# Ci&T Improves Productivity, Quality and Competitive Position with the IBM Rational Software Development Platform

## Overview

■ *The Challenge*
*Ci&T development teams were using an ad hoc software development process with a set of disparate development tools, making it difficult to consistently deliver quality software to its customers on schedule. To compete effectively in a worldwide market, the company also sought to achieve CMM certification and needed a proven, effective process and development tools.*

■ *The Solution*
*Ci&T established a comprehensive development environment and customized methodology by implementing RUP and IBM® Rational® tools for software configuration management, requirements management, model-driven development and automated functional testing.*

■ *The Benefit*
*RUP and IBM Rational software have been a major factor in significant improvements in quality, productivity and overall growth at*

*Ci&T. The development team has achieved CMM level 3 certification while decreasing defects by 50 percent, increasing productivity by 15 percent, and achieving an annual compound revenue growth rate of 43 percent.*

Founded in 1995, Ci&T is a leader in the Brazilian Information Technology (IT) sector, which is the largest and most competitive in Latin America. Ci&T expertise across many industries enables the company to develop and deploy business critical e-business solutions for major companies in Latin America and the United States with maximum return on investment. Ci&T's component-based software development approach provides a foundation for rapidly delivering high-quality, cost-effective solutions to its customers.

Today, Ci&T uses a modern development process, aligned with the Software Engineering Institute's Capability Maturity Model (CMM) and based on the IBM Rational Unified Process® (RUP). Supported by tools from the IBM Rational Software Development Platform, this process ensures predictability for Ci&T in meeting schedule, cost and high

quality standards. Using IBM Rational solutions, Ci&T identifies customer business needs and requirements and addresses them with custom, component-based solutions that evolve with customer requirements and provide significant competitive advantages.

**The Business Challenge**
Before Ci&T development teams began using RUP and IBM Rational tools, they used an informal development methodology and a set of disparate development tools. Lacking a consistent methodology and integrated tools, Ci&T was hindered in its efforts to deliver timely software solutions and gain market share in an increasingly competitive international market. Bruno Guicardi, Project Director at Ci&T, recalls, "Before we adopted RUP, our entire software development process needed to be enhanced. We were using an ad hoc process, which caused difficulties in software maintenance and communication between team members. It also limited our ability to scale and grow. To be more productive and deliver solutions faster, we were moving to component-based architectures. When we expanded into international markets,

our requirements needed to be even more formalized. All the information — from requirements to tests — had to be tracked and more efficiently managed so that scope, costs and schedule could be brought under control. Our aim was to have more predictability."

In addition, as Ci&T expanded, the company saw an opportunity to gain a competitive advantage by achieving CMM certification. "One of the most important challenges to Brazilian software companies today is to compete in the fast-growing international outsourcing industry. Gaining CMM certification was a verification of our commitment to quality and was very important for us in order to be more competitive inside Brazil and abroad. CMM certification was a major milestone for us," notes Guicardi.

### Selecting IBM Rational Solutions
Seizing the opportunity to better meet the needs of its customers and distinguish itself from the competition, Ci&T's leadership decided to adopt RUP across all of the company's development projects. Ci&T development teams also began using IBM Rational tools to support the development process, including:

- IBM Rational RequisitePro® for requirements management,
- IBM Rational ClearQuest® for defect and change tracking,
- IBM Rational ClearCase® for software asset management,

- IBM Rational Rose® for use case modeling and model driven development, and
- IBM Rational Robot® for automated functional testing.

"RUP was chosen as the basis for all company projects, and the Rational tools support the development activities of the team. The decision to use the Rational methodology and tools was based on the commitment Rational software has always shown for software engineering best practices, its leadership in the market, and its tools' support of UML (Unified Modeling Language) and other open standards," says Guicardi.

### Requirements Management and Traceability
Ci&T works closely with its customers to accurately identify business needs. Ci&T analysts use IBM Rational RequisitePro to define project requirements and manage them throughout development. According to Guicardi, effective requirements management is a key to managing costs and risks on Ci&T projects. He explains, "Rational RequisitePro allows us to gather and track requirements during the entire project lifecycle. Because we typically work on fixed-price projects, managing requirements is very important, and we use Rational RequisitePro to ensure we have them accurately defined before we even submit a proposal. We also manage our test cases in Rational RequisitePro which really helps communication. We have different teams for testing and defining

requirements, and because they are both using the same tool, they are able to communicate more effectively."

To help ensure everyone on involved in the project — including the customer — understands the project requirements clearly, Ci&T analysts rely on use cases which describe system behavior from a user's perspective. Use cases for each project are defined in text form in Rational RequisitePro and also modeled in use case diagrams using IBM Rational Rose.[1]

### Modeling Service-Oriented Architectures
In addition to use case modeling, the Ci&T development team also uses Rational Rose to create application models using UML. These models, like requirements in Rational RequisitePro, also help the team communicate more effectively and eliminate misunderstandings in implementing a system's design. Developers also use Rational Rose to automatically generate Java™ framework code from the UML models. "Java code generation saves a lot of time in a phase of the project where we must put a lot of things in place," says Guicardi.

After developers complete coding, they use Rational Rose to reverse-engineer a model from the code that was actually implemented to ensure that model and code remain synchronized. Guicardi notes, "Reverse engineering gives us the ability to look at what was actually implemented in the project and what

really happened to the diagrams and the architectural design guidelines." Rational Rose is also playing a key role in helping Ci&T leverage more Web services and service-oriented architectures to shorten time to market and increase responsiveness to customer needs. "Rational Rose is fundamental to our ability to model robust service-oriented architectures and Web services. For us, Rational Rose is a fantastic tool, one that we use well all over the company," says Guicardi.

### Automating and Integrating Software Configuration Management

Of all the IBM Rational tools Ci&T has deployed, none have been more instrumental in the development team's success than IBM Rational ClearCase and IBM Rational ClearQuest. Ci&T developers are using the Unified Change Management (UCM) capability in Rational ClearCase and Rational ClearQuest, which provides out-of-the-box workflow for automating change across the software lifecycle and across multi-functional development teams.

Guicardi reports, "Change management is made much easier by Rational ClearCase and Rational ClearQuest. Many of the practices that CMM demands for configuration management and change management are automated and enforced by these tools."

"We use Rational ClearQuest and Rational ClearCase in virtually

every project in the company. With Rational ClearQuest we track changes and report defects. We also use it to track project metrics; for example, the average defects per lines of code, average number of changes by project size, and so on. In addition, our projects have on average from five to 15 people working on them concurrently. They are all developing in parallel — baselining and later integrating their code. Rational ClearCase makes that a straightforward process," he adds.

### Support for Hand-offs and Ongoing Maintenance

Many Ci&T projects are handed off to the customer upon completion, while others are maintained and updated by Ci&T for the duration of the contract. In both cases, Rational tools offer advantages to Ci&T and its customers.

When Ci&T hands off a completed project, it also includes the development assets including all Rational Rose models. This greatly accelerates the transfer of knowledge from Ci&T to the customer. "We provide everything to the customer. That helps because some of our customers use the entire Rational toolset themselves, and almost all of our customers are using at least one Rational tool in their development. In some cases, our customers already have their own customization of RUP, and we are able to establish a joint customization for the project and use the same RUP methodology," notes Guicardi.

On projects for which Ci&T performs maintenance, the QA team develops automated functional regression tests using IBM Rational Robot. These tests enable repeatable, time-saving regression testing whenever Ci&T releases a new version of an application.

"In the maintenance contracts, we have more intense use of Rational Robot. On those projects we have to regression test more often, and automated testing has significant value," adds Guicardi.

On all projects, IBM software provides Ci&T with a seamless development and deployment environment – an environment which includes IBM Rational Web Developer for WebSphere Software and Eclipse integrated development environments (IDEs), as well as IBM WebSphere® Application Server and IBM DB2® information management software in the production environment. "We see an increasing number of customers demanding DB2 software for their database, and IBM WebSphere Application Server is clearly the most demanded application server," Guicardi reports.

### Flexibility, Speed, Clarity

Ci&T has realized many benefits since adopting the Rational Software Development Platform, including accelerated development, improved communication, and better insight into the entire development process. Guicardi explains, "One key benefit is that RUP and the Rational tools

provided us with a complete framework so we did not have to reinvent the wheel. They help us communicate objectively, which is crucial in the projects we work on. Rational tools make it easy to analyze the details, the results of the process and the project with objective information. Before, we really did not have the objective information we needed to assess progress. Now we have metrics — objective data for defects, changes, and productivity. No problems can hide from us and go undetected. Also, the flexibility of the process enables us to provide our customers with shortened schedules, great time to market and a very agile product."

Ci&T has also performed detailed analysis of tangible improvements in software development since the team began using IBM Rational tools and RUP. Guicardi reports, "We have measured a decrease in defects per line of code by 50 percent. We have a very low rate of defects — 80 percent fewer than best-in-class average according to industry studies. Our productivity, measured in lines of code per hour, has increased 15 percent annually. Today, our productivity in function points per staff-month is more than double the industry average. Switching from a waterfall approach to an iterative approach has helped us reduce the time needed for us to show a version of a working system to the customer by 70 percent. After the first two years of using RUP, 85 percent of our projects were completed on budget. And, our revenue has

grown 700 percent, with an annual compound growth rate of 43 percent. Rational tools were a major factor in those gains."

He concludes, "Rational solutions have played an important role in our expansion into international markets because they were fundamental in achieving CMM level 3, which we did in record time. Our process continues to evolve, and we are now on our way to CMMi level 4. Rational solutions have accelerated delivery and reduced costs by enabling us to establish a productive and controlled development environment, which ultimately leads to higher quality and guarantees software product integrity."

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