

## WHITE PAPER

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### **Dialect Solutions Group: Achieving ROI with IBM Rational ClearCase and IBM Rational ClearQuest**

Sponsored by: IBM Rational Software

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#### **IDC OPINION**

Most new software development teams begin their organizational existence with an informal, somewhat unstructured approach to software development. Over time, these organizations typically invest more heavily in IT, creating increased software diversity, complexity, and manageability challenges. As the development and maintenance of software assets scale, organizations must find methods to reliably manage these assets while ensuring that development and maintenance activities produce higher-quality results. The objectives of a more structured approach to the software development life cycle are often:

- Increased development staff productivity
- Improved application quality
- Increased manageability of the software development life cycle
- Faster execution of application development tasks
- Better predictability in the software development life-cycle process

This case study and other IDC research demonstrate that important benefits can be obtained by a careful examination of an organization's software development life cycle and the introduction of tools and technology in the areas of software configuration management and defect tracking that bring key organizing principles and developmental efficiencies.

#### **IN THIS WHITE PAPER**

This IDC study looks at software configuration management and defect tracking tools from the end-user perspective of Dialect Solutions, a progressive, technology-oriented product and service company based in Australia. IDC interviewed Dialect Solutions in October 2002. This study chronicles Dialect Solutions' experiences with IBM Rational ClearCase and IBM Rational ClearQuest and the impact these tools have had on Dialect Solutions' software development life cycle. The company's experiences were driven by a strategic objective to improve the speed, quality, cost, and control of the software development life cycle, all of which are discussed in this study.

## SITUATION OVERVIEW

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### DIALECT SOLUTIONS AND THE NEED TO MANAGE CHANGE AND COMPLEXITY

The software development life cycle, the process by which software and internal applications are developed, deployed, and maintained, is defined by many interrelated tasks and activities that generally coalesce around higher-order phases, including design, development, testing, deployment, and maintenance. As reliance on IT increases over time, organizations progressively introduce tools to help facilitate and automate each of these stages and effectively manage the overall process. Despite their strong reliance on IT, most organizations still have not adopted technology to support all aspects of the software development life cycle. However, IDC believes organizations that have are enjoying significant productivity and manageability gains.

One of the most challenging aspects of software development is managing source code changes, which can be driven by an evolution of requirements or ongoing improvements to application design or functionality that address existing requirements. The way in which change is managed has a significant impact on product quality and developer productivity. Corporate developers and project managers must quickly determine and share the status of a software change or release. Management of source code changes and defect tracking is the role of software configuration management and defect tracking software, which is the particular focus of this case study.

As a young yet highly progressive technology-oriented product and service provider, Dialect Solutions has achieved success more quickly than other firms. The success of Dialect Solutions in selling into large financial services companies, each of which requires many unique and highly customized features, created an acute need for the company to rapidly address issues of productivity, quality, and manageability tied to its software development life cycle. This case study discusses Dialect Solutions' experiences with software configuration management (IBM Rational ClearCase) and defect tracking (IBM Rational ClearQuest) tools and their impact on the organization.

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### DIALECT SOLUTIONS OVERVIEW

Dialect Solutions Group (Dialect Solutions) is an Australian company established in July 2002 through the merger of technology-centric companies: News Connect, which provides voice, wireless, and data software tools and infrastructure, and QSI Payments, which specializes in electronic payment software. The mission of Dialect Solutions is to help customers improve their business by leveraging new technology and solving significant technical issues. Controlling interest in Dialect Solutions is 100% owned by Queensland Press Pty Ltd, an associate of News Corporation and a company with significant financial resources and diversified investments. Dialect Solutions has approximately 130 employees, of which 30 are dedicated to research and development (R&D) primarily associated with the development of payment processing software.

QSI Technologies is the software R&D group within Dialect Solutions' QSI Payments division that develops electronic payment processing software products for a variety of applications such as Web-based shopping carts, touch-tone and speech recognition bill payment services, vertical industry payment solutions, and enterprise payment solutions. Although the QSI Technologies group is the focus of this case study, we will simply refer to this group as Dialect Solutions for the remainder of the document.

Dialect Solutions caters to a variety of large financial service customers that either have bought and deployed the QSI payment software or have payment services hosted by Dialect Solutions. The company's customers include American Express, MasterCard International, and Royal Bank of Scotland. Many of the solutions provided to these clients are customized, creating a strong need for effectively managing and versioning software releases.

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#### CURRENT IT ENVIRONMENT

At the time of our interview, Dialect Solutions employed 30 software engineers who develop and support the company's electronic payment processing software products. QSI Payments started out in the early 1990s as a system integrator and evolved its business in the late 1990s to provide electronic payment processing support for Web-based and other forms of electronic payments. The software is written almost entirely in Java using open source Java integrated development environments (IDEs). The resulting application has been deployed on Solaris Unix, Windows NT, and Windows 2000. The architecture consists of a server that provides the transaction processing with a small client-side application with an API into which the merchant can interface via a number of supported devices.

Given that payment software is used by a relatively small number of large customers, a considerable amount of customization is done for each customer. Consequently, some of the most significant challenges facing Dialect Solutions regard establishing and maintaining a core product that can be reused and easily extended according to customer requirements. Other challenges include developing and managing a migration path to a full Enterprise Java Beans (EJB) version of the software and transitioning from an emerging product with rapid new releases to an established product with fewer but well-coordinated periodic releases. The software development group at Dialect Solutions uses Rational ClearCase and Rational ClearQuest to help meet these challenges.

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#### IBM RATIONAL SOFTWARE'S ROLE IN SUPPORTING THE SOFTWARE DEVELOPMENT LIFE CYCLE

Like many small software development organizations, Dialect Solutions started out with an informal approach to software development. Product development and communication were accomplished through a series of informal meetings, conversations, emails, and customer requests. With no formal design process and little documentation defining software requirements and change requests, software development was ad hoc, change management and software configuration management were manual processes, and software testing was equally limited. Customer requests for special features often resulted in "cloning" the base product and adding features to it. The result of this approach was an increasing amount of redundant code, which had a predictably adverse impact on required maintenance. However, Dialect Solutions' software development approach changed dramatically over an 18-month period beginning in mid-2001.

Management determined that the informal software development process, with its inherent lack of structure, was inconsistent with the organizational objectives of development efficiency, product quality, and maintenance. In early 2001, management decided to invest in software configuration management tools and other resources to bring automation to and increase the structure of the software development process. The company began evaluating a variety of tools and hired staff specifically to oversee changing the software development process. Management then decided to implement a range of tools from IBM Rational Software, including Rational ClearCase, Rational ClearQuest, and IBM Rational Suite TestStudio. Dialect Solutions selected IBM Rational software because of the

company's strong reputation and ability to provide an integrated set of tools to address all aspects of the development and deployment life cycle. Rational ClearQuest was rolled out in November 2001, followed rapidly by Rational ClearCase. Using these two tools, Dialect Solutions met its objectives regarding development efficiency, software quality, and managerial control over the software development life cycle.

#### **ROI ANALYSIS TIME FRAMES**

The 2001–2004 time frame for this ROI analysis was selected to allow for inclusion of all net quantitative costs associated with the implementation and ongoing support of Rational ClearCase and Rational ClearQuest as well as all net quantitative benefits that Dialect Solutions felt it could predict with reasonable accuracy in coming years.

#### **BENEFITS OF IBM RATIONAL CLEARCASE AND IBM RATIONAL CLEARQUEST**

As Dialect Solutions' business grew, maintenance and upgrades for existing payment products emerged as some of the most critical activities requiring a significant proportion of the development staff's time. As a result, the ability to track changes and enhancement requests through the development life cycle became essential. Prior to the Rational software implementation, Dialect Solutions maintained two separate databases: one for source defect records and one for enhancement requests. The contents of these two databases were successfully migrated into Rational ClearQuest, which now holds both defect records and enhancement requests. Through the migration process, Dialect Solutions uncovered previously undetected "bad data" and removed it from the system. The migration provided Dialect Solutions with a more effective, easily maintainable database that contained only the current and relevant defects and enhancement requests. Moreover, Rational ClearQuest's graphing and reporting tools allowed the company to generate useful defect and enhancement metrics, which were unavailable through the old system.

In another area of the life cycle, Dialect Solutions system testers have experienced a marked change in their job functions as a result of the Rational ClearCase and Rational ClearQuest implementation. Prior to using Rational ClearCase and Rational ClearQuest, the system testers did not have a specific list of changes to test against to ensure the quality of a release. Rational ClearCase and Rational ClearQuest provide the testers with a baseline and a specific list of changes from which they can perform a cross-check of scheduled, unscheduled, and actual fixes. The resulting "trickle-down effects" of these capabilities include an overall improvement in software quality and a reduction in project risk through improved testing control and management. The process improvements increased Dialect Solutions' productivity and enabled the company to find defects earlier in the development process, fix defects easily and inexpensively, and offset the liability of increased testing time. Another "indirect benefit" cited by Dialect Solutions was improved customer relations through increased product quality that resulted from these changes. Bugs could be tracked and product enhancements could be developed in less time.

The configuration management features within Rational ClearCase have benefited Dialect Solutions' development staff by simplifying the management of the product source code. Previously, developers may have leveraged the same code base to develop multiple customized versions of their core payment software product for different customers. This approach required that changes to the core product be made to each individual version of the product for every customer. This time-consuming and inefficient approach required maintenance duplication that actually increased the possibilities for bugs or additional maintenance work. With Rational ClearCase, Dialect Solutions could more easily segment and "componentize" a product's code base (a function of Rational ClearCase's ability to understand

branching), minimizing unneeded code and statistically improving software quality by facilitating a higher degree of code reuse. An additional benefit of the code componentization approach was that developers could more easily perform in parallel development.

Dialect Solutions' team leaders and management regularly utilize Rational ClearQuest reporting tools to help manage resources and projects. The reports enable management to track estimated development and test times against the actual time spent, improving the development staff's ability to plan and forecast these activities. Dialect Solutions management has been impressed with the granularity of the data collected and reported by Rational ClearCase and Rational ClearQuest and believes it has benefited from improved visibility throughout a project. The Rational tools also provide a tighter control over key aspects of the software development life cycle. A compelling quote from the development managers at Dialect Solutions went as follows: "If it isn't in ClearQuest, it isn't happening."

Dialect Solutions also indicated that Rational ClearCase and Rational ClearQuest provide the crucial ability to link configuration management with defect and enhancement requests. Linking the two sets of requests with IBM Rational tools has simplified software development and maintenance processes, increased developer productivity, increased software quality, and facilitated an improved structured approach to software development.

The net result of these collective improvements was an expected net headcount productivity gain of slightly more than 13% in 2002. This net headcount productivity gain was expected to rise to slightly more than 14% in 2003 and slightly more than 15% in 2004. The overall net quantitative financial benefit from these expected headcount gains will amount to slightly more than \$249,000 in 2002 and increase to nearly \$286,000 in 2003 and \$306,000 in 2004.

Total net quantitative benefits over the ROI time frame are more than \$840,000. Dialect Solutions believes that more than 40% of these benefits were realized by the development staff due to structure and efficiency that Rational ClearCase and Rational ClearQuest brought to the development process. Moreover, according to Dialect Solutions, these same benefits also carried over to business analysts, software architects, and the testing team. The management reporting benefits also extended to the team leaders.

#### ***COSTS ASSOCIATED WITH USING IBM RATIONAL CLEARCASE AND IBM RATIONAL CLEARQUEST***

The net quantitative costs accrued as a result of the investment in Rational ClearCase and Rational ClearQuest came mainly in the areas of software licensing and maintenance, implementation, QuickStart program, training, and hardware. Software licensing and maintenance for Rational ClearCase and Rational ClearQuest accounted for 67% of the overall costs, totaling slightly less than \$239,000 over the ROI study time frame.

The hardware costs incurred resulted from the purchase of a dedicated server for Rational ClearQuest. The overall cost of this server, which included system implementation, annual maintenance contracts, system administrator time, and backup costs, totaled less than \$53,000 over the ROI time frame.

Implementation costs of slightly less than \$31,000 accounted for payments to outside professionals to configure Rational ClearCase and Rational ClearQuest for the development needs of Dialect Solutions. These implementation costs include the migration of historical information into the Rational ClearQuest environment.

Dialect Solutions also purchased IBM Rational's QuickStart program, which added slightly more than \$25,000 to the net quantitative costs. Staff training in 2002 and 2004 is expected to total slightly more than \$11,000.

Total net quantitative costs for Rational ClearCase and Rational ClearQuest amounted to slightly less than \$359,000 over the 2001–2004 ROI time frame.

#### **RETURN ON INVESTMENT**

Dialect Solutions achieved breakeven on its ROI after 12 months of using Rational's software tools. This outcome is very compelling due to the company's decision not to amortize Rational ClearCase and Rational ClearQuest license costs over four years. Despite absorbing all license costs for the Rational products in 2002, Dialect Solutions reached a break-even point by early 2003. The expected annual ROI for Dialect Solutions in 2003 is projected to be 636%, in addition to the 599% ROI anticipated for 2004. On a cumulative basis, the overall ROI over the four-year time frame is 234% and total savings over the ROI study time frame is more than \$482,000.

Dialect Solutions' decision to invest in Rational ClearCase and Rational ClearQuest was based on a need to gain more automation and control over development processes while implementing a formal development life cycle and was not necessarily contingent on realizing a positive ROI. Regardless, Dialect Solutions is realizing significant qualitative and quantitative benefits through use of IBM Rational tools and has made a sound return on its investment.

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#### SUMMARY OF BENEFITS ASSOCIATED WITH USING IBM RATIONAL CLEARCASE AND IBM RATIONAL CLEARQUEST

Rational ClearCase and Rational ClearQuest have helped Dialect Solutions achieve the following benefits:

- Productivity gains throughout the entire development team
- The ability to maintain a core product of base functionality while providing customization for its customers
- Improved ability to conduct parallel development across projects with a similar code base
- The capability for system testers to work from a baseline and cross-check scheduled and actual fixes
- The ability to monitor metrics not previously available to understand and improve the development process
- The ability to accurately track defects and enhancements across the development life cycle
- Improved software quality and risk management
- Improved customer relations through higher-quality releases and more accurate scheduling

## **FUTURE OUTLOOK**

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### **DIALECT SOLUTIONS' PERSPECTIVES ON THE USE OF IBM RATIONAL CLEARCASE AND IBM RATIONAL CLEARQUEST**

Dialect Solutions firmly believes that Rational ClearCase and Rational ClearQuest brought material benefits to its software development processes. The IBM Rational products were purchased by Dialect Solutions to facilitate a broad-based initiative across the R&D group to increase productivity, provide more tools for project management, and gain more control of the software development processes. Through the implementation of a formal development life cycle, the introduction of new tools from IBM Rational Software, and the introduction of associated methodologies and templates, Dialect Solutions was able to restructure its software development approach to great effect.

The initiative has been highly successful and yielded some interesting results. From a system test perspective, Dialect Solutions has found that the new products and procedures have slowed down the testing process — a small portion of the overall development cycle. Viewing the overall results across all product disciplines, Dialect Solutions has found that risks are decreased, while productivity, quality, and project management improved significantly. These changes enabled the company to improve its customer relations, and the customers benefit from increased quality and reliability of Dialect Solutions' payment software products.

Although both Rational ClearCase and Rational ClearQuest are valuable to Dialect Solutions, Rational ClearQuest surfaced most frequently during the product discussions. Dialect Solutions has found the ability to track the exact status of all source code and projects through Rational ClearQuest is essential to the organization. Moreover, the company relies heavily upon Rational ClearQuest's monitoring capabilities of the development process. In the future, Dialect Solutions plans to capitalize on Rational ClearQuest's various reporting features to gain further knowledge of its development process and to find new and innovative ways to improve software development.

## **ESSENTIAL GUIDANCE**

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### **CONCLUSION AND RECOMMENDATIONS**

IDC research has found software configuration management and defect tracking tools to provide clear and quantifiable benefits to organizations. These tools provide advantages to all participants of the project team, including systems testers, developers, team leaders, project leaders, and management. The implementation of Rational ClearCase and Rational ClearQuest required the modification or creation of new processes, but the advantages gained in terms of quality and productivity, combined with greater knowledge and organization, more than compensated for the added overhead.

Dialect Solutions nearly achieved breakeven on ROI within the first year of using the products. Front loading of licensing and maintenance costs delayed the ROI break-even point; however, a decreasing cost structure over time allowed ROI to increase dramatically during the last two years of the analysis. More important, the automation and rigor introduced to the development life cycle will provide a means for more manageable and controllable growth as the company continues to expand.

Although IDC believes, and this case study demonstrates, that software configuration management is highly beneficial to smaller organizations, it is essential to any organization to grow and expand. The features these tools offer for parallel development, automated builds, branching, and merging are invaluable to development groups. Moreover, the control and information that defect tracking tools add to the development process are key to ensuring quality, productivity, and timely releases. Rational ClearCase and Rational ClearQuest offer a long list of compelling features in addition to the ability to successfully integrate with other tools that manage the remaining key aspects of the software development life cycle.

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#### APPENDIX: AN OVERVIEW OF IBM RATIONAL CLEARCASE AND IBM RATIONAL CLEARQUEST

One of the most challenging aspects of software development is managing change. Changes to source code are the result of new requirements or a difficulty in meeting stated requirements. The way in which change is managed has a significant impact on product quality and developer productivity. Therefore, corporate developers and project managers must quickly determine and share the status of a software change or release.

Rational ClearCase, a software asset management tool, and Rational ClearQuest, a defect and change tracking tool, streamline the processes of software configuration management by eliminating common pitfalls such as:

- Slow or incomplete releases
- Poor communication
- Error-prone manual processes
- Difficulty assessing project/release status
- Insufficient file backup

#### **IBM RATIONAL CLEARCASE**

IBM Rational ClearCase software asset management offers essential functions for transparent code sharing, version control, workspace management, build and release management, and traceability. The solution is designed to manage software change and complexity. IBM Rational's unique diff/merge technology automatically accepts uncontested changes and highlights conflicting changes for fast resolution.

By automating many of the necessary, yet error-prone tasks associated with software development, Rational's software configuration management solution frees teams of all sizes to build quality software faster for any size project. Transparent file access to all software artifacts allows developers to access the most current code versions in parallel, at any time, effortlessly. Transparent code sharing supports parallel development, which enhances team productivity. Unlike competitive tools that offer copy-based file access, Rational ClearCase's transparent file system enables developers to share code efficiently, improve team communication, and conserve valuable time and network resources, therefore enhancing team productivity. Developers no longer have to wait for code to be checked in to access it. With automatic and unlimited branching, multiple developers can access files and efficiently design, code, test, and enhance software from a common code base.



To automate the build process, Rational ClearCase creates a "bill of materials" that enables build engineers to quickly perform a build of current or previous source structures. This important capability provides improved recoverability for development organizations.

Many organizations must contend with the challenge of distributed development and the synchronization of work. With Rational ClearCase MultiSite, automatic, error-free replication of project databases is and transparent access to all software artifacts. In this way, Rational ClearCase provides a robust mechanism for managing remote software development.

### ***IBM RATIONAL CLEARQUEST***

IBM Rational ClearQuest offers a complete solution for managing defect and change tracking. The product is unique in that it is easily customizable with regard to fields, processes, and the user interface, and it can scale to meet the needs of any size project or team. Building upon that flexibility, Rational ClearQuest supports a "design once, deploy anywhere" approach with the capability for deployment on any major platform, including the Web and Unix.

For organizations with distributed teams, Rational ClearQuest offers Rational ClearQuest MultiSite, an optional add-on solution that supports synchronized development across geographically distributed sites. Designed to track more than just defects in code, Rational ClearQuest tracks enhancement requests and defects in documentation across the software development life cycle. Rational ClearQuest's automated email notification ensures that all members of a software team are tied into critical changes in the project. Furthermore, comprehensive querying, charting, and reporting capabilities deliver meaningful insights into the true status of projects and enable users to accurately predict deployment dates, manage project resources, and improve productivity.

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