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Building an Operations-Management System

Online Exclusive

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The proliferation of services-industry players combined with advancements in computing and communications technologies has fueled increasing competitiveness in the geospatial industry. This has necessitated the drive to accelerate operational excellence.

Computer-assisted workflow-management systems and enterprise-integration applications have gone from a luxury item to business "must haves." And while there's no debate over the information technology (IT) necessity, there's debate between packaged products vs. customized developments. It's a matter of barriers vs. benefits, especially in terms of costs, schedules, ease of implementation and effectiveness of the respective solutions.

This article describes an effective implementation of a homegrown, computer-assisted enterprise solution: an Operations-Management System (OMS) developed in phases, with a modular approach, to meet challenging project requisites and integrate with a continual improvement process.

Mother of Innovation

Need always is the "mother of innovation," and this project was no exception. The business need was for RMSI to "ramp up" a large workforce in a short period of time for a geospatial data integration project. This drove the conceptualization of a computer-assisted OMS. The challenge was to assemble a team of approximately 400 people in three months for a project expected to be completed in one year.

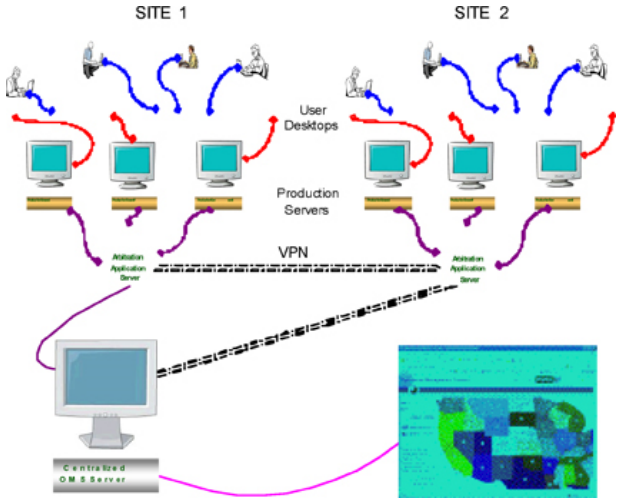
Apart from the usual challenges of recruiting and training a potentially large workforce, the aggressive timeline for the proposed project was critical to client expectations. Therefore, as work requirements were being scoped, it was necessary to simultaneously develop project specifications and system design/development of a work-processing software platform. This further increased the challenges of managing a newly recruited team nimble enough to work in a continually evolving production environment with changing work instructions.

Keeping in view the aggressive timelines, a phased approach was planned. Each component would be developed as a standalone component based on priority. Time is money, and large blocks of time/money were saved by gathering high-level requirements for all components at the initial design stage and defining the interface protocols and database commonalities at the commencement stage.

The OMS

The OMS is a complex, multi-tiered structure, as the production environment involved a large workforce spread across two office locations, connected via Virtual Private Network and an array of data servers as well as an arbitrator server at each site.

Multiple teams worked in parallel on different geographic extents, with a U.S. county as a base extent. The arbitrator server provided the routing details for the relevant data server based on the counties to be worked by a given user desktop. The two arbitrator servers synchronized periodically to ensure that project-monitoring information was up-to-date. The arbitrator server at the main office also doubled as a master server to enable centralized management of user rights and authorizations.



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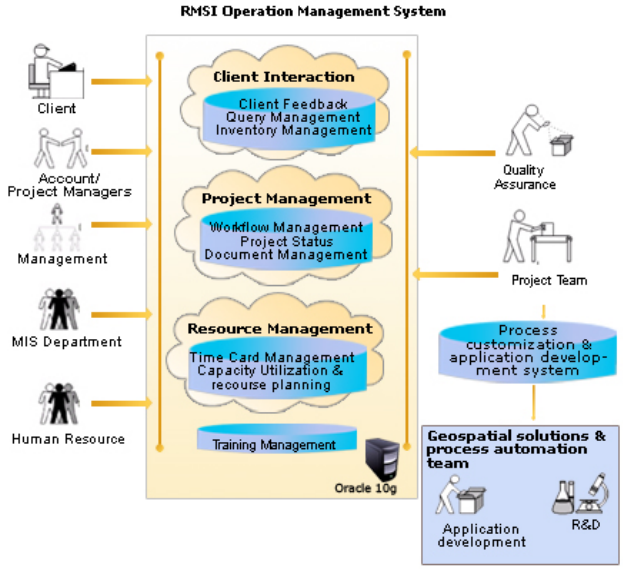
The Web-enabled OMS interlinks various functions and systems as required for project management. The key modules constituting the OMS included the following:

Workflow management

- Project-status monitoring
- People-resource management
- Inventory management
- Document management
- Query management
- Process customization and automation-applications management
- Training management



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Workflow Process

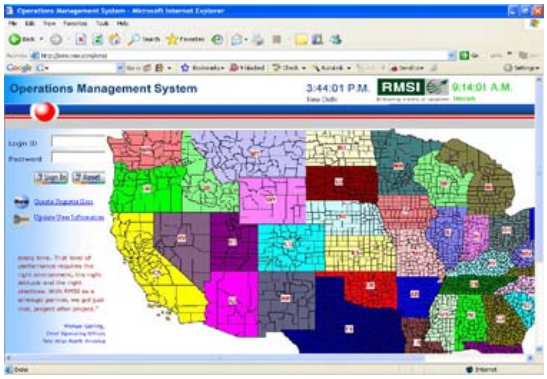
The work involved enhancing GIS datasets such as streets, railroads and water features, using aerial images of multiple vintages (with overlapping geographical extents, with use priority assigned by image resolution and source), Global Positioning System-enabled field reports and allied GIS datasets as well as conflating the best of geometry and/or attribute from respective datasets to a singular enhanced output dataset in consonance to the modeling specifications.

The workflow process included the following:

- Receipt of spatial and nonspatial data inputs that were loaded to production servers with inventory-tracking information stored at the central OMS terminal.
- Development of Work Allocation Units (WAU) defining non-overlapping bounding extents for distribution to individual users The WAU size was based on predefined parameters to constitute a finite quantum of work. Each WAU was tagged with a unique ID.
- Multiple stages of a sequential production flow, wherein the OMS enables and monitors the allocation and receipt of the WAU to and from individual users.
- Delivery of the final output dataset after a quality check of algorithmic checks and visual inspection, with the OMS exporting preformatted dispatch notes for the respective work order being delivered.

Information Allocation

Effective planning and monitoring are critical elements for successful project execution, ensuring that the correct information gets to the proper person at the expected time. Thus, the underlying philosophy for the OMS implementation was the integration of timing, content and people onto a single platform.



A system with well-defined user rights for different stakeholders tracks the project from receipt of input from the client until shipment of deliverables.

A system with well-defined user rights for different stakeholders tracks the project from receipt of input from the client until shipment of deliverables. The system also helps in inventory management by maintaining a record of complete details pertaining to inventory received with relevant version, priority of use and storage location.

Such a system also helps monitor work progress and ensures versioning management of the process-customization applications developed and released for the project. The system is synchronized with other legacy databases to gather employee information as well as daily attendance information.

Work-Quality Tracking

The work-quality tracking module had two components. The internal quality feedbacks and observed errors were tracked as an integral part of the workflow, and then all client feedback is thoroughly analyzed and recorded in the OMS.

The system maintained records of client feedback by description, cause, criticality, status (open/closed), and corrective and preventive actions taken. This enabled quality-standard maintenance and trend analysis to determine

needs for training as well as performance feedback for individuals and teams.

Document Management

The document-management module enabled a comprehensive collection of all project-related inventories, including client and internal specifications as well as user manuals for various inhouse process-customization applications.

The system facilitated a matrix combination of user rights based on the confidentiality grading of the document category and the user-level authorization for reading, modifying, deleting and/or printing for the respective grade.

For example, not all users can download, save/print or use a print-screen option for documents in read mode. Similarly, not everyone can upload any document on the interface. This helped share information with all concerned stakeholders, while still maintaining the required level of security and confidentiality.

Issue Management

The issue-management module extends via the Internet as a multi-tiered communication interface reaching to the client. The system enables team members to log in technical queries, which can be answered by project leaders or forwarded to the client for due clarifications.

The system enables users within the organization and at the client end to access, share, track, and store queries and solutions during the entire lifecycle of the query until it accepts as resolved and archives such interactions to capture tacit knowledge for future reference. The tracking of queries also helped determine the training needs for the respective individual or teams as well as reflected on the requirements for process or documentation revisions.

Training Management

The training-management module helped organize, implement and coordinate varied training programs (e.g., conceptual, technical, behavioral, etc.) across the organization in a structured way. The system published a training calendar, with training categorized as foundation, intermediate or advanced for a given discipline.

Users could log in to the system to choose the training that they wished to participate in, with the first level of allocation being made after a user met the prerequisites for the specified category of training and on a "first-come, first-served" basis. The request for participation then would be forwarded for supervisor authorization to ensure that project plans take care of the scheduled absence from the project, and the approval status is confirmed to the participant.

The OMS Impact

Key benefits observed on the specific project included the following:

- Ease of work tracking through easy-to-generate, real-time reports
- Schedule tracking
- Efficient tracking of projects and individuals
- Quantitative data for staff appraisal
- Tracking of re-works and assessment of quality costs
- Tracking delays in which "First In, First Out" wasn't followed
- Effective change control through online maintenance of project documents
- Real-time assessment of current documentation in case of changes
- Version control of Process Customization and Automation applications

Overall, OMS played a significant role in the success of a large GIS project through effective monitoring of each individual, with quality tracking, and efficient inventory management from input to output as well as enabling document distribution and versioning control.

Goals and Objectives

The effort to develop the OMS evolved into a companywide business initiative that strives for increased operational excellence. The following goals and objectives now are being established:

Goals

- Institutionalize OMS concepts across the various projects as an aggregator of best practices
- Make OMS an enabler of a holistic approach for data driven decision-making through robust data collection and enhanced data analysis
- Continuous monitoring and benchmarking improvements through algorithmic measurement of functional metrics

Objectives

- Enhancing client satisfaction
- Improving productivity
- Boosting profitability

Further Directions

The OMS is being expanded through interfacing with a Time-Card Management System and Client-Feedback Register. Further enhancements are being made to include the entire project lifecycle, from authorizing project initiation by its sponsor to allocation of project codes, project planning and closing, with enhancements to project execution as well as controlling components addressed by the current OMS.

Another key enhancement is to develop a common "Stakeholder View" cutting across projects and functions, providing status and reports for senior management.

The RMSI OMS was designed specifically with geospatial data integration projects in mind. It will provide a high-level "dashboard" to monitor progress of all projects within the organization, along with options to drill toward micro-level granularity of information.

The enhanced system shall extend as a Web-enabled interface between client and RMSI, and it can be used to track client-specific projects. User groups will include project teams, stakeholders and the client. To manage (add/edit /review and present) project-related information and monitor its progress with respective authorizations, all rights defined in the system are based on roles and not designations.

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