CIMdata

How PLM is Being Applied to Support Today's Dynamic Enterprises

"Characteristics and Issues of Today's Global Enterprises"

A CIMdata Whitepaper

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Over the last several years, Product Lifecycle Management (PLM) has emerged as the common term used to describe the creation, management, and use of product related information and processes (i.e., an enterprise's intellectual assets or complete product definition) throughout the entire product lifecycle and extended enterprise. Until recently, PLM solutions were designed exclusively for large, distributed manufacturing enterprises that had the extensive resources required to deploy and maintain them. Today's PLM solutions are designed not only for large companies, but also for mid-sized manufacturing enterprises in multiple sectors. Increasingly companies of all sizes are recognizing the need for PLM solutions. At the same time, the capabilities of the solutions being offered have improved significantly.

PLM's ability to enable global enterprises to better create and manage their product related information and processes has been proven for some time now. However, until recently PLM solutions have not combined enough pre-packaged functionality that is easy to implement at a reasonable price point for companies of all sizes. The emergence of these prepackaged capabilities has not appeared overnight, but has come as a result of the continuous innovation and maturing of the PLM solution providers and their products.

As PLM's scope has expanded, a greater emphasis has been placed on the development and delivery of focused business solutions. These focused solutions are comprised of prepackaged functionality designed to simplify implementation and solve specific business problems. Common prepackaged functionality includes component sourcing, supplier management, project and program management, and many other diverse business capabilities. However, simply providing a prepackaged solution by scaling down existing features and technology is not sufficient. Products that are based on a specific, pre-developed data model often prove inflexible during implementation and require significant programming to deploy effectively.

A complete PLM solution includes a combination of the right technology, appropriate features, "best practices" approaches, and focused implementation methodologies. To truly address the requirements of all enterprises the solution must also be easily tailored to fit the specific needs of the organization, which facilitates implementation and gets the solution into production as quickly as possible.

This trend toward flexible, focused solutions is good for customers and the PLM industry alike, and CIMdata expects it to continue. The approach makes it easier for all enterprises to improve product lifecycle activities.

Characteristics and Issues of Today's Global Enterprises

The companies that can benefit most from PLM typically come from the following industrial sectors:

- Aerospace supply chain participants (i.e., tier 1, tier 2, and some tier 3)

- Automotive supply chain participants (i.e., tier 1, tier 2, and some tier 3)

- Consumer products companies (i.e., appliances, toys, etc.)

- Electronics equipment manufacturers and their supply chain participants, especially tier 1, tier 2, and contract manufacturers

- Machine tool and heavy equipment manufacturers, primarily those that design and produce manufacturing equipment, such as multiple-axis turning machines, assembly equipment, conveyors, and generators

- Medical equipment manufacturers, especially those that have FDA audit requirements

- Telecommunication equipment manufacturers and their supply chain participants, especially tier 1 and tier 2 manufacturers

- Utilities, especially those that need to track and maintain physical assets at a facility level, such as an electric substation or power generation station

Companies within these industrial sectors are particularly receptive to PLM solutions that provide out-of-the-box capabilities that solve specific business problems because they share many of the same business challenges and characteristics:

- An increased focus on design/engineering and production of primarily electro-mechanical parts, components, and assemblies, with the need to capture and manage their product definition information throughout the enterprise

- Increasing requirements by larger customers for specific program management control by the supplier, regular status updates, and comprehensive project-related documentation

- Engineering and design environments, where the Engineering Manager understands the need for configuration management, and they have developed engineering documentation standards and processes that can be easily automated

- Manufacturing engineering responsibilities are well defined and the relationship between product engineering and manufacturing engineering is well understood

- The need to integrate with one or more MRP II/ERP systems to communicate product definition information, but with limited design supply chain management requirements; only basic supplier and/or customer access is required

- The need to manage components and suppliers as part of the product development process, not as a separate, "after the fact" task

- Limited Information Technology (IT) resources, so the software must be reasonable in total cost, be easy to install and maintain, be integrated in nature to reduce integration costs, and generate a quick ROI (i.e., months, not years)

These characteristics apply to many enterprises that supply Original Equipment Manufacturers (OEMs), as well as companies that sell their products directly to retailers, distributors, or consumers.

Due to constrained financial and support resources, these companies are rarely early adopters of new solutions. However, as prepackaged solutions become available at more cost-effective price points, these enterprises adopt the technology to solve long-standing business problems. Over the last several years, PLM solutions have become both feature rich and price affordable. As a result, enterprises of all sizes are increasingly embracing PLM solutions, and are actively applying PLM solutions to support their business and enhance their competitive status.

How PLM is Being Applied to Support Today's Global Enterprises

For the most part, enterprise PLM solutions such as Aras Innovator (see http://www.aras.com/ for a description of Innovator) and others focus on PLM issues that affect multiple domains, such as program management, engineering, manufacturing, purchasing, and quality. PLM solutions provide the greatest value to companies that design/engineer parts, components, and complex assemblies. Typical functionality includes: Project management; CAD file management and basic CAD integrations (i.e., simple one-way integrations that transfer BOM information from the CAD tool to the PLM solution); bill-of-material (BOM) and bill-of-information (BOI) creation and management; documents and CAD file visualization (usually some combination of 2D and 3D viewing is provided); approved vendor list management; and workflow management capabilities to automate various engineering and manufacturing processes (e.g., engineering change, BOM release to manufacturing, corrective actions, and configuration control).

For companies that design/engineer simple parts or components, configuration management support is not as critical. As a result, with these types of companies PLM solutions are being implemented in support of data vault management, workflow automation, and applications that sustain specific needs in the engineering/manufacturing process (e.g., change management and quality assurance). For companies that design/engineer medium to highly complex products (e.g., engines/turbines, machine tools, medical equipment, and heavy equipment), these capabilities are being supplemented by configuration management support.

In addition, the PLM solutions that are supporting today's enterprise usually work with a wide variety of

software applications and with paper documents. They are usually delivered on a mix of computers, workstations, and associated hardware. Typical users include managers, administrators, and end-users from a variety of departments including engineering, manufacturing, purchasing, marketing, sales, quality, and information technology that all need to create, capture, access, share, and/or manipulate product related information.

Freudenberg-NOK Solves Program Management

Freudenberg-NOK was first established in 1989 as the American partner in the global Freudenberg and NOK Group, which has total annual sales of over $7 billion and worldwide automotive sales of approximately $4 billion. On track to reach $1.5 billion in sales by 2005, Freudenberg-NOK is a leader in automotive sealing and vibration control products and a supplier to all automakers producing in North America, as well as all major tier one chassis and drivetrain suppliers. Freudenberg-NOK is an organization that incorporates several corporate cultures, which complicated implementing PLM into its automotive manufacturing environment.

The ability for Freudenberg-NOK to manage its diverse, project teams is critical to the success of its business and was a key reason the company chose to pursue a PLM strategy.

The robust project management functionality and the flexible architecture were two important factors in Freudenberg-NOK's selection of the Aras Innovator PLM solution. Together, they allowed the implementation team - which consisted of representatives from both Aras and Freudenberg-NOK – to quickly and easily configure an APQP-based stage-gate, new product development process solution.

According to the director of CAE Technology and Support for Freudenberg-NOK, multiple product development groups within the company's manufactured products division will use the Innovator project management tool. The standardization provided by the stagegate product development template will bring consistency to Freudenberg-NOK's project management process. It will also provide a higher level of executive project visibility as a result of its built-in report and performance metrics.

The Aras project capabilities are rolled out to users across five sites. Once it is fully deployed, approximately 1200 users scattered across 20 sites will use the Aras-enabled APQP program management solution. As is typically the case with organizations similar in size to Freudenberg-NOK, the company sought to purchase a PLM solution that would satisfy its immediate requirements – in this case, program management – as well as its overall, long-term PLM initiative in a cost-effective manner.

It was pointed out that Aras's architecture offered Freudenberg-NOK a PLM application suite and a project management module that contained a significant amount of pre-packaged functionality and a high level of performance at a total cost of ownership that fit into the company's budget. The fact that

The Aras subscription licensing model would provide access to all of Aras's functionality without the purchase of additional modules or software was a considerable plus. In addition, Aras's ease of use and intuitiveness made training new users straightforward and efficient.

According to Freudenberg, during the deployment process, less than four hours of training were required to get new users to a level of proficiency that enabled them to work comfortably with the system and perform their jobs. The simplicity of the interface and the flexibility of the architecture have allowed Freudenberg-NOK to roll out the application quickly and cost effectively.

Our research has shown that PLM solutions improve communication and cooperation between these diverse groups and form the basis for organizations to support their product lifecycle activities.

The key PLM factors to consider are the solution's ability to deliver out-of-the-box applications and solutions based on best practices that are easily tailored to support the enterprise's product related information creation and management requirements.

Vendor Profile: Aras Innovator

Aras Innovator, an enterprise PLM solution suite, provides capabilities equivalent to those offered by traditional PLM solution providers, but at a significantly lower total cost of ownership. Built on top of standard relational database management system (RDBMS) technology, Aras Innovator takes advantage of HTTP/HTTPS, XML, and SOAP protocols to deliver its functionality through a

standard Web browser. Aras includes numerous solutions based on PLM best practices. Aras Innovator's suite constitutes a full-featured engineering business solution supporting engineering and manufacturing processes throughout the plant and the extended supply chain. Aras supports: Project Management, Design Management, Production Management, Quality Management, Sourcing Management, and Tooling Management.

Project Management provides customers with a phase-gate approach to program management. Instead of focusing on tasks and activities, Project Management offers manufacturers the ability to manage at the program level tracking milestones and deliverables. Each milestone is linked to a set of deliverables that constitute the work that must be completed within the phase (i.e., requirements document, specification, BOM, drawings, etc.). Deliverable status is rolled up to provide a dashboard view of active projects. Drill-down capabilities allow users to see the action items that remain, and scorecards report project performance to goals.

Design Management focuses on managing elements of the product design, including graphics, drawings, and CAD files. Users can import Bills of Material (BOMs) as files, or derive them from the native CAD models. Design Management provides templates for engineering change order (ECO) and engineering change release (ECR) processes, with simple, easy-to-use graphical workflow tools included to adapt these workflows to meet local requirements.

Production Management enables users to build the Manufacturing BOM (M-BOM) and routing based on manufacturing processes, not just from the Engineering BOM contents. Production Management manages libraries of standard manufacturing work instructions and provides access to the appropriate tools and set-up procedures through their Work Centers. Users build process plans by associating specifications, operations, tool lists, instructions, and other data with the necessary parts from the M-BOM. An instance of the routing can then be used in conjunction with a work order to form a Traveler. Shop floor execution data are collected as the part or lot moves through manufacturing.

Quality Management provides a comprehensive quality management solution that includes the ability to create quality plans that are tied directly to the manufacturing routing. An electronic logbook captures quality data about parts for traceability. This data is linked to specific parts or lots in the Traveler (i.e., an instance of a quality plan). Logbooks support two types of data collection: attaching files to the log and user entry of inspection and test data. All data elements are managed in the Innovator database and can be manipulated for SPC reporting. Quality Management provides corrective action functionality and also supports the generation and management of waivers and deviations. In addition, procedures and work instructions can be kept under control in the online vault for ISO 9000 or other quality standards compliance.

Sourcing Management helps users manage relationships with their supplier base. It supports the management of an enterprise's Approved Vendor List (AVL) process and data on a part-by-part basis. Users can process requests for new parts or new suppliers, and manage data about suppliers and audits conducted to qualify them. It also supports development and management of bid packages used to support part acquisition as well as information on contracts awarded. Vendor performance measurement supports actual purchase information, delivery performance, and quality levels based on incoming inspection results.

Tooling Management helps companies manage tooling, equipment, jigs, fixtures, and consumables that support their manufacturing processes, often some of the most expensive assets for manufacturing firms. This solution both manages tooling designs and links them to product designs for engineering change impact analysis. It also helps users track tool locations, those responsible, and tools available within a tool crib. Preventive maintenance and calibration schedules are managed on either a due date or usage basis.

The platform's core PLM functions are robust and flexible, meeting the requirements of the enterprises of all sizes. All applications are built-in, and work off the same common, extensive data model. This enables new functionality to be added easily, and simplifies implementation and eventual software upgrades.

Aras is ideal for geographically dispersed firms, as the underlying technology and architecture are designed to scale to multi-site and high user-count installations to meet the requirements of larger organizations.

Aras customers can utilize the prepackaged solutions and tailor them to changing business requirements when and if required. Tailoring can be done during

implementation, in real-time, and/or during continuous improvement and reengineering projects.

The full production version of Aras Innovator is available www.aras.com. There are no PLM license fees. Users can expand their implementations at will, at no additional cost.

Given CIMdata's definition of the PLM functionality applicable to today's global enterprises and their PLM requirements, Aras's approach and solution are right on target. Their solution, based on years of experience designing and implementing enterprise PLM solutions, builds in many features that overcome the inherent issues that arise during enterprise implementations. Aras is built from the bottom up for ease of implementation and use, and Aras' clients have found that limited consulting is required. This low service to software ratio is increasingly required by companies undertaking PLM deployments, and is especially important in these cost-sensitive times.

Summary

CIMdata expects the application of PLM solutions within global enterprises to grow at a fast pace as: 1) enterprises recognize the need to improve their management of intellectual assets—an enterprise's key to enable product and process innovation; 2) these enterprises more clearly recognize their need to become better integrated with customers and suppliers to address cost, quality, and delivery; and 3) the solutions provided by suppliers like Aras continue to become easier to deploy and support.

Aras and other PLM solution providers that focus on solving the problems of global enterprises will continue to be successful as long as their solutions are tuned to be quick and easy to install and comprehensive in nature. Many of today's PLM solutions are proven and very capable of providing the product definition information management functionality required by the typical manufacturing enterprise. The mini-case study contained herein provides creditable evidence in support of this conclusion.

Finally, Aras' proven ability to quickly develop enterprise applications and business solutions is impressive. This ability speaks to the robustness of the underlying architecture of the platform and its ability to quickly and inexpensively satisfy new business requirements. This is a total cost of

ownership issue that is greatly appreciated by all enterprises no matter what their size.

About CIMdata

CIMdata is the leading PLM consulting and research firm dedicated to helping industrial organizations around the world establish effective PLM strategies, assist in the selection and deployment of PLM technologies and products (e.g., PDM, visualization, collaboration, CAD/CAM, etc.), and helping organizations optimize their operational structure and processes to implement solutions that manage their entire product or plant definition lifecycle. For PLM solution providers, CIMdata helps define business and market strategies, delivers worldwide market information and analyses, provides education and support for internal sales and marketing teams, as well as overall support at all stages of business and product programs to make them optimally effective in their markets. While CIMdata works extensively with providers of PLM solutions, it is important to understand that CIMdata neither resells nor represents any solution provider's products. CIMdata's reputation is built on remaining completely independent and objective regarding the providers of PLM solutions.

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