

# Iterative Requirements Management with IBM Rational Suite AnalystStudio

IT project requirements management is difficult because requirements change during projects. Keeping in line with real business needs requires managing the requirements iteratively.

This white paper explains the problems faced by IT departments in defining and processing the project requirements. It shows how these problems are solved by requirements management solutions. It explains why efficient IT management requires such solutions. It explains how IBM Rational Suite AnalystStudio meets the challenge of iterative requirements management.

This white paper was written by Yphise at the request of IBM Rational software. It outlines the benefits of requirements management. It positions IBM Rational software in this market. Good reading.

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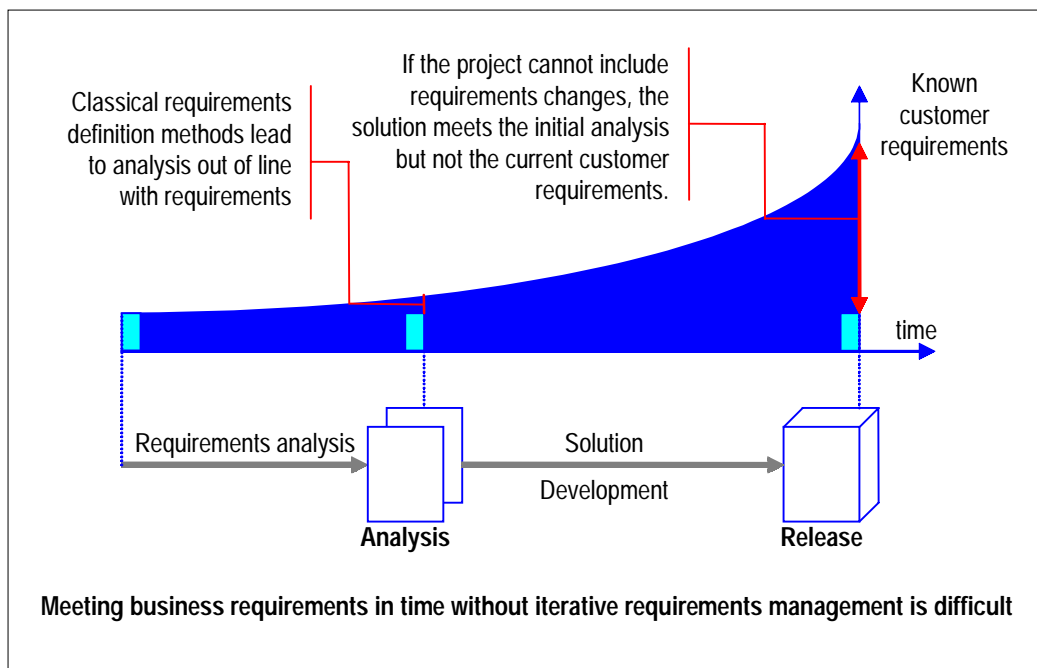
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# The challenge: meeting the business requirements in the best time-to-market



## Comments

- The challenge for IT departments is how to maintain development in line with business requirements, despite changes and deadlines.

Definition of Requirements. Project requirements include all needs, goals and constraints, both functional and nonfunctional. They justify the project and ensure its value for the business. Requirements describe what the business wants.

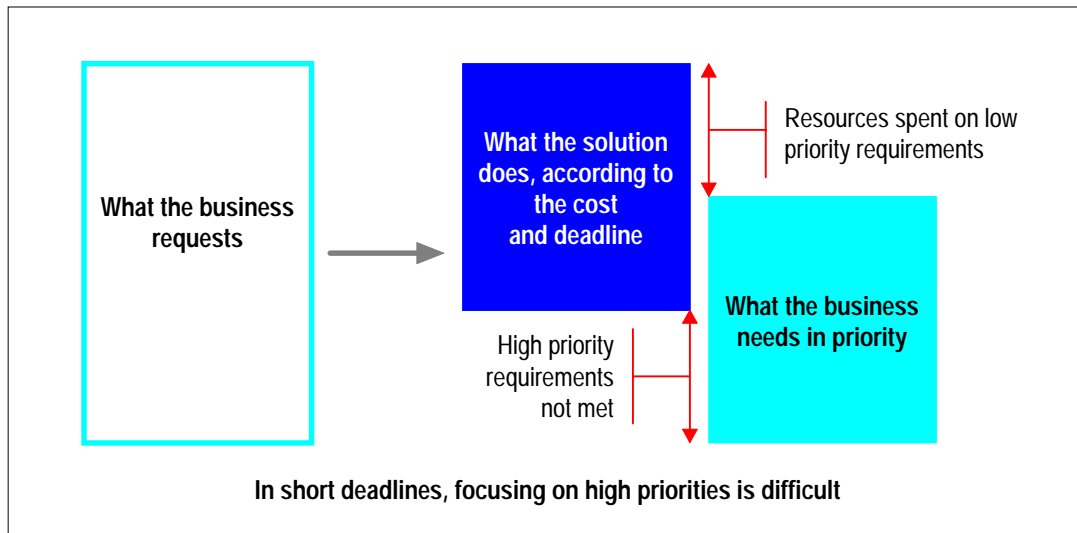
A major operational risk for IT departments is lack of responsiveness to business requests. IT departments must be able to change the information system within the deadline requested by the business.

- Business requirements change continuously. The business units may not always be able to express their requirements fully and immediately. In classical methods, an initial analysis is drafted, and developments do not follow the requirements changes. The results delivered meet the requirements known at the launch of the project, but they are far from the actual business requirements. Thus, **enterprises lose competitiveness due to inappropriate time-to-market.**

Project deadlines get shorter because of market and competition changes. Deadlines cannot be met by using classical methods, i.e. collecting the requirements and drafting the analysis.

Telecom. "If the competition launches a new product or service, the time available to respond is short. We must very quickly develop a solution to sell and we must manage equivalent services. We cannot afford to spend a long time in discussions with the business in order to draft in-depth analysis."

- Costs and deadlines do not usually make it possible to process all the business requests in the first release. Project teams do not always know how to handle business priorities. Project teams may find it hard to define the scope and priorities of the project.



- Understanding the requirements and responding to requirements changes are a challenge independent of the **team size**. However, the larger the teams, the higher the need for requirements management, because of the variety of needs regarding requirements and the communication issues between players.

In small teams, players often have several roles. E.g. Developers analyze, develop and test. This reduces the risk of losing information in the **transfers between players**. However, this does increase the risk of **processing the requirements at an inappropriate level of responsibility**. Indeed, players with various roles may skip the earlier steps of the project, especially analysis, and focus on the later steps, such as development. Requirements management solutions improve control over the various project steps.

- IT departments may have various maturity levels in the area of requirements management. This maturity increases or decreases the problems described above.

⇒ **No requirements management.** The enterprise deals with all the problems described above. It may not identify the business requirements and may therefore develop unsuitable solutions.

⇒ **Managing the requirements in text documents.** Requirements are written in specifications or analysis reports. This provides the business units and project teams with a starting point to discuss what to do in the project.

In such cases, changing the requirements is difficult. Tracking the changes in order to understand the changes, as well as backtracking, may be impossible. The organization and qualification of requirements to decide priorities are difficult, because documents are usually structured to facilitate the expression of requirements by the business, not by priorities. Requirements are managed as a whole. They cannot be linked in a unitary way to other project components. Ensuring that tests meet the requirements is difficult.

⇒ **Managing the requirements in databases** (or in spreadsheets for simple cases). This solution makes it possible to link requirements one to another, to structure them and to supplement them with qualification information.

This solution does not ensure ease of change and traceability. It makes prioritization possible. However, this solution does not make it possible to rebuild easily a full and synthetic document of the requirements to be arbitrated. Therefore, the discussion between business units and project teams remains difficult. This requirements management is not natural for the business.

⇒ **Managing the requirements in text documents and databases.** The main problem with this solution is data consistency between the text and the qualification, organization, and decision data managed in the database. Data must usually be duplicated.

⇒ **Requirements management software.** Requirements management software manages the text description of requirements and the complementary information in order to qualify them and to decide the project scope. It organizes the requirements.

However, if this requirements management solution is not integrated into the application change cycle, then the design, development and testing may not meet the requirements.

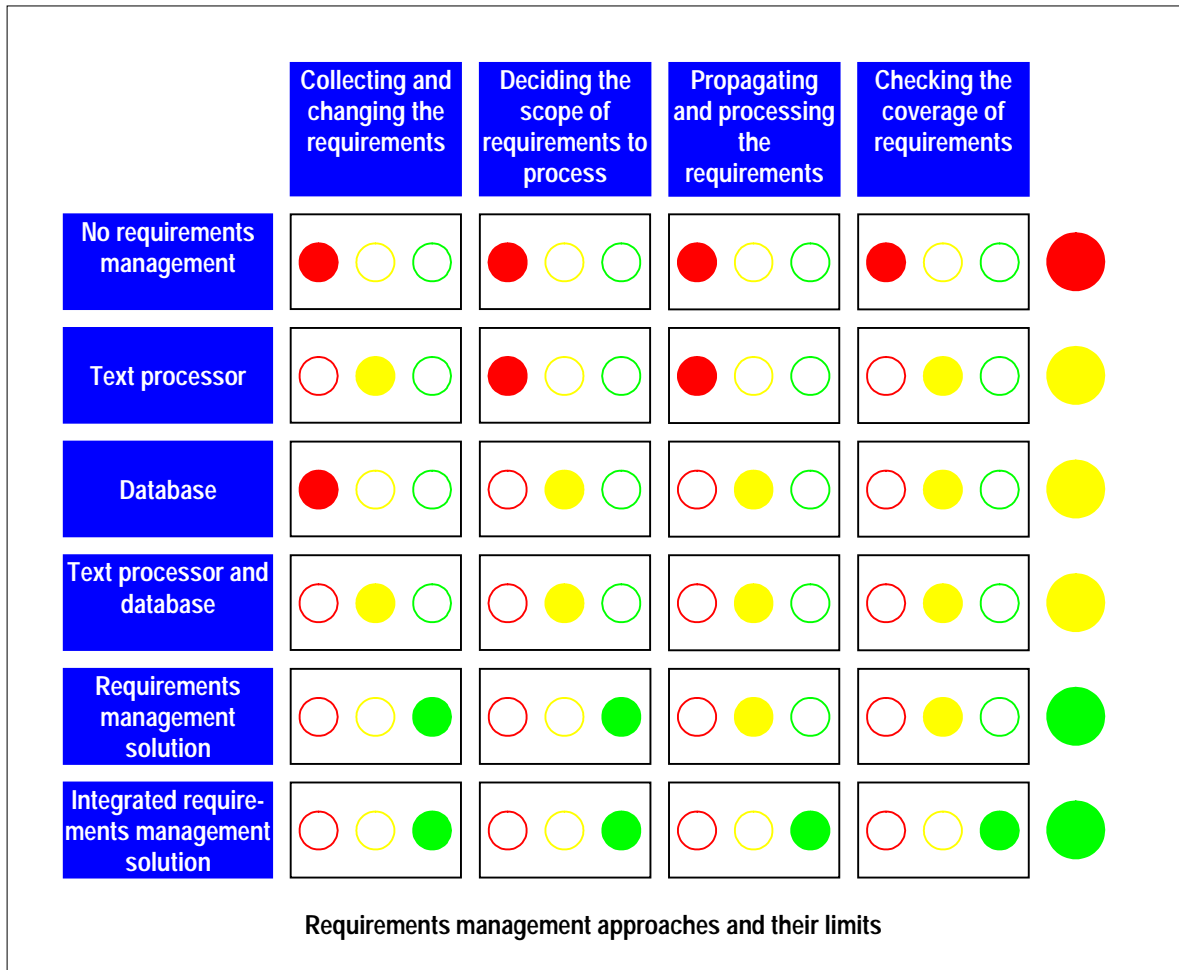
Services. "We are not skilled in UML yet. This is why we do not integrate IBM Rational Rose yet. However, IBM Rational RequisitePro does allow us to define and manage all use cases as text."

⇒ **Requirements management software integrated end-to-end into the development and maintenance cycle.** Integration of the requirements management solution into the development and maintenance cycle ensures that requirements are known, understood in the same way and used by every project player. Integration avoids the need for requirements duplication. These are stored in the requirements management tool and accessed directly from design or test tools.

Requirements management problems are solved fully only when the requirements management solution is integrated end-to-end into the development and maintenance cycle.

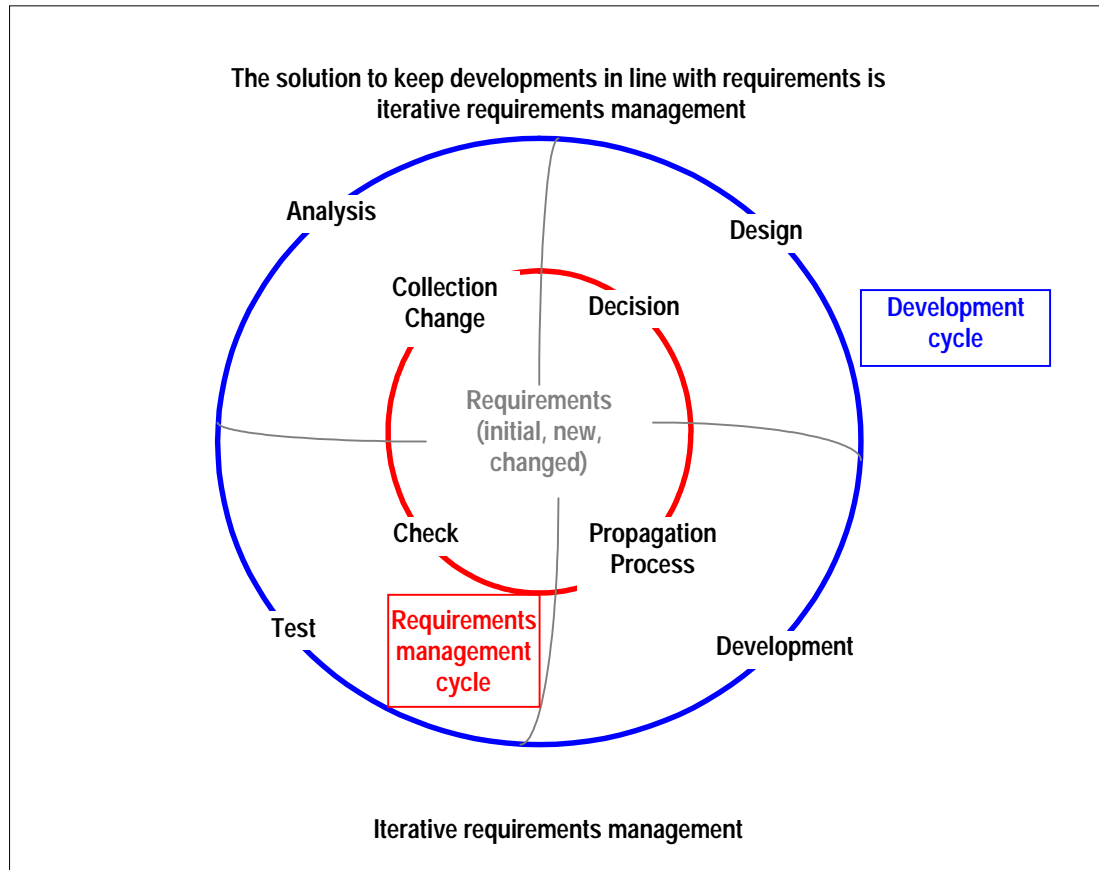
Administration. "We do not use every product in IBM Rational Suite AnalystStudio. We integrate step-by-step, as we reach new maturity levels in requirements management. At this time, we are using IBM Rational RequisitePro, IBM Rational Rose and IBM Rational SoDA. The next step will include IBM Rational ProjectConsole. Rational Suite AnalystStudio makes progressive implementation possible."

The grid below shows the main limits of the various approaches.



The next chapter shows the target that IT departments must reach in order to meet responsiveness and requirements change control challenges.

# Iterative requirements management



## Comments

- The responsiveness challenge requires **managing the requirements iteratively**. Analysts must include new requirements and changes in requirements throughout the projects. The usual methods of requirements management (e.g. drafting exhaustive specifications before development) are not appropriate when management of continuous changes in the requirements is involved.

Services. "Project deadlines were a major problem for us. A misunderstanding of requirements and changes in the requirements would entail additional costs and delays. With IBM Rational Suite AnalystStudio, we can control our project deadline. We are not longer hit by bad surprises when validating the requirements."

- Iterative requirements management is part of **iterative development**. Managing the requirements iteratively requires a development cycle where new requirements may be included at each iteration. Iterative development avoids tunnels between requirements definition and result validation.
- Efficient control of requirements changes calls for the integration of requirements management into the application development and maintenance cycles.



## 1. Collecting and changing the requirements

Collecting the requirements or changes from the business is difficult because of the number and variety of players. The chapter "Improving communication between the various project players to better define requirements" explains how to solve this problem.

Services. "In our projects, decision makers are distributed all over the United States. Collecting and validating the requirements is difficult. Some information may be missed, not intentionally, but because it was overlooked by some addressees. IBM Rational Suite AnalystStudio helps us centralize the requirements and provide all the involved decision makers with read and check access."

## 2. Deciding which requirements must be processed on a priority basis and which requirements can be processed later, i.e. deciding the priorities and project scope

Setting the priorities and deciding in which release to process requirements is difficult. This is due to the lack of information to qualify these requirements and the lack of synthetic view of the decision criteria. The chapter "Deciding the project scope and the requirements priority" explains how to solve this problem.

Services. "We had critical problems in the area of decisions with regard to priorities in major projects. We needed to qualify the requirements and to manage the attributes. However, the Word documents we used did not support this. With IBM Rational Suite AnalystStudio, we can keep our documents, while managing the requirements attributes accurately."

## 3. Propagating the requirements in order to process them consistently throughout the application development and maintenance cycle—design, development, testing and deployment—regardless of tools or processes

The heterogeneity of the tools and wording used by the various players makes it difficult to meet the requirements throughout the project. The chapter "Propagating the requirements to all the project players" explains how to solve this problem.

Manufacturing. "We integrated the requirements management, design and testing. Without tools to integrate the requirements until testing occurs, our iterative development method would be impossible to manage."

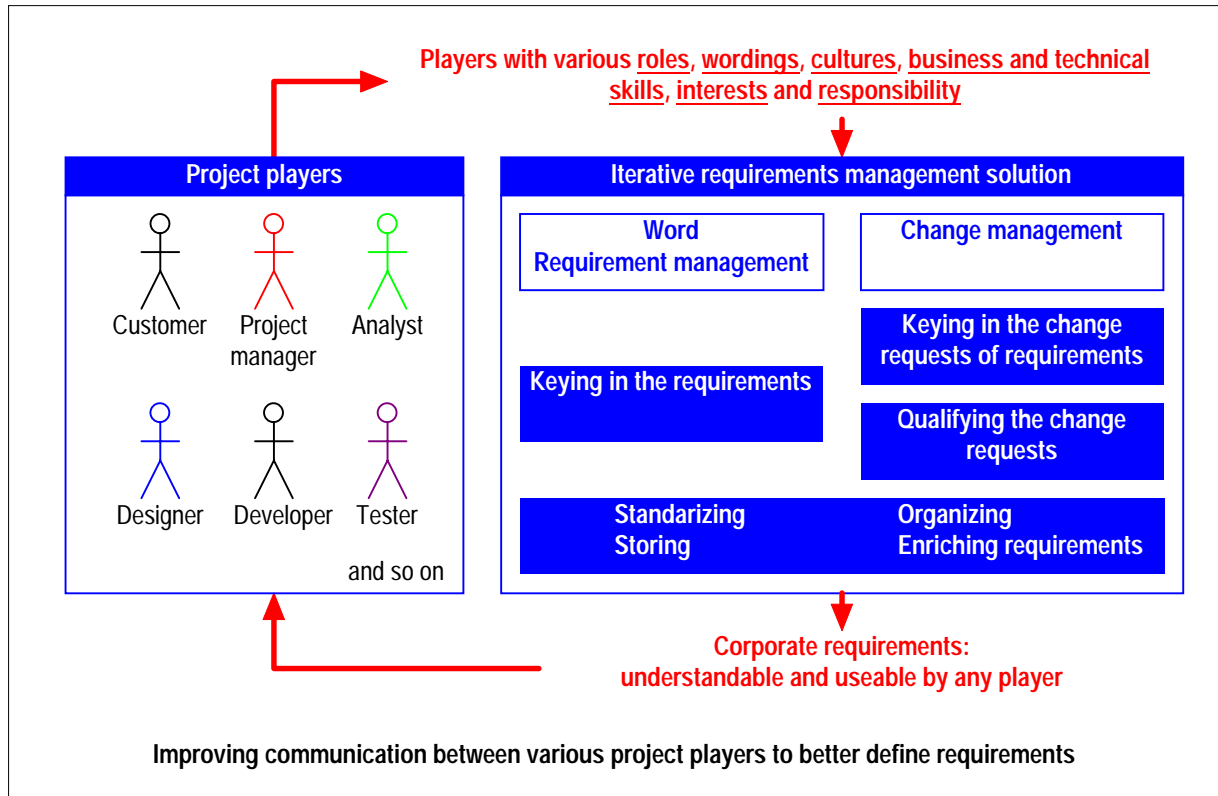
## 4. Checking and proving to the business that requirements are met

Proving the coverage of requirements is difficult, because the result must be tested according to requirements. Tracking the relationship between the requirements and the test results is also difficult. The chapter "Ensuring the requirements coverage" explains how to solve this problem.

Manufacturing. "We build test campaigns on the functions defined in IBM Rational RequisitePro. We can now ensure that tests do cover the requirements. We can now start improving the test automation."

*The next four chapters detail the needs, what must be done to master iterative requirements management, and how IBM Rational Suite AnalystStudio tools this method. The final chapter presents the details of the IBM Rational Suite AnalystStudio solution.*

# Improving communication between the various project players to better define requirements

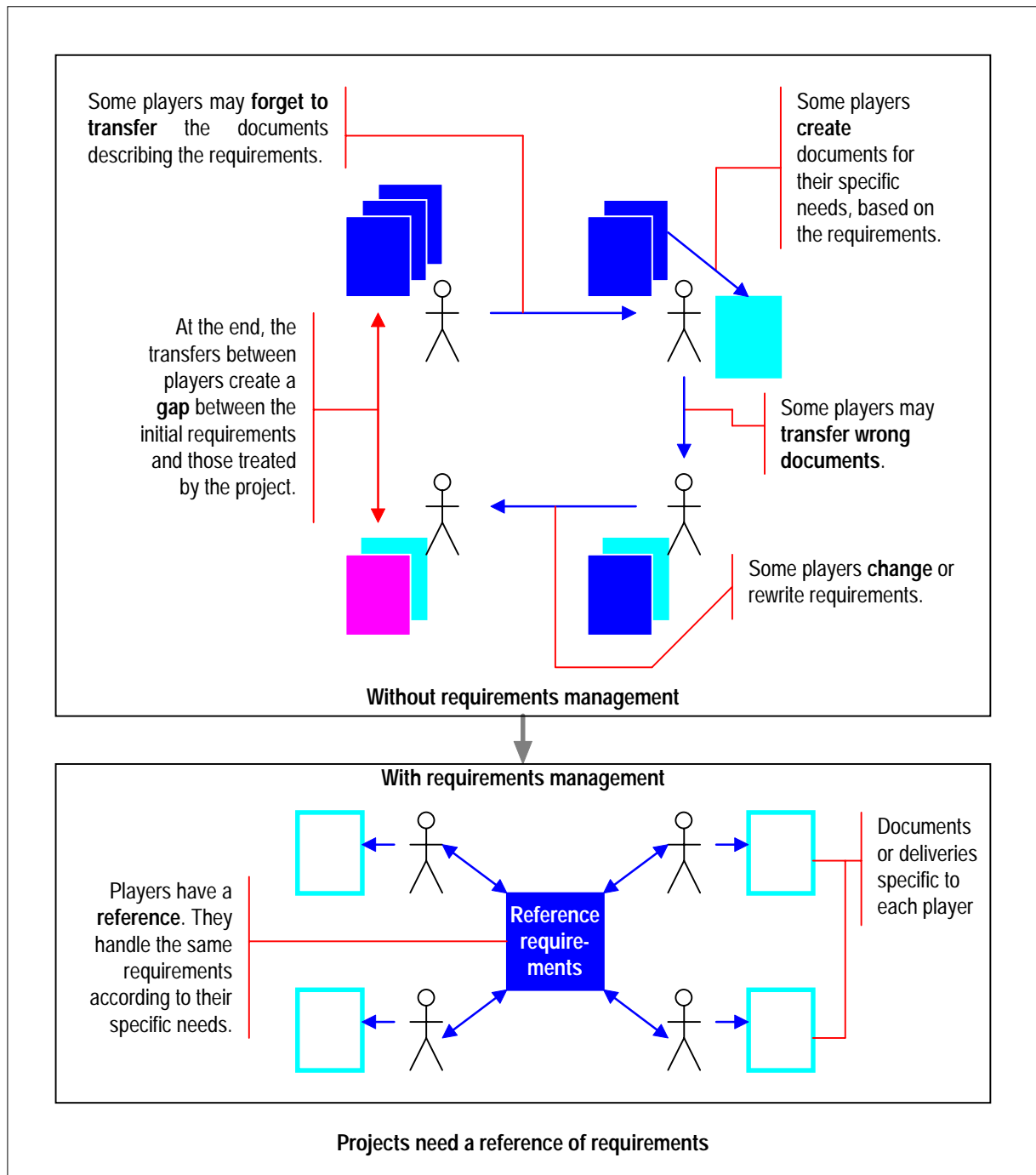


## Comments

- Iterative requirements management requires efficient communications between the various project players in order to define requirements. This provides, for **each development iteration**, an input of requirements on which players agree. This allows the management of **requirements changes between two iterations**. Focusing every iteration on the most important needs of the business requires the collaboration made possible by iterative requirements management.
- Collecting the requirements is difficult, because they are distributed among various players. They may be written in various office documents, emails or memos. Some requirements are not written (e.g. requirements expressed in informal talks or not tracked). This makes it difficult to understand what must be done. A **user-friendly and easy-to-use interface** facilitates the collecting of requirements from the business. **Microsoft Word** is appropriate, because a large part of the requirements often exists already in office documents. Most players are skilled in the use of this tool.
- Some projects fail because of **miscommunication between the business and the IT teams**. This leads to ambiguities, misunderstandings and loss of information. When players do not have a single reference of requirements, they may set out the requirements in their own words.

A **reference of requirements** is called for, on which all players can agree. The solution must standardize the requirements.

- ⇒ Requirements management provides a **shared format**. This facilitates the communication of requirements to the players, as well as changes in the requirements. The business and the IT teams have the same interface.
- ⇒ Requirements management controls the wording of requirements, through a **corporate glossary**. This detects any confusing words. This normalizes the requirements according to words agreed upon by all the players.



- Distinguishing between requirements and **change requests pertaining to requirements** is important.
  - ⇒ This makes it possible to accurately **track** the changes in the requirements and how the current requirements have been obtained.

⇒ **Validation cycles** of requirements and change requests differ. Responsibilities differ.

⇒ **Clear** requirements require separate documents for the requirements (i.e. agreement between the business and the project teams) and the change requests (i.e. building and negotiation required to reach the agreement on requirements).

This requires a specific interface in order to key in the change requests pertaining to the requirements.

- Requirements collected from the business are **not homogeneous**. They may be general or specific, technical or business-oriented, and they may involve one or several functions. If requirements are managed only in Word documents, these various levels are mixed. The project teams cannot use this result easily.

Requirements management solutions help **organize requirements**. They help sort requirements easily and unambiguously. They facilitate the transfer and reorganization of requirements. They manage the dependencies between requirements.

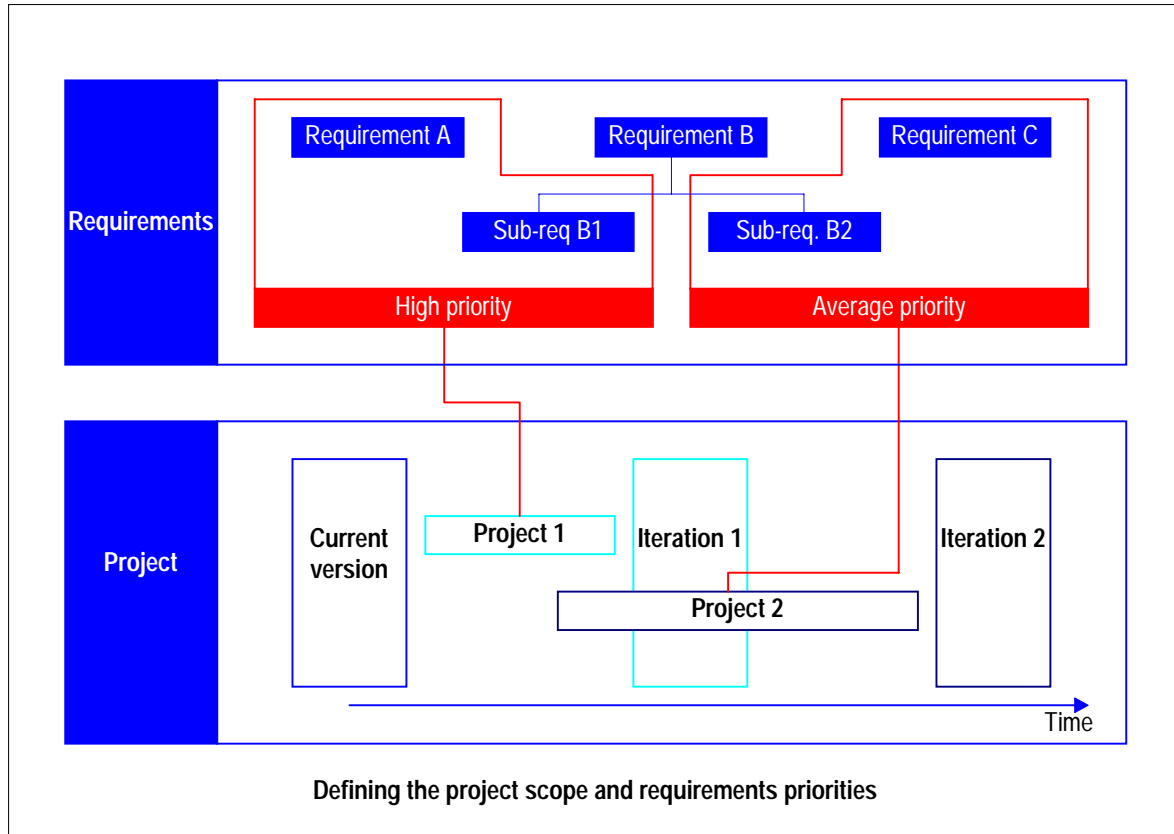
### **IBM Rational Suite AnalystStudio**

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IBM Rational Suite AnalystStudio is an appropriate solution for solving the issues in the areas of requirements collection and change.

- The main interface for the keying-in of requirements in IBM Rational RequisitePro is **MS Word**. Specific menus are available in order to manage the requirements directly in the text processor software.
- IBM Rational Suite AnalystStudio facilitates the management of **use cases** for collecting the requirements. Use cases can be understood by both the business units and the project teams. **IBM Rational Rose** displays the cases graphically (UML models), while **IBM Rational RequisitePro** displays them as text. Both tools are integrated into AnalystStudio, which provides a **shared format** in order to avoid misunderstandings and ambiguities.
- IBM Rational Suite AnalystStudio includes **IBM Rational RequisitePro** for requirements management and **IBM Rational ClearQuest** for change management. IBM Rational ClearQuest manages the change requests pertaining to requirements. This solution ensures that no requirement is changed without **agreement and validation**. Change requests are stored separately from requirements. IBM Rational ClearQuest controls the agreement between players before a change request is accepted.
- **IBM Rational Unified Process (RUP)** provides a **method and recommendations** to ensure that the requirements collected are easy to understand by every player. IBM Rational Suite AnalystStudio includes RUP.

# Defining the project scope and requirements priorities



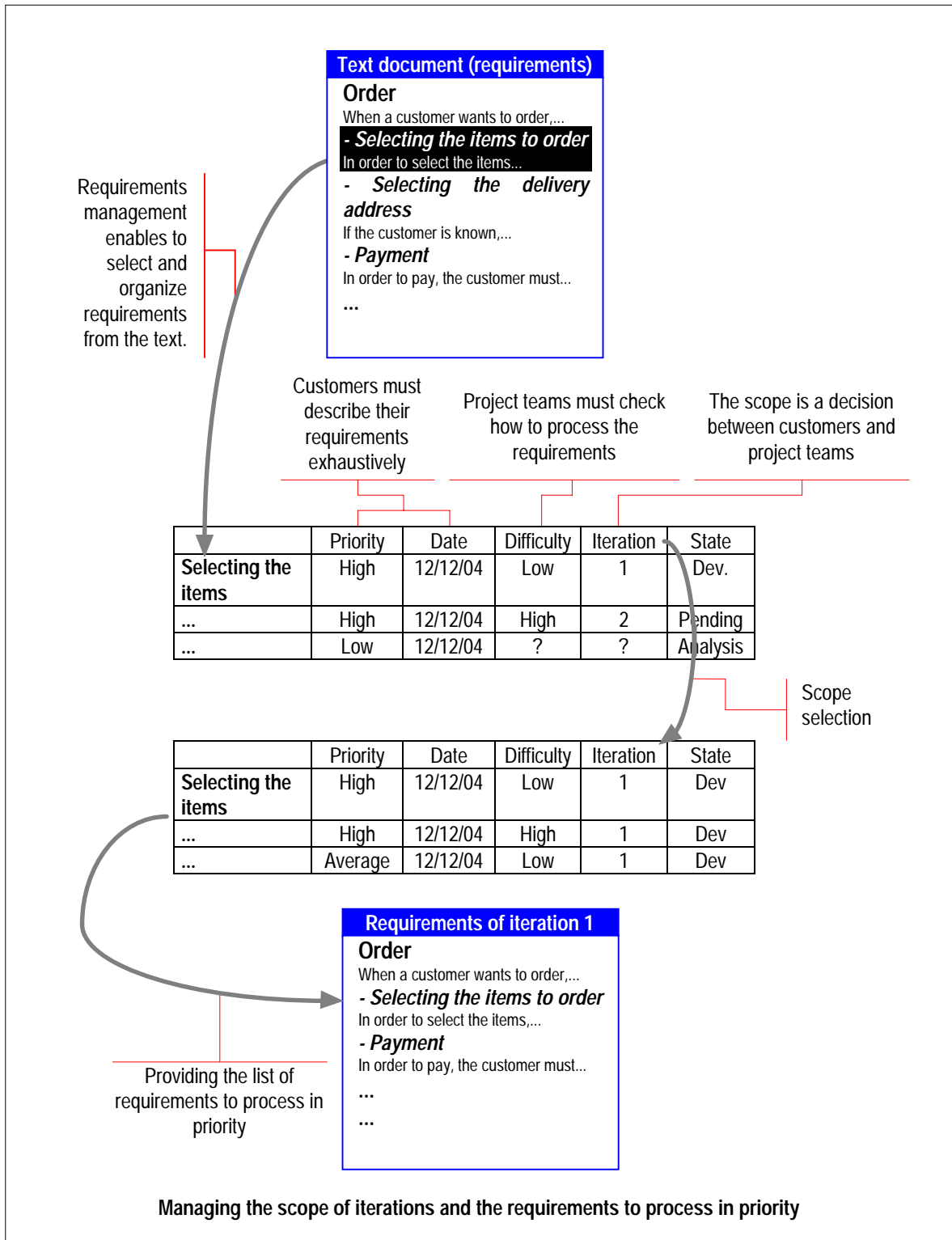
## Comments

- **The next iteration cannot include every requirement.** Iterative requirements management helps split projects into subprojects or iterations. The project scope can be revised at each iteration, according to the events in the previous iterations (e.g. new business requests, technological constraints). Each iteration focuses on a requirements subset.

Project teams must identify what can be done with the available resources. They must define the project scope in order to optimize the value for the business within the frame of these resources. Scheduling the project according to all the project requirements requires decisions. Withdrawing the requirements that are too expensive may also require decisions that are arrived at by business and the project teams.

Such decisions are difficult. A list of requirements that includes only all expected functional and technical characteristics does not help such decision making. The requirements description must be enriched by **supplementary information**, such as priority, delivery date, cost estimates, impact on the information system, skills and technological knowledge.

This information provides the business and project teams with an objective discussion framework in order to **decide on the scope** of each iteration. Requirements management solutions manage the requirements **attributes**. They help **organize** requirements, i.e. **sort, filter and select** them according to attribute value. They provide the players with list of requirements in line with the set scope.



- Every requirement cannot be systematically assigned to one and only one iteration.

⇒ Some requirements are **transversal to several projects**, particularly some nonfunctional requirements pertaining to the treatment of operational risks. The requirements management solution must help manage multiple dependencies.

⇒ Some requirements can only be processed **partially**. Project teams can meet such requirements only step-by-step: the first iteration provides a first-level solution, the second iteration improves the solution to a second level, and so on.

The requirements management solution helps decompose the requirements into sub-requirements and sharpen them during the project in order to improve the solution.

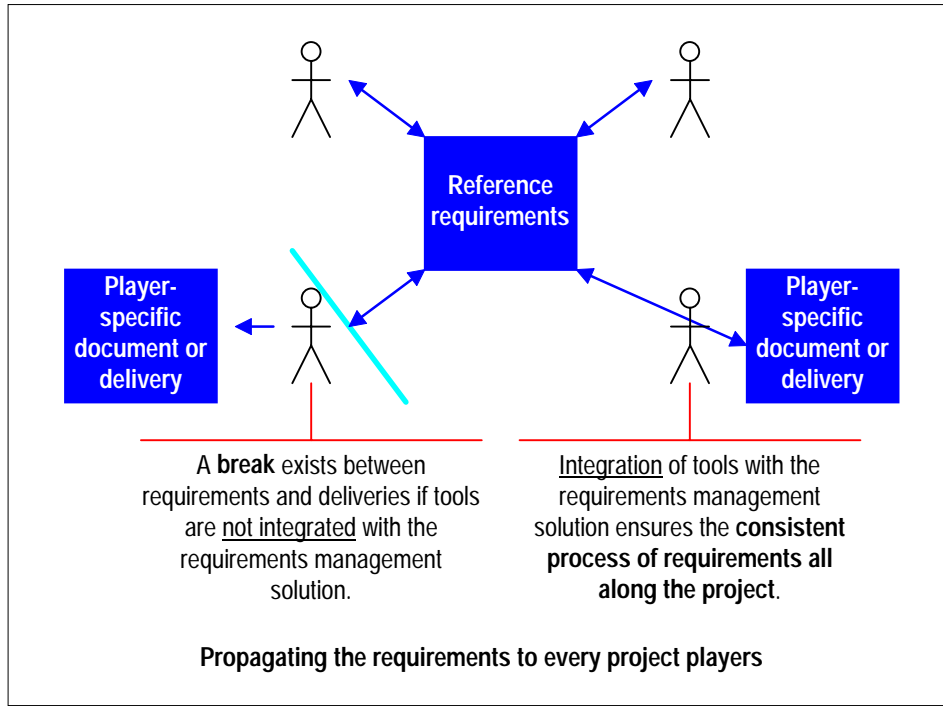
### **IBM Rational Suite AnalystStudio**

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IBM Rational Suite AnalystStudio is an appropriate solution for the handling of project priority management issues.

- **IBM Rational RequisitePro** makes it possible to create and assign requirements **attributes**. Their value may be assigned directly in **MS Word** through contextual menus.
- IBM Rational Suite AnalystStudio provides **project templates** to facilitate the decomposition of requirements into sub-requirements.
- **IBM Rational Unified Process (RUP)** provides the **method** and **recommendations** to decompose the requirements. IBM Rational Suite AnalystStudio includes RUP.
- IBM Rational RequisitePro **tracks requirements across projects**. This facilitates the management of requirements **transversal** to the projects. This makes it possible to define dependencies between requirements belonging to various projects. Shared requirements can be grouped into a single project and reused in several projects **without any duplication**.

# Propagating the requirements to all project players



## Comments

- Business requirements are the central focus throughout the project. A challenge for the project teams is the requirement-oriented project management, in order to meet business expectations. Project teams must ensure that every player knows the requirements. This requires a requirements reference (see Chapter entitled "Improving the communications between the various project players in order to define requirements").

Driving the projects according to requirements is difficult when the various project components are not clearly and directly related to requirements. Project players need to retrieve the requirements in their own tools. They need to link their own documents and deliveries to the requirements.

**The requirements management must be integrated into the iterative development and maintenance cycle and into the tools of these cycles.**

- Integration of requirements management solutions into change management tools (e.g. IBM Rational ClearQuest), software configuration management tools (e.g. IBM Rational ClearCase), design tools (e.g. IBM Rational Rose) and testing tools (e.g. IBM Rational TestManager) is important.

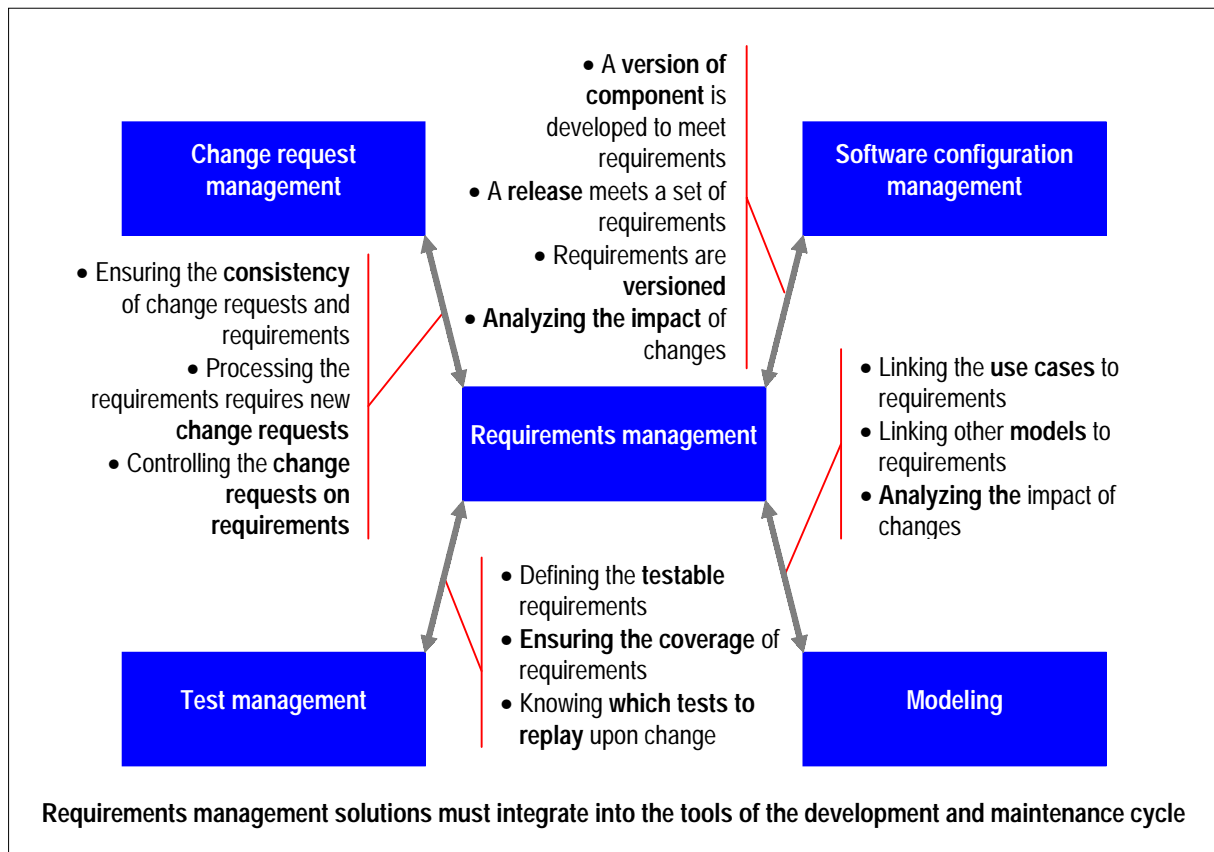
Integration allows the project players to work in compliance with the requirements. It also helps ensure **consistency** with requirements upon change. It helps analyze accurately the impact of requirements changes on design, development and testing. Iterative requirements management requires integration because it must include changes in the requirements on an ongoing basis.



⇒ Upon requirements change, the models, components and tests that are impacted must be identified.

⇒ Upon model or component change (e.g. bug fixing), the compliance of the change with the requirements must be checked. This requires knowing to which requirements the models and components are related.

Managing the requirements iteratively requires **versioning the requirements** and tracking their changes. Integration into specific third-party version management tools is appropriate to ensure traceability over time and a rollback capacity.

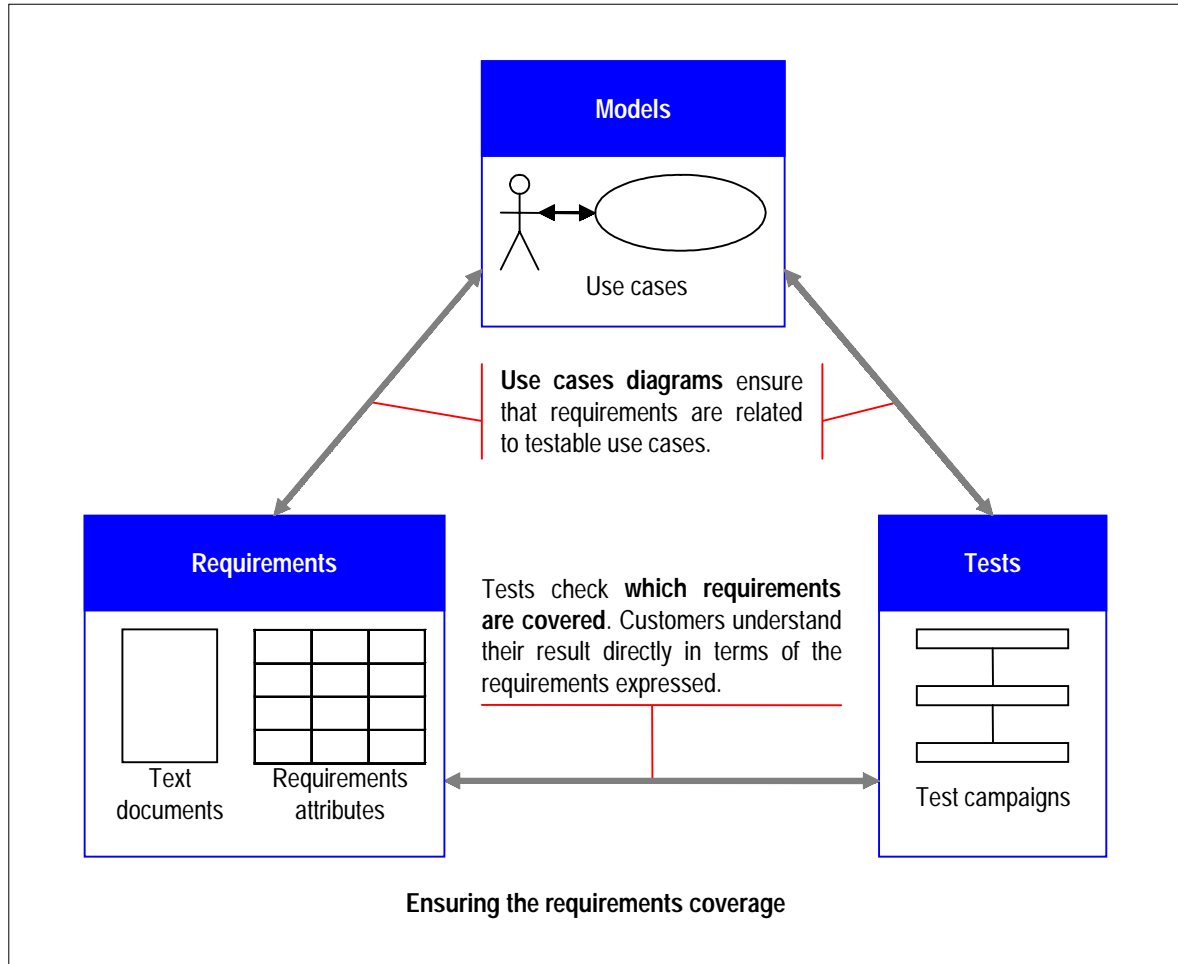


## IBM Rational Suite AnalystStudio

IBM Rational Suite AnalystStudio is appropriate for the solution of integration problems of requirements management into the application development and maintenance cycle.

- The integration of **IBM Rational Rose** and **IBM Rational RequisitePro** provides a direct access to the requirements **text** from the use case **diagrams**.
- The integration of **IBM Rational TestManager** and **IBM Rational RequisitePro** avoids the duplication of requirements. This manages the relationship dynamically between **test cases** and requirements.
- The integration of **IBM Rational RequisitePro** and **IBM Rational ClearCase** makes it possible to include requirements in **project baselines**.
- **IBM Rational Unified Process (RUP)** ensures that all players have the same **process** and that they use the requirements **consistently**.

# Ensuring the requirements coverage



## Comments

- **The business wants project teams to prove that the requirements are implemented and tested.** It is not interested in a technical view of the tests. Test campaigns must be designed and run in order to check the requirements.

⇒ Every test scenario depends on one or several requirements. If tests do not check the business requirements, they are likely to be useless.

⇒ Every requirement must be covered by one or several test scenarios.

Iterative requirements management leads to **anticipate the tests** and improve their efficiency. It makes it possible to focus testing on the requirements of each iteration. It avoids the need to have to wait for the project to be completed.

- **Automating** the update of the requirements **coverage** status requires integration of the requirements management solution into the application life cycle. If the number of requirements is huge, ensuring the coverage of every requirement

requires automation. In complex projects, this step of the requirements management cycle requires **integration** of the requirements management and the test planning and campaign management.

- Iterative requirements management requires **frequent** checks of the coverage, at least once by iteration. This requires automation.
- Drawing up the test plans based on function specifications is often difficult. However, these plans can be easily defined from **use cases**. These use cases are **easily expressed by the business**. They are modeled by UML diagrams and text requirements description. Use cases ensure that requirements **can be tested**.

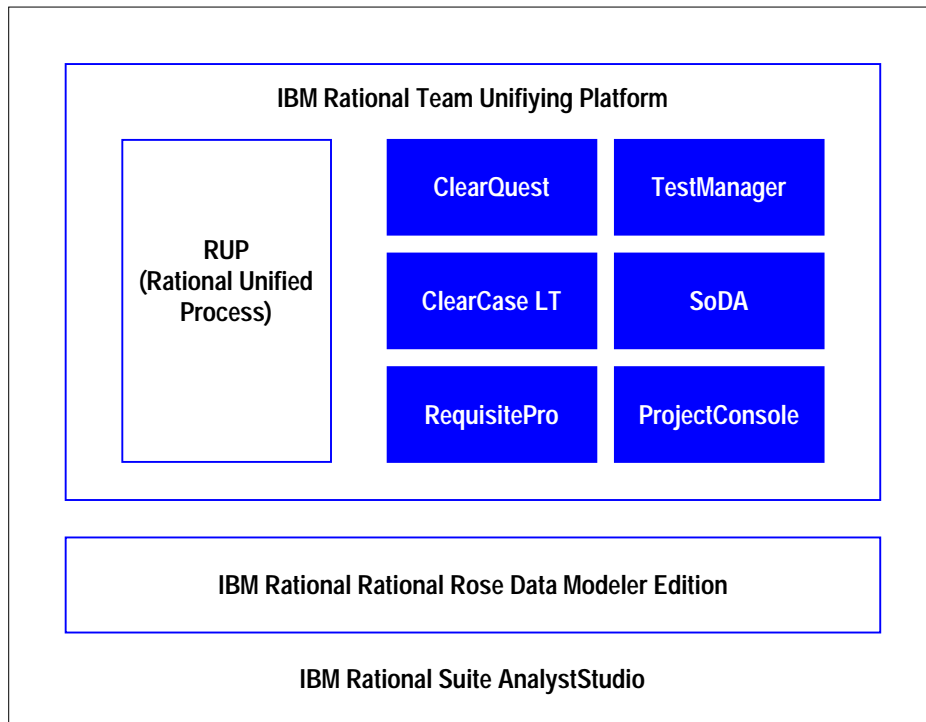
### **IBM Rational Suite AnalystStudio**

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IBM Rational Suite AnalystStudio is appropriate for the solution of issues pertaining to requirements checking and coverage.

- **IBM Rational TestManager** provides **coverage reports** of tests and related requirements.
- The integration between **IBM Rational Rose** and **IBM Rational RequisitePro** helps define requirements based on **use cases**.
- **IBM Rational TestManager** provides reports on the **risks associated with requirements changes** (suspectness reports). Test cases are linked to requirements. These reports draw up the list of test cases linked to the changed requirements, in order to check whether test cases are still valid or not.
- **IBM Rational RequisitePro** analyzes the **impact of changes** in the requirements. It provides a list of components linked to the changed requirement. It also displays what has been changed in the requirements.

# IBM Rational Suite AnalystStudio: an integrated iterative requirements management solution



## Comments

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- IBM Rational Suite AnalystStudio is the Rational solution for requirements management.

It provides the components required for the iterative requirements management integrated end-to-end into the application development and maintenance cycles. It includes a methodology (RUP) transversal to tools and software products (Rose, ClearQuest, ClearCaseLT, RequisitePro, TestManager, SoDA, Project Console).

- IBM Rational Suite AnalystStudio includes **IBM Rational Team Unifying Platform** and **IBM Rational Rose Data Modeler Edition**.

⇒ IBM Rational Rose Data Modeler Edition is used to model the use cases and the business processes and to design databases and applications.

⇒ IBM Rational Team Unifying Platform is a set of tools included in every Rational suite. It provides a common environment for all project players. It avoids data duplication between players and it facilitates communication.

IBM Rational Suite AnalystStudio		
Software product	Use for iterative requirements management	Comments
<b>IBM Rational Rose Data Modeler Edition</b>	Use case modeling	Rational Rose is a leading UML modeling tool. Rational Suite AnalystStudio provides all the functions required to define business, application and data models.  Use case diagrams defined in Rational Rose are dynamically linked to the documents describing the Rational RequisitePro use cases.
<b>IBM Rational RequisitePro</b>	Requirements management	Rational RequisitePro leverages Microsoft Word as interface for the keying-in of the requirements.
<b>IBM Rational ClearQuest</b>	Change request management	Change requests can be keyed in with Rational ClearQuest regardless of their target (requirements, application, model changes). Rational ClearQuest also manages the change cycle.  The integration of ClearQuest into Rational RequisitePro makes the management of requirements change requests possible. It is used to validate the change requests.
<b>IBM Rational ClearCase</b>	Version and configuration management	ClearCase manages the requirements versions.  Integration between Rational RequisitePro and Rational ClearCase links the versioned components to the requirements.
<b>IBM Rational TestManager</b>	Test plan and campaign management	Rational TestManager defines, manages and schedules the test plans and campaigns. Rational Robot (not included in Rational Suite AnalystStudio) integrates into Rational TestManager in order to automate the tests.  Integration of Rational RequisitePro into Rational TestManager helps check the test coverage and detect test cases made invalid by requirements changes.
<b>IBM Rational SoDA</b>	Documentation management	Rational SoDA provides the documents and reports required to track requirements in MS Word format.
<b>IBM Rational ProjectConsole</b>	Project management	Rational ProjectConsole tracks the project progress and the requirements coverage throughout the project.
<b>Rational Unified Process (RUP)</b>	Development methodology	RUP defines how to collect, manage and change the requirements.

Technical information on IBM Rational Suite AnalystStudio is available on the vendor's Web site: <[www.rational.com](http://www.rational.com)>.

# Conclusion

Iterative requirements management provides various benefits:

- The **cost** of development and maintenance projects is lowered because of improved collecting and formalization of requirements. Improved communication between players decreases the resources needed and the number of iterations due to incomplete, unclear or misunderstood requirements.
- The **duration** of development and maintenance projects is reduced. Responsiveness to business requests is enhanced. This improves corporate time-to-market. The definition of project goals is quicker, without useless iterations, rollbacks or withdrawals.
- The project **value** for the business increases at a constant cost and duration. The projects implement on a priority basis those requirements that are the most valuable to the business. The use of business and technical resources is optimized because of requirements propagation. The project value is clearly demonstrated to the business, thanks to the checking of the requirements coverage.

IBM Rational Suite AnalystStudio is a **requirements management solution integrated end-to-end into the application development and maintenance cycles**. It maximizes the value of iterative requirements management.

- IBM Rational Suite AnalystStudio facilitates **communications between project players**, thanks to the use of MS Word as interface for the keying-in of the requirements, to the collection of requirements as use cases in IBM Rational RequisitePro and IBM Rational Rose, and to the requirements change management in IBM Rational ClearQuest.
- IBM Rational Suite AnalystStudio facilitates decision making on **project scope and requirements priorities**. It manages the requirements attributes and project templates and it tracks requirements across projects.
- IBM Rational Suite AnalystStudio facilitates the **propagation of requirements** to all project players thanks to the integration of IBM Rational RequisitePro, IBM Rational Rose, IBM Rational TestManager and IBM Rational ClearCase.
- IBM Rational Suite AnalystStudio facilitates the checking of **requirements coverage** thanks to coverage reports, use cases, requirements change risk reports and impact analysis of the requirements change.
- **IBM Rational Unified Process (RUP)**, included in IBM Rational Suite AnalystStudio, provides a method and recommendations to manage the requirements iteratively.