How the Rational Unified Process Supports ISO 12207

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"My organization must comply with the ISO Standard 12207; can the RUP help me achieve this?"

The short answer to this question is "Yes!" The RUP provides great support for many critical coverage areas, which I'll detail in this article.

The international standard ISO/IEC 12207:1995-- Information Technology -- Software Lifecycle Processes (we'll refer to it as ISO 12207) establishes a common framework so that software practitioners can speak the same language when describing their software processes. It is not a complete, ready-to-use process, but only a framework that identifies, names, and relates various (sub)processes within the larger process domain.

The Rational Unified Process® (RUP®) is a process framework, but unlike ISO 12207, it comes not empty, but rather prepopulated with a wealth of guidance, methods, techniques, templates, and examples, out of which a concrete process can be instantiated.[1]

The purpose of this article is to:

- *Provide a brief overview of ISO 12207.*
- *Point to some differences between RUP and ISO 12207 terminology that may throw off the RUP practitioner (or the ISO 12207 literate).*
- *Describe how the RUP supports various parts of ISO 12207, and identify where and to what extent it fills in blanks.*[2]

An Overview of ISO 12207

Figure 1, which is extracted from ISO 12207,[3] represents a good map of what is covered in this standard.

It shows three classes of processes:

- Primary lifecycle processes (Section 5)
- Supporting lifecycle processes (Section 6)
- Organizational lifecycle processes (Section 7)[4]

These classes can be organized in *views*, and decomposed into *activities*, which are themselves decomposed in *tasks*. ISO 12207 stops, however, at the level of activities and only occasionally mentions specific tasks, never indicating that they are mandatory.

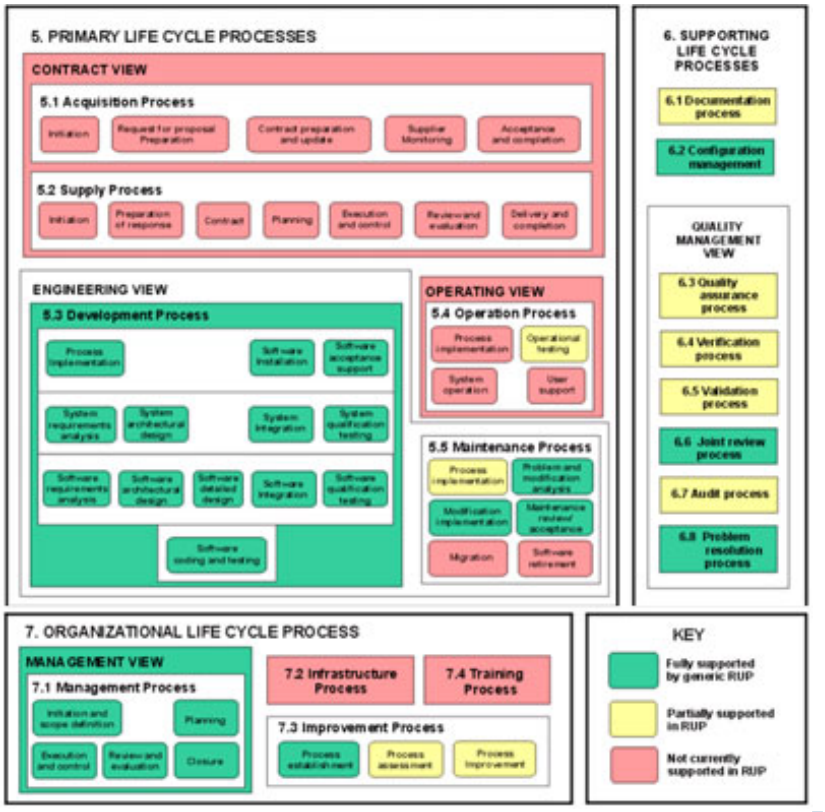

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Figure 1: ISO 12207 Processes, Views, and Key Activities (Source: Figure C.2 in the Standard)

ISO 12207 only defines, names, and indicates activities that *should take place* -- it never prescribes how they should be accomplished. It is completely neutral in terms of methods, techniques, languages, tools, and organizational structure.

It is important to note that the focus of ISO 12207 is primarily on the *acquisition* and *supply* of software, and only secondarily on software *development*. The Standard is intended for use in a two-party situation, but "may equally apply when the two parties are [ý] the same organization." This is apparent in Figure 1, which emphasizes the *Contract View*. In contrast, the generic version of the RUP focuses primarily on software development.

Differences in the RUP and ISO 12207 Terminology

There are a few differences between the way RUP (and the SPEM Software Process Engineering Metamodel for that matter) and ISO 12207 use terminology. Sometimes they use different terms that mean essentially the same thing; sometimes they use the same word or phrase but assign different meanings to it. If you are applying the RUP to help you achieve ISO compliance, it is important to understand these distinctions, so that you can apply terms correctly. Using the wrong terminology can potentially mislead assessors and delay certification.

- **Lifecycle.**[5] ISO 12207 uses the term *lifecycle* to describe the structure (i.e., the "architecture") of a complete process, that is, the collection of processes (in the ISO 12207 sense) needed to take a body of software all the way from initiating acquisition to retirement (see Figure 1), whereas in the RUP the term *lifecycle* is used to describe the unrolling ("enactment") of the process over time. In RUP, the focus is on development cycles, phases, iterations, milestones, and so forth, on a timeline; therefore *lifecycle* is related to planning. The RUP speaks of an iterative lifecycle or waterfall lifecycle, for example. ISO 12207 is silent on the shape of the process.
- **Tasks and Activities**. In ISO 12207, a *task* is a "set of elementary or atomic actions to be performed." These correspond to the RUP *Activities* and *Steps*. In ISO 12207, however, *activities* are sets of cohesive tasks, and are therefore more akin to the RUP concept of *Workflow Detail*.
- **Process**. An ISO 12207 process corresponds roughly to the RUP concept of a *Discipline*, but there are more processes in ISO 12207 than there are Disciplines in the RUP.
- **Output**. This is the term ISO 12207 uses for what the RUP calls an *Artifact* -- which results from an activity (the SPEM calls this a *Deliverable Workproduct*). In ISO 12207, artifacts that are not delivered are referred to as *non-deliverable items*.
- **Supporting *and* Organizational Processes**. ISO 12207 establishes a distinction between *supporting processes* and *organizational processes*, whereas the RUP treats them all as *Supporting Disciplines*. In ISO 12207, configuration management is a supporting process, and project management is an organizational process.
- **Infrastructure Process**. In ISO 12207, this term corresponds to the RUP *Environment Discipline*. The word *infrastructure* does *not* refer to the infrastructure of the software (OS, middleware, etc.).

RUP Coverage of ISO 12207

Refer again to Figure 1. The various colors indicate the level of support that an organization seeking to implement or comply with ISO 12207 will find in the RUP for each ISO 12207 process or activity.

- **Green**: The RUP provides in-depth coverage of this area. This is not to say that the RUP should be used "as is," out of the box. It should be tailored to suit the development conditions of the project, usually by eliminating some aspects, not by adding more.
- **Yellow**: The RUP provides some coverage, but it is likely that the organization will need to complement it with process elements: artifacts, activities, guidelines, and so on, that are specific to its domain, industry, or company, or from other processes.
- **Red**: The RUP does not provide anything significant in this area, beyond very general elements such as reviews, principles, and some techniques.

Let's take a brief look at the coverage RUP provides for specific areas.

Primary Lifecycle Processes (Section 5)

This is the area for which the RUP provides much substance, particularly in the *Engineering View*. There, the RUP provides an organization with all it needs to define the Development Process (5.3), and most of what it needs for the Maintenance Process (5.5).[6]

The RUP does not cover the Operation Process (5.4) except for Operational Testing. But as noted above, the current RUP does not cover the *Contract View:* Acquisition and Supply Processes (5.1 and 5.2).These are outside the main focus of the RUP. It should be noted, however, that the RUP provides extensive guidance in Requirements Management, which plays an important role in the interactions between supplier and acquirer.

Supporting Lifecycle Processes (Section 6)

The RUP provides great support for Configuration Management (6.2), and good to moderate support for all other processes in this category (6.2-6.8).

Organizational Lifecycle Processes (Section 7)

The RUP provides full support for the Management Process (6.2),[7] Infrastructure Process (6.2), and Improvement Process (6.3) in what it calls the Environment Discipline. It does not cover Training Process (7.4), beyond the development of training material.

Table 1 gives the ISO 12207-literate reader a few entry points into the RUP for each process.

Table 1. Where to Find ISO 12207 Processes in RUP 2002

ISO 12207 Process	Corresponding RUP Elements (some ISO 12207 *activities* are in *italics*)
5.1 Acquisition Process	Not covered, except elements related to Requirements.
5.2 Supply Process	Not covered, except elements related to Requirements.
5.3 Development Process	Disciplines: Requirements, Analysis and Design, Implementation, Test & Deployment. *Process Implementation* is covered by the creation of a Development Case (Role: Process Engineer) and a Software Development Plan (Role: Project Manager).
5.4 Operation Process	For *Operational Testing* see Role: Deployment Manager.
5.5 Maintenance Process	Selected activities in the Disciplines: Requirements, Analysis and Design, Implementation, Test (subset of the development process). *Problem and modification analysis* is covered by activities in Discipline: Configuration and Change Management. *Migration* is not covered, nor is *Software Retirement*.
6.1 Documentation Process	Note that all disciplines produce artifacts that are documents. See Templates. For delivered product documentation, see Role: Tech Writer, Graphic Artist, Course Developer, along with their respective associated activities.
6.2 Configuration Management Process	Discipline: Configuration and Change Management and parts of Deployment.
6.3 Quality Assurance Process	Discipline: Project Management. See concept: Evaluating Quality.
6.4 Verification Process	Discipline: Project Management.
6.5 Validation Process	Discipline: Project Management. Activity: Project Acceptance Review.

6.6 Joint Review Process	Discipline: Project Management; see various reviews. See PRA and CCB.
6.7 Audit Process	Discipline: Project Management. See its nine reviews and assessment activities. The RUP explicitly calls for Configuration Management Audits and also allows other kinds of audits to be performed as the owning organization or customer requires them. These audits are included in the QA Plan but not called out explicitly (in addition to the nine reviews).
6.8 Problem Resolution Process	Discipline: Project Management. Activities: Develop Problem Resolution Plans and Handle Exceptions and Problems. See also several activities in the Discipline: Configuration and Change Management, such as Submit Change Request Review Change Request, Make Changes, and so on. Also note that many Change Requests are the outcome of review activities.
7.1 Management Process	Discipline: Project Management. *Process implementation* is also covered by the creation of a development case (Role: Process Engineer) and several plans. These plans, which are part of the Software Development Plan, are developed by other roles in other disciplines.
7.2 Infrastructure Process	Discipline: Environment. Role: Tool Specialist and System Administrator, along with their associated activities.
7.3 Improvement Process	Discipline: Environment. Role: Process Engineer and its related activities.

7.4 Training Process	Role: Course Developer and its associated activities. Also Step: Train Project Staff, within activity: Acquire Staff.

A "Leg Up" on Compliance

There are many compelling reasons for using the RUP to assist in ISO 12207 compliance. The few differences in terminology between the two should not be a stumbling block. And although the RUP does not currently cover the acquisition and supply of software -- except in the area of Requirements Management, which plays an important role in supplier-customer interactions -- it does provide especially strong coverage in the Development Process, most of the Supporting Processes (e.g., Configuration Management), and the Project Management Process. All in all, for an organization that wishes to comply with the ISO 12207 standard, adopting the RUP will provide a serious "leg up" in the form of very detailed process guidance in many critical coverage areas.

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[1] For more information about the Rational Unified Process, see http://www.rational.com/products/rup/index.jsp

[2] Throughout this article I will reference RUP version 2002.05.

[3] See Figure C2 in Annex C of the Standard.

[4] The numbers in Figure 1 refer to sections and subsections of the Standard; hence they do not start with 1.

[5] Moreover, the RUP treats "lifecycle" as one word, while ISO 12207 treats it as two words: "life cycle."

[6] See *The Rational Edge* article "Software Maintenance Cycles with the RUP."

[7] The RUP does not cover financial and human resources aspects, but neither does ISO 12207.

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