intended environment according to documented procedures;
- operational support will be provided by resolving operational problems and handling user inquiries and requests;
- assurance will be provided that software (and host system) capacities are adequate to meet user need.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Problem Report	Risk Analysis	Risk List
Service Level Measures	Test Results	Test Evaluation Report
Field Measures	Change Request	Change Request/SCO
Test Plan	Service Level Measures	No equivalent
Test Script	Work-Around	Part of SCO, otherwise not prescriptive
Test Case	Problem Report	Change Request/SCO
System	Communication Mechanism	Not prescriptive at this level
Job Procedures		
Customer Request		

Base Practices:

CUS.4.1 Identify Operational Risks
Identify and mitigate risks to system operation and functionality.
> ***Not covered by the Rational Unified Process.***

CUS.4.2 Perform Operational Testing
Perform operational testing of each release of the software, assessing satisfaction against specified criteria.
> ***This is analogous to the test approach used for each iteration in the Rational Unified Process, which is mapped under ENG.5 and ENG.6.***

CUS.4.3 Operate the Software
Operate the software in its intended environment and in the specified way.
> ***Not covered by the Rational Unified Process.***

CUS.4.4 Resolve Operational Problems
Identify, record, and resolve problems arising from operation of the software (i.e. problems encountered by the operator as opposed to a user).
Note: the elimination of the cause of the operational problem will be handled by the SUP.8, Perform Problem Resolution.
> ***Operational problems are treated in the Rational Unified Process as any other problem or change request and this is mapped under ENG.7, Maintain System and Software, and SUP.8, Perform Problem Resolution.***

CUS.4.5 Handle User Requests
Monitor, record, and respond to all user requests and problems relating to the software, forwarding as appropriate to the maintenance function.
Note: the implementation of approved requests will be achieved through ENG.7, Maintain System and Software.
> ***The Change Management component of the Rational Unified Process handles all sources of change requests. More mapping is provided under ENG.7.***

CUS.4.6 Document Temporary Workarounds
Provide documented temporary work-arounds as appropriate to maintain operation of the system until a permanent solution to a problem can be found.
Note: the customer should be informed of the status and availability of the permanent solution.
> ***The Rational Unified Process is not prescriptive at this level, other than to have the CR/SCO record the workaround as part of the analysis.***

CUS.4.7 Monitor System Capacity and Service

Provide the capability to monitor system capacity and operational service on a regular basis, where appropriate.

> ***The Rational Unified Process has no equivalent activity.***

Capability Rating for CUS.4

Level 1: Performed Process

The Rational Unified Process covers only some of the practices and products required for CUS.4 and a rating of ***partially achieved (P)*** is appropriate for ***PA 1.1,*** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***CUS.4*** is ***Level 0.***

CUS.5 Provide Customer Service

The purpose of the Provide Customer Service process is to establish and maintain an acceptable level of service to the customer to support effective use of the software. As a result of successful implementation of the process:

- the customer support service needs will be identified on an ongoing basis;
- customer satisfaction with both the support services being provided and the product itself will be assessed on an ongoing basis;
- customer needs will be met through delivery of appropriate services.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Contract	Training Records	Not prescriptive at this level
Requirements Specification	Communication Mechanism	Not prescriptive at this level
Customer Requirements	Service Level Measures	No equivalent
Field Measures	Customer Satisfaction Data	No equivalent
Problem Reports	Benchmarking Data	No equivalent
Customer Satisfaction Survey	Customer Support Procedures	Not prescriptive at this level, the Deployment Plans will reference the procedures.
Review Records		
Customer Support Procedures		
Training Material		
Training Strategy/Plan		

Base Practices:

CUS.5.1 Train Customer

Provide training and documentation, as appropriate, to the customer so that the software can be effectively used.

> ***The Rational Unified Process requires that the preparation of Training Materials and the delivery of Training be done as part of the Deployment process component.***

CUS.5.2 Establish Product Support

Establish a service by which the customer can raise problems and questions encountered in use of the software, and receive help in resolving them.

> ***Support is delivered as part of Deployment and arrangements will be described in Deployment Plans.***

CUS.5.3 Monitor Performance

Monitor the operational performance of the software in order to be aware of problems which might impact level of service.

The Rational Unified Process is not explicit about this practice.

CUS.5.4 Determine Customer Satisfaction Level

Determine the level of customer satisfaction with the software products and services received.

Note: this may involve, as appropriate, field performance data, surveys, interviews, and studies. In some instances, the end-user of the software may be different from the customer of the software. In this case, both the customer and end-user satisfaction levels should be determined.

The Rational Unified Process is not explicit about this practice.

CUS.5.5 Compare with Competitors

Compare and monitor the level of customer satisfaction obtained for the software and services received relative to that of competitors.

Note: It may be necessary to obtain information on competitors from third party sources. It may also be necessary to include information on how competitors define:

- customer satisfaction;
- measurement techniques;
- criteria;
- collection and evaluation methods

to provide a meaningful comparison. Where comparative data is not available, absolute targets (e.g. % customers very satisfied, % repeat business) may be used as a basis for planning.

The Rational Unified Process is not explicit about this practice.

CUS.5.6 Communicate Customer Satisfaction

Communicate customer satisfaction data throughout the supplier organization, in a manner appropriate to the staff involved and the nature of the findings.

The Rational Unified Process is not explicit about this practice.

Capability Rating for CUS.5

Level 1: Performed Process

The Rational Unified Process covers only some of the practices and products required for CUS.5 and a rating of **partially achieved (P)** is appropriate for **PA 1.1,** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for **CUS.5** is **Level 0.**

Engineering Process Category (ENG)

ENG.1 Develop System Requirements and Design

The purpose of the Develop System Requirements and Design process is to establish the system requirements (functional and non-functional) and architecture, identifying which system requirements should be allocated to which elements of the system and to which releases. This process should be achieved by a group of people representing the diverse components of the system such as users, operators, hardware, software, etc. As a result of successful implementation of the process:

- requirements of the system will be developed that match the customer's stated and implied needs;
- an effective solution will be proposed that identifies the main elements of the system;
- the defined requirements will be allocated to each of those main elements;

- a relevant release strategy will be developed that defines the priority for implementing system requirements;
- the requirements, proposed solution and their relationships will be communicated to all affected parties.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer Requirements Maintenance Requirements Product Needs Assessment Customer Request Change Request Market Analysis	System Requirements	No equivalent in the Rational Unified Process
	System Design/Architecture	No equivalent in the Rational Unified Process
	Traceability Record/Mapping	No equivalent at this level
	Release Strategy/Plan	Project Plan (part of *Software* Development Plan – if system is all software)

Base Practices:

ENG.1.1 Identify System Requirements
Use the customer requirements as the basis for defining the required functions and capabilities of the system and document in a system requirements specification.

ENG.1.2 Analyze System Requirements
Analyze the prioritized requirements, identifying the necessary elements of the system and the interfaces between them.

ENG.1.3 Describe System Architecture
Establish the top-level system architecture.

ENG.1.4 Allocate Requirements
Allocate all system requirements to the elements of the top-level system architecture.

Note: the result of performing base practices ENG.1.2 to ENG.1.4 is a documented product configuration which describes the position of each element in the system architecture and the requirements which it must address.

ENG.1.5 Determine Release Strategy
Prioritize the system requirements and map them to future releases of the system.

ENG.1.6 Communicate System Requirements
Establish communication mechanisms for dissemination of system requirements, and updates to requirements to all parties who will be using them.

> ***The Rational Unified Process does not address system level (hardware, software, etc.) analysis and design except when the definition of 'system' collapses to all software, in which case the 'system' level artifacts are the same as the software artifacts.***

Capability Rating for ENG.1

Level 1: Performed Process
The Rational Unified Process covers none of the practices and products required for ENG.1 and a rating of **not achieved (N)** is appropriate for **PA 1.1,** the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for **ENG.1** is **Level 0.**

ENG.2 Develop Software Requirements

The purpose of the Develop Software Requirements process is to establish the requirements of the software component of the system. As a result of successful implementation of the process:
- the requirements allocated to software components of the system and their interfaces will be defined to match the customer's stated and implied needs;
- analyzed, correct and testable software requirements will be developed;
- the impact of software requirements on the operating environment will be understood;

- a relevant software release strategy will be developed that defines the priority for implementing software requirements;
- the software requirements will be approved and updated as needed;
- the software requirements will be communicated to all affected parties.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer Requirements Maintenance Requirements Product Needs Assessment Customer Request Change Request System Design/Architecture Problem Reports Communication Mechanism Database Design	Software Requirements	Use Case Model Survey, Supplementary Specification
	Analysis Results	Not prescriptive at this level

Base Practices:

ENG.2.1 Specify Software Requirements

Determine and analyze requirements of the software components of the system and document in a software requirements specification.

> *The Requirements Capture process component of the Rational Unified Process produces a Use Case Model and Supplementary Specification, capturing the software functional and non-functional (performance, quality, etc.) requirements of the system.*

ENG.2.2 Determine Operating Environment Impact

Determine the interfaces between the software requirements and other components of the operating environment, and the impact that the requirements will have.

Note: the operating environment includes tasks performed by or other systems used by the intended users of the software product.

> *The method used to reason about and capture the intended behavior of the system is the Use Case, which emphasizes the interactions between the proposed system and external entities (Actors) both human and non-human (other systems, for example), and thus clearly delineates system boundaries.*

ENG.2.3 Evaluate Requirements with Customer

Communicate the software requirements to the customer, and based on what is learned through this communication, revise if necessary.

Note: a suitable framework should be used for this communication. Measured user trials provide the best information but are expensive. Hands-on trials are better than a demonstration. Review of a paper specification is not to be encouraged. Refer also to the process CUS.2, Manage Customer Needs.

> *The Rational Unified Process requires that the Use Case Model and Supplementary Specification be reviewed with the customer and the user. Given the nature of these models, it is sensible to review them in their 'natural' electronic form. However, the primary means of evaluation in the Rational Unified Process is through the demonstration of working software at each iteration. The demonstrations intended in the Rational Unified Process are not lightweight or informal, but against a well-defined set of goals and associated evaluation criteria for each iteration. User participation is not precluded, but nor is it required – project-specific circumstances and planning will decide this.*

ENG.2.4 Determine Release Strategy

Prioritize the software requirements and map them to future releases of the software.

> *The Project Plan, which is part of the Software Development Plan, will be updated at each iteration – it contains the objectives and functionality for all planned iterations. The Iteration Plan is produced for each iteration, and describes the iteration contents in more detail. One of the prime drivers in the Rational Unified Process is the early exposure and mitigation of risk.*

ENG.2.5 Update Requirements for Next Iteration

After completing an iteration of requirements, design, code, and test, use the feedback obtained from use to modify the requirements for the next iteration.

> *An Iteration Assessment review is held at the conclusion of each iteration to determine how well objectives were met, review test results, and decide if plans and requirements need to be adjusted for the next iteration.*

ENG.2.6 Communicate Software Requirements

Establish communication mechanisms for dissemination of software requirements, and updates to requirements to all parties who will be using them.

> *The Rational Unified Process describes various models that are produced as part of the Requirements Capture component. These models may be transmitted to stakeholders in electronic form if, as the Rational Unified Process recommends, interested parties have at least a subset of the development environment to be used for assessment and V&V activities. If necessary, the models can be turned to document form. The Rational Unified Process strongly suggests this be automated, and describes how this can be done using tools supplied by Rational.*

Capability Rating for ENG.2

Level 1: Performed Process

The Rational Unified Process effectively covers all of the practices and products required for ENG.2 and a rating of *fully achieved (F)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ENG.2* is Level 3.

ENG.3 Develop Software Design

The purpose of the Develop Software Design process is to define a software architecture that accommodates the requirements and which can be tested against them. As a result of successful implementation of the process:

- an architectural design will be developed that describes major software components which accommodate the software requirements;
- internal and external interfaces of each software component will be defined;
- a detailed design will be developed that describes software units that can be built and tested;
- traceability will be established between software requirements and software designs.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Software Requirements	High level software design	Software Architecture (Document)
System Design/Architecture	Low level software design	Design Model

	Traceability record/mapping	Traceability in Design Model (to Use Case Model). Architecture describes how quality requirements are satisfied.
	Database Design	Design Model (but little detail)

Base Practices:

ENG.3.1 Develop Software Architectural Design

Transform the software requirements into a software architecture that describes the top-level structure and identifies its major components.

> ***The Architectural Design activity in the Analysis and Design component of the Rational Unified Process maps clearly to ENG.3.1.***

ENG.3.2 Design Interfaces

Develop and document a design for the external and internal interfaces.

> ***The Rational Unified Process uses the UML as its notation. As a matter of course, this requires that the interfaces for subsystems and classes be considered and captured in the design model. The Architecture Document will also describe important interfaces.***

ENG.3.3 Develop Detailed Design

Transform the top-level design into a detailed design for each software component. The software components are refined into lower levels containing software units. The result of this base practice is a documented software design, which describes the position of each software unit in the software architecture.

Note: the detailed design includes the specification of interfaces between the software units.

> ***In the Rational Unified Process, the design model is elaborated until all classes needed for an iteration have been specified, with their attributes and operations. The internal design of a class can be described with a state diagram (or if more appropriate, an activity diagram) which describes the interaction between the operations and the attributes. The Rational Unified Process does not require that every individual operation be designed down to the level of PDL because a high level programming language such as Ada or C++ does not need this. The design approach used leads naturally to the specification of class interfaces and the relationships between classes.***

> ***In the Rational Unified Process, the software design is captured in a Design Model using the UML notation, which has rigorously defined syntax and semantics. The model is most sensibly and conveniently produced using some kind of computer-based design tool (such as Rational's Rose), and retained in electronic form for dissemination and review and as the basis for implementation. The Rational Unified Process has the concept of 'reports' which are produced directly (and, ideally, automatically) from models, including the design model. These are snapshots of the evolving models, with particular items of interest delineated (for example, for review). They are not necessarily ever taken to hard copy; the Rational Unified Process does not prohibit this, but cautions against routinely producing paper copies.***

ENG.3.4 Establish Traceability

Establish traceability between the software requirements and the software designs.

In the Rational Unified Process, software functional requirements are expressed in Use Cases and are related to Use Case Realizations by a trace dependency. Thus, traceability at this level is built into the notation and design method. Non-functional requirements, which are captured in the Supplementary Specifications, are traced largely in the architectural design process, with design decisions captured in the Architecture Document.

The Rational Unified Process is not prescriptive about establishing the traceability of non-functional requirements that do not find a home in the Architecture Document. The Evaluation Criteria for each iteration would pick these up (along with the functional and other non-functional requirements) and the Iteration Assessment determines their satisfaction.

The Rational Unified Process – through iterative development and demonstration of working software – is able to avoid the undue concentration on traceability and the bureaucratic overhead that goes with it, without putting at risk the timely satisfaction of user needs.

Capability Rating for ENG.3

Level 1: Performed Process
The Rational Unified Process effectively covers all of the practices and products required for ENG.3, *in spite of weaknesses in Database Design and Traceability*, and a rating of **fully achieved (F)** is appropriate for **PA 1.1,** the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for **ENG.3** is Level 3.

ENG.4 Implement Software Design

The purpose of the Implement Software Design process is to produce executable software units and to verify that they properly reflect the software design. As a result of successful implementation of the process:
- verification criteria will be defined for all software units against software requirements;
- all software units defined by the design will be produced;
- verification of the software units against the design is accomplished.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Low level software design Database design Reuse repository Coding standards Software requirements System requirements	Software units (code)	Implementation Model/Components
	Test plan	Test plan
	Unit test script	Test Case
	Test Case	Test Procedure
	Test results	Test evaluation report

Base Practices:

ENG.4.1 Develop Software Units
Develop and document each software unit.
Note: this base practice involves creating and documenting the final representations of each software unit.

28

In the Rational Unified Process, an Implementation Model is constructed by the Architect with the Design Model as a primary input. The Implementation Model shows the structure of the system in terms of subsystems and components and, in the simple case, will map directly to the design model. The Implementation Model is built using UML notation and by default stored electronically. Important and interesting decisions about the Implementation Model are reported in the Implementation View section of the Architecture Document. An Implementer will be responsible for taking class definitions to code according to the implementation map provided by the architect in the Implementation Model.

ENG.4.2 Develop Unit Verification Procedures

Develop and document procedures for verifying that each software unit satisfies its design requirements.

Note: the normal verification procedure will be through unit testing, and the verification procedure will include unit test cases and unit test data.

The Rational Unified Process requires that each implemented class be subjected to unit test against its specification.

The Rational Unified Process is a little vague about how the unit tests are to be defined and how results are to be reported but does refer to the Test section so it is possible to infer that Test Cases, Test Procedures, and Test Evaluation reports are produced.

ENG.4.3 Verify the Software Units

Verify that each software unit satisfies its design requirements and document the results.

See comments against ENG.4.2.

Capability Rating for ENG.4

Level 1: Performed Process

The Rational Unified Process effectively covers all of the practices and products required for ENG.4, *in spite of vagueness about the documentation of Unit Tests*, and a rating of *fully achieved (F)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ENG.4* is Level 3*.*

ENG.5 Integrate and Test Software

The purpose of the Integrate and Test Software process is to integrate the software units with each other producing software that will satisfy the software requirements. This process is accomplished step by step by individuals or teams. As a result of successful implementation of the process:

- an integration strategy will be developed for software units consistent with the release strategy;
- acceptance criteria for aggregates will be developed that verify compliance with the software requirements allocated to the units;
- software aggregates will be verified using the defined acceptance criteria;
- integrated software will be verified using the defined acceptance criteria;
- test results will be recorded;

- a regression strategy will be developed for retesting aggregates or the integrated software should a change in components be made.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
System requirements Software requirements Maintenance requirements Change control High level software design Low level software design System design/architecture Software units (code) Release strategy/plan	Regression test strategy	Test Plan
	Traceability record/mapping	Iteration Assessment
	Build lists	Implementation Model, Release Notes
	Integration test strategy/plan	Test Plan, Integration Build Plan, Iteration Plan
	Integration test script	Test Case
	Software test plan	Test Plan, Iteration Plan
	Software test script	Test Case
	Test Case	Test Procedure
	Test results	Test Evaluation Report (for anomalous results)
	Integrated software	Implementation Model

Base Practices:

ENG.5.1 Determine Regression Test Strategy

Determine the strategy for retesting aggregates should a change in a given software unit be made.

> *The Rational Unified Process puts great emphasis on regression testing because it is built on an iterative approach. Additions and refinements are made to the tests that are executed for each build, accumulating a body of tests, which are used for regression testing at later stages. Most tests of iteration X are used as regression tests in iteration X+1. In iteration X+2, you would use most tests from iteration X and iteration X+1 as regression tests, and the same principle would be followed in subsequent iterations. Part of the suggested regression test strategy advised by the Rational Unified Process is the use of automated regression test support.*

> *Note that the Rational Unified Process focuses on regression testing as applied at the integration level, although it does suggest that regression testing should also be considered at the class level. The Rational Unified Process is also not explicit about where the regression test strategy should be captured, only by implication can the Test Plan be identified as fulfilling this purpose.*

ENG.5.2 Build Aggregates of Software Units

Identify aggregates of software units and a sequence or partial ordering for testing them.

Note: typically, the software architecture and the release strategy will have some influence on the selection of aggregates.

> *In the Rational Unified Process, Components are Integrated into Subsystems which in turn are integrated into (Software) Systems. Iteration Planning will identify the Use Cases which are to be realized for each iteration, and this, in conjunction with architectural input, will define the components (and their operations) needed for each iteration. As components are completed, they will be incrementally integrated (into partial or complete subsystems) in a Build*

Process. The selection of components, subsystems, and their ordering will be defined in the Integration Build Plan.

ENG.5.3 Develop Tests for Aggregates

Describe the tests to be run against each software aggregate, indicating software requirements being checked, input data and acceptance criteria.

> ***Based on the Iteration Plan and the Test Plan, Test Cases and Procedures are developed for each iteration for Integration Testing, which will (incrementally) demonstrate the Use Cases or Scenarios selected for the iteration. Note that the Rational Unified Process primary driver for test definition is the Use Case, so that in the (potentially several) builds that occur during an iteration, the test designer will have to identify the effect of the threads that traverse a subsystem. The kinds of tests that are to be performed will be identified in the Test Plan. The Test Case will describe the requirement (perhaps derived) that drove its creation. Note also that tests intended to probe subsystems are not prohibited from spanning subsystems so that more than one is tested at once – it will depend on how the builds are done and whether stubs are built. Integration testing is build–oriented (and based on the implementation model). Test components and subsystems may also need to be developed during integration testing.***

ENG.5.4 Test Software Aggregates

Test each software aggregate against the acceptance criteria, and document the results.

> ***The test execution step is identified in the Rational Unified Process, but not described in detail – only the steps are identified, including result verification and analysis, and logging of defects.***

ENG.5.5 Integrate Software Aggregates

Integrate the aggregated software components to form a complete system.

> ***In the Rational Unified Process, subsystems are integrated incrementally into system builds – which are then tested – based on the Implementation Model.***

ENG.5.6 Develop Tests for Software

Describe the tests to be run against the integrated software, indicating software requirements being checked, input data, and acceptance criteria. The set of tests should demonstrate compliance with the software requirements and provide coverage of the internal structure of the software.

Note: tests can be developed during process, ENG.2, *Develop Software Requirements,* ENG.3, *Develop Software Design* and ENG.4, *Implement Software Design.* Commencement of test development should generally not wait until software integration.

> ***The Rational Unified Process requires the performance of System Testing. The incremental nature of the integration process means that System Testing for an iteration is the natural culmination of the integration process. As before, testing will be driven by Use Cases or Scenarios, and the Test Plan will identify the kinds of testing that are to be performed. The Test Plan also establishes coverage requirements. In the Rational Unified Process, test planning and development can begin as soon as the required input artifacts to the activity are available – there is nothing inherent in the process which delays these activities until software integration.***

31

ENG.5.7 Test Integrated Software

Test the integrated software against the acceptance criteria, and document the results.

> *The test execution step is identified in the Rational Unified Process, but not described in detail – only the steps are identified, including result verification and analysis, and logging of defects.*

Capability Rating for ENG.5

Level 1: Performed Process

The Rational Unified Process effectively covers all of the practices and products required for ENG.5, *in spite of a lack of detail about regression test planning and test execution*. A rating of *fully achieved (F)* is appropriate for *PA 1.1,* the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ENG.5* is Level 3*.*

ENG.6 Integrate and Test System

The purpose of the Integrate and Test System process is to integrate the software component with other components – such as manual operations, hardware – producing a complete system that will satisfy the users expectations expressed in the system requirements. This process is managed step by step by a group of people including a software expert. As a result of successful implementation of the process:

- an integration plan will be developed to build system unit aggregates according to the release strategy;
- acceptance criteria for each aggregate will be defined to verify compliance with the system requirements allocated to the units;
- system aggregates will be verified using the defined acceptance criteria;
- an integrated system demonstrating compliance with the system requirements (functional, non-functional, operations and maintenance) will be constructed;
- test results will be recorded;
- a regression strategy will be developed for retesting aggregates or the integrated system should a change in components be made.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
System requirements	Build lists	Implementation Model, Release Notes
Software requirements	Integration test strategy/plan	Test Plan, Integration Build Plan
Maintenance requirements	Traceability record/mapping	Iteration Assessment
System design/architecture	Integration test script	Test Case
High level software design		
Low level software design	Test Case	Test Procedure
Release strategy/plan	Test results	Test Evaluation Report (for anomalous results)
System components		
	System test plan	Test Plan
	System test script	Test Case
	System	Implementation Model

Base Practices:

ENG.6.1 Build Aggregates of System Elements

Identify aggregates of system elements and a sequence or partial ordering for testing them.

Note: typically, the system architecture and the release strategy will have some influence on the selection of aggregates.

> *In the Rational Unified Process as it currently stands, a system is defined as:*

"As an instance, an executable configuration of a software application or software application family; the execution is done on a hardware platform. As a class, a particular software application or software application family that can be configured and installed on a hardware platform. In a general sense, an arbitrary system instance."

Therefore, the Rational Unified Process does not provide anything additional to support system testing, as the term is used in 15504.

ENG.6.2 Develop Tests for Aggregates.
Describe the tests to be run against each system aggregate, indicating software requirements being checked, input data, system components needed to perform the test, and acceptance criteria.
> ***See ENG.6.1.***

ENG.6.3 Test System Aggregates.
Test each system aggregate ensuring that it satisfies its requirements, and document the results.
> ***See ENG.6.1.***

ENG.6.4 Develop Tests for System.
Describe the tests to be run against the integrated system, indicating system requirements being checked, input data, and acceptance criteria.
Note: this can be performed during process ENG.1, *Develop System Requirements and Design.*
Note: the set of tests should demonstrate compliance with the system requirements.
> ***See ENG.6.1.***

ENG.6.5 Test Integrated System.
Test the integrated system ensuring that it satisfies the system requirements, and document the results.
> ***See ENG.6.1.***

Capability Rating for ENG.6

Level 1: Performed Process
The Rational Unified Process deliberately covers none of the practices and products required for ENG.6, and a rating of ***not achieved (N)*** is appropriate for ***PA 1.1,*** the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***ENG.6*** is ***Level 0.***

ENG.7 Maintain System and Software

The purpose of the Maintain System and Software process is to manage modification, migration and retirement of system components – hardware, software, manual operations, network if any – in response to user requests. The origin of requests might be a problem or the need for improvement or adaptation. The objective is to modify and/or retire existing systems and/or software while preserving the integrity of organizational operations. As a result of successful implementation of the process:

- the impact of (changes to?) organization, operations and interfaces on the existing system in operation will be defined;
- specifications, design documents and test plans will be updated;
- modified system components will be developed with associated documentation and test that demonstrate that the system requirements are not compromised;
- system and software upgrades will be migrated to the user's environment;

- on request, software and systems will be retired from use in a controlled manner that minimizes disturbance to the users.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer requirements Customer request Problem reports System design/architecture Change request Testing strategy Regression test strategy Change control	Maintenance requirements	Use Case Model Survey, Supplementary Specification, Iteration Plan
	Analysis results	Not prescriptive at this level
	Change control record	The Rational Unified Process assumes that this will be part of an automated CM system (such as Rational supplies) and that it will be possible to navigate from change request to changes made to a baseline.
	Release strategy/plan	Project Plan (part of *Software* Development Plan – if system is all software), Iteration Plan
	Release package	Not prescriptive at this level
	Release information	Release Notes, part of End-User Support Material

Base Practices:

ENG.7.1 Determine Maintenance Requirements
Determine the system and software maintenance requirements, identifying the system and software elements to be maintained, and their required enhancements.
Note: some of the required enhancements may have been previously planned but deferred.

> ***There is no separate activity in the Rational Unified Process directed at the determination of enhancements. The Rational Unified Process, based on an iterative approach is therefore already adapted to the introduction of change during development. It requires that structures and procedures be put in place to handle customer requests and feedback, however these are not particularly distinguished from the equivalent structures and procedures that are used in development.***

ENG.7.2 Analyze User Problems and Enhancements
Analyze user problems and requests and required enhancements, evaluating the possible impact of different options for modifying the operational system and software, system interfaces, and requirements.
Note: this base practice links to the process SUP.8, *Perform Problem Resolution*

> ***The Rational Unified Process defines Change Management as part of the supporting process components, and the analysis of problem reports and change requests is part of the Change Management process.***

ENG.7.3 Determine Modifications for Next Upgrade
Based on the above analyses, determine which modifications should be applied in the next system or software upgrade, documenting which software units and other system elements and which documentation will need to be changed and which tests will need to be run.

> ***The Rational Unified Process describes the selection of requirements and evaluation criteria for inclusion in the next iteration in the Iteration Plan, but this is done in a development context.***

ENG.7.4 Implement and Test Modifications

Use the other engineering processes, as appropriate, to implement and test the selected modifications, demonstrating that the unmodified system and software requirements will not be compromised by the upgrade.

> ***The inclusion of modifications and fixes in an iteration will be subjected to extensive regression testing in the Rational Unified Process, but again, all these activities are described in a development context.***

ENG.7.5 Upgrade User System

Migrate the upgraded system and software with applied modifications to the user's environment, providing for, as appropriate

- parallel operation of the previous and upgraded systems;
- additional user training;
- support options;
- retirement of the previous system.

> ***The Deployment Component of the Rational Unified Process covers all these issues, in outline form only, in the current release.***

ENG.7.6 Retire User System

Following approval, retire the obsolete system from the user environment, providing for, as appropriate

- parallel operation with replacement systems;
- conversion of data to new or replacement systems
- archiving of system and data files
- user training for the conversion program

> ***The Deployment Component of the Rational Unified Process mentions these issues but the treatment is very brief.***

Capability Rating for ENG.7

Level 1: Performed Process

If the treatment of maintenance in a development context is seen as acceptable then the Rational Unified Process largely covers the practices required for ENG.7, and a rating of ***largely achieved (L)*** is correct for ***PA 1.1,*** the *Process Performance Attribute.* However, there are enough differences in emphasis, and the treatment in some areas is so brief, that at the current release, a rating of ***partially achieved (P)*** is more appropriate. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***ENG.7*** is ***Level 0.*** However, the work to bring this to Level 1 would not be great.

Management Process Category (MAN)

MAN.1 Management Process

Basic Process

The purpose of the Management process is to organize, monitor, and control the initiation and performance of any processes or functions within the organization to achieve their goals and the business goals of the organization in an effective manner. As a result of successful implementation of the process:

- the activities and tasks that must be performed to achieve the purpose of the process or function will be identified;
- the feasibility of achieving process with available resources and constraints will be evaluated;

35

- the resources and infrastructure required to perform the identified activities and tasks will be established;
- activities will be identified and tasks will be implemented;
- performance of the defined activities and tasks will be monitored;
- work products resulting from the process activities will be reviewed and results analyzed and evaluated;
- action will be taken to modify the performance of the process or function when performance deviates from the identified activities and tasks;
- successful achievement of the purpose of the process or function will be demonstrated.

Note: this process supports performance of the process attributes 2.1 and 2.2 in those instances where it is invoked.

> ***Note that the Rational Unified Process does not define Management process in a generic, organizational level way. The Rational Unified Process is specific to software development and an organization which implements it successfully may still have inadequate management practice in other areas.***

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Requirements (applicable customer, software, system) Contract Commitment/agreements Project Measures Business Goals Quality Statement/Policy Life Cycle Models Software Development Methodology Job Procedures, Practices Training Strategy Tracking System Business Plan Process Measures Standards	Project Plan	Software Development Plan
	Project's Reuse Strategy	Software Development Plan (Development Case), Programming Guidelines, Software Architecture Document. This is not articulated in one place – reuse is part of the fabric of the Rational Unified Process and the Development Case will reflect its importance in a particular project.
	Project's Acquisition Strategy/Plan	Project Plan, Iteration Plan (under Resources) Note: this is dealt with in a lightweight way
	Estimates	Business Case, Project Plan, Iteration Plan. Metrics captured as required by Measurement Plan and reported in the Status Assessment
	Work Breakdown Structures	Project Plan, Iteration Plan Note: little prescriptive detail is provided on WBS, alternative structures, etc.
	Schedule	Project Plan, Iteration Plan
	Progress Status Report	Status Assessment
	Review Records	Not prescriptive at this level. The Rational Unified Process requires various reviews so the implication is that records will be kept, but the detail of these is not described.
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Quality Strategy/Plan	Software Development Plan. Note that the Rational Unified Process relies mainly on effective testing, in an iterative approach, to demonstrate quality. The Development Case (part of the SDP) will describe how the process is tailored to meet the quality requirements.
	Review Strategy/Plan	Software Development Plan

Input	Output	Equivalent Output in the Rational Unified Process
	Project Measures	Measurement Plan
	Analysis Results	The Rational Unified Process is not prescriptive at this level
	Risk Management Plan	Software Development Plan
	Communication Mechanism	The Rational Unified Process is not prescriptive at this level
	Training Records	The Rational Unified Process is not prescriptive at this level

Base Practices:

MAN.1.BP1 Identify Activities and Tasks
Identify the activities and tasks that have to be performed to achieve the purpose of the process or function and establish meaningful milestones.

> *The Rational Unified Process defines activities to be performed in software development, including those for management, and requires the Project Manager to select an appropriate lifecycle model and build a Development Case (as part of the Software Development Plan) which tailors the Rational Unified Process to suit the organization and project.*

MAN.1.BP2 Evaluate feasibility of achieving process.
Evaluate the feasibility of achieving process with available resources and constraints.

> *The Rational Unified Process requires the production of a Vision artifact during the Inception Phase and resource constraints will be identified which will be considered in the formulation of the Business Case and Risk List. This is done early in the Inception Phase and used as one of the checks on whether the project should proceed.*

MAN.1.BP3 Plan and allocate resources and infrastructure.
Plan and allocate the resources and infrastructure required to perform the identified activities and tasks according to a defined time schedule.

> *The development of a Project Plan and staffing according to this plan is the responsibility of the Project Manager. The selection, acquisition, and deployment of the software development environment are done as part of the environment workflow, with various workers participating.*

MAN.1.BP4 Implement activities.
Implement activities and tasks by assigning clear responsibilities to individuals.

> *The Staffing Plan, which is part of the Software Development Plan, will define the overall organizational shape and responsibilities during the 'staff project' activity. The Iteration Plan will do a finer grain allocation of work packages in the WBS to groups and individuals.*

MAN.1.BP5 Monitor performance.
Regularly monitor performance of the defined activities and tasks with respect to achievement of the established milestones within the defined cost and time constraints.

> *The Project Manager, as part of the 'Execute Iteration Plan' activity, is required to monitor progress against the metrics defined in the Measurement Plan. The Rational Unified Process suggests a minimum set of metrics which can be used to monitor progress and quality. The Status Assessment and Iteration Assessment artifacts are used to make information visible to all stakeholders.*

MAN.1.BP6 Review work products and evaluate results.
Review work products for completeness and quality and evaluate results.

The Rational Unified Process requires reviews at several levels, including one at the end of an activity (such as Design Test) to determine whether the activity has been successfully completed. There are also major review points, such as 'Review Requirements' at the end of core workflows. The iterative approach also means that regular demonstrations of capability are planned against evaluation criteria defined in the Iteration Plan.

MAN.1.BP7 Take action to modify performance.

Take appropriate action to modify performance of the process or function when performance deviates from what is expected.

The major checkpoint for project health is at the end of each iteration when an Iteration Evaluation is performed, and changes are scheduled to address deficiencies. Each minor review that raises issues is not concluded until these are resolved. The Rational Unified Process's guidelines on metrics also require that trends be monitored and corrective actions initiated when required.

MAN.1.BP8 Demonstrate successful achievement.

Demonstrate successful achievement of the purpose of the process or function by using quantitative or qualitative evidence.

At the top level, the Rational Unified Process is based primarily around the demonstration of working software through an iterative approach. At a lower level, activities are described which produce defined artifacts, which are subjected to review and corrective action if appropriate. A metrics program is put in place to provide objective evidence of progress and quality.

Capability Rating for MAN.1

Level 1: Performed Process

The Rational Unified Process contains all of the required base practices *but describes them in a project context.* There are also a few gaps in the Associated Work Products. The Rational Unified Process really was not intended to address *MAN.1* so a rating of *partially achieved (P)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *MAN.1* is *Level 0.*

MAN.2 Project Management Process

Basic Process

The purpose of the *Project management process* is to identify, establish, coordinate, and monitor activities, tasks, and resources necessary for a project to produce a product and/or service meeting the requirements. As a result of successful implementation of the process:

- the scope of the work for the project will be defined;
- the feasibility of achieving the goals of the project with available resources and constraints will be evaluated;
- the tasks and resources necessary to complete the work will be sized and estimated;
- interfaces between elements in the project, and with other projects and organizational units, will be identified and monitored;
- plans for execution of the project will be developed and implemented;
- progress of the project will be monitored and reported;
- actions to correct deviations from the plan and to prevent recurrence of problems identified in the project, will be taken when project targets are not achieved.

NOTE   This process supports performance of the process attribute 2.1 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Requirements (applicable customer, software, system) Commitment/agreements Risk Analysis Project Measures Risk Management Plan Quality Statement/Policy Life Cycle Models Software Development Methodology Job Procedures, Practices Tracking System Process Measures Standards Development environment	Project Plan	Software Development Plan
	Project's Reuse Strategy	Software Development Plan (Development Case), Programming Guidelines, Software Architecture Document. This is not articulated in one place – reuse is part of the fabric of the Rational Unified Process and the Development Case will reflect its importance in a particular project.
	Project's Acquisition Strategy/Plan	Project Plan, Iteration Plan (under Resources) Note: this is dealt with in a lightweight way.
	Estimates	Business Case, Project Plan, Iteration Plan. Metrics captured as required by Measurement Plan and reported in the Status Assessment.
	Work Breakdown Structures	Project Plan, Iteration Plan Note: little prescriptive detail is provided on WBS, alternative structures, etc.
	Schedule	Project Plan, Iteration Plan
	Progress Status Report	Status Assessment
	Review Records	Not prescriptive at this level. The Rational Unified Process requires various reviews so the implication is that records will be kept, but the detail of these is not described.
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Review Strategy/Plan	Software Development Plan
	Project Measures	Measurement Plan
	Analysis Results	The Rational Unified Process is not prescriptive at this level
	Communication Mechanism	The Rational Unified Process is not prescriptive at this level
	Configuration Management Plan	CM Plan

Base Practices

MAN.2.BP1 Define the scope of work.

Define the work to be undertaken by the project, and determine that achievement of the goals of the project is feasible with available resources and constraints.

Note: for the identification of quality goals see MAN.3.BP1.

> *In the Inception Phase, the Rational Unified Process describes the creation of two artifacts, the Vision and the Business Case, which together describe the scope of the project and the economic justification for it. The feasibility of the project will be considered at this stage and the risks identified. At the end of the inception phase, it will be determined whether the project should or should not continue based on economic and technical risk considerations.*

MAN.2.BP2 Determine development strategy.

Evaluate options available for achieving the goals of the project, and determine, on the basis of risks and opportunities, which strategy will be adopted.

> *The Rational Unified Process defines a set of activities, techniques, and artifacts that are used to develop software. It is possible when defining a development case to configure the process to suit the domain and style of the project – in fact, this is a required part of the Rational Unified Process. However certain techniques underpin Rational Unified Process – the use of OO analysis and design for example – and it is not possible to remove these from the Rational Unified Process.*

MAN.2.BP3 Select software life cycle model.

Select a software life cycle model for the project which is appropriate to the scope, magnitude and complexity of the project.

> *In the Rational Unified Process, the Process Engineer, using the Project Plan as input will configure Rational Unified Process to suit the project and organization, producing the Development Case. The Project Manager will use the Development Case as input when doing iteration planning. Rational Unified Process contains guidelines for the selection of suitable software life cycles.*

MAN.2.BP4 Size and estimate tasks and resources.

Size and estimate tasks and resources necessary to complete the work by evaluating the options available for achieving the goals of the project and by taking into consideration existing risks and opportunities.

Note: this implies for projects involving the development of software that a development strategy is determined, a software life cycle model which is appropriate to the scope, magnitude and complexity of the project is selected, and what is needed for the entire software life cycle to satisfy the software requirements is estimated.

Note: for the identification of existing risks see MAN.4.BP2.

> *The Rational Unified Process obviously requires that this be done to build a Project Plan and Iteration Plans. Some qualitative information is provided and there is some guidance on metrics but Rational Unified Process really has no substantial content on estimation.*

MAN.2.BP5 Develop work breakdown structure.

Develop a work breakdown structure incorporating project tasks, deliverables and sequence and relating these to the resources required to accomplish them and to the strategy to be followed.

> *The development of a detailed WBS is required for the Iteration Plan but no detailed guidance is provided – however a sample MS Project template is included as a starting point. There is no discussion of WBS structures.*

MAN.2.BP6 Identify infrastructure requirements.

Identify and select the environmental and human resource elements needed to support the project strategy and performance.

> *The Rational Unified Process has an entire core workflow, Environment, devoted to infrastructure and tools issues and setup, and an activity, Staff Project (driven by the Project Manager) to select appropriate human resources and form teams.*

MAN.2.BP7 Establish project schedule.

Establish the project schedule, based on the work breakdown structure, estimates, and infrastructure elements.

> *The Project Manager, having established the staffing and team structure, will produce an updated Project Plan and later a finer grained Iteration Plan.*

MAN.2.BP8 Allocate responsibilities.
Identify the specific individuals and groups contributing to, and impacted by, the project, allocate them their specific responsibilities, and ensure that the commitments are understood and accepted, funded and achievable.

> ***This is covered in the Rational Unified Process by the Staff Project and planning activities. However, there is little substance on alternative team structures.***

MAN.2.BP9 Identify interfaces.
Identify and monitor the efficiency of interfaces between elements in the project and with other projects and organizational units.

> ***There is little in the Rational Unified Process that deals with these aspects of project management and the discussion of interfaces (e.g. subcontractor, associate contractor) does not exist.***

MAN.2.BP10 Establish and implement project plans.
Provide a mechanism to ensure that project plans are formally developed, implemented and maintained, and available to those involved with the project. Document the results of the activities in this process within the project plans, and ensure that the plans are published to all those involved.

> ***The Software Development Plan, Project Plan, and Iteration Plan are all formal artifacts in the Rational Unified Process and will be placed under configuration management for controlled distribution to all stakeholders.***

MAN.2.BP11 Track progress against plans.
Regularly compare and report the status of the project against the project plans. Use disciplined approaches to regularly evaluate the performance of the project. Methods and techniques which can be applied include: metrics, technical and managerial reviews, assessment of established quality and performance criteria.

NOTE   For the establishment and assessment of quality criteria see MAN.3, *Quality management process*. For the evaluation of risks, see MAN.4, *Risk management process*.

> ***The Rational Unified Process deals with tracking through regular demonstration of progress (through iterations) and a metrics program designed to provide the Project Manager with objective evidence of trends. Work in progress is also subjected to review and corrective action. Major milestones, established at the phase transitions, keep all stakeholders expectations in synchronization.***
>
> ***Note that the Rational Unified Process does not contain much guidance on the set-up and conduct of major managerial and joint (all stakeholders) technical reviews. By implication, these occur, but Rational Unified Process only deals with them in passing.***

MAN.2.BP12 Act to correct deviations.
Actions are taken when project targets are not achieved, to correct deviations from the plan and to prevent recurrence of problems identified in the project. Project plans are updated accordingly.

> ***There is strong emphasis in the Rational Unified Process on the correction of problems identified by the trends in the metrics collection program and following the Iteration Assessment. Corrective action plans are also captured in the software assessment section of the SDP.***

***However, the absence of separate, well-delineated V&V and Quality Planning
leaves Rational Unified Process open to criticism.***

Capability Rating for MAN.2

Level 1: Performed Process

Certain base practices are not dealt with, or only weakly dealt with, under the Rational Unified Process. There are also a few gaps in the Associated Work Products. A rating of ***partially achieved (P)*** is appropriate for ***PA 1.1,*** the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***MAN.2*** is ***Level 0.***

MAN.3 Quality Management Process

New process

The purpose of the Quality Management Process is to monitor the quality of the project's products and/or services and to ensure that they satisfy the customer. The process involves establishing a focus on monitoring the quality of product and process at both the project and organizational level. As a result of successful implementation of the process:

- quality goals, based on the customer's stated and implicit quality requirements, will be established for various checkpoints within the project's software life cycle;
- an overall strategy will be developed to achieve the defined goals;
- identified quality control and assurance activities will be performed and their performance confirmed;
- actual performance against the quality goals will be monitored;
- appropriate action will be taken when quality goals are not achieved.
-

Note: This process supports performance of the process attributes 4.1 and 4.2 in those instances where it is invoked.

Note: This process goes beyond the quality control and assurance activities performed in *Quality assurance process* (SUP.3), to provide an overall approach to meeting the stated and implicit requirements of the customer.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer Requirements Project Plan Business Plan Quality Statement/Policy Quality Plan Work Breakdown Structure Review Strategy /Plan Field Measures	Quality Goals	Measurement Plan section (Measurement Plan is part of SDP)
	Project Plan	Software Development Plan
	Quality Strategy/Plan	Software Development Plan. Note that the Rational Unified Process relies mainly on effective testing, in an iterative approach, to demonstrate quality. The Development Case (part of the SDP) will describe how the process is tailored to meet the quality requirements.
	Quality Measures	Metrics that are to be collected to support the quality goals are defined in the Measurement Plan. The Status Assessment and the Iteration Assessment capture the actual metrics.
	Work Breakdown Structures	Project Plan, Iteration Plan Note: little prescriptive detail is provided on WBS, alternative structures, etc.
	Process performance data	This exists in the Rational Unified Process in various forms: defect reports, review reports, test reports, etc.

Input	Output	Equivalent Output in the Rational Unified Process
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Review Records	Not prescriptive at this level. The Rational Unified Process requires various reviews so the implication is that records will be kept, but the detail of these is not described.

Base Practices

MAN.3.BP1 Establish quality goals.

Based on the customer's stated and implicit requirements for quality, establish quality goals for the product and process that can be evaluated throughout the project, possibly in a quantitative manner.

Note: For projects involving the development of software quality goals are established for various checkpoints within the project's software life cycle.

> *The Rational Unified Process distinguishes between functional and non-functional requirements. Non-functional requirements such as product quality requirements are captured in the Supplementary Specification. The Measurement Plan defines how the quality goals are to be tracked (with defined metrics) and the part of the Iteration Assessment is to ensure that the iteration met its quality as well as functional requirements.*
>
> *The Rational Unified Process does not contain a heavyweight treatment of software quality issues. For example, it does not discuss the possible decomposition of high-level quality goals into subfactors that can be objectified and tracked through intermediate artifacts, for example, design. The premise is that, with a relatively simple set of metrics, it is possible to track emerging qualities such as reliability and maintainability directly in the evolving software.*

MAN.3.BP2 Define overall strategy.

Develop an overall strategy at the project and organizational level to achieve the defined goals by defining the metrics that will measure the results of project activities and by defining acceptance criteria that will help to assess whether the relevant quality goals have been achieved.

> *The Rational Unified Process requires that a Measurement Plan be produced which defines the metrics to be tracked. Evaluation Criteria are also set for each iteration.*
> *Again, the Rational Unified Process does not prescribe a very extensive, fine grain quality tracking program.*

MAN.3.BP3 Identify quality activities.

For each quality goal, identify quality control and assurance activities which will help achieve and monitor that quality goal, both at the project and organizational level.

Note: For projects involving the development of software these activities are integrated within the project's software life cycle, see also the SUP.3 Base Practices.

> *The Rational Unified Process has quality activities integrated at the engineering level: the main quality driver will be the use of demonstration of*

working software against defined evaluation criteria. Quality metrics are defined which will track the emerging software's quality compliance.

This apparent lack of clearly delineated 'quality' activities, owned and run by a separate organizational entity, may hinder the acceptance of the Rational Unified Process in organizations where such practice is entrenched.

MAN.3.BP4 Perform quality activities.
Perform the identified quality activities and confirm their performance.

> ***This can only be confirmed in an instance of the Rational Unified Process. The necessary activities are however prescribed by the process.***

MAN.3.BP5 Assess quality.
Throughout the project and at least at the identified checkpoints within the project's software life cycle, apply the defined quality metrics to assess whether the relevant quality goals have been achieved.

> ***The suggested metrics program in the Rational Unified Process will track trends in metrics and trigger corrective actions if out-of-bounds conditions arise. The Iteration Assessments are also clearly defined and are required points at which functional and quality compliance are tested.***

MAN.3.BP6 Take corrective action.
When defined quality goals are not achieved, take corrective or preventive action both at the project and organizational level.

Note: The corrective action can involve fixing the product generated by a particular project activity or changing the planned set of activities in order to better achieve the quality goals or both.   The preventive action can involve modifying product specifications or process definitions, or both, to prevent recurrence of the non-achievement.

> ***The Rational Unified Process requires that the corrective action process defined in the SDP be invoked when defects in function or quality are detected.***
> ***The Rational Unified Process does focus on product quality, but the issues of process compliance and quality are not considered in depth. A Defect, for example, is defined as a product anomaly or flaw.***

Capability Rating for MAN.3

Level 1: Performed Process
Certain base practices are not dealt with, or only weakly (in 15504 terms) dealt with, under the Rational Unified Process. There are also a few gaps in the Associated Work Products. A rating of *partially achieved (P)* is appropriate for *PA 1.1,* the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *MAN.3* is *Level 0.*

MAN.4 Risk management process

New process
The purpose of the *Risk management process* is to identify and mitigate the project risks continuously throughout the lifecycle of a project. The process involves establishing a focus on monitoring of risks at both the project and organizational levels.   As a result of successful implementation of the process:

- the scope of the risk management to be performed for the project will be determined;
- appropriate risk management strategies will be defined and implemented;
- risks to the project will be identified in the project strategy, and as they develop during the conduct of the project;

- the risks will be analyzed and the priority in which to apply resources to monitor these risks will be determined;
- risk metrics will be defined, applied, and assessed to determine the change in the risk state and the progress of the monitoring activities;
- appropriate action will be taken to correct or avoid the impact of risk.

Note: This process supports performance of the process attribute 2.1 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Project Plan Business Goals Software Development Methodology Risk Management Strategy/Plan Customer Requirements Estimates Quality Strategy/Plan Test Plan Installation Plan Project Measures Process Measures Quality Measures Field Measures Service Level Measures Customer Satisfaction Data Schedule Progress Status Report	Risk Analysis	Risk List captures the results but is not quite the same as a working analysis.
	Risk Management Plan	Risk List
	Risk Measures	Not maintained separately from the Risk List.
	Process Performance Data	Every activity in the Rational Unified Process has defined inputs and outputs and completion criteria. The activities also form the basis of the Project Plan. However, the kind of fine-grained process tracking implied here is not prescribed in the Rational Unified Process.
	Assessment/Audit Records	Not prescriptive at this level (except for the Status and Iteration Assessments which are at a coarser granularity).
	Review Records	The Rational Unified Process identifies that review records have to be output from review processes but is not prescriptive as to their contents.
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.

Base Practices

MAN.4.BP1 Establish risk management scope.
Determine the scope of risk management to be performed for the project, in accordance with organizational risk management policies.

Note: Issues to be considered include the severity, probability, and type of risks to identify and manage.

> ***This is not defined separately in the Rational Unified Process but is by implication part of the activity of identifying risk. The Rational Unified Process does not draw from the organizational context in this instance.***

MAN.4.BP2 Identify risks.
Identify risks to the project both initially within the project strategy and as they develop during the conduct of the project.

Note: Risks include cost, schedule, effort, resource, and technical risks.

> ***Risks are identified in the Rational Unified Process at the beginning of the project and are reexamined at the conclusion of each iteration (or more frequently with the status assessment if the iterations are long).***

MAN.4.BP3 Analyze and prioritize risks.
Assess the probability of occurrence, impact, time-frame, causes and interrelationships of risks for determining the priority in which to apply resources to mitigate these risks.

45

> *This is done as part of the 'Identify Risks' activity in the Rational Unified Process.*

MAN.4.BP4 Define risk management strategies.

Define appropriate strategies to manage each risk or set of risks, both at the project and organizational level.

> *This is done as part of the 'Identify Risks' activity in the Rational Unified Process.*
>
> *The Rational Unified Process does not deal extensively with the organizational level context.*

MAN.4.BP5 Define risk metrics.

For each risk (or set of risks) define the metrics that measure the change in the risk state and the progress of mitigation activities.

Note: Metrics should cover changes in the probability, impact and time-frame of risks

> *The 'Identify Risks' activity defines the metrics associated with risk management and captures them in the Risk List. The Measurement Plan will define how these are to be collected.*

MAN.4.BP6 Implement risk management strategies.

Carry out the defined management strategies both at the project and organizational level.

> *This practice is implicit in a deployed instance of the Rational Unified Process.*

MAN.4.BP7 Assess results of risk management strategies.

At identified checkpoints, apply the defined metrics to assess the expected progress and level of success of the risk management strategies.

> *The Rational Unified Process requires that risks be assessed regularly – at least with every iteration and more often if the iteration cycle is long.*

MAN.4.BP8 Take corrective action.

When expected progress in risk mitigation is not achieved, take appropriate corrective action to correct or avoid the impact of risk.

Note: Corrective action may involve developing and implementing new mitigation strategies or adjusting the existing strategies.

> *The requirement and procedures for corrective action are documented in the SDP. The triggers will occur with every risk assessment.*

Capability Rating for MAN.4

Level 1: Performed Process

The Rational Unified Process covers most of the requirements of 15504. The omissions and deficiencies do not preclude a rating of *largely achieved (L)* for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *MAN.4* is Level 1**.**

Support Process Category (SUP)

SUP.1 Documentation process

Extended Process

The purpose of the *Documentation process* is to develop and maintain documents that record information produced by a process or activity. As a result of successful implementation of the process:

- a strategy identifying the documents to be produced during the life cycle of the software product will be developed;

- the standards to be applied for the development of documents will be identified;
- all documents to be produced by the process or project will be identified;
- the content and purpose of all documents will be specified, reviewed, and approved;
- all documents will be developed and published in accordance with identified standards;
- all documents will be maintained in accordance with specified criteria.

Note: The process supports performance of the process attribute 2.2 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer Requirements Customer Request System Design/Architecture Product Needs Assessment Process Description Review Plan Distribution List Delivery Instructions Problem Reports Change Request Standards Quality Criteria	Documentation Requirements	The Rational Unified Process describes a set of documents as part of the prescribed artifact set; the Development Case will describe which artifacts are selected for a particular project. The Development Case may also require that certain Reports are made formal.
	Documentation Policy	The Development Case will be constructed with organizational policy as an input. The Rational Unified Process does prescribe a default set of documents and contents.
	Documentation Plan	There is no plan specifically targeted at documentation in the Rational Unified Process. The Development Case will describe required artifacts and reports.
	Process Performance Data	Every activity in the Rational Unified Process has defined inputs and outputs and completion criteria. The activities also form the basis of the Project Plan. However, the kind of fine-grained process tracking implied here is not prescribed in the Rational Unified Process.
	Customer Documentation	The Development Case will define which artifacts and reports need to be made formally deliverable based on project and organizational inputs. The Project Plan will already have captured a view of what should be prepared at each milestone.
	Review Records	The Rational Unified Process identifies that review records have to be output from review processes but is not prescriptive as to their contents.
	Delivery Record	Not prescriptive at this level
	Acceptance Record	Not prescriptive at this level
	Change Control	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Change History	Part of the automated configuration management system for items under CM – all artifacts to be delivered will be in this category.
	Work Product	Each artifact in the Rational Unified Process is defined with a set of characteristics (content, format, and style) so it may be evaluated.

Base Practices

SUP.1.BP1 Develop documentation policy.
Determine documentation policy which addresses where, when and what should be documented during the life cycle of the software product/service.

> *The Rational Unified Process is prescriptive about what artifacts are required and when they should be produced. These include documents and models. As part of configuring the Rational Unified Process, input about the organizational context is used to decide whether artifacts should be omitted or, if retained, what form they should take.*

> *The Rational Unified Process also describes reports which are views of models – these may also be used for documentation in the traditional sense.*

SUP.1.BP2 Establish standards for documents.
Establish standards for developing, modifying and maintaining documents.

> *The Rational Unified Process requires that these standards be developed and captured in the SDP.*

SUP.1.BP3 Specify documentation requirements.
Specify requirements for documents, including:

> title; date
> identifier;
> version history;
> author(s),
> authorizer;
> outline of contents;
> purpose;
> distribution list.

> *Every document is specified with an annotated outline and a template covering most of the items listed above (distribution list and authorizer missing).*

SUP.1.BP4 Develop documents.
Develop documents at required process points according to established standards.

> *This can only be confirmed in an instance of the Rational Unified Process, but the Rational Unified Process does prescribe the production of artifacts.*

SUP.1.BP5 Check document.
Review documents before submission and authorize documents before distribution or release.

Note: In the case of user documentation, this is a particularly important base practice, because documentation intended for use by system and software users should accurately describe the system and software and how it is to be used in a manner which is clear and useful to the user.

Note: Documents should be checked through verification or validation process with stakeholders.

> *Although the Rational Unified Process requires a review at the end of an activity, these reviews are not purely document–focused. There is an implication that all artifacts will receive some review attention, but this is lightly prescribed.*

SUP.1.BP6 Distribute document.
Distribute and confirm receipt of documents via appropriate media to specified audiences.

> *By implication (listed in the purpose or intended audience for an artifact), the document will be distributed but the Rational Unified Process is not prescriptive at this level.*

SUP.1.BP7 Maintain document.
Maintain documents according to the defined procedures.

Note: If the document 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.2, *Configuration management process*. If the document is part of a product baseline under maintenance, its maintenance is covered by process ENG.2, *System and software maintenance process*.

> ***As the process is iterated, artifacts will be updated because the Rational Unified Process characterizes them as a natural by-product of the software process. The Rational Unified Process also emphasizes the importance of a rigorous change and configuration management process.***
>
> ***There is no separate activity in the Rational Unified Process directed at the determination of enhancements. The Rational Unified Process, based on an iterative approach is, by its nature, adapted to the introduction of change during development, and requires that structures and procedures be put in place to handle customer requests and feedback. However, these are not particularly distinguished from the equivalent structures and procedures that are used in development.***

Capability Rating for SUP.1

Level 1: Performed Process

The Rational Unified Process covers most of the requirements of 15504. The omissions and deficiencies do not preclude a rating of **largely achieved (L)** for **PA 1.1,** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for **SUP.1** is Level 1**.**

SUP.2 Configuration management process

Basic Process

The purpose of the *Configuration management process* is to establish and maintain the integrity of all the work products of a process or project. As a result of successful implementation of the process:

- a configuration management strategy will be developed;
- all items generated by the process or project will be identified, defined, and baselined;
- modifications and releases of the items will be controlled;
- the status of the items and modification requests will be recorded and reported;
- the completeness and consistency of the items will be ensured;
- storage, handling, and delivery of the items will be controlled.

Note: The process supports performance of the process attribute 2.2 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Configuration Management Plan Configuration item Change Request Release Strategy/Plan Problem Reports Tracking System Product Configuration	Configuration Management (file, library, system)	In the Rational Unified Process, the Implementation Model will be built in the context of an automated CM system with all the characteristics described in the standard for this output. This could be expressed more clearly in the Rational Unified Process description.
	Configuration Item	The Implementation Model (this needs to be consistently defined) contains all configuration items. Through the CM system these are versioned and have change history.
	Change Control Record	In Rational Unified Process, the Change Request is statused and effectively becomes the record of change.

Input	Output	Equivalent Output in the Rational Unified Process
	Build Lists	Implementation Model, Release notes (although this needs to be made clear)
	Integrated Software	Part of the Implementation Model
	System	Implementation Model, Deployment Artifacts
	Release Package	Implementation Model, Deployment Artifacts
	Change History	The Rational Unified Process requires that Change History be maintained, either manually (in the source header, for example) or automatically through annotation of changes made through the CM system (the latter needs clarification).
	Configuration Management Plan	Configuration Management Plan
	Progress Status Record/Report	Status Assessment
	Communication Mechanism	Not prescriptive at this level
	Handling and Storage Guide	Not prescriptive at this level

Base Practices

SUP.2.BP1 Develop configuration management strategy.
Determine configuration management strategy, including configuration management activities and schedule for performing these activities.

> ***The Rational Unified Process requires the Configuration Manager to capture this strategy in the CM Plan.***

SUP.2.BP2 Establish configuration management system.
Establish a configuration management system including libraries, standards, procedures and tools.

> ***The Implementation Model is set up in the context of a CM tool.***

SUP.2.BP3 Identify configuration items.
Identify configuration items, such as software system, modules, components and related documents by identifying the documentation that establishes the baseline; the version references and other relevant identification details.

> ***This is part of the setup of the Implementation Model.***

SUP.2.BP4 Maintain configuration item description.
Maintain an up-to-date description of each configuration item.
Note: the description should identify:
-        its decomposition into lower level configuration components;
-        who is responsible for each item;
-        when it is placed under configuration management.

> ***This is part of the Implementation Model description.***

SUP.2.BP5 Manage changes.
Record and report status of configuration items and modification requests. Changes of any configuration items should be reviewed and authorized.

> ***The Rational Unified Process requires a Product Change Process to be established that is intended to satisfy these needs.***

SUP.2.BP6 Manage product releases.
Release and delivery of any configuration items should be reviewed and authorized.

> ***The Project Manager has ultimate authority over the release of a version of the Implementation Model. Delivery and installation is done according to the Deployment Plans. The Rational Unified Process is not prescriptive about Functional Configuration Audit and Physical Configuration Audit, for***

example, except to mention them under CM concepts. The Rational Unified Process possibly needs a separate Release Activity.

SUP.2.BP7 Maintain configuration item history.

Maintain a history of each configuration item in sufficient detail to recover a previously baselined version when required.

Version histories are supported by Rational's ClearCase, which is the kind of CM automation required for the Rational Unified Process to work efficiently.

SUP.2.BP8 Report configuration status.

Regularly report status of each configuration item and their relationship in the current system integration.

The Rational Unified Process has an explicit step in an activity for the Project Manager to define at what frequency configuration status is to be reported. The formal reporting vehicles for this would be the Status Assessment and the Iteration Assessment.

The Rational Unified Process does not explicitly tie back the plan for status reporting to the Status Assessment.

SUP.2.BP9 Manage the release and delivery of configuration items.

The storage, handling, release and delivery of the configuration items should be controlled.

The Project Manager and the Configuration Manager define the protocols for storage, handling, etc.

This is mentioned in the Rational Unified Process as part of a planning exercise but the plan execution is not clearly described. See comment above on release activities.

Capability Rating for SUP.2

Level 1: Performed Process

The Rational Unified Process covers most of the requirements of 15504. The omissions and deficiencies do not preclude a rating of *largely achieved (L)* for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *SUP.2* is Level 1**.**

SUP.3 Quality Assurance Process

Basic Process

The purpose of the Quality Assurance Process is to provide assurance that work products and processes of a process or project comply with their specified requirements and adhere to their established plans. As a result of successful implementation of the process:

- a strategy for conducting the quality assurance process activities and tasks will be developed, implemented, and maintained;
- evidence of quality assurance activities and tasks will be produced and maintained;
- problems or non-conformances with contract requirements will be identified;
- adherence of software products, processes and activities to the applicable standards, procedures, and requirements will be verified objectively;

Note: To be unbiased, quality assurance must have organizational freedom and authority from persons directly responsible for developing the software product or executing the process.

Note: Quality assurance should be coordinated with and may make use of the results of other supporting processes, such as Verification, Validation, Joint Reviews, Audits, and Problem Resolution.

Note: Establishment of a quality management system in accordance with ISO 9001 will establish a capable quality assurance process.

Note: The process supports performance of the process attributes 2.1 and 2.2 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Requirements Software Development Methodology Process Description Job Procedures, Practices Process Measures Quality Measures Project Plan Quality Strategy/Plan Review Strategy/Plan Project Measures Quality Criteria Standards Work Product Descriptions Quality Statement (policy) Quality Records	Quality Plan/Strategy	Software Development Plan. Note that the Rational Unified Process relies mainly on effective testing, in an iterative approach, to demonstrate quality. The Development Case (part of the SDP) will describe how the process is tailored to meet the quality requirements.
	Process Description	The Rational Unified Process is configured to create a Development Case which describes the project or organization specific process derived from the Rational Unified Process. The required characteristics are largely present in the Rational Unified Process (purpose, activities, inputs and outputs, etc.) Missing are: expected execution times, entry and exit criteria (other than implicit completion of preceding activities and availability of inputs), process measures (except for general statements), and quality expectations.
	Job Procedures, Practices	Not prescriptive at this level
	Standards	The Rational Unified Process can be made compliant with a variety of standards. It also contains standard requirements for activities and artifacts. However, in many cases, these are not described in the sort of detail required by 15504.
	Review records	Not prescriptive at this level.
	Assessment/Audit Record	Not prescriptive at this level (except for the Status and Iteration Assessments which are at a coarser granularity)
	Progress Status Record/Report	Status Assessment
	Meeting Minutes	Not prescriptive at this level
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.

Base Practices

SUP.3.BP1 Develop quality assurance strategy.
Develop, implement, and maintain quality policy, scope of assurance, and responsibilities for quality.

> *The Rational Unified Process is based on the notion that quality engineering is an integral part of the process and the responsibility of everyone on a project. The SDP (which is the responsibility of the Project Manager) has much to say about how software product is to be assessed and the*

Measurement Plan will define metrics to enable objective judgements to be made about emerging quality.

However, the Rational Unified Process is silent about the notion of the role of a separate independent Quality Assurance organization. The organizational context is dealt with in the formation of the Development Case. The lack of a distinct Quality Plan will be troublesome to some.

SUP.3.BP2 Establish quality standards.

Establish quality standards for each process and work product.

The Rational Unified Process is focused on software-products and does require the setting of quality standards for end-product; however, there is little defined for process and for intermediate artifacts. The exceptions are those things, such as architecture and design models, that are deemed to have a direct bearing on the quality of the end-product.

SUP.3.BP3 Define quality records.

Define quality records that demonstrate conformance of process and work products to quality standards.

Not prescribed.

SUP.3.BP4 Assure quality of process activities.

Carry out a series of activities to provide the required level of confidence that the software processes have followed the specified standards.

Not prescribed.

SUP.3.BP5 Assure quality of work products.

Carry out a series of activities to provide the required level of confidence that the work products meet the quality standards and requirements.

Partly defined (for some key artifacts).

SUP.3.BP6 Report quality results.

Report performances, deviations, and trends of the above activities to appropriate audience.

Not prescribed.

SUP.3.BP7 Handle deviations.

Any deviations should be reported, analyzed, corrected and further prevented.

Note: ISO/IEC 12207 contains specific requirements for the content of the verification plan.

Note: ISO/IEC 12207 contains specific criteria for verification activities that are dependent on the object of the verification activity.

A corrective-action process is defined but it relates to product.

Capability Rating for SUP.3

Level 1: Performed Process

The Rational Unified Process covers little of the requirements of 15504: the kind of quality process espoused by Rational Unified Process is not like that defined in 15504. This means that a rating of **not achieved (N)** is appropriate for **PA 1.1,** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for **SUP.3** is **Level 0.** Whether this is an area where the Rational Unified Process leads the standard is open to debate – there are certainly people who say the kind of process described in the standard is ineffective.

SUP.4 Verification Process

Basic Process

The purpose of the Verification Process is to confirm that each software work product and/or service of a process or project properly reflects the specified requirements. As a result of successful implementation of the process:

- a verification strategy will be developed and implemented;
- criteria for verification of all required software work products will be identified;
- required verification activities will be performed;
- identified defects will be found and removed from software work products;
- results of the verification activities will be made available to the customer and other involved organizations.

Note: The process supports performance of the process attribute 2.1 and 2.2 in those instances where it is invoked.
Note: The process normally involves the performance of testing of the work products to ensure that they fulfill their intended use.
Note: The process is closely linked with performance of the *Software testing process* (ENG.1.6) and *System integration and testing process* (ENG.1.7).
Note: ISO/IEC 12207 contains specific requirements for the content of the verification plan.
Note: ISO/IEC 12207 contains specific criteria for verification activities that are dependent on the object of the verification activity.
Note: This process is closely linked with performance of the *Software integration process* (ENG.1.5).
Note: The process may involve performance of techniques including peer reviews, formal proof, and traceability analysis, among others.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Requirements Software Development Methodology Process Description Work Product Project Plan Quality Strategy/Plan Review Strategy/Plan Quality Criteria Standards Work Breakdown Structures Test Strategy/Plan Coding Standards Progress Status Report Verification Policy	Verification Plan/Strategy	The SDP contains the plan for software assessment. In the Rational Unified Process this is very much focused on executable software product, but most activities in the Rational Unified Process conclude with a review. The Rational Unified Process does not require a separate Verification Plan – except for the Test Plan – with any particular contents.
	Meeting Minutes	Not prescriptive at this level
	Review Records	Not prescriptive at this level
	Assessment/Audit record	Not prescriptive at this level (except for the Status and Iteration Assessments which are at a coarser granularity).
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Quality Records	Not prescriptive at this level
	Quality Measures	Metrics that are to be collected to support the quality goals are defined in the Measurement Plan. The Status Assessment and the Iteration Assessment capture the actual metrics.
	Acceptance Record	Not prescriptive at this level
	Problem Report Record	Change Request

Input	Output	Equivalent Output in the Rational Unified Process
	Tracking System	In the Rational Unified Process, the Implementation Model will be built in the context of an automated CM and Change Control/Defect Tracking system, with all the characteristics described in the standard for this output. It is not perfectly clear in the Rational Unified Process that a system is an output.

Base Practices

SUP.4.BP1 Develop verification strategy.
Develop a verification strategy specifying the criteria for verification of all required work products.

> *The Rational Unified Process requires the production of an SDP, one of the sections of which covers the plan for software assessment. The Rational Unified Process prescribes some review points and associated checklists.*

> *However, this is not treated as a separate discipline – except for Test (considered as a form or component of V&V).*

SUP.4.BP2 Conduct verification.
Verify identified work products according to specified strategy.

> *The Rational Unified Process requires reviews and tests to be performed as planned, with appropriate corrective action follow-up.*

SUP.4.BP3 Determine actions for verification results.
Analyze problems found in verification and determine action to solve the problems.

> *This is part of the change/defect tracking process and system that the Rational Unified Process requires be established.*

SUP.4.BP4 Track actions for verification results.
Track status and results of actions for correcting problems identified in verification. The results should be made available to the customer and other involved organization.

> *This is part of the change/defect tracking process and system that Rational Unified Process requires be established.*

Capability Rating for SUP.4

Level 1: Performed Process
The Rational Unified Process covers all of the spirit of the requirements of 15504. However, the Rational Unified Process does not require the coverage of all work products that 15504 seems to need. Judged against the letter of 15504, the Rational Unified Process can only be awarded a rating of *largely achieved (L)* for *PA 1.1,* the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *SUP.4* is Level 1.

SUP.5 Validation process

Basic Process
The purpose of the Validation Process is to confirm that the requirements for a specific intended use of the software work product are fulfilled. As a result of successful implementation of the process:

- a validation strategy will be developed and implemented;

- criteria for validation of all required work products will be identified;
- required validation activities will be performed;
- all identified problems will be resolved;
- evidence will be provided that the software work products as developed are suitable for their intended use;
- results of the validation activities will be made available to the customer and other involved organizations.

Note: This process is closely linked with performance of the *System integration and testing process* (ENG.1.7).
Note: The process normally involves the performance of testing of the work products to ensure that they fulfill their intended use.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Software Development Methodology Process Description Work Product Traceability Record/Mapping Test Requirements Regression Test Strategy/Plan Integration Test Strategy/Plan Quality Strategy/Plan Review Strategy/Plan Quality Criteria Standards Test Strategy/Plan Validation Policy	Validation Plan/Strategy	The SDP and the Test Plan essentially fulfill this need.
	Test Script	Test Case
	Test Case	Test Procedure
	Test Results	Test Evaluation Report
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Quality Records	Not prescriptive at this level
	Review Records	Not prescriptive at this level
	Analysis Results	Will be part of the CR/Defect analysis – otherwise not prescriptive
	Problem Report Record	Change Request
	Tracking System	In the Rational Unified Process, the Implementation Model will be built in the context of an automated CM and Change Control/Defect Tracking system, with all the characteristics described in the standard for this output. It is not perfectly clear in the Rational Unified Process that a system is an output.
	Meeting Minutes	Not prescriptive at this level

Base Practices

SUP.5.BP1 Develop Validation Strategy
Develop a validation strategy specifying the criteria for validation of all required work products.

> *In Rational Unified Process, this activity is centered on Test (particularly System Test). For each iteration, a set of evaluation criteria, drawn from requirements, is used to demonstrate and validate the software.*
> *The Rational Unified Process does not describe validation (in the sense used here) for other artifacts. For example, the User Guide and training material might be subjected to validation for fitness-for-purpose, not in terms of content, but as didactic instruments.*

SUP.5.BP4 Perform validation.
Conduct validation using identified techniques, processes, and test cases against requirements and quality standards.

> **The Rational Unified Process specifies the requirements for Test in terms of methods and artifacts.**

SUP.5.BP5 Determine actions for validation results.

Analyze problems found in validation and determine action to the problems.

> **As in verification, this is part of the change/defect tracking process and system that the Rational Unified Process requires be established.**

SUP.5.BP6 Track actions for validation results.

Track status and results of actions for correcting problems identified in validation. The results should be made available to the customer and other involved organizations.

> **As in verification, this is part of the change/defect tracking process and system that the Rational Unified Process requires be established.**

Capability Rating for SUP.5

Level 1: Performed Process

The Rational Unified Process covers all of the requirements of 15504 for validation as it applies to executable software. If the interpretation of the requirements of 15504 is thus limited, a rating of **fully achieved (F)** is appropriate for **PA 1.1,** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for **SUP.5** is Level 3**.** If it is concluded that other artifacts should be included then the rating would change.

SUP.6 Joint review process

Basic Process

The purpose of the Joint Review Process is to maintain a common understanding with the customer of the progress against the objectives of the contract and what should be done to help ensure development of a product that satisfies the customer. Joint reviews are at both project management and technical levels and are held throughout the life of the project. As a result of successful implementation of the process:

- periodic reviews will be held at predetermined milestones;
- the status and products of an activity of a process will be evaluated through joint review activities between the customers, suppliers, and other stakeholders (or interested parties);
- review results will be made known to all affected parties;
- action items resulting from reviews will be tracked to closure.

Note: The process supports performance of the process attribute 2.1 in those instances where it is invoked.
Note: The process is most commonly invoked in circumstances where performance of a project is governed by a form of contract.
Note: ISO/IEC 12207 contains specific requirements for project management reviews and for technical reviews.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Contract Project Plan	Meeting Minutes	Not prescriptive at this level
Meeting Minutes Customer Request	Review Records	Not prescriptive at this level
Progress Status Report Problem Report	Review Strategy/Plan	Software Development Plan
Test Results Customer Requirements Acceptance Test Plan	Assessment/Audit Record	Not prescriptive at this level (except for the Status and Iteration Assessments which are at a coarser granularity)
Process Performance Data Process Measures	Acceptance Record	Not prescriptive at this level
Quality Strategy/Plan Risk Analysis Project Measures Quality Measures Service Level Measures Risk Management Plan Acceptance Record		

Input	Output	Equivalent Output in the Rational Unified Process
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.
	Improvement Opportunity	Would be done in the Rational Unified Process using a CR – the Rational Unified Process does not distinguish carefully between product changes and process changes.
	Contract Review Records	Not prescriptive at this level

Base Practices

SUP.6.BP1 Prepare joint review.
For preparing a joint internal (inter-process) or external (developer/customer) review, the following items should be prepared:

        scope of review;
        topics for review;
        attendees;
        responsibilities of attendants;
        desired outputs;
        a schedule;
        resource and facility requirements.

The Rational Unified Process defines review points and guidelines for reviews which cover all the base practices described here as they relate to reviews in general. However, the Rational Unified Process does not recognize, in any detail, specific planning or process for Joint Reviews.

SUP.6.BP2 Establish review criteria.
Establish criteria for a joint review, such as for problem identification, resolution and agreement.

SUP.6.BP3 Conduct joint management review.
Conduct periodic joint management reviews to evaluate and assess:

        proposal against requirements;
        achievement against project plan and schedule;
        risks;
        readiness to transfer to the next process.

SUP.6.BP4 Conduct joint technical review.
Conduct periodic joint technical reviews to evaluate and assess technical issues and status against customer requirements and acceptance criteria documented in the contract.

SUP.6.BP5 Conduct joint process review.
Conduct periodic joint process reviews to evaluate and assess suitability and capability of the current processes for a project.

SUP.6.BP6 Conduct joint system acceptance review.
Conduct joint system acceptance review to demonstrate to the customer that the final system's completeness and correctness in configuration and functionality complies with appropriate standards and specifications, and satisfies the acceptance criteria documented in the contract.

SUP.6.BP7 Determine actions for review results.
Analyze review report; distribute review report; propose resolution(s) for the review results; determine priority for actions.

SUP.6.BP8 Track actions for review results.
Track actions for resolutions of identified problems in a review; report and document changes of work products and processes.

Capability Rating for SUP.6

Level 1: Performed Process
The Rational Unified Process does not distinguish Joint Reviews, although it still requires reviews at critical points in an iteration and at phase transitions. Therefore, a rating of ***not achieved (N)*** is appropriate for ***PA 1.1,*** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *SUP.6* is *Level 0.*

SUP.7 Audit Process

Basic Process
The purpose of the Audit Process is to independently determine compliance of selected products and processes with the requirements, plans, and contract, as appropriate. As a result of successful implementation of the process:

- an audit strategy will be developed and implemented;
- audits will be held at predetermined milestones;
- compliance of selected software work products and/or services or processes with requirements, plans, and contract will be determined according to the audit strategy;
- the conduct of audits by an appropriate independent party will be arranged;
- problems detected during an audit will be identified, communicated to those responsible for corrective action, and resolved.

Note: The process supports performance of the process attribute 2.1 in those instances where it is invoked.
Note: This process may be employed by any two parties, where one party (auditing party) audits the software products or activities of another party (audited party).
Note: ISO/IEC 12207 identifies specific software work products (and results of an activity) to be audited.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Process Description Standards	Audit Plan	No equivalent
Audit Policy Business Plan Quality Strategy/Plan Contract Problem Report Test Results Customer Requirements	Quality Strategy/Plan	Software Development Plan. Note that the Rational Unified Process relies mainly on effective testing, in an iterative approach, to demonstrate quality. The Development Case (part of the SDP) will describe how the process is tailored to meet the quality requirements.
Test Plan Corrective Actions Customer Documentation	Assessment/Audit Record	Not prescriptive at this level (except for the Status and Iteration Assessments which are at a coarser granularity).
Quality Goals Quality Criteria Assessment/Audit Record	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system.

Base Practices

SUP.7.BP1 Develop and implement audit strategy.

Develop and implement audit strategy specifying the criteria for compliance with the requirements, plans, and contract as appropriate.

> ***The Rational Unified Process does not discuss audit, except in the context of configuration management functional and physical audit.***

SUP.7.BP2 Plan an audit.

For planning an audit, the following items should be prepared:

- scope of audit;
- topics for audit;
- attendees;
- responsibilities of attendants;
- entry and exit criteria for the audit;
- a schedule;
- resource requirement.

SUP.7.BP3 Audit software development activities.

Conduct audits at predetermined milestones to ensure:

- contract meets organization's requirements;
- system specification meets customer's requirements;
- design conforms with specification;
- software products reflect the design documents;
- testing coverage meets quality assurance requirements;
- software product quality reached organization's standards;
- documentation complies with managerial and customer's requirements.

SUP.7.BP4 Audit management activities.

Conduct audits at predetermined milestones on management activities to ensure:

- proposal against requirements;
- achievement against project plan and schedule;
- risks control;
- compliance with appropriate standards.

SUP.7.BP5 Audit process performance.

Conduct audits at predetermined milestones on process performance to ensure the suitability and capability of the current processes for a project.

SUP.7.BP6 Audit final products and system.

Audit the final system to ensure that completeness and correctness of configuration and functionality complies with appropriate standards and specifications, and satisfies the acceptance criteria documented in the contract.

SUP.7.BP7 Identify corrective actions from the audit report.

Analyze audit report; distribute audit report; document proposed resolution(s) for audit results; determine priority for actions for resolutions.

SUP.7.BP8 Track actions for audit report.

Track actions for resolutions of identified problems by audit; report and document changes of work products and processes.

Capability Rating for SUP.7

Level 1: Performed Process

The Rational Unified Process does not deal with audit at all (as it is described here). Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *SUP.7* is *Level 0.*

SUP.8 Problem resolution process

Basic Process

The purpose of the Problem Resolution Process is to ensure that all discovered problems are analyzed and resolved and that trends are recognized. As a result of successful implementation of the process:

- the problem resolution activities will be identified to ensure that all discovered problems are analyzed and resolved;
- problem reports will be prepared upon detection of problems (including non-conformances) in a software product or activity;
- a mechanism will be provided for recognizing and acting on trends in problems identified.

Note: The process supports performance of the process attributes 2.1 and 2.2 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Customer Request Review Records Problem Report Quality Measures Field Measures Service Level Measures Test Results Corrective Actions Problem Analysis Results	Tracking System	In the Rational Unified Process, the Implementation Model will be built in the context of an automated CM and Change Control/Defect Tracking system, with all the characteristics described in the standard for this output. It is not perfectly clear in the Rational Unified Process that a system is an output.
	Problem Report	Change Request
	Analysis Results	Not prescriptive at this level – part of change request chain.
	Corrective Actions	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system
	Change Request	Change Request
	Release Strategy/Plan	Project Plan (part of Software Development Plan if system is all software), Iteration Plan
	Maintenance Requirements	Use Case Model Survey, Supplementary Specification, Iteration Plan (note that the Rational Unified Process does not distinguish requirements discovered as maintenance requirements)
	Change Control Record	The Rational Unified Process assumes that this will be part of an automated CM system (such as Rational supplies) and that it will be possible to navigate from change request to changes made to a baseline.
	Work Breakdown Structure	Project Plan, Iteration Plan Note: little prescriptive detail is provided on WBS, alternative structures, etc.
	Project Plan	Software Development Plan

Input	Output	Equivalent Output in the Rational Unified Process
	Change History	Should be part of an automated CM system.

Base Practices

SUP.8.BP1 Establish problem report system.
A problem report system should be established to ensure problems and diversions can be detected, described, recorded, analyzed, corrected, and prevented in every process.

> *In Rational Unified Process, the Project Manager is tasked to set up a Change Management Process and capture it in the CM Plan. However, Rational Unified Process has a product focus and does not distinguish process related problems.*

SUP.8.BP2 Prioritize problems.
Prioritize problems according to the cause, range and severity level described in problem reports.

> *It is suggested in the Rational Unified Process that the CR form have a priority field as well as an indication of the severity or criticality of the failure.*

SUP.8.BP3 Determine actions for problems.
Analyze problem causes; propose resolution(s); and determine priority for actions.

> *This is part of the resolution process described in the Rational Unified Process.*

SUP.8.BP4 Track actions for problems.
Track resolutions of identified problems; notify affected parties; report and document changes of work products and processes.

> *This is part of the resolution process described in the Rational Unified Process.*

SUP.8.BP5 Review and distribute solutions.
Distribute corrected component or system after a formal review and authorization.

> *This will occur in the Rational Unified Process as part of the planning for an iteration.*

SUP.8.BP6 Analyze problem trends.
Collect and analysis data on problem occurrence, detection, affected range, and correction actions at product, process, project and organization levels, in order to identify the trends of problems in practices and processes.

> *The Measurement Plan will capture the set of metrics for tracking trends in defects, closure rates, etc. The assessment of these trends occurs regularly as input to the preparation of the Status Assessment and the Iteration Assessment.*

Capability Rating for SUP.8

Level 1: Performed Process
The Rational Unified Process prescribes everything required by the standard. Therefore, a rating of *fully achieved (F)* is appropriate for *PA 1.1,* the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *SUP.8* is Level 3*.*

> *There is a slight difficulty because the Rational Unified Process closely associates problem resolution with configuration management, so the issues of defect or problem tracking are not well delineated.*

Organization Process Category (ORG)

ORG.1 Organizational Alignment Process

New process

The purpose of the Organizational Alignment Process is to ensure that the individuals in the organization share a common vision and culture and understanding of the business goals to empower them to function effectively. Although business re-engineering and Total Quality Management have a much broader scope than that of software process, software process improvement occurs in a business context, and to be successful, must address business goals. As a result of successful implementation of the process:

- a vision, mission, goals, and objectives for the business will be made known to all employees;
- everyone in the organization understands their role in achieving the goals of the business and is able to perform that role.

Note: The process is outside the scope of ISO/IEC 12207. Some reasons are:

The issue of overall business culture is beyond the scope of ISO/IEC 12207.

The tailoring process and the guidance on tailoring and relations between processes and organizations presented in the ISO/IEC 12207 annexes address some of the issues related to the Organizational alignment process;

From the perspective of ISO/IEC 12207, the ramifications of implementation of the Organizational alignment process are implicit and expected to be built into the contract for any specific project.

Note: This process supports performance of the process attributes 4.1 and 5.2 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent output in the Rational Unified Process
Business goals	Process description	None at the organizational level
Vision	Team goals	
Project plan	Commitments / agreements	
Quality statement / policy	Quality statement/policy	
Customer satisfaction data	Quality strategy/plan	
Market analysis record / report	Communication mechanism	
Policies	Policies	
Life cycle models	Personnel policies	
Standards	Project plan	
Quality strategy plan	Personnel records	
	Training records	
	Work breakdown structure	
	Quality criteria	
	Interfaces	
	Schedule	
	Plan	

Base Practices:

ORG.1.BP1 Establish strategic vision.

Establish a strategic vision for the organization that identifies what business the (software producing part of) the organization is in.

> *The Rational Unified Process Environment core workflow contains an activity 'Assess Current Organization' which produces an artifact 'Development Organization Assessment'. This artifact is intended mainly as a precursor to the production of a Development Case, but it does address some of the issues of relevance here. However, the intent is not to develop a vision for the organization.*

ORG.1.BP2 Deploy vision.
Deploy the organization strategic vision to all individuals working for the organization, using appropriate management and communication mechanisms.

> *While the organization assessment is shared with staff in the organization, the purpose is not to share the vision, but to prepare the ground for deployment of the new process.*

ORG.1.BP3 Establish quality culture.
Define and implement a quality policy to contribute to the achievement of the business goals.

> *No mapping in the Rational Unified Process.*

ORG.1.BP4 Build integrated teams.
Build teams with an integrated product perspective whose goal is to satisfy the customer.

> *No mapping in the Rational Unified Process.*

ORG.1.BP5 Provide incentives.
Provide incentives to team members to work as a team to accomplish to contribute to the strategy of the organization.

> *No mapping in the Rational Unified Process.*

Capability Rating for ORG.1

Level 1: Performed Process
The Rational Unified Process does not address this component, nor was it intended to do so. Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG.1* is *Level 0.*

ORG.2 Improvement process

Basic Process
The purpose of the Improvement Process is to establish, assess, measure, control, and improve a software life cycle process. As a result of successful implementation of this process:

- a set of organizational process assets will be developed and made available;
- the organization's process capability will be assessed periodically to determine the extent to which process implementation is effective in achieving the organization's goals;
- the effectiveness and efficiency of the organization's processes with respect to business goal achievement will be improved on an ongoing basis.

The improvement process consists of three component processes:

ORG.2.1	Process establishment process
ORG.2.2	Process assessment process
ORG.2.3	Process improvement process

ORG.2.1 Process Establishment Process

Component Process of ORG.2 - Improvement process
The purpose of the Process Establishment Process is to establish a suite of organizational processes for all software life cycle processes as they apply to its business activities. As a result of successful implementation of the process:

- a defined and maintained standard set of processes will be established, along with an indication of each process's applicability;
- the detailed tasks, activities and associated work products of the standard process will be identified, together with expected performance characteristics;

- a strategy for tailoring the standard process for the product or service will be developed in accordance with the needs of the project;
- information and data related to the use of the standard process for specific projects will exist and be maintained.

Note: This process supports performance of the process attribute 3.1 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Business goals Vision Policies Software development methodology Life cycle models Quality statement or policy Product / service requirements Standards Quality measures Quality strategy/plan Reuse plan Reuse strategy Benchmarking data Request for proposal Commitments/agreements Contract Requirement specification	Process goals	The Rational Unified Process Process Description identifies the generic goals for the process. The actual organization goals will be specific to the adopting organization.
	Process description	The Rational Unified Process is well described in HTML form.
	Work breakdown structure	There is some guidance towards the formulation of a WBS and an outline MSProject template is provided – but this area is only lightly treated.
	Job procedure	The Rational Unified Process has activity and step descriptions. The actual procedures would be organization specific and may be built with the Development Case or by individual Project Managers.
	Work products	The Rational Unified Process identifies inputs and outputs for activities.
	Standards	The Rational Unified Process is itself a standard for software development and it is also configurable to meet specific organizational needs. It is tailorable to be compliant with official development standards such as J-STD-016 and ISO 12207.
	Quality statement/policy	The Rational Unified Process expects such policies to be in place but does not dictate their formulation.
	Quality criteria	The Rational Unified Process concentrates on criteria for judgement of software product quality and the objective demonstration of these criteria. An organization may have additional criteria (for artifacts and process) as part of its business strategy.
	Review strategy/plan	The Rational Unified Process requires reviews at the end of most activities and provides some guidance on how these should proceed. Review specifics would be captured in the SDP. The Rational Unified Process does not specify details of general joint (customer-developer) technical and management reviews. Also, the Rational Unified Process does not explicitly prescribe reviews for all artifacts.

Input	Output	Equivalent Output in the Rational Unified Process
	Interfaces	The Rational Unified Process defines activities in terms of input-output, workers, and sequence. There is little in the Rational Unified Process that prescribes organizational interfaces and protocols.
	Quality records	Not prescriptive at this level
	Process measures	The Rational Unified Process has little on process measures; the focus is on product.
	Project plan	Software Development Plan
	Communication mechanism	Not prescriptive at this level
	Distribution list	Not prescriptive at this level
	Training records	No equivalent
	Schedule	Part of the Development Case
	Plan	Part of the Development Case
	Product needs assessment	Part of the Development Case
	Development environment	The Environment Core Workflow covers the software aspects of this output but not the facilities (buildings, etc.) at the organizational level.

Base Practices

ORG.2.1.BP1 Define goals.
Define the process goals that are to be achieved by following the process in the organization.
Note: One input to defining the goals is the organization's strategic vision.

> *It is not a current design goal for the Rational Unified Process to determine process goals – it has intrinsic generic goals – but an organization will have its own goals determined by strategic business vision.*

ORG.2.1.BP2 Identify current activities, roles, authorities & responsibilities.
Identify the activities that comprise the way the process is currently and/or should be performed and identify the roles, authorities and responsibilities for these activities.

> *The Rational Unified Process has an activity, "Assess Current Organization", which examines the people and process as a precursor for the configuration and deployment of the other components of Rational Unified Process.*

ORG.2.1.BP3 Define and document the processes performed in the organization.
Define and document the processes that are performed in the organization by identifying and describing :

- inputs and outputs for the process;
- entry and exit criteria for entering and exiting the process
- control points in the process where key reviews and decisions are made.
- external interfaces with related processes, which supply inputs and consume outputs.
- internal dependencies between the activities in the process.
- process measures for the process that can be used to demonstrate achievement of the process goals.

> *The Rational Unified Process artifact "Development Organization Assessment" will describe the context (including process) into which the Rational Unified Process is to be deployed. The existing processes are not*

documented in detail with the intent of formalizing them and making them the basis for process improvement.

ORG.2.1.BP4 Establish policy
Establish a written organization policy for using and tailoring the organizations standard process family in order to perform the tailored processes.
This should be part of the Development Case.

ORG.2.1.BP5 Establish performance expectations.
Establish expectations for process performance when using the organizations standard process family.
This is not covered in a quantitative way.

ORG.2.1.BP6 Deploy the process.
Deploy the organizations standard process family available throughout the organization.
This is equivalent to the deployment of the configured Rational Unified Process.

ORG.2.1.BP7 Check the standard processes deployment.
Control the deployment and the availability of the standard process family within the organization.
As above.

ORG.2.1.BP8 Maintain the standard processes.
Maintain the standard process description.
This is a task performed by the Process Engineer.

Capability Rating for ORG 2.1

Level 1: Performed Process
The Rational Unified Process effectively covers most of the requirements of the standard. Therefore, a rating of *largely achieved (L)* is appropriate for *PA 1.1,* the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG 2.1* is Level 1**.**

ORG.2.2 Process Assessment Process

Component Process of ORG.2 - Improvement process
The purpose of the Process Assessment Process is to determine the extent to which the organization's standard software processes contribute to the achievement of its business goals and to help the organization focus on the need for continuous process improvement. As a result of successful implementation of the process:

- an efficient and effective process assessment method will exist to determine the current capability of the organization and its processes to produce products and services consistent with its business goals;
- the relative strengths and weaknesses of the organization's standard software processes will be understood;
- accurate and accessible assessment records will be kept and maintained;
- reviews of the organization's standard processes will be carried out at appropriate intervals to ensure their continuing suitability and effectiveness in light of assessment results.

Note: ISO 15504-3 defines an approach to the performance of this process.
The Rational Unified Process does not address this process.

Base Practices

ORG.2.2.BP1 Determine the assessment method.
Define which method is used to perform the assessment.

ORG.2.2.BP2 Define assessment goals.
Define and validate the assessment goals and identify the criteria to validate the achievement of the goals.

ORG.2.2.BP3 Define the assessment inputs.
Define the assessment inputs including the assessment scope, the processes to be investigated within the defined organizational unit, the highest level to be investigated, the organizational unit which deploys these processes, the process context, the assessment constraints and the assessment model.

ORG.2.2.BP4 Plan the assessment.
Plan the assessment process, specifying the required inputs, the activities to be performed in conducting the assessment, the resources and schedule assigned to these activities, the selection and defined responsibilities of the assessors and organization participants in the assessment.

ORG.2.2.BP5 Perform the assessment to collect data.
Perform the assessment to collect the data required for evaluating the processes within the scope of the assessment in a systematic and ordered manner.

ORG.2.2.BP6 Validate the data.
Validate the data collected as appropriate, ensuring that the validated data sufficiently covers the assessment goal.

ORG.2.2.BP7 Identify strengths and weaknesses.
Identify the relative strengths and weaknesses of the organization unit's processes by using the collected data.

ORG.2.2.BP8 Maintain the assessment records.
Keep and maintain the assessment records accessible for the further actions.

ORG.2.2.BP9 Exploit the assessment result.
Exploit the assessment results to maintain the organization's standard processes.

ORG.2.2.BP10 Report the assessment result.
The assessment results, including at minimum the outputs specified in Clause 4.5 of ISO15504 Part 3, shall be documented and reported to the Assessment Sponsor.

Capability Rating for ORG.2.2

Level 1: Performed Process
The Rational Unified Process does not address this component, nor was it intended to do so. Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG.2.2* is *Level 0.*

ORG.2.3   Process Improvement Process

Component Process of ORG.2 - Improvement process

The purpose of the Process Improvement Process is to continually improve the effectiveness and efficiency of the processes used by the organization in line with the business need. As a result of successful implementation of the process:

* changes to standard and defined processes will be made in a controlled way, with predictable results;
* the organization will effect improvements to its processes through activities such as process assessment and review;
* monitored software process improvement activities will be implemented in a coordinated manner across the organization;
* historical, technical, and evaluation data will be analyzed and used to improve these processes, to recommend changes in projects, and to determine technology advancement needs;
* quality cost data will be collected, maintained, and used to improve the organization's processes as a monitoring activity, and to serve to establish the cost of prevention and resolution of problems and non-conformity in software products and services.

Note: This process supports performance of the process attributes 5.1 and 5.2 in those instances where it is invoked.

The Rational Unified Process does not address this process.

Base Practices

ORG.2.3.BP1 Identify improvement opportunities.
Identify opportunities for software process improvement.

ORG.2.3.BP2 Define scope of improvement activities.
Define the purpose, objectives, scope, and priorities of the process improvement activities in accordance with the business goals of the organization.

ORG.2.3.BP3 Understand the process.
Assess the process to understand its strengths and weaknesses.

ORG.2.3.BP4 Identify improvements.
Identify where the process needs to be improved to achieve its process goals.

ORG.2.3.BP5 Prioritize improvements.
Prioritize the improvements which can be made in the process based on an analysis of the impact of potential improvements on achieving the goals of the process.

ORG.2.3.BP6 Define measures of impact.
Define measures that can be used to determine the impact of the process changes on achieving the process's goals.

ORG.2.3.BP7 Change the process.
Change the process to improve it.

ORG.2.3.BP8 Confirm the improvement.
Pilot test changes to confirm that they improve the process based on analysis of appropriate data.

ORG.2.3.BP9 Deploy improvement.
Deploy improved processes across the organization as appropriate.

Capability Rating for ORG.2.3

Level 1: Performed Process

The Rational Unified Process does not address this component, nor was it intended to do so. Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG.2.3* is *Level 0.*

ORG.3 Human Resource Management Process

Extended Basic Process

The purpose of the Human Resource Management Process is to provide the organization and projects with individuals who possess skills and knowledge to perform their roles effectively and to work together as a cohesive group. As a result of successful implementation of the process:

- the roles and skills required for the operations of the organization and the project will be identified through timely review of the organizational and project requirements;
- training will be identified and conducted to ensure that all individuals have the skills required to perform their assignments, using mechanisms such as training strategies and materials;
- individuals with the required skills and competencies will be identified and recruited using mechanisms such as procedures or they will be trained as appropriate to perform the organizational and project roles;
- effective interaction between individuals and groups will be supported;
- the work force will have the skills to share information and coordinate their activities efficiently;
- objective criteria will be defined against which group and individual performance can be monitored to provide performance feedback and to enhance performance.

Note: This process supports performance of the process attribute 3.2 in those instances where it is invoked.

The Rational Unified Process does not address this process.

Base Practices

ORG.3.BP1 Identify human resource needs.

Identify needs for human resources across the organization based on organizational and project inputs to build the knowledge and skills of the staff. These needs may be met through training, recruitment or other staff development mechanisms.

ORG.3.BP2 Develop or acquire training.

Develop or acquire training that addresses the common training needs.

ORG.3.BP3 Train personnel.

Train personnel to have the knowledge and skills needed to perform their roles.

ORG.3.BP4 Recruit qualified staff.

Establish a systematic program for recruitment of staff qualified to meet the needs of the organization, while providing opportunities for career development for existing staff.

ORG.3.BP5 Evaluate staff performance.

Evaluate the performance of staff, either individually or in groups, in respect of their contributions to the goals of the organization as a whole.

ORG.3.BP6 Provide feedback on performance.

Ensure that feedback is provided to staff on the results of any performance evaluations performed.

ORG.3.BP7 Maintain staff records.
Maintain adequate records of staff, including not only personnel details, but also information on skills, training completed, and performance evaluations.

ORG.3.BP8 Define project teams.
Define the teams which will be needed to perform the work of the project, defining the structure and operating rules for the team, required knowledge and skills.

ORG.3.BP9 Empower project teams.
Empower teams to perform their job, by ensuring that they have:
- an understanding of their job;
- a shared vision or sense of common interest;
- appropriate mechanisms or facilities for communication and work;
- support from the appropriate management for what they are trying to accomplish.

ORG.3.BP10 Maintain project team interactions.
Obtain and maintain agreement on the implementation of interactions between teams.

Capability Rating for ORG.3

Level 1: Performed Process
The Rational Unified Process does not address this component, nor was it intended to do so. Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG.3* is *Level 0.*

ORG.4 Infrastructure Process

Basic process
The purpose of the Infrastructure Process is to maintain a stable and reliable infrastructure that is needed to support the performance of any other process. The infrastructure may include hardware, software, methods, tools, techniques, standards, and facilities for development, operation, or maintenance. As a result of successful implementation of the process:
- an infrastructure will be established that is consistent with and supportive of the applicable process procedures, standards, tools, and techniques;
- the infrastructure will meet all requirements for functionality, performance, safety, security, availability, space, equipment, cost, time, and data integrity.

Note: This process supports performance of the process attribute 3.2 in those instances where it is invoked.

Associated Work Products

Input	Output	Equivalent Output in the Rational Unified Process
Product needs assessment Change request	Product/service/customer/system/software requirements	Vision, Business Case, Stakeholder Needs
Environment requirements	Project plan	SDP
Quality strategy/plan Software development methodology Life cycle models Business goals Work product Policies Standards Risk management Project plan Business plan Reuse strategy Reuse plan Problem reports Change control Product/service/customer/system/soft	Development environment	The Environment Core Workflow covers the software aspects of this output, but not the facilities (buildings, etc) at the organizational level.

Input	Output	Equivalent Output in the Rational Unified Process
	Recovery plan	No direct equivalent in the Rational Unified Process. This should be dealt with in the SDP and CM Plan, but the Rational Unified Process does not spell this out clearly.
	Backup/recovery records	Not prescriptive at this level
	Reuse strategy	Part of the Software Architecture Document, but this is not organizationally focused.
	Reuse plan	No equivalent in the Rational Unified Process
	Policies	Not prescriptive at this level
	Standards	The Rational Unified Process can be made compliant with a variety of standards: it also contains standard requirements for activities and artifacts. The Environment Core Workflow requires the development of guidelines for design, coding, etc.

However, in many cases, these are not described in the sort of detail required by 15504. |
	Reuse repository	No equivalent in the Rational Unified Process
	Change control	Change Request/Software Change Order and associated registers are expected to be part of an automated change/configuration management system
	Review records	Not prescriptive at this level. The Rational Unified Process requires various reviews – the implication is that records will be kept, but the detail of these is not described.
	Software development methodology	The Rational Unified Process contains a definition of a software development method and is based on UML.
	Life cycle models	The Rational Unified Process can accommodate various software life cycle models. Although it is based on an iterative approach, this can be adapted to be 'grand design', incremental, etc. The Project Manager is required to select an appropriate lifecycle model as part of planning the project.
	Process description	The Rational Unified Process is configured to create a Development Case which describes the project or organization-specific process derived from the Rational Unified Process. The required characteristics are largely present in the Rational Unified Process (purpose, activities, inputs and outputs, etc.)

Missing are: expected execution times, entry and exit criteria (other than implicit completion of preceding activities and availability of inputs), process measures (except for general statements), and quality expectations. |

Input	Output	Equivalent Output in the Rational Unified Process
	Quality criteria	The Rational Unified Process concentrates on criteria for judgement of software product quality and the objective demonstration of these. An organization may have additional criteria (for artifacts and process) as part of its business strategy.
	Quality measures	Metrics that are to be collected to support the quality goals are defined in the Measurement Plan. The Status Assessment and the Iteration Assessment capture the actual metrics.

Base Practices

ORG.4.BP1 Identify software engineering environment requirements.

Determine requirements for the software engineering environment, identifying :

> process roles and activities it should support;
>
> security issues it should address;
>
> throughput and data sharing requirements;
>
> backup and recovery;
>
> remote access facility.

> ***While the Rational Unified Process recognizes the need and identifies activities for the selection, installation, and deployment of software engineering environments, it provides little detail on the specifics and does not identify a worker for this activity. It also does not specify this activity at the organization level.***

ORG.4.BP2 Provide a software engineering environment.

Acquire and provide a software engineering environment which satisfies the requirements.

> ***Part of the Environment Core Workflow.***

ORG.4.BP3 Provide support for individuals using the infrastructure

Provide support for those who will utilize the software engineering environment.

> ***Part of the Environment Core Workflow, but no detail is provided.***

ORG.4.BP4 Maintain software engineering environment.

Perform maintenance on the software engineering environment for the purposes of :

> correcting defects;
>
> improving performance;
>
> modifying the environment to keep up with changes in the process activities and tools it supports;
>
> controlling changes to enable regression if necessary.

> ***Part of the Environment Core Workflow, but no detail is provided.***

ORG.4.BP5 Provide a workspace conducive to productive performance.

Provide a workspace, with appropriate furnishings and office equipment, that encourages productive performance.

> ***No equivalent in the Rational Unified Process.***

ORG.4.BP6 Ensure data integrity and security.

Provide the means to ensure that data resulting from project or process activities are protected from loss, corruption or damage.

> ***Mentioned as part of supporting the development environment, but with no details provided.***

ORG.4.BP7:   Provide remote access facility.
Provide the software project's technical and managerial staff with the means to access their work environment and data from a remote location, as appropriate.

> ***The Rational Unified Process would regard this as a project-instance specific issue.***

Capability Rating for ORG.4

Level 1: Performed Process
The Rational Unified Process mentions some of these issues under Environment but the treatment is very light, therefore a rating of ***partially achieved (P)*** is appropriate for ***PA 1.1,*** the *Process Performance Attribute*. This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for ***ORG.4*** is ***Level 0.***

ORG.5 Measurement Process

New process
The purpose of the Measurement Process is to collect and analyze data relating to the products developed and processes implemented within the organizational unit, to support effective management of the processes, and to objectively demonstrate the quality of the products. As a result of successful implementation of the process:

- an appropriate set of measurements, driven by the project and organizational goals, will be identified;
- data required will be collected and analyzed;
- a collection of historical data relating to process implementation will be established and maintained;
- measurements will be used to support decisions and provide an objective basis for communication between the interested parties.

Note: The process supports performance of the process attributes 4.1 and 4.2 in those instances where it is invoked.
Note: This process is closely linked to the Project management process (MAN.2).

> ***The Rational Unified Process requires the selection of metrics to be used for making objective judgements about progress and quality, and it requires a Measurement Plan which defines these metrics and assigns responsibility for their collection. However, it does so only in a project context, and the focus is on product metrics. ORG.5 has a higher-level cross-project objective and requires process metrics to be established as well.***

Base Practices

ORG.5.BP1 Establish metrics for process management.
Establish measurable metrics for processes measurement and enable data to be collected and analyzed against the metrics.

ORG.5.BP2 Establish metrics for work products quality.
Establish measurable metrics for work products quality and enable data to be collected and analyzed against the metrics.

ORG.5.BP3 Conduct quantitative process management.
Conduct quantitative process management based on quantitative metrics, benchmarks or statistical data.

ORG.5.BP4 Measure the quality of work products.
Measure work products quality based on established metrics, benchmarks, or statistical data.

ORG.5.BP5 Benchmark processes.
Analyze processes with benchmarks; find gaps of processes to the benchmarks; improve processes for narrowing the gaps.

Capability Rating for ORG.5

Level 1: Performed Process
The Rational Unified Process does not address this component, nor was it intended to do so. Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG.5* is *Level 0.*

ORG.6 Reuse Process

New process
The purpose of the Reuse Process is to promote and facilitate the reuse of new and existing software work products from an organizational and product/project perspective. As a result of successful implementation of the process:
- reuse strategies will be defined;
- reuse activities will be identified and established;
- a reuse infrastructure (eg., networks, configuration management, repositories, etc.) will be established and maintained.

> ***The Rational Unified Process does not address this process directly. There is some indication in several Rational Unified Process activities of where reuse is facilitated, but no explicit plan is required.***

Base Practices

ORG.6.BP1 Define organizational reuse strategy.
Identify, develop and apply reusable entities at all organizational levels and in every processes to improve productivity and quality.

ORG.6.BP2 Establish reuse library.
Establish a library system for collection, categorization, management, maintenance, control, and update of reusable entities.

ORG.6.BP3 Identify reusable entities.
Identify reusable entities such as code modules, tests, interfaces, frameworks, documents, processes, experiences, domain knowledge and external resources.

ORG.6.BP4 Develop reusable entities.
Development of reusable work products, such as code modules, tests, interfaces, frameworks, documents and domain knowledge.

ORG.6.BP5 Keep reusable entities stable and consistent.
Maintain consistency, stability and standardization of reusable entities in the reuse library.

ORG.6.BP6 Report and certify reusable entities.
Report and certify validated and up-to-date reusable entities.

ORG.6.BP7 Report and describe reusable domain knowledge.
Report and describe up-to-date reusable domain knowledge and experience.

Capability Rating for ORG.6

Level 1: Performed Process

The Rational Unified Process does not address this component, nor was it intended to do so. Therefore, a rating of *not achieved (N)* is appropriate for *PA 1.1,* the *Process Performance Attribute.* This means that the most a project or organization could achieve, without augmenting the Rational Unified Process, for *ORG.6* is *Level 0.*

Conclusions

Summary of Ratings

This is presented as a graph of ratings against process, with the processes grouped by category.
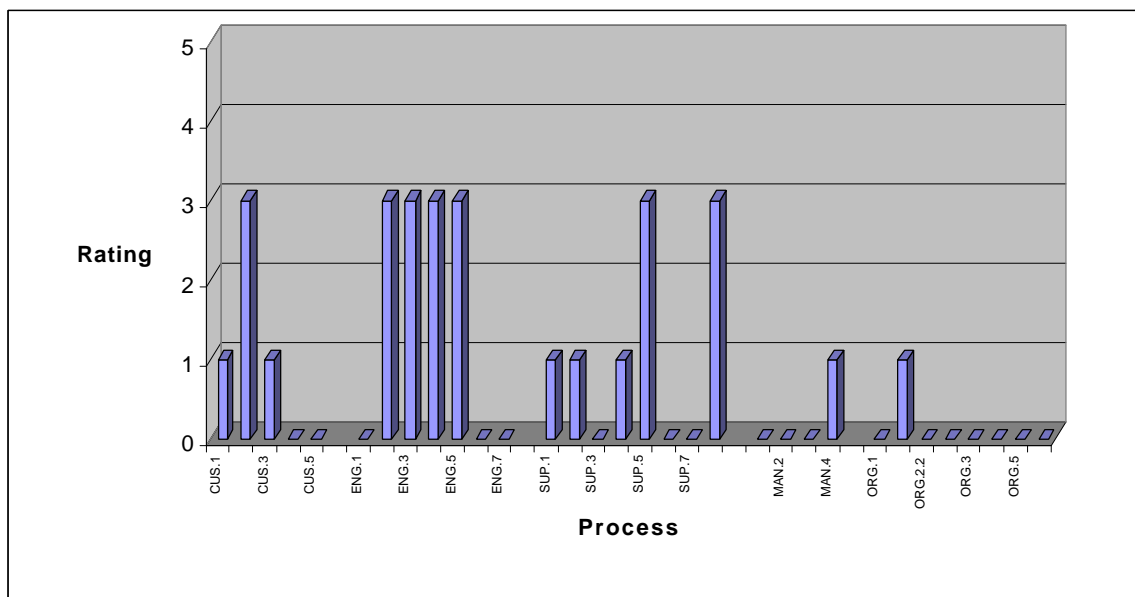
There are no surprises here, these ratings reflect the engineering focus of the Rational Unified Process. As it stands, the Rational Unified Process needs augmentation mainly in the Management and Organization areas and the traditional Quality function to meet the requirements of 15504 at higher ratings.

Appendix A: Relationship between ISO 9000 and ISO/IEC 15504[3]

15504 processes	ISO 9001 mapping
Acquire Software	Contract Review Requirements (4.3)
Manage Customer Needs	Contract Review Requirements (4.3)
Supply Software	Handling, Storage, and Delivery (4.15)
Operate Software	Servicing Requirements (4.19)
Provide Customer Service	Servicing Requirements (4.19)
Develop System Requirements and Design	Design Control (4.4)
Develop Software Requirements	Contract Review Requirements (4.3)
Develop Software Design	Design Control (4.4)
Implement Software Design	Design Control (4.4)
Integrate and Test Software	Testing (4.10)
Integrate and Test System	Testing (4.10)
Maintain System and Software	Servicing Requirements (4.19)
Develop Documentation	Document Control (4.5)
Perform Configuration Management	Product Identification and Tracing (4.8)
Perform Quality Assurance	Quality Records (4.14)
Perform Work Product Verification	Testing (4.10)
Perform Work Product Validation	Testing (4.10)
Perform Joint Reviews	Inspect Status (4.12)
Perform Audits	Internal Quality Audits (4.17)
Perform Problem Resolution	Control of Nonconforming Products (4.13), Corrective and Preventive Action (4.14)
Manage the Project	Management Responsibilities (4.1)
Manage Quality	Quality System (4.2)
Manage Risks	Process Control (4.9)
Manage Subcontractors	Purchasing (4.6)
Engineer the Business	Management Responsibilities (4.1)
Define the Process	Process Control (4.9)
Improve the Process	Statistical Techniques (4.20)
Provide Organizational Infrastructure	Management Responsibilities (4.1)
Provide Skilled Resources	Management Responsibilities (4.1)

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[3] Drawn from 15504 assessor training material