

**VOLVO**

# Implementing RUP in an organization

- The Volvo IT approach

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**Volvo Information Technology**

Volvo IT White Paper

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## *Table of Contents*

<b>ABSTRACT</b> .....	<b>1</b>
<b>INTRODUCTION</b> .....	<b>2</b>
Volvo IT .....	2
The Software Process Improvement Context at Volvo IT .....	2
<b>BUSINESS CONTEXT</b> .....	<b>4</b>
Business Challenges and Objectives .....	4
Expected Effects.....	4
<b>IMPLEMENTATION OF A NEW APPLICATION DEVELOPMENT PROCESS</b> .....	<b>5</b>
The Method Strategy .....	5
Evaluation Criteria .....	5
MAPS – The RUP Implementation Project .....	6
<b>EXPERIENCE FROM RUP PROJECTS</b> .....	<b>11</b>
Questionnaire .....	11
Success Stories .....	11
<b>ASSESSING THE EFFECT OF USING RUP</b> .....	<b>12</b>
How to Measure Effects of Using RUP .....	12
The SPICE Framework .....	12
Establishing Target Capability Profiles for RUP .....	13
The Assessment Program .....	14
Assessment Results .....	15
How to Translate Process Capability to Productivity .....	16
<b>CONCLUSIONS</b> .....	<b>17</b>
Have we reached the objectives? .....	17
General Recommendations .....	17
<b>REFERENCES</b> .....	<b>18</b>

## **Abstract**

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The Rational Unified Process <sup>®</sup>[1] or RUP<sup>®</sup> is a complete software-development process framework developed by Rational Software<sup>®</sup>. It is an iterative development methodology that can be described as “use-case driven, risk driven and architecture driven”. For many software developers starting to use RUP these are new concepts, meaning that a lot of training and coaching is needed in projects where RUP is used for the first time. Just “reading the book” is not enough!

This white paper describes how Volvo Information Technology is implementing RUP, and how the effects of using RUP are assessed through questionnaires and by using the SPICE Framework <sup>[2]</sup>(ISO 15504) to assess the improvement of the software process capability of the development teams.

## **Introduction**

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### **Volvo IT**

Volvo Information Technology (Volvo IT) is a wholly-owned subsidiary of AB Volvo, one of the largest industrial groups in the Nordic Region. Volvo IT provides all types of industrial IT solutions in a variety of technical environments. The company was formed in 1998, through a merger of all IT resources from different Volvo Group companies. Volvo IT provides Volvo Group, Volvo Cars (since 1999 owned by the Ford Motor Company) and other selected customers with cost-effective IT-solutions resulting in long-term business value.

Volvo IT is a comprehensive global IT company with about 4300 personnel and annual sales in excess of SEK 5 billion.

The Application Development Techniques organization, which is represented at the larger sites, is responsible for supporting application development and maintenance teams with development processes, methods, tools and application development environments.

### **The Software Process Improvement Context at Volvo IT**

Software process improvement is always performed in a business context. Since Application Development is one of the key processes within Volvo IT, the implementation of a new Application Development Process must be seen as a major enhancement of that key process.

In our efforts to implement RUP we have worked on three “layers”:

- The Method Strategy level
- The Process/Method Development level
- The Application Development level

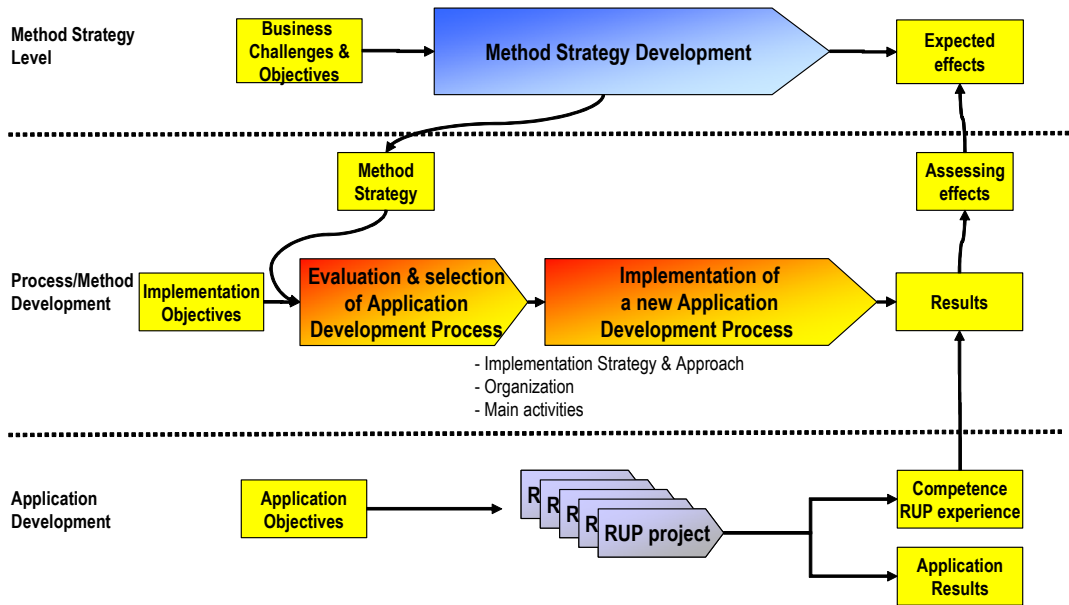


Figure 1: The Software process improvement context

At the Method Strategy Level we focus on the business challenges and objectives, and what Effects we expect by improving the software processes within Volvo IT. This is discussed in the chapter “Business Context”.

To fulfill the objectives of the Method Strategy we need Processes and Methods for e.g. Application Development. In the chapter “Implementation of a New Application Development Process” we discuss the strategy for evaluation, selecting and implementing such process and methods. We also discuss the Implementation Objectives and the results to verify the expected effects on the Software Process Improvement level in that chapter.

The basis for assessing the results of the RUP implementation is the results of the projects that use RUP. In the chapter “Experience from RUP Projects” we present some feedback and lessons learned from customers and developers.

In the chapter “Assessing the Effect of Using RUP” we discuss how we have used the experience from the RUP projects together with SPICE assessments to verify to which extent we have reached the expected effects of improving Volvo IT’s Software processes.

## **Business Context**

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### **Business Challenges and Objectives**

Like most other companies in the IT business, Volvo IT faces new challenges that require changes in the way we develop deliver and maintain software applications. Some of these challenges are:

- The applications are becoming more and more integrated with the business. Therefore the application development process must be integrated with the business engineering process.
- The pace of business change is increasing. Therefore Volvo IT must improve productivity to be able to respond to new and changing requirements.
- The customers want global solutions. This fact leads to an increasing number of projects where the project team is distributed over several countries and continents.

The conclusion is that we need an Application Development process, which together with our existing processes for Project Management and Business Engineering establishes a framework to meet the challenges and fulfill the objectives.

### **Expected Effects**

The long-term expected effects of using the new process framework are:

- Well-defined business requirements as input to the application development project.
- Better product fit to actual needs at time of delivery
- Shorter lead time until delivery of first version of the application
- More projects on-time and within budget
- Reduced rework costs
- Better product maintainability
- One common process for Application Development.

## Implementation of a New Application Development Process

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Gartner Group states that:

*“To fully implement an AD methodology in an AD organization with 100 to 200 developers could easily require two to three years.”*

Since Volvo IT is a much bigger company than the example in the Gartner quote, it was important to understand that this kind of effort would take time, and would need proper management. Volvo IT initiated a project in mid 1998 to set up a strategy for how to manage methodological issues and to find suitable common application development process candidates.

### The Method Strategy

Implementing or changing the application development process in a business is a task with a lot of traps. In the Method Strategy we stated “critical success factors” for our work to establish a common application development process in the company. The success factors were very much based on what Gartner Group and others have found. Some of the most important success factors are:

- **Management commitment.**  
We are convinced that it is absolutely necessary to have a very active commitment from top management, and that the management understands the extent of the change when a company is about to implement a new and common process.
- **In-house process engineering skills.**  
The application development process (including its different variants) is a central part of Volvo IT’s business, and therefore it is important that we have control of the content and configuration of the different process variants within the company.
- **Integration between the application development process and its methods and tools.**  
Just a process (describing *what* to do) for application development is not enough, nor is just methods (describing *how* to do it) - we need both of them, and it is important that the different methods and tools are consistent with each other and with the process.
- **The process must be easy to distribute.**  
Since we realize that the process we select will continue to evolve, it must be easy to distribute new versions and configurations of the process. Too many good processes and methods have become “shelfware”, and that is not what we mean by “implemented”.

### Evaluation Criteria

Based on the Method Strategy, Volvo IT decided to start investigating the market for suitable candidates of application development processes. It was an objective for Volvo IT to use a known, tried and tested standard process from a supplier on the market that supports modern application development practices.

For that purpose we first established a set of criteria, which was to be used in the evaluation of the different candidates, with a focus on the process itself as well as possible relationships with the supplier. The criteria we set up were:

- **Iterative process.**  
To be able to respond to the rapidly changing business requirements, it is important that the process supports iterative development.
- **The process must be configurable.**  
Every project is unique, and a process is a generic, normative, description of an ideal

situation. Therefore the process must be configurable to the needs of the specific project. However, even if every project is unique, it is possible to classify projects in “project types”. Therefore we also have a need to configure the process, not only for one specific project, but also for some “process variants”.

- **Global Training and Support.**

It is important that the developers within Volvo IT can get the equivalent training and support where we have our main sites.

- **Well-established supplier.**

Since this is a long-term investment, it is important to select a supplier that we expect to survive on the market. It is also important that the supplier has a strategy to continue the development of the process influenced by customer needs.

Based on the criteria, Volvo IT evaluated a number of different possible processes and suppliers, and the result was that we selected the Rational Unified Process to be our common application development process.

## MAPS – The RUP Implementation Project

Based on the Implementation Strategy, Volvo IT decided to establish a project for the implementation of RUP. The project got the name MAPS – **M**ethods **A**nd **P**rocess for **S**ystem development.

### A Staged Approach

Changing the “production process” of a business always means stress for the business concerned. When the business’s process, and thereby the procedure in the business, changes, this means a cultural shift to a very great extent. This cultural shift means that the people within the business need to change their way of “looking at” and “thinking of” the business.

In order to facilitate this cultural shift we must start to gain experience of the new application development process. Since we realized that it would be impossible for our company to start using RUP in all new projects at once, we decided to use a staged implementation approach.

The first step, according to this approach, was to start a few pilot projects, and based on the experience from those projects continue with more projects in a number of implementation steps (see Figure 2).

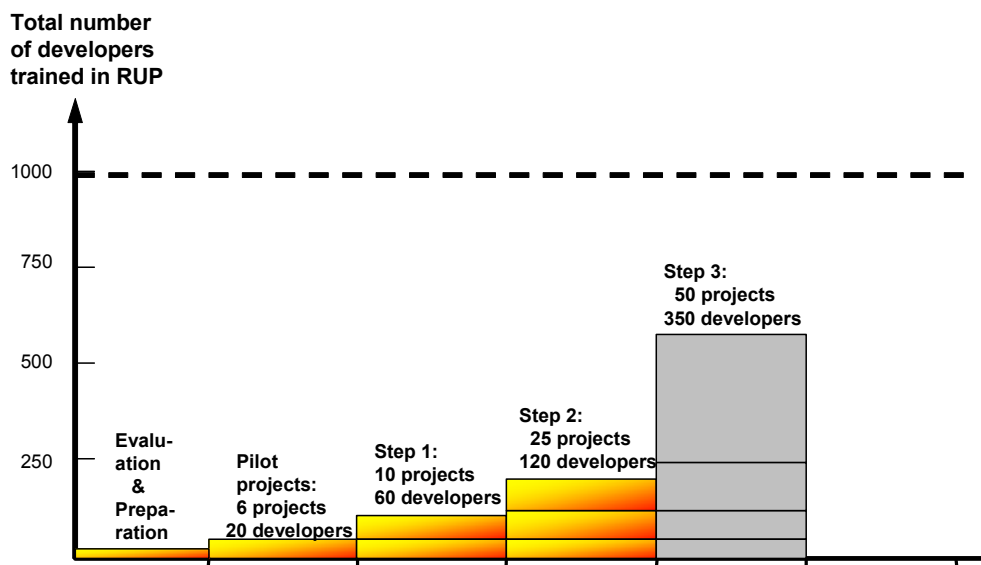




Figure 2: The staged approach

The results from the MAPS project were expected to be:

- A sufficient number of developers who are trained in RUP, the use of UML and Rational Suite, having gained experience from at least one project on how the process, methods and tools fit together.
- A sufficient number of in-house staff in order to make Volvo IT self-supporting when it comes to RUP Coaches and RUP Specialists.
- Support material adapted to the specific needs of Volvo IT to be able to give support to RUP projects.

The MAPS project will continue until a “critical mass” of developers, coaches and specialists is reached.

### **How to start?**

We started by defining criteria for selection of suitable projects during the first implementation step. The reason for the criteria was that we realized that we could not afford the first RUP projects to fail in any respect, so we had to be very selective when we decided which projects should be the first ones to use RUP. The criteria were:

- Project Size: Project team 3 - 10 persons, Duration 3 - 9 months, 2000 - 5000 hours of effort.
- Time to learn: Delivery must not be “critical deadline”. We also expected productivity to be lower in initial phases of first projects: we estimated that at least 4 extra weeks were needed to learn the new process, methods and tools.
- Interest in learning: The Project Manager and the team must be interested in learning RUP.

### **How to organize?**

It is proven that the most efficient way of learning new things (e.g. RUP, UML and the tools) is to combine theory and practice. To be able to use RUP and the tools for the first time, and at the same time build a high-quality product, the project team needs a lot of support. It is the responsibility of the RUP Coaches to give that support. The support material is developed by RUP Specialists. They also assist the RUP Coaches as they are supporting the developers. In the beginning we needed external expertise since we had no ready-to-go, in-house staff within Volvo IT who could act as Coaches or Specialists.

We realized that it would be impossible for the MAPS Project to “push” RUP into the organization – we needed the organization to “pull”. To achieve this, we established local Coordinators at each development site of Volvo IT. The coordinators can be seen as a sub-project manager, with the responsibility to coordinate all the RUP implementation activities within his or her site. In fact, the coordinators are the MAPS project team.

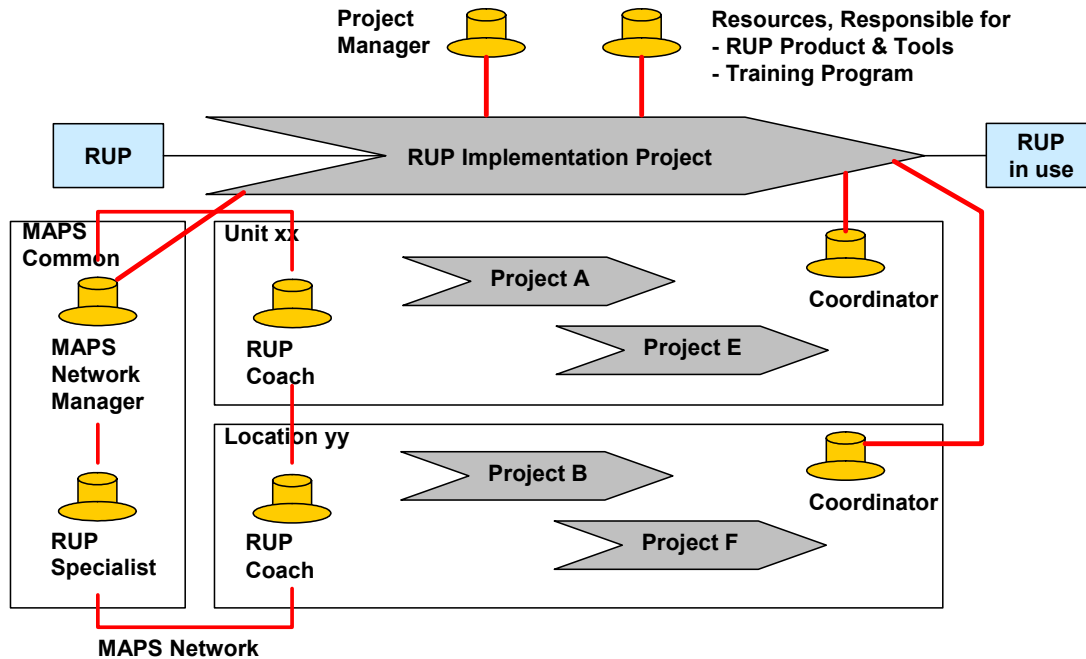


Figure 3: RUP Implementation Project organization

This approach has proved to work out very well. Today we have Volvo IT staff acting as RUP Coaches as well as RUP Specialists.

### Implementation Key Roles

At Volvo IT it is the line organization's responsibility to use RUP. Resources such as training, licences, tools and coaching are supplied by the MAPS project.

#### *RUP Coach*

The long-term purpose of a RUP Coach is to support the use of RUP at his or her site, giving practical assistance to project members, and informing interested parties about new development, plans and results.

The short-term objective is to learn how to Coach; becoming skilled in the process, methods and tools by participating in RUP projects and exchanging experience with other coaches by participating in the Coach network.

The Coach needs an understanding of the artifacts produced in each workflow and the level of ambition appropriate in each phase and iteration depending on project characteristics.

To be able to act as a RUP Coach, experience in system development is required and also an understanding of the development roles and their part in the process. The Coach must be able to judge which tools are appropriate, taking into consideration the type of project and the project members' prior experience. The Coach also needs good personal qualities such as leadership abilities (to make things happen and focus on the results), communication skills (to be able to listen, win confidence, motivate and convince), and educational abilities (to be able to put theory into practice).

#### *RUP Specialist*

The responsibilities of a RUP Specialist include development and improvement of support material, e.g. Volvo IT's configuration of RUP and its templates, guidelines, etc. The Specialist is also responsible for assisting the RUP Coach when supporting projects.

To be able to act as a RUP Specialist, the person should have extensive experience in supporting RUP projects (e.g. from working as RUP Coach), thorough knowledge of RUP, process configuration and reviews.

Normally a RUP Specialist is focused on one or a few RUP Workflows.

**Coordinator**

The responsibilities of a Coordinator are to plan, manage and monitor the use of the process, methods and tools at his or her site. The work of the Coordinator entails planning and monitoring the use of RUP, assisting the site management in finding suitable RUP projects, coordination of training and informing staff, customers and other interested parties about RUP.

The Coordinator should also participate as a member of the Steering Committee of the projects where RUP is used to monitor the use and effects of RUP.

To be able to act as a Coordinator, the person must have a general understanding of RUP and its implications for the projects. The person must also be trusted as site representative, both from the management’s and the developer’s point of view.

**Main project activities**

The main part of the MAPS activities are performed locally in the different RUP Projects. MAPS’s major responsibility is to coordinate all those activities. The different activities can be categorized in the following groups.

**Training**

Training in RUP, methods and tools is necessary and a prerequisite for success! But training only gives the theoretical knowledge of RUP, the methods and the tools. We are convinced that this theoretical knowledge is not enough and therefore the training sessions are followed by more support during the first RUP projects (see below).

Depending on which role(s) a person has in the project, he or she is recommended to take different training courses according to the table below. Most of the training courses are standard Rational courses, but we also have a short introductory training for people who need to understand the characteristics of a RUP project and the difference between a RUP project and a “traditional” project. Examples of people in that target group are customers, users and Volvo IT managers, who usually are involved in Steering Committees.








Training Course	Length	 Project manager	 Analysts	 Developers	 Testing Professionals	 Volvo IT managers	 Customers, Users, etc.	 MAPS Coaches
RUP at Volvo IT	0,5 day	(X)	(X)	(X)	(X)	X	X	(X)
RUP Fundamentals	2 days	X	X	X	X		(X)	X
RMUC	2 days	X	X	(X)	(X)		(X)	X
Object Oriented Analysis and Design using the UML	4 days	X	X	X	(X)			X
Introduction to Rational Rose 2000	1 day		X	X				X

Figure 4: Basic training per key project role and other stakeholders

**Support to RUP Projects**

As described above, the approach of learning RUP is to combine theoretical knowledge with practical work. Based on experience from the RUP projects we have categorised the support in three types: Workshops, Coaching activities and Reviews.

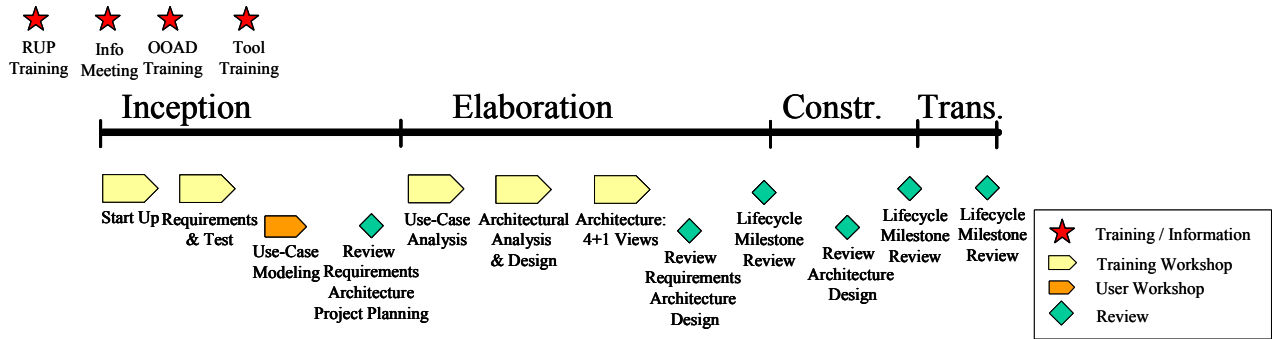


Figure 5: Workshop and review structure

## Workshops

We very soon realized that all projects had almost the same problems when facing certain activities for the first time. To make the coaching more effective and proactive we created a set of configurable workshops. Every workshop:

- Refreshes the theoretical knowledge, gained at the training courses
- Applies the theoretical knowledge to the specific RUP project's problems, artifacts, etc.

Since RUP, UML and the tools are new to most of the developers, it is important to concentrate the workshops as early as possible in the project. In practice this means that there is normally a heavy focus on this kind of support in the Inception and Elaboration phases.

## Coaching

Coaching is the day-to-day support to different roles in the RUP Project team between the workshops. The coaching activities are normally of a very practical and tangible nature. It may concern how to interpret RUP activities or artifacts, how to create a specific UML model in a specific situation or how to use a certain tool in a specific situation.

## Reviews

Reviews are crucial! On top of the normal reviews to secure the quality of the product built within the project, we also evaluate the effects of the support delivered to the project. This "extra" evaluation is important to us since the RUP Implementation will be evaluated based on the success of the RUP projects it is supporting.

The reviews are performed at least at the end of the phases, but they can also be used as "status assessments" at the end of iterations.

## Experience from RUP Projects

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To implement and start using a new common application development process is a very large investment for a company like Volvo IT. Therefore it was very important for us to get the feedback on how RUP itself and the support were received by the RUP project team members and the customers.

### Questionnaire

One way of evaluating RUP and the RUP support is to use a questionnaire. The evaluation is done with customer representatives, the project manager and the project team when the RUP project is closed. The questionnaire focuses on five different areas:

- RUP vs. “The traditional way of working”.
- The Development process.
- The training.
- Coaching and support.
- The iterative approach.

For each area we use several questions to find out the opinions from the stakeholders.

The result is compiled and presented to the project team and to the MAPS project’s Steering Committee. Our overall objective is to have at least 80% satisfied respondents (level 3 or 4 on a scale from 1 to 4). The results show that we far exceed this target – in some cases up to 95%!

If we summarize lessons learned based on detailed questions in the questionnaire and additional comments given by the respondents, the most important messages are:

- The focus on requirements and risks during the project is especially appreciated.
- The cost of maintaining the application is expected to be lower compared to maintaining an application developed the traditional way.
- To implement a new Application Development process is an investment in competence, and must be regarded as a long-term improvement.

### Success Stories

The most valuable proof is when the customers of the RUP projects say that they like the “new” way of working. We have got several examples of that. Below are quotes from the customer of one of the RUP projects, presented in an internal Volvo IT magazine:

*"It has been fantastic. We have been invited to take part in a dialogue and have been given a turn-key solution."*

*"We have found that the different phases have brought up things we would probably never have thought about otherwise. As we found the architecture in good time, we were not overtaken by any unpleasant surprises at the eleventh hour."*

*"They have really been working to find examples of the way different solutions work and have explained things in a way everyone understands. Everyone has been involved and influenced the process, right down to the production leaders and assembly workers. They have always been very receptive to our needs and wishes. It was almost as though they could read between the lines. Working in this way has also made us much better at imposing demands."*

## Assessing the Effect of Using RUP

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### How to Measure Effects of Using RUP

The total number of developers to be trained in RUP is estimated at 1000 people. This equals an investment in the range of 50 – 100 million SEK, equal to 5 – 10 million USD. So the question from top management was no surprise: “Can you prove that RUP is a good investment?” Unless positive effects from using RUP in the first round of projects could be documented, why should we continue?

Well, what could we measure?

- The questionnaire designed for providing feedback on RUP pilots would apparently not be regarded as objective evidence. It’s normal to be positive when you are among the first to work with a new process and using new tools.
- Just looking at delivery precision (Actual Time and Cost compared to early estimates) of projects using RUP would not be enough to judge the effects of RUP. On the contrary, the iterative approach enables the customer and the supplier to agree on changes in scope and priorities as knowledge about the problem and the solution grows.
- Then we came across the Software Process Improvement and Capability dEtermination (SPICE) Framework for assessing “process capability”. By assessing the “traditional way of working” of a project team, and later on comparing these data with the results of an assessment of the same team “working with RUP”, we would hopefully be able to document how the software process capability of the team was improving.

### The SPICE Framework

SPICE <sup>[2]</sup> (ISO/IEC TR 15504) provides a two-dimensional model of processes and process capability that forms the basis for process assessments. Processes are grouped into five categories:

- Customer – Supplier processes, e. g. Requirements Elicitation
- Engineering processes, e. g. Software Construction
- Supporting processes, e. g. Configuration Management
- Management processes, e. g. Project Management
- Organization processes, e. g. the Human Resource Management

Within each category, processes are described by a statement of the purpose of the process, which includes an outline of the intended outcomes of process implementation.

For each process, the process capability is assessed using nine attributes, examining the performance of the process, how it is managed, what work products are produced and how changes are managed, etc. The rating of these attributes is used to derive the capability level for the process. Each process receives a separate capability level rating.

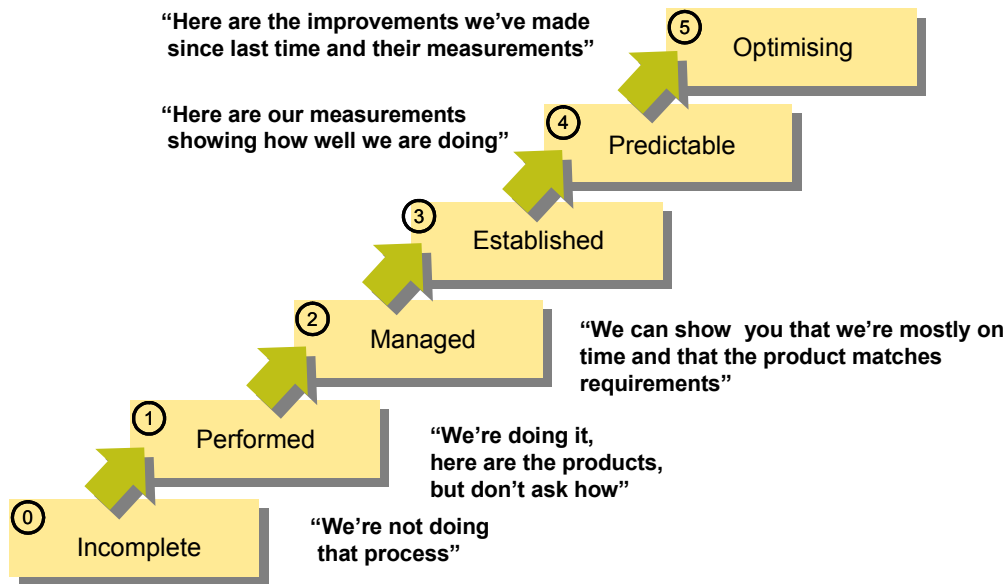


Figure 6: The SPICE Capability levels

SPICE has a lot in common with the Capability Maturity Model <sup>[3]</sup> - CMM (TM) from the Software Engineering Institute (SEI) of Carnegie Mellon University, US. The main difference is that SPICE allows you to select which process you want to assess, and each process is rated by itself, whereas CMM has a "packaging" of processes that must be performed according to certain requirements in order for the Organization to be at a certain maturity level. The new CMM Integrated (CMMI) offers a similar approach to SPICE.

## Establishing Target Capability Profiles for RUP

So, it should be possible to establish a "target capability profile" that an organization would achieve if it followed RUP in an idealistic way. As a matter of fact such a target profile existed within Rational Software <sup>[4]</sup>, as a result of an internal study in 1998 by John Smith of Rational Software. This study assessed an older version of RUP using an older version of SPICE.

In the spring of 2000 a "target capability profile" for RUP version 5.5 was determined using the current version of SPICE at the University of Borås, Sweden <sup>[5]</sup>. The result of this study shows that capability level 3 is expected for a set of selected processes in an idealistic situation when following the RUP approach. However, this is expected to be achieved in a 2 – 3 year time horizon for a team working with RUP. We cannot expect project teams to reach level 3 on their first project using RUP if they set out at level 1 or 2.

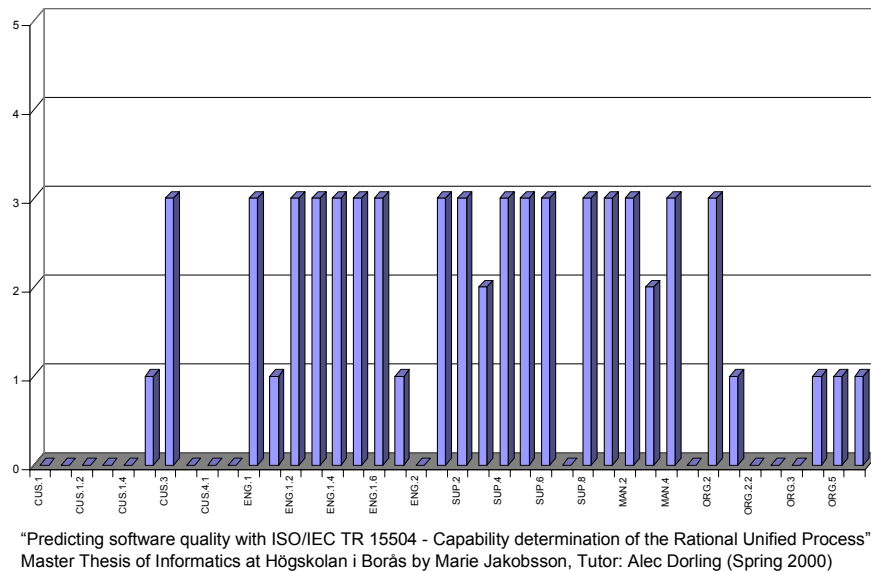


Figure 7: RUP's SPICE Capability profile

## The Assessment Program

We set up an assessment program to determine the “Before/After” capability profiles for three of the ten RUP project teams in Step 1 of our RUP implementation. The projects were chosen to represent different application areas, different sites and different technical environments.

We engaged an external consultant to train a few internal assessors and to lead the assessment team, and we planned our assessment program with the following phases, according to the requirements of SPICE:

- Pre-Assessment Questionnaires, with collection of key documents
- Assessment plan and schedule
- 1-hour briefing of project team (one week before interviews)
- 1-day interviews of project team
- Validation and Rating
- Feedback of findings to project team (day after interviews)
- Assessment Report (one week after interviews)

The scope of the assessments in terms of processes assessed is shown in Figure 8. For all these processes, the expected capability level = 3 when using RUP 5.5 in an idealistic way.

For each project assessed:

- The “Before-assessment” or “the traditional way of working” was performed at the beginning of the project, looking at how the project was likely to have been performed had it not been selected to be one of our RUP projects.



- The “After-assessment”, assessing the way of working with RUP was performed in the Construction Phase of RUP.

The interviews were limited to fit within one day, in order to disturb the project team as little as possible while at the same time gathering enough information to be able to give a correct rating. In one case one day was too short to assess all the processes we had planned to assess. We also discovered that in some cases it was too early to assess the Integration and Testing processes since they had not been performed in the first iterations to the extent that a fair rating could be given.

## Assessment Results

Below the assessment results for one of the projects is shown. For each process, the upper bar is the “Traditional way of working” and the lower bar is “Working with RUP”.

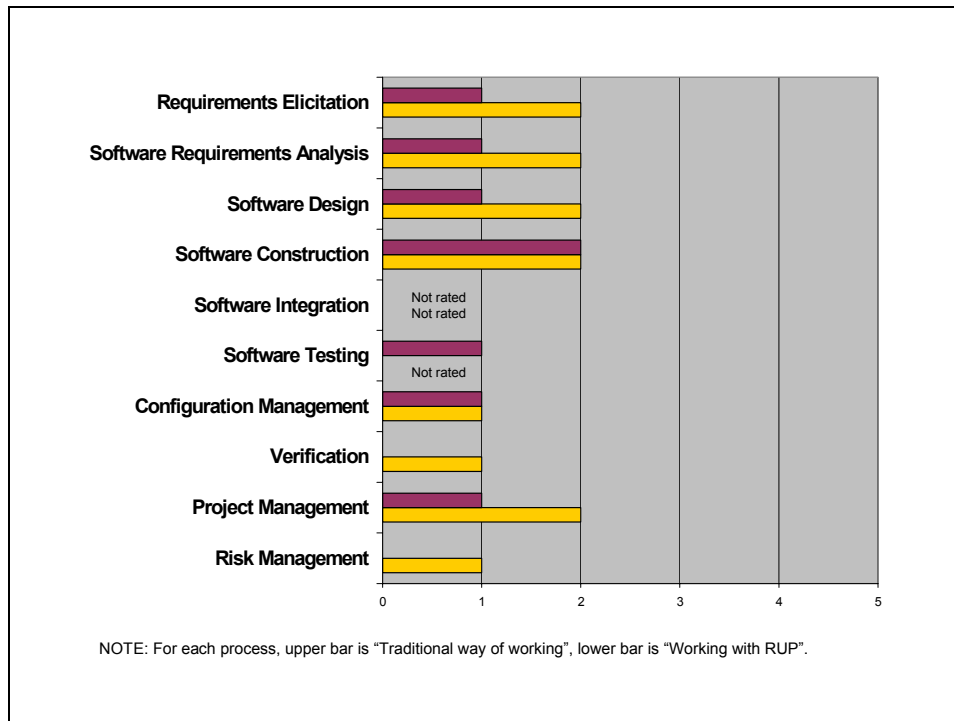


Figure 8: Capability Levels “Before/After” for one RUP project

The diagram shows that the capability increased from level 1 to level 2 in the Requirements, Analysis, Design and Project Management processes. The Verification and Risk Management processes were not performed at all in the traditional way of working. “Working with RUP”, they were rated at level 1.

In all of the three projects we assessed, the Requirements, Analysis, Design, Construction and Project Management processes were all rated at level 2 in “working with RUP” (with one exception). These are the processes that have been focussed on in the coaching of these first RUP projects. It is clear that the focus when starting to use RUP is on getting the end product right first, meaning that the engineering processes, modelling techniques and new tools are given the most attention. In two of these projects the Windows DNA environment was used for the first time, adding more needs for training and coaching in technical issues.

The assessment result clearly indicates that the implementation of RUP is having an effect. However, there is a big potential for further improving process capability with growing experience in RUP. Process improvement actions were suggested to the project teams at the feedback sessions

where the results of each assessment was presented and discussed. There is also a potential for enhancing the support given to RUP projects on the Management and Supporting processes. Suggested actions concerning both the content of the support as well as how the support is delivered were documented during the assessments. So, besides providing evidence that the implementation of RUP is having a positive effect, the assessments also gave valuable insights into strengths and weaknesses of how we are running the implementation.

## **How to Translate Process Capability to Productivity**

When we reported what we had found to top management, they were quite pleased but could not hold back the question: “Can you tell us how much money we will be saving?”

Well, that’s a tough one to answer ... However, the April 2001 issue of the IT Metrics Strategies contains an article <sup>[6]</sup>, discussing how much faster, cheaper and better a team working at CMM level 2 is compared to a team working at CMM level 1. The article is based on aligning statistics from CMM assessments to the large database run by Quantitative Software Management (QSM), containing productivity measurements from over 2500 projects. While this article discusses some very large projects, it also refers to data presented by QSM <sup>[7]</sup> which shows that moving from CMM level 1 to CMM level 2 when coding and testing a business application of some 50,000 lines of code, will

- Reduce the schedule by 17 %
- Reduce the effort by 46 %
- Reduce defects by 51 %

And, moving on from CMM level 2 to CMM level 3 will again reduce effort and defects by some 50 %!

Now, CMM maturity levels are not exactly the same as SPICE capability levels, but the message is clear: Software Process Improvements will have a very positive effect both on Time-to-market and Cost, as well as on the Quality of the products.

By implementing RUP, we will be able to reach Capability Level 3 for selected processes in a 2 – 3 year time horizon for teams working with RUP. So, even if the investment needed for implementing RUP according to “The Volvo IT approach” is substantial, our potential savings are much bigger.

Top management accepted this “chain of circumstantial evidence”, and gave us the approval to continue with the next step in the implementation plan.

## Conclusions

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### Have we reached the objectives?

Based on the feedback from questionnaires and customer testimonies, the conclusion is that we are moving in the right direction. Customers as well as developers like the new way of working and say that the requirements are of better quality which leads to a more solid architecture. The possibilities of managing changing requirements and having a first version of the product up and running early in the project are especially appreciated. They also expect that the products built according to RUP will be easier and cheaper to maintain.

The SPICE assessment results clearly indicate that the implementation of RUP increases the application development capability. However, there is great potential for further improving process capability with growing experience in RUP.

When it comes to “One common process for Application Development” we know that it will take time to reach that objective. Probably it will take another five years, but today we are confident that it can and must be done.

### General Recommendations

Based on our experiences and assessments we think that this approach of implementing RUP will work well in other organizations as well. Some of our key success factors have been:

- Management commitment. Make sure that management gives active support to the implementation of RUP from the beginning and throughout the implementation project.
- Establish an implementation project. It is important to separate this kind of large effort from the normal activities in the line organization. To establish a separate project makes it possible to give the effort the needed focus and attention.
  - Staged approach. Do not try to implement all parts of RUP in all parts of the company at once. To implement a new application development process is to implement a new way of thinking and working in the company. A lot of competence build-up for different roles is needed and that takes time.
  - Well-defined roles and responsibilities. Do not try to “push” RUP into the organization. Use an organization with well-defined and distributed responsibility to coordinate the implementation and to coach project members.
- Packaged Workshops (incl. support material), to be tailored to the specific project’s needs. Make sure that you can support the RUP projects with well prepared support material.

However... To implement a new application development process like RUP is still a challenge for the software process improvement team and for the company. Some of our lessons learned are:

- Up-front investment. It takes time and it costs a lot of money to implement a new development process. Therefore the effort should be regarded as an investment in competence. As for every investment you should estimate the profitability.
- Don’t underestimate human factors. To change people’s way of thinking and acting takes time. It is important to be patient.

Still – it is possible!

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# THE SECRET BEHIND SUCCESSFUL INDUSTRIAL IT.



A problem, which has almost been solved, is still an unsolved problem. A solution that works in theory is still not a solution. A problem is not actually solved until the solution has been proven to work in practice (and hasn't created a new problem somewhere else). This is how we have learned to look at matters after many years amidst the realities of industry.

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