IBM Software
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Optimizing asset and service management in the manufacturing industry

IBM

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Introduction

Around the world, companies are realizing that now, more than ever, we are interconnected—economically, technically and socially. At the same time, the world is becoming more instrumented and intelligent. With a trillion networked things—vehicles, roadways, pipelines, appliances, computers, phones and even livestock—the amount of information our assets are generating is growing exponentially. Only with the most powerful systems can we analyze these mountains of data and turn them into actionable information that will help the world work smarter.

Global integration is indeed changing the corporate model and the nature of business itself. In a time when financial failures in a particular geography are felt around the world, enterprises are being forced to respond by rapidly changing business models while continuing to manage risks and rising costs. For companies competing in manufacturing markets, including aerospace and defense, automotive, oil and gas, machinery, pharmaceuticals and electronics, the ability to respond quickly to changing conditions is critical—whether to address new regulatory requirements, mitigate security threats or take advantage of new market opportunities.

But these same companies are all too often hindered by the systems and processes that are supposed to enable their success. In many industrial enterprises, for example, business units operate isolated asset and service management systems and processes, often built using rigid architectures that are difficult to upgrade. These siloed solutions present numerous problems—they generate incomplete views into asset and service performance, are difficult to govern with consistent change management processes, are inhibiting globalized skills standardization, and are costly to support and maintain. Other departments, stymied by ineffective systems, have developed their own homegrown solutions. These one-off applications compound the problem of isolation when the data to support a decision is maintained outside the reach of corporate reporting. They also pose challenges with regard to integration, support and security.

Integration of systems to link silos of business tools together provide capabilities to manage asset portfolios holistically, with a view into asset and service performance that enables manufacturing companies to perfectly align capacity with demand at the right time. More importantly, this integrated strategy can enable companies to leverage a consistent framework across the enterprise, extending the value of their investments.

This white paper illustrates how integrated information can enable the critical capabilities demanded by modern enterprises. In addition, it describes how integrated asset and service management solutions and partnerships can help optimize production operations by creating visibility, control and automation across portfolios. It also provides examples of how leading organizations in manufacturing environments have achieved significant business value by implementing these solutions.

Industry imperatives

Four key imperatives are driving the decisions of many manufacturing companies today: standardizing across a diverse global population, managing increasingly complex assets, aligning resources to demand and enabling information integration.

Standardizing across a diverse global population

Globalization takes advantage of lower production costs and localization, but it also introduces other challenges related to consistency in product quality and manufacturing operations. Retirees and furloughed workers take valuable knowledge with them. A standardized approach to business processes which captures best practices is necessary not only to preserve valuable knowledge of assets but also to give guidance where the knowledge does not yet exist.

Managing increasingly complex assets

Organizations are interested in standardizing processes for both IT and physical assets, creating a desire to leverage best practices from a wide view of domains. This makes the traditional method of managing them separately difficult and complex. The assets themselves are growing more complex too and are getting smarter. Devices now have embedded IT components which allow them to be monitored, communicated with and tracked more effectively in order to provide better information for decision making. Line of business leaders now require direct IT support to implement asset productivity improvements, and both share responsibility for capacity and performance of the manufacturing line.

Aligning resources to demand

The recent economic downturn has taught manufacturers the importance of flexible manufacturing—hard lessons of "tuning" resource capacity are all around us. In this environment, asset performance is even more critical. Companies must produce quality materials within a specific timeframe without fail. Manufacturing engineers are looking at new ways to assess asset condition, and technology is quickly responding.

Enabling information integration

In all manufacturing industry segments, management at all levels needs access to real-time information from different sources, presented in different views or dimensions, in order to better respond to changing requirements or new market situations. Information from a variety of sources—such as enterprise resource planning (ERP), manufacturing execution systems (MES), production operations, enterprise asset management (EAM) and product lifecycle management (PLM)—needs to be captured, analyzed and displayed in the format that best meets the needs of each business user.

An industry framework approach

It is this need for enterprise-wide **information integration** that led to the concept of industry frameworks. A well-designed framework consists of industry-relevant extensions and standards such as OMG PLM Services, ISO STEP, VDA, OAGIS, ISA 88/95, MIMOSA and others, built on a service-oriented architecture (SOA). An integrated information framework must also be designed to validate different sources of information or applications while integrating different software applications. And it should do so in a non-invasive manner without the need to rip and replace current applications. Enterprises can then take a phased approach to improving their access to information.

An integrated information framework approach enables the highest quality decision-making capabilities for executive and operational management.

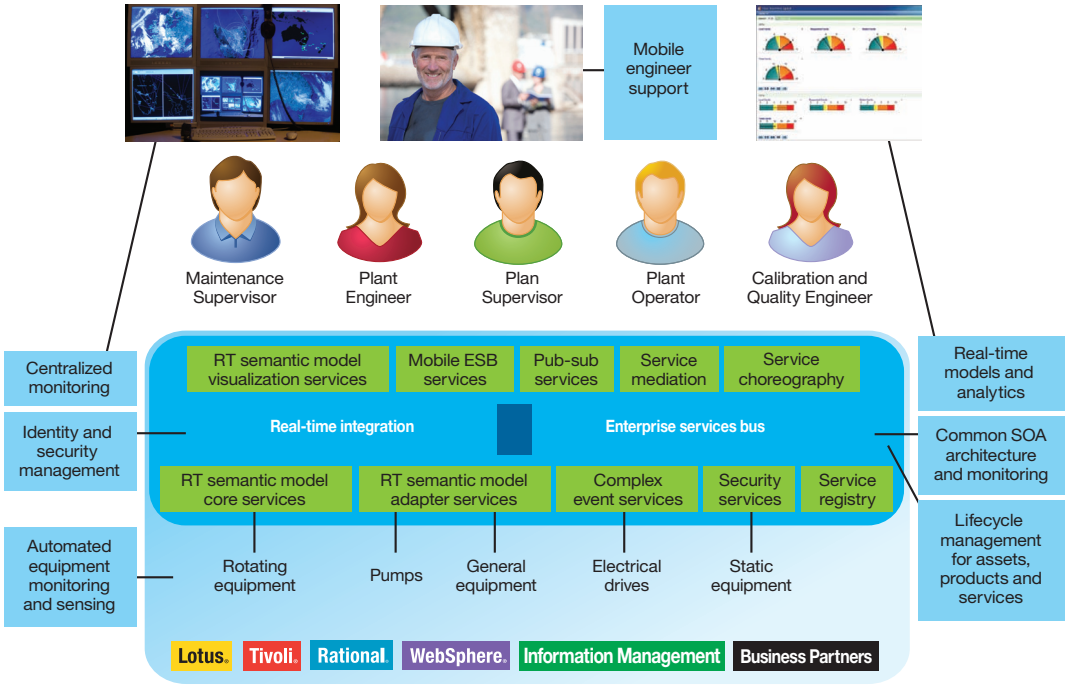

Figure 1: In manufacturing environments, an integrated information framework is an effective way to link different business systems together, enabling an efficient and low-cost pipeline for real-time transfer and analysis of data.

Linking together different business systems results in an efficient, low-cost pipeline for real-time transfer and analysis of data. An integrated information framework should leverage SOA technology in combination with an open, industry standards-based reference semantic model (RSM) to federate disparate data. Aggregation of data is expensive, while federation of data is low cost and sustainable over the long term. Applications that are Web services-enabled are easily linked; for those that are not, SOA technology "wrappers" can be built to link them to the framework.

A framework should not be a data model and should not constrain the way applications implement the information contained within the model. However, it should provide the ability to create and maintain consistent representations with metadata abstraction, such as for equipment, relationships, unit operations, measurements, equipment status reports, vendor specifications and more. This strategy satisfies a "technology-neutral" language to:

- Preserve existing application and system investments.
- Leverage common process models across applications.
- Build new coarse-grained and fine-grained service definitions for information access.

The impact of how an asset performs is understood only in the context of the role in which it is expected to serve. Consider an example where an organization must evaluate their maintenance practice strategy for managing their perimeter security system. Perimeter access is significantly important for this organization because deliveries, customers, employees and shipments are involved. Only through a full assessment of the risk associated with the loss of service of their perimeter security assets—based on their importance to the mission of the organization—can the organization assess the true cost of the assets.

By understanding these dependencies, the organization in our example can also gain an understanding of performance. An asset class maintained in pristine condition carries a high cost. Likewise, an asset that degrades to the point of failure requires exponentially greater effort to return it to operational condition. The goal, therefore, is a perfect balance of capacity and demand, which might involve some sacrifice of service, and is determined by the optimal ratio of quality level to cost. In addition, safety, security, risk exposure and social responsibility are factors that must weigh into decisions about how to invest in a maintenance strategy.

For instances where asset performance demands high levels of service, advanced manufacturers are implementing sense-and-respond strategies that both identify, assess and predict asset failure based on actual performance criteria.

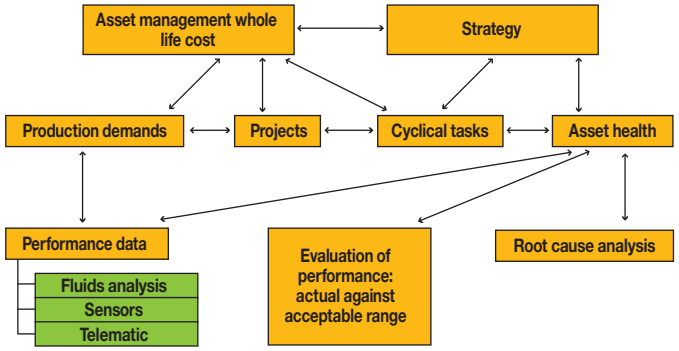

Figure 2: Combined information views provide the most accurate profiles to support decision making.

Connecting to external monitoring

A wide variety of sensor technology is available to monitor measurement points on assets, some in an automated transmission mode and some which use an "on request" approach. Data from sensors and actuators can be linked to an asset management system to capture data for condition-based maintenance and other asset health decisions. Monitoring technology can provide real-time monitoring and management of these complex environments, from high-level service views to the underlying infrastructure dependencies.

Analyzing the findings

Findings uncovered through the process of monitoring may need to be further analyzed to extract value from the information. Individual findings may be insignificant, but in combination they may signify a risk. Integrated information framework technologies should foster an environment whereby manufacturing can capture these previously disassociated business events. These events must support monitoring and display of asset health data via a role-based dashboard interface and should trigger follow-up activities to respond to specific incidents.

Measuring the rate of change and identifying impending trends

Linking together disparate information, analyzing the correlations, and identifying trends enables enterprises to focus on the greatest areas of risk and build appropriate response plans. Analytic tools can be used to deliver advanced and optimized planning and scheduling capabilities, focusing on the "how, what and why" answers that are most relevant to maintenance and repair operations.

Managing massive amounts of readings

The complexity of assets has grown exponentially over the years. The level of technology and the potential points of failure have increased as well, necessitating automated ways of recognizing exceptions. Advanced analysis tools can also help companies turn massive amounts of data into actionable information by applying rules that identify exceptions.

Managing asset configuration rules

As assets have grown in complexity, so have sub-component design and asset configurations. Technology products should support management of asset configurations, including rules associated with "fit and function" and creating the link between engineers who design a change and the technician or engineer who implements the change in the field, helping reduce risk and improving safety and compliance.

Partnering with customers on asset risk and service levels

More and more, companies think in terms of buying a *solution* instead of a *product*—they are willing to pay for performance to secure the products and services that meet their service level requirements without added risk. Sophisticated service management capabilities enable these types of performance-based business models, while other tools help companies manage assets either through third-party outsourcing or through an internally shared services model.

Asset management as a revenue stream

As the realities of our new economy drive manufacturers to seek out new revenue streams, there is an increasing focus on current customers and the new revenue streams available from aftermarket services. Original equipment manufacturers (OEMs) realize the value of the intellectual data they have and are combining this knowledge with services. Provisioning for success early on is key:

- Asset catalogs must provide operating models for asset performance. Understanding the requirements of each asset enables proper scope of obligation.
- Standardized job plans provide consistency and reduce learning curves. "On-ramping" new customer contracts is a key phase of the relationship and a key factor for profitability. A standardized approach to response smoothes this transition and helps measure the success of the service contracting phase.
- Service level agreements (SLAs) are a competitive strategy. Insufficient support could result in significant fines for SLA non-compliance.

Customer relationships are enhanced through improvements in communications. Work management flows must manage communications with customers at chosen times during work process cycles. Clear communication with customers sets correct expectations and clarifies work requested/work completed information, which in turn results in less work in progress and fewer invoice days outstanding.

OEMs who are looking to expand their relationship with existing customers must consider each of these critical points:

- How best to understand the asset catalog at the customer sites under support
- How to eliminate variances in the way services are delivered to customers
- What sort of risk/reward relationship the customer is looking for, and how to meet the SLA commitments that comprise such agreements
- How to ensure that the work performed for customers is in fact under contract so payment is not disputed
- How activities are assessed for generated value, and what measures are used to identify low-value activity versus high-value activity

Missteps at any one of these points can result in high costs or damage to customer relationships and should be carefully considered when planning the strategic approach to services programs.

Connecting all phases of the asset lifecycle

Performance information about products in the field is difficult to find if you are a manufacturer. Design information about products in the field is difficult to find if you are a customer or technician performing maintenance, repair or operations on those products. Until now, sharing information between product suppliers and field operations has been limited because technical product information is generally accessible only through the systems used to design them, and customers and service providers do not normally have access to this information.

Manufacturers have a similar problem. They do not have a view of how customers install and maintain their products. The inability for manufacturers and customers to share information and collaborate in service-after-sales has led to inefficient field operations, underutilization of products for customers, and inadequate product performance and redesign information for manufacturers. An important common issue is product performance.

Usage or design issues that show up in the field are often not fed back to manufacturers. The result is that future products inherit many of the faults that have been experienced in the field but not communicated back to the manufacturer. When manufacturers and consumers cannot collaborate, warranty problems, downtime, poor maintenance work, and the inability of the technician to "fix it right the first time" can result. The impact on manufacturers is evident too: lower sales, lower profits due to customer warranty claims, low rate of customer retention, and loss of competitive leadership.

Today, manufacturers and customers need to collaborate through services delivered after the sale in order to improve asset performance. Connecting all phases of an asset's lifecycle should foster the exchange of product information, when and where it is needed.

For companies using PLM strategies, and where service-after-sales requirements are eminent, there are a number of benefits to integrating service lifecycle management as part of the sophisticated asset management solution:

- Direct access between users and PLM resources without the requisite need for engineering workstations
- Efficient product searches while ensuring accurate and up-to-date results
- Rapid product navigation with browsing features and intuitive access to the full product definitions using current 3D graphics and simulation capabilities

Real results: Customer success stories

As a leader in research and innovation, IBM has assisted manufacturing customers around the world to leverage asset and service management solutions on integrated information frameworks to achieve measurable business value:

- A major company in the aerospace and defense industry is setting new industry standards for delivery and performance and has been rewarded with a more than 40 percent increase in revenues resulting from services. IBM® Maximo® Asset Management technology plays a key role in their go-to-market strategies. Data gathered from the IBM Maximo Asset Management solution supports client relationships and illustrates a high-visibility approach to commitments of service delivery. This powerful combination of process and technology has enabled them to achieve dramatic results.
- A heavy equipment manufacturer is running parametric analysis against performance models to determine asset health in order to more accurately determine full cost and risk analysis of work. IBM Tivoli® Netcool® products provide monitoring, linking current asset status to a dashboard. Associating multiple condition points is helping the company manage production and asset demands based on probability and risk.
- A leading rail car manufacturer launched its services business in the mid-1990's. Their goal was to transform the company into an integrated provider of transportation solutions by aggressively expanding their footprint through the entire lifecycle of rail vehicles, and to develop products and services that help their customers run better railroads. They have achieved 30 percent annual growth in this business unit. Technologies to monitor asset health—in combination with IBM Maximo Asset Management technology to connect their resource teams—have provided the scalability they require to take on more business and to grow revenue streams.
- A major company in aerospace and defense uses IBM Maximo Asset Management to manage all asset maintenance data by product and to track all asset-related data after the product has been sold to the customer. The IBM ILOG® solution has been applied to inventory stocking models to drive down capital investments in inventory by more than $30 million USD. Other major benefits for the company include significant improvements in SLA compliance, significantly reduced repair cycle times for defective parts, improved warranty claim management, and a significantly reduced inventory through improved visibility and sharing across different fleets.
- A major manufacturer of print devices is embedding IBM technology, including IBM WebSphere® Business Events, to monitor health and energy usage for fleets of printers it supplies to its customers. By monitoring asset readiness and energy usage against plan, they are assured of maximum efficiency at the lowest possible cost for their customers, converting maintenance and engineering from a cost center to a profit center.
- A large worldwide manufacturer of utility, construction and mining vehicles and equipment has implemented IBM SPSS® to proactively monitor and analyze multiple parameters from various sources, e.g., identify machines operating abnormally, develop repair procedures before failure by analyzing previously unknown conditions, incorporate technical resolutions into existing processes, and improve early identification of quality issues. The resulting analyses have been incorporated into existing analysis practices to ensure the highest levels of accuracy, and have also resulted in actions to properly maintain specific conditions and document maintenance practices.

"An organization's ability to learn, and translate that learning into action rapidly, is the ultimate competitive advantage."

—Jack Welch

Summary

For manufacturers, economic uncertainty and new global business models are putting increased pressures on an already demanding industry. Manufacturers who are leaders are successful at finding competitive strengths. Asset expertise, delivered via services supported by integrated information frameworks, provides broad visibility, control and automation to asset performance. Leaders are positioned to make changes as needed in response to changing conditions. A framework strategy should support this agility in such a way that it is scalable across the globe and sustainable as new strategies evolve. Integrated information frameworks are a critical element of the solution market leaders are using to optimize asset and service management for production operations.

For more information

To find out how you can leverage IBM integrated asset and service management solutions and Integrated Information Framework to achieve measurable business value, contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/tivoli/solutions/asset-management

About Tivoli software from IBM

Tivoli software from IBM helps organizations efficiently and effectively manage IT resources, tasks and processes to meet every-shifting business requirements and deliver flexible and responsive IT service management, while helping to reduce cost. The Tivoli portfolio spans software for security, compliance, storage, performance, availability, configuration, operations and IT lifecycle management, and is backed by world-class IBM services, support and research. For more information on Tivoli software from IBM, visit: **ibm.com**/tivoli

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