Achieving ROI with Rational Requirements Management Tools

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INTRODUCTION

The term "requirements management" is still somewhat of an oxymoron in the process of software development. However, the lack of an unambiguous and continually up-to-date definition of requirements is a major cause of project failures. Problems are least costly to correct when they are detected early in the development life cycle — particularly when the correction involves changes to the software architecture. Although, intellectually, most IT practitioners understand the value of developing and maintaining clear and concise requirements throughout a project's life cycle, actually achieving this has been difficult and elusive.

Requirements Management: A Historical Perspective

Virtually all development projects begin with at least some notion of a definition of requirements. However, in too many cases the requirements definition activity is very informal (e.g., hallway conversations, emails, phone discussions). Of those teams that do begin a project with formally defined requirements, those projects are generally incomplete and inadequately managed or uncoordinated. More importantly, once requirements are captured, the documents in which they are housed generally remain static. That is, they represent the requirements as understood and defined at a particular point in time, usually early in the project life cycle. The development itself then proceeds into implementation using this static set of requirements during what could be thought of as a "quiet period" for the development team since the requirements are essentially frozen.

While this might initially seem like a logical approach to requirements management, the real world doesn't work this way. Change is constant and the one absolute in software development. Permitting changes to requirements in an uncontrolled manner throughout the development life cycle invariably results in confusion, missed schedules, and cost overruns. Frustration occurs among end users, analysts, developers, and managers alike. Laments such as, "Users keep changing their minds," "The application doesn't meet our needs," and "This project is taking too long and costing too much" are all too common.

The Increasing Importance of Requirements Management

Requirements management has always been important but is now being increasingly recognized as vital to software project success.

Requirements management has always been important but is now being increasingly recognized as vital to software project success as businesses rely more and more on software for conducting business- and mission-critical functions.

Just what is involved in a formal requirements management process? In short, such a process elicits stakeholder needs, captures and communicates requirements to all team members, prioritizes and organizes requirements, and manages changes to requirements throughout the project life cycle. Formal requirements definitions and management are employed in many technical disciplines to a much greater extent than has been in evidence in the IT arena. For example, the more physical engineering disciplines, such as computer hardware development, have long embraced much more rigorous methodologies and procedures for managing requirements than does the world of software development.

The goal must be to embrace and manage change, not to prevent it.

One might argue that Word documents, email, phone calls, and stakeholder meetings alone are adequate for managing requirements. In fact, that is the methodology currently used for most projects in a large number of IT shops. However, this informal, ad hoc approach doesn't ensure rigorous requirements definition that is communicated and understood by all parties. More importantly, it doesn't lend itself to managing the inevitable requirements changes that will occur throughout the life of the project. The goal must be to embrace and manage change, not to prevent it. In today's world of complex, multitier distributed systems and diverse and distributed development teams coupled with the mission- or business-critical nature of software applications and relentless time-to-market pressures, casual, ad hoc management of requirements is becoming increasingly inadequate and ineffective.

THE VALUE OF MANAGING REQUIREMENTS

Requirements definition and analysis is an important first step in software development. And, managing changing requirements throughout the software development life cycle is key to developing a successful solution — one that meets users' needs and is developed on time and within budget. A crucial aspect of effectively managing requirements is communicating requirements to all team members throughout the entire life cycle. In truth, requirements management benefits all project stakeholders, end users, project managers, developers, and testers by ensuring that they are continually kept apprised of requirement status and understand the impact of changing requirements — specifically, to schedules, functionality, and costs.

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Requirements management is not limited to only software design and implementation tasks. For example, formal, up-to-date requirements can be valuable to test and quality assurance (QA) activities. Building test plans and test cases based on requirements facilitates testing the intent of the application, not just the code. When test planning occurs in parallel with development, the time savings can be significant.

A far larger number of IT shops have software configuration management tools and processes in place than have adopted formal requirements management. However, uncontrolled requirements changes can have as great an impact on the success or failure of a project as the lack of version control or code change management. Effective requirements management should span the complete life cycle from initial concept definition; through modeling, design, and analysis; through coding; through testing; to ongoing maintenance and enhancements. IT shops that do not have effective requirements management processes and tools in place are exposed to the risk of serious and costly project delays and rework.

Rational Software is a prime example of a vendor offering tools for IT organizations to support formal requirements management processes. Rational Software's RequisitePro requirements management tool and Rational Suite AnalystStudio (of which RequisitePro is a key component) offer a powerful solution for requirements management.

RATIONAL REQUIREMENTS MANAGEMENT TOOLS

Rational Software's requirements management tool is Rational RequisitePro. It is offered both as a standalone product and as a key component of Rational Suite AnalystStudio (discussed in further detail later). Rational Suite is the organization of Rational tools and processes to support various project team functions — which Rational packages as "studios" — in a consistent fashion. These functions include project management, requirements and analysis, software development, content management, and system testing. The foundation of Rational Suite — common to all of the studios — is the "team unifying platform," which consists of the Rational Unified Process, requirements management, test management, defect and change tracking, and configuration management.

Rational RequisitePro and all Rational tools are supported by a worldwide service organization that includes training, consulting services, and technical support geared to help Rational customers speed technology deployment and accelerate project delivery.

Rational RequisitePro

Rational RequisitePro facilitates better communication, enhances team collaboration, and reduces project risk. A key feature of RequisitePro is its tight integration with Microsoft Word, undeniably the most widely used vehicle for documenting and sharing textual information electronically. Since requirements are quite often proposed, updated, reviewed, and modified by a wide range of technical and

business professionals using Word documents, this integration allows project teams to continue use of a familiar tool.

While documents are useful for capturing requirements, they do not effectively permit prioritizing and organizing requirements. Rational RequisitePro's features allow organizing, prioritizing, tracing relationships, and tracking changes to requirements, all while dynamically linked to the original Word document.

Rational Suite AnalystStudio

Rational Suite AnalystStudio is targeted at the requirements and analysis tasks of application development and includes Rational tools and processes to support requirements management throughout the entire software development life cycle. Key components of Rational Suite AnalystStudio are Rational RequisitePro for requirements management and Rational Rose for business, use-case, data, and application modeling. The integration between Rational RequisitePro and Rational Rose allows users to textually capture requirements (as use cases — which describe an end user's view of requirements — or in other forms) in RequisitePro while creating the corresponding use-case diagram in Rational Rose. Changes made in one tool are reflected in the other tool, allowing everyone on the team to access the same requirements information from either tool.

The remainder of this paper is devoted to case studies for a Rational customer using Rational RequisitePro to facilitate the requirements management process. Both qualitative and quantitative benefits experienced by this customer are discussed.

ROI CASE STUDY METHODOLOGY

IDC employed a structured interviewing methodology to collect return on investment (ROI) qualitative and quantitative data for Rational customers using Rational RequisitePro to manage requirements. Four case studies are presented. The same methodology was employed for all case studies.

ROI Components Defined

Net quantifiable benefit (NQB) is the difference between the savings achieved through the implementation of Rational RequisitePro, versus either not implementing the solution at all or implementing equivalent solutions in a different way. NQB can be either direct, in terms of incremental revenue gained or expense saved, or indirect, from the redeployment of resources to tasks that the organization would alternatively have had to hire new and like resources to perform. All net benefits are expressed in U.S. dollars.

Net cost (NC) is the difference between the total cost and expenses associated with Rational RequisitePro and the similar costs associated with the most likely alternative solution (which can be none at all). Typical NC components include software licensing and maintenance costs, product consulting costs, training and education costs, and any added hardware costs associated with implementing the RequisitePro software. All net costs are expressed in U.S. dollars.

ROI Calculation

ROI is the ratio of total net benefit divided by total net cost. This ratio is equal to 1 when net benefits equal net cost, which represents stasis, equilibrium, or no improvement. A ratio less than 1 reflects a negative improvement and a ratio greater than 1 reflects a positive improvement.

ROI is frequently expressed as a percent, in which case the ROI result is multiplied by 100. The percentage ROI calculation can thus be represented as:

$$ROI = (NQB/NC) \times 100\%$$

Other ROI Considerations

ROI is also a relative measure in that the benefits and costs of Rational RequisitePro are compared to an alternative solution — typically, what the organization had been doing to address this business problem before the implementation of RequisitePro. It follows that NQB and NC will be defined differently for each interviewee situation, and, in some cases, the results will not be as quantifiable as in others.

Typically, to perform "true" ROI analysis, a savings or revenue that is recognized in terms of personnel resources can be included in the ROI analysis only if those resources have been eliminated as a result of the product implementation. However, that is rarely the case. Resources are more likely to be assigned to other projects or areas where they are needed. The savings are still real because if the staff had not been reassigned, additional resources would have to have been hired.

In the following case studies, increased productivity, shortened development cycles, reduced testing times, and enhanced application quality emerged as some key benefits from using Rational RequisitePro.

In the following case studies, increased productivity, shortened development cycles, reduced testing times, and enhanced application quality emerged as some key benefits from using Rational RequisitePro. Where these benefits exist, IDC does not "require" that an organization perform a reduction in force in order to realize these benefits since it is expected that "found time" will be put to use in a productive manner.

ROI Data Collection Methodology

To collect the data, IDC conducted telephone interviews in June and July of 2001. The purpose of the interviews was to understand the business problems the organizations were seeking to solve, the role of Rational RequisitePro in solving these business problems, and the ROI associated with the implementation of RequisitePro.

IDC established a series of predefined questions for use in the ROI interviews. These questions were designed to enable the collection of complete ROI data as well as to provide a consistent framework for analyzing the ROI data. These questions enabled IDC to understand the organizations' general approach to development and deployment as well as evaluate the relative attributes, benefits, and costs associated with Rational RequisitePro.

A three-year "ROI horizon" was employed. Therefore, all of the ROI data shown is for accumulated actual and projected savings over a fixed three-year period from 1999 through 2001.

All data collection and ROI calculations associated with these case studies were performed by IDC analysts.

CASE STUDIES

Four project teams from three different companies using Rational RequisitePro were interviewed for this study. The resulting case studies are presented below.

Case Study: CitiPower

Company Overview and Business Environment

To meet the changing regulatory environment and meet evolving customer needs, CitiPower made a significant investment in its IT infrastructure.

CitiPower, headquartered in Victoria, Australia, is a wholly owned subsidiary of American Electric Power and is a retailer and distributor of electrical power, primarily for inner Melbourne. While its customer base may be considered small relative to other utilities, its customers are large and highly valued due to their commercial nature. The privatization of the electrical utilities in Australia brought about broad changes in the regulatory environment. To meet the changing regulatory environment and meet evolving customer needs, CitiPower made a significant investment in its IT infrastructure.

Current IT Environment

Currently, CitiPower's IT department has a staff of approximately 100–120. This includes a large number of contract employees with strategic sourcing from organizations such as IBM, Tier, Halcyon, and PricewaterhouseCoopers. These contract employees were hired to work with existing personnel to enable CitiPower to implement its Full Retail Contestability (FRC) program. This program makes it possible for CitiPower to conform to the new competitive regulatory environment and enhances its ability to support and acquire customers in a newly competitive industry. The FRC program is a large-scale project so important to CitiPower that it warranted additional staff to allow it to be executed and completed in accordance with government schedules. Once implemented, a smaller staff will be retained to maintain and enhance the new system.

Emerging Needs and Role of Rational RequisitePro

The road to privatization of the power industry has resulted in a regulatory environment in constant change and evolution. As the government put new structures of rules and regulations in place, the utilities had to quickly adapt to the changes. Therefore, CitiPower initiated a project to completely revamp its internal infrastructure. Among the products CitiPower is using are the Rational Unified Process, Rational Rose, Rational ClearQuest, Rational Suite TestStudio, Rational Suite AnalystStudio, and Rational RequisitePro, an integral component of Rational Suite AnalystStudio.

In regard to requirements management, Rational RequisitePro has provided clear benefits to CitiPower by centralizing the requirements process and providing traceability from requirements inception through testing. At the start of the FRC project, in September 1999, CitiPower employed RequisitePro to gather requirements and track use cases through the analysis phase. From a team perspective, RequisitePro enabled IT management to understand and control who is executing updates to the project and facilitated versioning of the documentation throughout the project.

ROI Analysis

Net quantifiable benefits. CitiPower recognized benefits in three areas from using Rational RequisitePro. The complexity of the FRC system convinced CitiPower that a significant investment be made in building clear specifications for the system. These specifications would likely lead to productivity gains across the entire life cycle of the project. While CitiPower estimated moderate productivity gains of only 10% in this process, the financial gains are considerable due to the scale of the requirements-gathering process. CitiPower initially employed 40 analysts to collect requirements. Over a 1.5-year period, this number declined to 19 before the collection of requirements was complete. Given the scope and duration of the requirements-gathering process, CitiPower believes it realized a net benefit of approximately $630,000 by using RequisitePro instead of pursuing a manual approach using Word documents, spreadsheets, and email.

CitiPower also believes that developing clear, accurate, and accessible requirements helped developers and quality assurance staff become more productive.

Net costs. Costs for the FRC project consisted of license and maintenance costs, training costs, and consulting costs. All of these costs were incremental and associated with bringing Rational RequisitePro into CitiPower.

Rational RequisitePro license and maintenance costs amounted to nearly $9,000 over the three-year time horizon for this ROI study and include a pro-rated share of the complete license and maintenance costs for Rational Suite AnalystStudio. It should be noted that RequisitePro is just one tool included in AnalystStudio and the full cost of AnalystStudio was more than $26,000. However, for the purposes of this requirements-management–focused study, the allocated net cost for Rational RequisitePro was approximately $9,000.

Training costs for the analysts that used Rational RequisitePro were the most significant net cost for the FRC project and amounted to $97,000 for all 40 analysts involved in the project.

Consulting costs, which consisted of support provided to CitiPower by Rational Software, amounted to $39,500.

Total costs for the FRC project over the three-year ROI time horizon were slightly more than $145,000.

Return on investment. The ROI for this project is 434%, which equates to an ROI factor of 4.3. This means that for every dollar invested in requirements management for this project, a net benefit of $4.30 was realized.

Benefits of Using Rational RequisitePro

By using Rational RequisitePro, CitiPower has achieved the following:

- Centralized requirements process

- Traceability of requirements through testing phase

- Template control

- Application and documentation versioning

- Improved project control

- Improved accuracy of requirements

Case Study: DaimlerChrysler Technology User Profile Project

Company Overview and Business Environment

DaimlerChrysler is a global organization in the business of manufacturing cars, trucks, and buses. With group headquarters located jointly in Stuttgart, Germany, and Auburn Hills, Michigan, DaimlerChrysler has more than 400,000 employees. The Technical Computer Center (TCC) group within DaimlerChrysler is responsible for evaluating and implementing information technology in support of the product development process to facilitate the attainment of functional, quality, cost, and timing goals.

Current IT Environment

DaimlerChrysler has an extremely heterogeneous mix of hardware platforms, operating systems development environments, packaged applications, and custom-built applications.

DaimlerChrysler has an extremely heterogeneous mix of hardware platforms, operating systems development environments, packaged applications, and custom-built applications. Flexibility once existed in choosing software to meet requirements, but DaimlerChrysler is moving toward a more standardized approach in order to facilitate better consistency, maintenance, and ease of use. The Lotus Notes Application Development group is one of many TCC groups. It consists of five developers, with one developer per project. This is one of the groups pioneering the use of RequisitePro within TCC.

Emerging Needs and Role of Rational RequisitePro

The TCC supports the vehicle engineering operations for DaimlerChrysler's Chrysler Group. While the Lotus Notes Application Development group members were successfully meeting their objectives, their methodology for accomplishing tasks was not highly efficient and did not promote strong intergroup coordination. Project requirements were gathered on an ad hoc basis through meetings, phone calls, emails, and other methods. Projects were undertaken but without a clear plan or critical path being established. This lack of an

organized requirements management process resulted in miscommunication, missed deadlines, and, ultimately, cost overruns.

To better address these issues, the Lotus Notes Application Development group decided to utilize Rational RequisitePro for a new project called Technology User Profile Database (TUP). TUP objectives are 1) to identify internal customers of new software initiatives and 2) to collaborate with other groups in TCC to make sure identified customers have the tools and technology needed to perform their job.

By using RequisitePro, the Lotus Notes Application Development group aimed to eliminate difficulties associated with coordinating the activities of four independent groups within TCC that were responsible for supporting these customers. RequisitePro was used to establish a clear plan and critical path to enable the project to proceed and to which all four groups could report when their tasks were complete. This would provide a means for better and more accurate communication and better schedule management.

Although about 800 people currently use the TUP database, this number is expected to grow into the thousands over the next two years. While the TUP project is still under way, Rational RequisitePro has already enabled the participants of this project to develop a critical path and create a master list of manageable requirements. Impact analysis can be easily evaluated on proposed changes, and changes can be communicated to all parties involved. RequisitePro has allowed TUP project members to take control of the project, which is believed to have a positive impact on quality, costs, and customer satisfaction.

ROI Analysis

Net quantifiable benefits. DaimlerChrysler recognized benefits in three application development life-cycle areas from using RequisitePro. The reach of the TUP convinced the TCC staff that better requirements would lead to increased application quality, which would positively affect the productivity of TUP users. Since more than 800 people would be using the TUP database by the end of 2001, even slight productivity gains across this user community would equate to significant net benefits.

DaimlerChrysler believes that RequisitePro helped drive substantial productivity gains in the gathering of requirements. A conservative estimate was a net gain of 50%. However, since only two people and four months were involved in requirements gathering, this net benefit amounted to only $90,000.

The ability of RequisitePro to help bring order to the process of gathering specifications also yielded benefits in the form of less time required of those 10 domain experts who provided the specifications to the analysts who collected them. The net benefit in terms of domain expert time saved was $28,000, which reflects a labor savings of 50%.

The ability of RequisitePro to provide a clear, continually up-to-date, and easily accessible repository of requirements also has the added benefit of enabling the developer community to write better code to develop better solutions that meet users' needs. The lack of ambiguity in the requirements, due in part to use cases, allows developers to focus more on development and create higher-quality code. TCC management expects that developers will be about three times more productive and that this will result in a net productivity increase of nearly $126,000.

Other TCC staff involved in application development, such as those involved indirectly in supporting the application development process, will also benefit from the accessibility of these requirements. Productivity gains in the area of 5% are expected for these staff, resulting in net gains of approximately $30,000.

The last, yet most compelling, component of net benefits is the increased relevance of the resulting TUP application that conservatively will increase the productivity of end users. This relevance comes from a more detailed understanding of what users do and need so that the TUP database and application can ensure they receive the hardware, software, and training they need in a timely manner. TCC management expects that the increased quality of the TUP application will save about one hour of time per user every five weeks. Due to the large number of TUP users and core role of this application, net benefits are sizable and expected to be about $60,000 during just the last four months of 2001.

Total net benefits related to the development and use of the TUP application over the ROI time horizon are approximately $334,000.

Net costs. Overall costs for this project were remarkably low. License costs were nominal, amounting to just more than $5,000. Consequently, maintenance was close to being insignificant, and training for the several analysts involved was also just more than $5,000.

Total new costs were, therefore, just more than $11,000.

Return on investment. The ROI for this project was the highest recorded across any of the cases in this paper. The reasons for this represent a combination of benefits that extend across product development, reaching all the way to the user, a large user community, and a project of modest scale from a development perspective relative to its impact on users.

The ROI for this project was 2,980%, which is the equivalent of an ROI factor of 29.8. Despite the high ROI associated with this project, the TUP project will eventually reach 10,000 users over the next several years, which explains why DaimlerChrysler is so interested in making a concerted effort to increase the quality of the TUP application.

Benefits of Using Rational RequisitePro

By using Rational RequisitePro, DaimlerChrysler has achieved the following:

- Ability to accurately predict schedules

- Improved requirements management

- Capability to leverage requirements in defining test plans

- Support for managing requirements change impact

- Verification of test plans and product quality

- Creation of critical path

- Improved project communications

Case Study: DaimlerChrysler Virtual Service Project

Company Overview and Business Environment

This third case study once again comes from DaimlerChrysler and, in fact, also comes from its TCC group at the same location as the TUP group. However, in this case, we examine a different business unit within TCC, one that is focused on virtual services.

Current IT Environment

The VSP creates an important feedback loop, which DaimlerChrysler believes will lead to increased quality and shorter cycle times for build vehicles.

Within TCC is the Virtual Service team — focused on using Web technology, called Virtual Tools, to develop service products — which is part of the Virtual Service Project (VSP). The Virtual Service Workbench (VSW) is being developed as a first step in integrating virtual tools into the Dealer Technical Operations (DTO) development processes. The goal is to track a vehicle service issue from DTO back to product and process design. The VSP therefore creates an important feedback loop, which DaimlerChrysler believes will lead to increased quality and shorter cycle times for build vehicles.

Emerging Needs and Role of Rational RequisitePro

The Virtual Service team shares the same difficulties in managing requirements as does the Lotus Notes Application Development group.

By using RequisitePro to manage the VSW project, the Virtual Service team hopes to track requirements more rigorously as they evolve, ensure all requirements are addressed during the development phase, and promote a more organized product development environment. The VSW project is still in process. However, the Virtual Service team can already attest that RequisitePro has improved the ability to track and manage requirements, that scheduling is more predictable and accurate, that use cases are easier to develop given clear requirements, and that use of a standardized process and tool enhances the team's ability to outsource work where necessary.

The primary benefit stated by the VSP group in using RequisitePro was its ability to provide the "infrastructure" associated with collecting requirements.

Net quantifiable benefits. The primary benefit stated by the VSP group in using RequisitePro was its ability to provide the "infrastructure" associated with collecting requirements. This infrastructure is a combination of the methodology and tools provided by RequisitePro. The VSP group found that RequisitePro enabled it to increase its productivity in collecting requirements by a factor of 3 or 4. Using 3.5 as the midpoint, the net benefit equates to about $300,000, given the duration of the requirements-gathering process and number of people involved.

The VSP group also saw a number of RequisitePro benefits for developers. The integration of RequisitePro with other Rational products including Rose enables use cases to be easily captured. Ultimately however, the existence of and access to product requirements was found to improve developer productivity by 40%, since developers no longer needed to also function as business analysts. Although the VSP group's experience with RequisitePro is limited to less than one year, net benefits across a three-person developer staff amounted to $54,000.

Total net benefits amounted to $354,000.

Net costs. Net costs for the VSP group included several node-locked RequisitePro licenses for use by business analysts and a larger pool of floating licenses for use by analysts, developers, and managers. License costs were not amortized and, when combined with two years' maintenance, amounted to just more than $28,000.

No training, consulting, or hardware costs were incurred in bringing RequisitePro into the VSP group due to its existing familiarity with Rational products and recent company-sponsored upgrades to desktop hardware and servers.

The ROI experienced by the VSP group was 1,252%, which equates to an ROI factor of 12.5.

Return on investment. The ROI experienced by the VSP group was 1,252%, which equates to an ROI factor of 12.5. This means that for every dollar invested in bringing RequisitePro into the VSP group, a net benefit of $12.52 was achieved.

Benefits of Using Rational RequisitePro

The VSP group also made it clear that the benefits of RequisitePro extended well beyond just the business analyst and developer communities. Although not easily quantifiable, the VSP group found benefits to the quality assurance staff by more easily building test cases due to the staff's close relationship with requirements. By using Rational RequisitePro, DaimlerChrysler has achieved the following:

- Ability to track requirements more rigorously

- Provided a more structured product development environment

- Improved business analyst and developer productivity

- Eased the process of building test cases due to the existence of more complete requirements

Case Study: Merrill Lynch

Company Overview and Business Environment

Merrill Lynch is one of the world's leading financial management and advisory companies. Managing total client assets of approximately $1.6 trillion, Merrill Lynch provides both investment banking services as well as investment management services to private and commercial clients. The Private Client Technology (PCT) group within Merrill Lynch is responsible for order management and manages order processing for both domestic and international individual clients. Technology is extremely important to Merrill Lynch operations as it facilitates the high volumes of transactions it executes and enables its staff to effectively service the needs of its clients.

Current IT Environment

The order-processing department within the PCT group is dedicated to order-processing applications development. The staff includes dedicated personnel performing project management and business analysis. Due to the high volume of monetary transactions executed for clients by Merrill Lynch, order management is a mission-critical activity. The mission of order processing is to deliver high-performance systems that comply with business needs of availability, capability, maintainability, and performance. Toward this end, the order-processing department initiated a project in the past year to upgrade order-processing applications with advanced software to enhance the existing systems and improve performance.

Emerging Needs and Role of Rational RequisitePro

While Merrill Lynch was successful with both application development and operations, the decision was made that a full life-cycle development methodology was required to improve the speed and accuracy of developing applications. It was determined that Rational was the best candidate based on the experience that personnel had with Rational, the strength of the Rational Unified Process (RUP), and the fact that Rational had a fully integrated tool set to meet the needs of the entire life cycle. The RUP is a process based on guidelines, templates, and best practices that accelerates and aids in increasing the quality of e-development activities. While Rational RequisitePro was not part of the initial large-scale adoption, it was instituted during the past year for use on the order-processing project. Before implementing Rational RequisitePro, requirements were gathered via Word documents, screen mock-ups, conference calls, and emails. However, the head of the order-processing group believed that in order to increase speed and accuracy, a formal requirements management process needed to be put in place — one in which requirements would be tested and traced from the definition phase through testing. Hence, Rational RequisitePro was brought on board.

Rational RequisitePro formalized the requirements-gathering process to the benefit of all participants. RequisitePro is being used extensively by the order-processing group for requirements and document management. Those providing requirements have found that issues and concerns are being addressed early in the process rather than during testing or production. This was found to lead to fewer development problems and the need to perform redevelopment late in the process or after production release. Moreover, after user interface requirements were finalized, the developers were able to begin coding discrete elements of the application while further requirements were still being addressed, enabling a pseudo-parallel process and faster development stream. Due to each requirement being indexed, project members could quickly and easily access requirements and their associated status. Finally, the requirements stored in Rational RequisitePro enabled a faster and more complete definition of test cases and enabled the order-processing department to set accurate project dates much earlier in the project than had been previously possible. Due to these benefits, the order-processing group has found that the development time frames were reduced by two to three times with improved accuracy.

ROI Analysis

Net quantifiable benefits. The most compelling aspect of using Rational RequisitePro for Merrill Lynch was the estimated 35% increase in productivity that it afforded developers. As a result, IDC estimates the net benefit to the developer community of the PCT group was nearly $580,000.

Although not quantified, the PCT group also found that increased specificity and accuracy of requirements led to higher-quality code and a reduction in the number of bugs that would subsequently be found in the production application. The senior management of the PCT group feels — and IDC supports this claim — that resolving a bug in a production application can be 20 to 30 times more costly than the effort it takes to avoid the bug through a careful definition of requirements. While not all bugs can be eliminated in this fashion, many clearly can.

Net costs. Unlike other organizations that found productivity through the automation that RequisitePro provides in the gathering of requirements, Merrill Lynch perceives the use of RequisitePro as an incremental burden due to the more exacting and detailed process that the business analysts must now adhere to. While the result was a far more detailed specification that led to developer productivity and a higher-quality application, there was a cost in the form of added time to build the specifications. The PTC group believes that two months of requirements gathering led to an additional cost of nearly $42,000.

License and maintenance costs for RequisitePro amounted to $42,000 and were fully absorbed by this project alone.

Training costs associated with business analyst downtime amounted to nearly $44,000, while costs associated with training and consulting provided by Rational Software amounted to $42,000.

PC and server upgrades to support Rational RequisitePro added more than $11,000 in net costs, and deployment and backup costs also added just more than $13,000.

The total net cost for using RequisitePro in this project was approximately $194,000.

Return on investment. The ROI for this project was 298%, which equates to an ROI factor of 2.9.

The ability to achieve an ROI approaching 300% given net costs, which included more than $194,000 of expenses that would not be reoccurring in the next two years, speaks the dramatic benefit that Merrill Lynch realized by using RequisitePro.

Benefits of Using Rational RequisitePro

By using Rational RequisitePro, Merrill Lynch has achieved the following:

• Capability to trace requirements to test plans

• Support for managing requirements change impact

• Improved productivity

• Accelerated time to market

• Improved product quality

• Ability to accurately predict schedules

CONCLUSION AND RECOMMENDATIONS

From the case studies performed, IDC has found a clear and quantifiable benefit to be gained from employing Rational RequisitePro to address requirements management. While a wide range of advantages was cited by the organizations interviewed, the quantifiable benefits were most evident in the form of productivity gains to business analysts. However, a strong common theme was the productivity that RequisitePro drove across many key dimensions of the software development life cycle, including application development and quality assurance. The DaimlerChrysler TUP case also found benefits that extended to internal end users of the application developed based on requirements managed by RequisitePro.

The ROI factors experienced by the organizations interviewed varied from 2.98 to 29.80, as shown in Table 1. The composite ROI across the four cases was 5.00.

Table 1: Composite ROI for RequisitePro Case Studies

Case	Net Benefits ($)	Net Costs ($)	ROI Benefit ($)	ROI Factor
CitiPower	630,018	145,325	484,693	4.34
Daimler TUP	333,706	11,199	322,508	29.80
Daimler VSP	354,000	28,264	325,736	12.52
Merrill Lynch	579,688	194,417	385,271	2.98
Total	1,897,412	379,204	1,518,208	5.00

Key Assumptions:
• The net benefits and net costs capture the key quantifiable dimensions of ROI for each of the cases listed.
• The ROI time frame for this analysis was 1999–2001, although some projects did not span all three years.
• Present value calculations were omitted from the analysis due to the current and actual orientation of the ROI.

Message in the Data:
• The overall composite ROI factor is 5.00, which reflects a strong value proposition associated with the use of RequisitePro.

Source: IDC, 2002

As seen in Table 1, the standard deviation around the mean ROI was quite high. The highest ROI, which came from the Daimler-Chrysler TUP case, resulted primarily from a relatively large developer community that was able to increase its productivity by a lofty factor of 3, as well as a very large end-user constituency that, despite achieving only marginal productivity gains, added considerably to the net benefits.

The DaimlerChrysler TUP case pointed out that by creating a feedback loop whereby end-user experiences help drive requirements, it would be possible to increase the velocity of the software development life cycle.

The DaimlerChrysler TUP case also pointed out that by creating a feedback loop whereby end-user experiences help drive requirements, it would be possible to increase the velocity of the software development life cycle. This increase would help gain faster access to incremental productivity gains and more rapidly advancing application functionality, thereby providing more opportunities to gain competitive advantage. While it is not yet possible to capture the ROI associated with this feedback loop, it is not difficult to see how this approach would be perceived as extremely compelling.

What we are witnessing in the CitiPower and Merrill Lynch cases are organizations that have successfully initiated a rigorous approach to requirements management and immediately achieved a respectable ROI in the process.

At the other extreme were the CitiPower and Merrill Lynch cases, which saw ROIs in the 300–400% range. In both of these cases, the diminished ROI was largely a result of significant training costs, which would not likely be as severe on future projects. Therefore, what we are witnessing in the CitiPower and Merrill Lynch cases are organizations that have successfully initiated a rigorous approach to requirements management and immediately achieved a respectable ROI in the process.

Perhaps the most important and partially unexpected finding reflected in virtually all of these case studies is the extent to which organizations found benefits across the entire software development life cycle as a result of adopting a structured and integrated approach to requirements management. Significant investments made early on in the life cycle undoubtedly generate dividends across all subsequent activities.

The overall ROI experience in the requirements management cases presented here is also highly compelling in its own right. Considering that an ROI factor of 1 represents "break even" and an ROI factor of 2 is a 100% ROI, the ROIs documented here range from respectable to outstanding.

Despite the lack of attention that requirements management has received historically, the increasing importance of software in nearly every aspect of business is transforming a practice that was once an art into a science. Regardless of the "cultural" barriers to adoption that have existed around requirements management, these cases provide a current and compelling message to organizations that requirements management should now be viewed as the corner-stone of application development.

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