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# Maximo to the Max

## Following One Organization's Upgrade Experience

by Shelley Whitener, CMRP; Ed Williams, CMRP; Sabine Boruff and Tom Arcuri

**S**andia National Labs has been using Maximo almost since its inception. Over the years we have utilized the Maximo tools that conformed nicely to our maintenance processes. We took advantage of the software capabilities to improve our planning and tracking of maintenance work. However, we still fell into the same category of most Computerized Maintenance Management System (CMMS) users, that is, we were only utilizing a fraction of the system's capabilities to improve our processes.

Early in 2006, we were given a corporate mandate to upgrade to the current web-based version of Maximo in order to support the Oracle 10g upgrade. This time, we made the choice to think big and see how we could improve our maintenance processes as part of the upgrade project. This article will discuss the approach, activities, and outcomes of our upgrade project. We will demonstrate the successful partnership between Maintenance, Engineering, IT, and the vendor (IBM), as well as how we used Lean Six Sigma tools, such as Value Stream Analysis, to identify process improvement opportunities. We will also discuss the integration of stand alone, in-house legacy applications and databases into Maximo. We believe our experience may provide a road map for others facing similar challenges, illustrating the importance of advanced planning, an integrated project team, partnering with your vendor(s), as well as our 'lessons learned'.

### About Sandia National Labs

Sandia National Laboratories (Sandia) was established on Kirtland Air Force Base in Albuquerque, New Mexico, in 1945 during the Manhattan Project as a division of the Los Alamos Laboratory. On request of President Harry Truman, Sandia became an independent laboratory on November 1, 1949. Sandia is now a multi-program national security laboratory operated by Sandia Corporation, a Lockheed Martin company, for the U.S. Department of Energy's National Nuclear Security Administration (NNSA).

Sandia employs about 8,600 full-time (equivalent) personnel at several locations: its main facilities in Albuquerque, New Mexico, and Livermore, California; test ranges in Tonopah, Nevada, and Kauai, Hawaii; the Pantex Plant weapons facility near Amarillo, Texas; and the Carlsbad, New Mexico, Field Office, which leads the nation's transuranic waste disposal efforts.

Since 1949, Sandia has expanded its mission to develop science-based technologies that support our national security. Today, Americans depend on Sandia's technol-

ogy solutions to solve national and global threats to peace and freedom. Primary sponsors are the NNSA, the Department of Defense, and the Department of Homeland Security. Sandia also works with other government agencies, industry, and academic institutions to accomplish missions in five key areas:

- **Nuclear Weapons:** Ensuring the stockpile is safe, secure, reliable, and can support the United States' deterrence policy
- **Energy and Infrastructure Assurance:** Enhancing the surety of energy and other critical infrastructures
- **Nonproliferation:** Reducing the proliferation of weapons of mass destruction, the threat of nuclear accidents, and the potential for damage to the environment
- **Defense Systems and Assessments:** Addressing new threats to national security
- **Homeland Security:** Helping to protect the nation against terrorism

Other research disciplines, which support these mission areas, include materials and process sciences; computational and information sciences; microelectronics and photonics sciences; engineering sciences; pulsed power sciences; manufacturing sciences; surety sciences; chemical and earth sciences; and biotechnology.

### Facilities Facts

The Facilities Management and Operations Center at Sandia's Albuquerque, New Mexico site manages over 900 buildings comprising over seven million square feet. There are approximately 120 in-house craftsmen supporting these facilities. Some additional facts about our facilities and infrastructure are:

- 35 miles of paved roads, 53 miles of unpaved roads
- 75 acres of pavement
- 100 miles of power transmission lines (5kV, 46kV, 115kV)
- 70 miles of water lines
- 17,670 tons of chilled water cooling

- 23 miles of natural gas lines
- 46,000 facilities maintenance work orders per year
- 25,000 additional facilities service requests per year
- 37,000 assets managed through Maximo
- 30,000 items managed through Maximo inventory

## Where We Were (2005)

Sandia was one of the earliest Maximo users. For the past several years we have been running Maximo 4.1.1, with the basic philosophy of not upgrading with every new release, but waiting until a new version was well vetted before we upgraded. In late 2005, we were preparing to upgrade to Maximo 5.2 when we learned that a corporate mandate would require us to move to Maximo 6, which supported the Oracle 10g relational database. At the time, Maximo 6 was generally available to all customers, but the upgrade scripts from Maximo 4.1.1 were not released yet. Thus, this time we would not have the luxury of waiting until all the “bugs” were eliminated in a new release. The big question was, “Are we ready for this?” The prospect of change was a bit daunting to many users because they were so accustomed to Maximo 4.1.1.

To some extent, we were using most of the available applications in Maximo 4.1.1. We had a solid master equipment list, but with varying degree of details recorded for the equipment. We used the preventive maintenance (PM) application extensively, and many PMs had equipment-specific job plans with engineering standards. Every maintenance job was tracked in the work order application. We were also starting to use the condition monitoring application in select areas. The labor, inventory, and purchasing applications were all integral to Sandia’s Maximo database. However, some of Maximo’s valuable tools (such as Safety Plans) were not implemented at Sandia, and the new version offered features that would enable us to incorporate more of our facilities asset management activities into one system.

We saw this upgrade as an opportunity to implement previously unused Maximo applications, and enhance the use of existing applications to improve the effectiveness and efficiency of our maintenance processes. Simultaneously, we were seeking solutions to other identified sources of inefficiency and inconsistency. For instance:

- Like many other companies, Sandia had developed several other stand-alone databases over the years to manage assets, projects, and services. For the most part, these other databases did not communicate directly with Maximo or with each other. In many cases, overlaps in information for the various databases resulted in duplication of work and even discrepancies in data.
- We lacked a single, standardized process flow for getting maintenance work accomplished. Each crew had developed unique, undocumented processes that worked for them.
- We did not have consistent, well-defined roles and responsibilities for team supervisors, planners, technical assistants, etc.

## Scope of the Upgrade

The magnitude of this upgrade was significantly larger than typical upgrades because we were spanning two major application versions in the move from Maximo 4.1.1 to Maximo 6.2.1, as well as introducing new add-on applications. Several key aspects of the upgrade contribute to the expansive scope of the project:

- Technology change from client-server to web-based
- Complete rewrite of all reports – conversion from SQR to Actuate
- Use of Maximo Enterprise Adaptor (MEA) to initially load/refresh person, location, and user data
- Integration of help desk functions into Maximo
  - Replace legacy software with Maximo Service Desk
  - Replace legacy customer query tool with Maximo Self Service
- Implementation of new Maximo Mobile Inventory Manager

Each of these areas introduced complexity to the project, but each also brought new advantages to our overall work management process. Having a web-based application would provide greater accessibility and more intuitive navigation to users. Reports integrated within Maximo would be more useful and efficient. Implementing the Maximo Service Desk would consolidate an in-house application, as well as, creating a single point of entry for all requests for service. Maximo Mobile applications would also directly integrate with the core Maximo applications rather than simply

interface.

Minimizing customizations to migrate during the upgrade was also very important to our project scope. This would be accomplished in two ways. First, many of our customizations could be replaced by newly available functions in the Maximo 6. Second, some customizations which couldn’t be replaced with new functionality could be eliminated by changing or improving our work processes.

## Our Approach

To ensure that we would be ready for the changes ushered in with this major upgrade, we decided to take an approach that was new for us at Sandia. Typically, software upgrades are primarily the responsibility of the IT department, forcing them to seek user input and “buy-in.” For this Maximo upgrade, the Maintenance Engineering department formed a cross-functional project team to manage the upgrade. The team included the following representation:

- Functional Lead – Maintenance Engineer
- Technical Lead – Maximo Developer/IT SME
- Key Maximo Users – 2 Maintenance Planners, Other Ad-hoc Users
- Technical Support Team – 4 Maximo Developers, Database and Server Administrators
- Key Stakeholders – Warehouse Supervisor, Maintenance Manager, Planning Supervisor
- Ad-hoc Consulting Support (IBM)

We began with a Project Charter<sup>1</sup>, which concisely documented the objectives, purpose, description, deliverables, schedule, and cost of the upgrade project. The charter was approved by management from both the Maintenance Engineering and IT departments. From the onset, we recognized that strong management support would be especially critical to the success of this upgrade. Because of the significant changes it would impose on the user community, it was very important that senior management visibly and vocally supported this effort from the top down. The project team reported periodically to a steering committee comprised of managers from Facilities and IT.

The first task of the project team was to develop a project plan and master schedule. The project plan identified and described eight major objectives (see Table 1). Sub teams were then formed to focus on each objective.

Each sub team was lead by a member of the project team, who identified key individuals for each sub team. Each objective required collaboration between IT and users.

Table 1 - Project Plan Objectives

Objective	Description
1	Existing Mobile Maximo Conversion
2	Full Mobile Maximo Evaluation Plan
3	Site Project Request System (SPRS) to Maximo (Service Desk)
4	Work Flow
5	Maximo-driven Process Upgrades
6	Maximo-facilitated Process Optimizations
7	Training
8	Continuous Improvement & Sustainment Plan

The project team solicited and encouraged active participation from the user community, including the evaluation of existing processes. For example, the sub team working on Objective #4, Work Flow, conducted many interviews and mapped out the various existing process flows for preventive and corrective work orders. This exercise helped us recognize the need to consolidate and standardize into a single, more efficient process. The team organized a Lean Six Sigma Value Stream Analysis event to achieve this objective. We invited key users and stakeholders to participate, and we engaged the Maximo experts to ensure that our new process could be supported by and integrated into the Maximo 6 configuration. The event was a successful and essential step in our goal of improving the maintenance process<sup>1</sup> as part of the Maximo upgrade.

The IT members of the project team continually analyzed existing customizations with the goal of eliminating them either by new configuration options or new functionality available in Maximo 6. Users were consulted regularly on the impacts, if any, these changes would have on work processes. These efforts increased the efficiency of future upgrades by reducing the amount of non-standard configurations within Maximo.

A common goal shared by all team members was to learn about and utilize new applications and features offered with Maximo 6. Rather than fighting to maintain status quo, everyone kept an open mind in seeking practical ways that the upgrade could help improve our processes and satisfy business objectives. For example, adding the Service Desk module as the front-end to the application provided the opportunity to incorporate two stand-alone

databases and the potential for more consolidation in the future. This decision brought us much closer to realizing the vision of a “one stop shop” for facilities services. Also, by building meaningful and personalized home pages, called Start Centers, for our users, we recognized the opportunity to improve communications, ease-of-use, and data accessibility for all users and in-house customers. The team embraced these and many other opportunities to improve our existing processes.

We also communicated frequently with the vendor early in the project. This became even more important when our vendor, MRO Software, was purchased by IBM in the early stages of our project. We involved our key vendor contacts in software, services, and support throughout our project. This meant that when problems arose they were already aware of our situation and able to respond appropriately. Without this relationship in place, emergencies that occurred would most certainly not have been resolved as effectively or with the same shared sense of urgency.

Finally, we designed the framework of the upgraded system with consideration for future expansion and additional system and process consolidation. Other groups within Sandia are becoming Maximo customers and we also support the facilities at our satellite site in California. The potential for a single database encompassing multiple sites and different types of service is now possible, thanks to the forward thinking of the IT department.

### Where We Are Now

We went live with Maximo 6.2.1 on October 22, 2007. We were a few months behind our original master schedule, but with our team-based project approach, we were still able to accomplish the upgrade successfully. Not to dwell on excuses, but a few of the events that caused delays in the schedule were:

- Upgrade scripts came later than originally expected, and early scripts were problematic. This issue resulted in a six month impact to our original schedule.
- Consulting support was delayed two months due to contract/procurement negotiations.
- Unexpected upgrade errors occurred (associated with being one of the first customers to attempt this upgrade). The cumulative effect of these errors on our schedule was one to two months.
- Mobile inventory application functionality and performance issues required

several dedicated resources at both Sandia and IBM for approximately five months.

This created a huge impact on the project because the initial estimate was that the application could be installed and configured in two weeks.

The delays in schedule and unanticipated problems caused us to move our “go-live” date from May to October. Still, in order to meet the October target many activities had to be compressed, and the implementation of some applications and features had to be put on hold until after the upgrade. For example, we originally planned to install the mobile application for managing work orders in the field as part of the upgrade, but it had to be postponed due to the difficulties in getting the mobile inventory application working to our standards.

Once the upgrade was complete, we then faced the challenging task of implementing the process and culture changes in conjunction with the software upgrade. For the past 18 months, several teams and individuals have been experiencing maintenance process improvements, and Maximo has helped facilitate and reinforce these improvements. This is the phase when the rubber meets the road. In tandem with training users on the new software, we are also impacting the entire maintenance culture at Sandia through process changes. Some of the key process improvements include:

- Streamlined process for all service requests (maintenance, custodial, projects, etc.)
- A single maintenance work process
- Well-defined roles, responsibilities, and accountabilities
- Weekly scheduling (phased in on a crew-by-crew basis)
- More thorough feedback from craftsmen on work done

In June, 2008, we successfully upgraded our Sandia California site to Maximo 6.2.1 and greatly improved the consistency of asset and work management between New Mexico and California.

### Where We Are Going

By no means was this project complete when Maximo 6.2.1 was installed and operational. Continuous improvement plans and milestones were established, and many post-upgrade improvements have been implemented. Maximo 6.2.1 was an integral part of process

redesigns during our recent Facilities Transformation effort. Some of our on-going goals include the following:

- Incorporate several additional stand-alone databases, which will achieve a corporate initiative of consolidation, simplification, and standardization.
- Install interfaces with other systems to enhance communication with other processes.
- Display meaningful Key Performance Indicators (KPIs) on Start Centers.
- Develop the qualifications application so that training and qualification records are integrated into the Maximo database.
- Install and deploy the Maximo Mobile Work Management application for work orders, meter reading, and condition monitoring.
- Expand the Maximo Workflow to increase process efficiencies.

### Key Accomplishments / Lessons Learned

In summary, we would like to review the primary activities that set this upgrade project apart and transformed the experience from painful to pleasurable.

- (1). The project charter & plan
- (2). The cross-organizational project team
- (3). Engaging the vendor
- (4). Constant communication, internally and externally
- (5). The use of Lean Six Sigma (value stream analysis) to improve processes
- (6). The development database
- (7). Training focused on embracing the change
- (8). Management support and engagement from beginning to end

It is a simple list which may seem obvious to anyone who has been through a change of similar magnitude. However, it is very easy to lose sight of the improvement goals and fall back to status quo during a lengthy project full of obstacles. The tools listed above provided the structure and motivation to keep those involved pressing for the goal. At Sandia, we have realized the benefits of our perseverance with a contemporary CMMS system, fully integrated with, and supportive of, a greatly improved maintenance process.

### Reference

1. Both the Project Charter and the improved work process can be viewed online at [www.uptimemagazine.com](http://www.uptimemagazine.com). From the home page

follow the links to Articles. You can navigate by either subject matter (Information Technology) or by issue (April 2009)

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