

State of Michigan improves efficiency and quality with IBM Rational Software Development Platform.

Overview

■ **The Challenge**

Michigan's timber management system was PC-based, using a manual process to update a central database each week. The goal was to build a more efficient, Web-based replacement. They also needed a software development platform that helped them meet stringent regulatory compliance and quality demands.

■ **The Solution**

The state's IT department adopted the IBM Rational Software Development Platform, including the IBM Rational Unified Process methodology and tools to develop an advanced processing system for timber management.

■ **The Benefit**

With more efficient management of timber sales, revenue from timber has doubled from \$25 million to \$50 million annually. Also, the Department of IT has improved productivity, increased efficiency by 20%, and garnered higher ratings for customer satisfaction.

Since 1993, Michigan's Department of Natural Resources (DNR) had used a Timber Sale System (TSale) running on stand-alone PCs in more than 40 offices across the state to track timber sales contracts, enforce administrative constraints, and collect revenue from sales. The system relied on a complex workflow that required data from proposals to be first transferred, to designated upload PCs, then transferred to a central location where it was combined into a single database on a weekly basis.

Over time, TSale had become outdated and the state found that the system was not providing the capabilities required to satisfy current or future government needs. To address these needs, the Department of Information Technology (IT) began developing a replacement to TSale, called the Vegetative Management System (VMS). VMS is a Web-based system designed to provide end-to-end automation of the timber sale process. It also assists the DNR in planning, performing, monitoring, and analyzing commercial forest

treatments, while enabling significant improvements in quality control and data analysis.

The Department of IT provides services to 20 departments within the state government to meet the demand for efficient, low-maintenance, high-quality information systems that comply with state and federal regulations. The VMS development effort was identified by the Governor's office as a "dashboard" project—one of approximately 20 core projects statewide that are closely monitored by the Governor's office because of their importance to state government.

Technical challenges

Before beginning work on VMS, the Department of IT sought to address several technical challenges related to its current development approach.

First, the Department wanted to ensure that its developers would be able to deliver a system that met the quality standards required by VMS. Sam Roberts, project manager for the VMS project, explains, "In the past, we had rolled out systems that

had defects which were not found during testing. That was partly due to our testing process, which relied on manual testing and a manual process for tracking the tests. As a result, one of our goals was to eliminate high maintenance costs due to quality issues by testing in a more structured, automated manner.”

Managing risk was another key objective. In the team’s current development process, identifying and addressing risks tended to occur late in development. “We were not using a true waterfall method, but it wasn’t a true iterative process either; it was a mix. Because risk management is tied closely to process, we wanted to move away from the waterfall approach towards a much more iterative process,” says Roberts.

Lastly, to ensure that the application they delivered fully met user needs and complied with all applicable regulations, the IT team needed to clearly define and track requirements—as well as defects and enhancement requests—throughout the project. “We needed to make sure we understood clearly what we needed to develop and that the field team—the people who use the system—understood what we were doing and how they would use it in the field. We also had to take that

information and combine it with the policies, regulations, and business practices, that we are legally bound to follow.”

Selecting IBM Rational

After a thorough evaluation of available alternatives, the Department of IT decided to adopt the iterative approach of IBM Rational Unified Process®, or RUP®, supported by a range of solutions from the IBM Rational Software Development Platform, including:

- IBM Rational RequisitePro® for requirements management
- IBM Rational ClearQuest® for defect and change tracking
- IBM Rational ClearCase® for software configuration management
- IBM Rational Rose® XDE™ Developer Plus for visual modeling
- IBM Rational TestManager and IBM Rational Robot for test management and automated testing

To accelerate the deployment of IBM Rational solutions, the team engaged IBM Rational services to conduct on-site training courses. “The training helped us to get up and running,”

says Roberts. “Of course, we’ve learned on our own as the project progressed as well, but the training has been well worth it.”

Customizing RUP, leveraging use cases

Before the team began development work on VMS, Roberts customized RUP to integrate the development process with the department’s existing project management methodology, based on Project Management Body of Knowledge (PMBOK).

In addition to moving toward an iterative development methodology, one of the bigger changes to the department’s existing approach was the addition of use case analysis. By defining how VMS would function from the user’s perspective, use cases enabled the development team and all project stakeholders to clearly understand the system requirements.

As the team gathered and defined use case requirements in Rational RequisitePro following the RUP methodology, they discovered additional advantages. “Use case analysis helped us conduct our tests in a much more structured manner,” says Roberts. “In addition, we were able to define exactly what we were supposed to be doing and why. As we were going through this effort, we discovered we were not doing some of the things

that we were supposed to according to our policies and business practices. In some cases, we made improvements to our business practices that will ultimately benefit our organization.”

Augmenting the use case requirements in Rational RequisitePro, the team used IBM Rational Rose XDE Developer Plus to create use case diagrams and storyboards. These diagrams, along with sequence diagrams, gave developers an unambiguous view of system functionality as they built VMS.

Complying with state and federal regulations

In developing VMS, the Department of IT had to ensure compliance with numerous governmental and legislative requirements. “As a department of the State of Michigan, we always have to make sure we comply with state and federal mandates and follow certain process required by law. Because the VMS system takes in funds, there are additional banking systems regulations regarding the deposit of funds and tracking those funds as they change hands. We must restrict access to certain information and implement security features. There are a host of different legislative rules that we have to follow, and we designed those in as requirements to the system,” says Roberts.

Roberts reports that RUP and IBM Rational tools help the team to ensure compliance requirements are

accurately defined, implemented and tested. “We trace all of our requirements through to testing. I work directly with the quality assurance team to ensure that all compliance tests are done so that I can check them off.”

Software configuration management

The VMS development team used IBM Rational ClearCase to streamline parallel development and manage multiple versions of the application simultaneously. This enabled the team to make minor changes to deployed versions of the application, without interfering with their work on larger scale enhancements in the next planned release.

The team used the Unified Change Management (UCM) capabilities of Rational ClearCase, and its integration with Rational ClearQuest to implement an activity-based approach to managing change. “Rational ClearCase is a robust and stable software configuration management (SCM) solution,” says Govindarajan Umakanthan, a business analyst on the VMS project. “Its integration with Microsoft® Visual Studio® .NET™ made it easy to use and increased developer productivity. And UCM enabled us to deploy a usage model rapidly.”

Testing and tracking defects

As developers implement new features, they use Rational Robot to build and execute automated functional tests on the new functionality. Later, they rerun these scripts as regression tests to ensure recent changes have not introduced any problems with existing functionality. While the department plans to expand its use of automated testing for quality assurance, the team is already using Rational TestManager to manage both manual and automated testing.

Once the testing process identifies a defect, it is entered into Rational ClearQuest. The team uses Rational ClearQuest to track defects and enhancement requests, but more importantly, they use it to automate and enforce a development workflow.

Roberts explains, “In our process, when a bug is identified, the project manager meets with the project coordinator from the technical side. We create a record in Rational ClearQuest and determine a timeframe for when it has to be resolved, based on priority. Likewise, enhancement requests are evaluated based on priorities, budget, and schedule. We track all these items in Rational ClearQuest.” Roberts also uses Rational ClearQuest to assign defects or enhancement requests to developers, and then track them through follow-up testing.

More flexibility in staffing

Prior to adopting RUP, the department frequently experienced difficulties when staff members retired or moved to new positions. Because the teams lacked a consistent process that encouraged thorough documentation throughout development, the departure of a single developer had a serious impact on all projects that he or she was involved with.

Roberts notes, “On some of our smaller projects we have only one programmer, and that programmer may have several such projects. If that programmer leaves, we would lose an enormous amount of knowledge and expertise. Now that we have a standardized methodology with better documentation—including requirements and use case diagrams—we are better able, as an organization, to handle that situation. Today, on all of our major projects, we have a standard process and we are documenting everything very carefully.”

Always in the green

As one of the governor’s dashboard projects, the VMS development effort was under considerable scrutiny. Having a proven methodology in place along with a fully documented development effort was a significant benefit. Umakanthan explains, “VMS is

the first major dashboard project to use RUP and its iterative development methodology extensively. This resulted in VMS staying in green status— reflecting that everything was running fine— from the beginning.”

Roberts adds, “RUP and the IBM Rational tools were very helpful in assisting us with that. We would have audits about every six months. We used Rational RequisitePro and Rational ClearQuest to lay everything out for the auditors, so they could see everything we were doing and how we were progressing.”

Increased quality and improved efficiency

According to Roberts, since adopting the IBM Rational Software Development Platform, the Department of IT has increased its efficiency while delivering higher-quality systems to its customers. “We have seen an increase in time efficiency of 20 percent,” says Roberts. “We saved time by shifting resources from manual regression testing to other tasks, because we were doing automated testing with Rational automated software quality solutions. Also, all of our defect tracking information is now managed in one location, as is our documentation. Everyone is getting the same information, no matter which group they are in. When we need to

make an update, we can do it in one spot, not ten different places. That saves us additional time and results in documentation that is more accurate, which makes our team more efficient and more effective.”

The team’s ability to deliver higher quality software has also improved as a result of using automated test management and defect tracking tools in support of a use case-based testing methodology. “In the past, we would push software out to the customer, and not know that what we had delivered was a system with bugs in it. Now, we are able to test extensively, because of the time savings from not having to do everything manually. As a result, we rarely push anything out with a defect. In the few instances where we have done that, we simultaneously release a workaround, so that our customers fully understand what the problem is, how we plan to resolve it, and when they can expect a permanent fix. In that way, we have built trust with our customers as well.”

Satisfied customers

Improved quality and closer collaboration with business users has not only built trust among the business customers, it has also resulted in very high levels of overall satisfaction for VMS users. During a recent survey of the state’s Forest, Minerals and



Fire Management offices, 103 of 110 respondents agreed or strongly agreed that VMS met their needs, with the remaining 7 respondents holding a neutral position. "VMS has received great reviews from end users for its speed, usefulness and user-friendliness," confirms Umakanthan.

VMS also enables the state to better manage its natural resources, and planned functionality will further enhance this capability. "We are working on a module called SaleMap that will provide loggers with a detailed geographic picture to help them identify the exact plot of land they should work on and make their jobs easier," explains Roberts.

Revenue doubled

When VMS replaced TSale, the sale of timber from state-managed land was generating US\$25 million annually. Today, with VMS, that figure is closer to \$50 million.

While Roberts notes that some of the increase may be the result of other factors, VMS has certainly played a role in the increase. "We are tracking more timber transactions more accurately and more efficiently. We are getting information out faster to a much larger group of people. All of that is helping the state bring in more revenue, and manage the land better as well," he says.

Roberts notes that his team's commitment and effort, combined with RUP and IBM Rational tools, were keys to the success of VMS. "I don't think you can drop Rational tools and Rational Unified Process on someone's desktop and expect them to be off and running," he says. "But I know that when we invested the time in learning how to use the tools and implement the process, it reaped huge benefits as we moved forward. We are better able to identify and address risk, and comply with the policies and procedures that must legally adhere to. We are not yet as fully automated as we would like to be — but we are getting there, grabbing one success at a time as we move in that direction."

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