PRODUCT LIFECYCLE MANAGEMENT, THE FOURTH ENTERPRISE APPLICATIONS CLASS

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Abstract: Second European PLM summit indicates gathering business momentum PLM (product lifecycle management) systems are “the fourth enterprise applications class” behind ERP, SCM (supply chain management) and CRM (customer relationship management) – but there’s still a way to go and few manufacturers ‘doing PLM’ yet think they’re getting to the value they should. The integration of PLM and ERP significantly improves the productivity and effectiveness of users and organizations working with product and plant related information. These two enterprise domains encompass many of the critical functions required to develop, test, manufacture, deliver, use, and support a product throughout its life, and integration of PLM and ERP can deliver significant benefits for companies of all sizes. IBM offers SMARTEAM as the foundation for the PLM ‘tower’ and IBM Web Sphere as the ‘span’ that connects SMARTEAM to multiple ERP towers. Also, Siemens SIS will address opportunities for enhanced integration of ERP; manufacturing execution systems (MES); and product life-cycle management (PLM).

1. PLM versus ERP Architectures. Who’s the Master?

Each enterprise system must be the master of its own data, and not interfere with the others: PLM is the process by which manufacturing companies develop, describe, manage and communicate information about their products, both internally and among their supply chain partners.
PLM architecture
- Object-oriented
- Structured for knowledge reuse and information management
- Ad-hoc relationship navigation in multiple directions over multiple object types
- Advanced version, iteration, baseline, and view capabilities
- Rich relationships with contextual attributes
- Configuration management introduced early in the design process

ERP architecture
- Transaction-oriented
- Organized around physical products and processes
- Relationships are thin and usually unidirectional
- Inflexible navigation
- Weak configuration management tools

Figure 2. PLM Process

This process begins at the earliest phases of design and development and continues throughout the entire life of the product, which includes production launch, volume production, and, finally, retirement.

PLM software helps companies better manage their products throughout their lifecycle in part by serving as a single central source of product information that can be systematically shared across an extended enterprise and accessed by other systems.

Unlike Enterprise Resource Planning (ERP) systems, which excel in managing a product's manufacturing data while in production, PLM systems are designed to manage all the product's information from initial concept to end of life. In particular, PLM software provides benefits during the product's design and development phase when engineers make the critical design decisions that determine the quality and cost of the product over its lifetime.

Benefits of PLM: At its best PLM software enables engineers to access more accurate part, supplier and product info so that they can make better design decisions. This in turn enables the company to produce better products that are less
costly to produce. With PLM software, the product development process itself becomes more efficient through automation and technology enabled collaboration.

2. PLM and ERP Integration: Business Efficiency and Value

The business motivations for integrating PLM and ERP, factors that should be considered, and various approaches and methods that can be used to perform the integration. Initial PLM and ERP integrations occurred in larger companies because they had the resources needed to support such projects. But all companies, regardless of size, face similar problems and have the same needs for integrating PLM and ERP. Most companies, particularly small to medium enterprises (SMEs) within the supply chains, are working to add more value to their products and services and not just provide commodity components. Other companies that compete on pricing need the efficiencies that PLM and ERP integration delivers. ERP and PLM solutions address different business needs and processes.

PLM manages the innovation process – enabling companies to quickly create right-to-market products and to leverage part re-use. It focuses on the digital, context-oriented intellectual property (information), functions and business processes – the assets associated with product and plant definition. It manages the definition lifecycle and the relationships between product-related information and processes.

For example, PLM links product requirements to the functional definition of a product, the geometry of the product, and the service procedures used to maintain the product. PLM applications have been designed and optimized to maintain digital information in context.

ERP ensures that a quality product is produced according to customer demand in a timely, cost-controlled manner. It is focused on the physical, transaction-oriented business processes and deliverable assets, and addresses production planning and scheduling, inventory management, cost, and other physical aspects of product production. It has been optimized to manage transactions and large volumes of historical transaction data.

The following figure illustrates the primary functional domains of PLM and ERP/ERM. In this figure, ERM or Enterprise Resource Management, encompasses ERP as well as some other enterprise functions, but ERP is the foundation for ERM. It is important to note that there can be significant overlap areas between ERP/ERM and PLM and each is continuing to expand and deliver support for more business processes and functions.
Large enterprises may integrate PLM and ERP to work downward along their supply value chain. These companies want to enable their suppliers to exchange design, change, and other information directly with their PLM and ERP environments.

SMEs typically integrate PLM and ERP to better enable them to more quickly and accurately respond to requests from their partners for quotes, designs, and physical components that will be integrated into end products. As integration technologies and vendor provided solutions have improved, SMEs can now integrate PLM with ERP in a similar manner as large enterprises – achieving many of the same efficiencies and benefits.

Benefits of Integrating PLM and ERP:

There are many benefits associated with the integration of PLM and ERP. These benefits accrue in several areas including:

- Ensuring consistency and use of product/plant related information by personnel in organizations throughout the enterprise
• Reducing the time to bring new and better products to market at a lower cost while improving quality
• Creating and using common product-related terminology and processes throughout the Business

3. Bridging the divide: Integrating PLM and ERP
IBM Product Lifecycle Management

It’s a familiar and common scenario: To accomplish numerous day-to-day business functions, a manufacturing company creates several separate departments, such as purchasing, manufacturing and sales, and then in turn, each department implements its own individual business applications.

Typically, the primary area of investment for business applications has been Enterprise Resource Planning (ERP) to manage the tangible resources used in product manufacture and distribution – such as purchase orders, shop floor procedures, inventory and finances. In parallel, as product development has become more complex, manufacturers have also tended to invest in Product Lifecycle Management (PLM) to optimize the management of product concept and design, and engineering data and processes.

The problem? At best, two highly effective systems that operate independently. At worst, process and information silos that have a crippling effect on business productivity.

To make successful business decisions, manufacturers need to ‘bridge’ the divide that separates these two business-critical systems. This will facilitate enterprise-wide collaboration and enable processes that access, combine and exploit the knowledge of each. The result? A company achieving its maximum potential. Uniting business-critical systems. Addressing strategic business challenges.

When the applications, people, processes and information a company relies upon to run its business efficiently are disconnected, problems can grow quickly:
• Data maintained in multiple places must be synchronized using a mix of manual and batch processes
• Users are frustrated at having to input redundant data using multiple user interfaces, resulting in lost time and input errors
• Information is not timely due to cumbersome information retrieval from multiple applications
• Decision-making is slow and faulty, based on incorrect, or out-of-date, information.

At its simplest level, bridging between an ERP and PLM system aligns business processes and facilitates the sharing of data. By helping to eliminate the typical data errors, redundancies and process bottlenecks caused by disconnected systems, significant operational efficiencies can be realized, improving a company’s responsiveness to marketplace demands.
By synchronizing digital product lifecycle data stored in a PLM system with production data stored in an ERP system, enterprise-wide processes based on automatic, bi-directional transfer of information (such as parts lists, bill of materials (BOMs) and product structures) can be executed more accurately and efficiently. In addition, when each department has access to its own data in the full enterprise context, it can more easily find, revise and visualize different types of product data – independent of formats and systems.

![Figure 5. Bi-directional transfer of information (such as parts lists, bill of materials (BOMs) and product structures)](image)

To build a solid bridge you need to have strong towers near each shore and a strong, flexible way to span between them.

IBM offers SMARTeAM as the foundation for the PLM ‘tower’ and IBM Web Sphere as the ‘span’ that connects SMARTeAM to multiple ERP towers. Successful business integration technology should be:

- Robust enough to support mission-critical enterprise applications
- Able to provide relevant realtime, and near realtime, data synchronization
- Able to automate processes and information exchange across disparate systems
- Scalable and flexible enough to meet expanding needs
- Adaptable to support application upgrades and revisions without requiring complete ‘rewiring’ of the connections.

![Figure 6. Bridging between an ERP and PLM](image)
SMARTEAM, an IBM PLM solution developed by Dassault Systèmes, leverages the latest information technology to provide organizations with robust PLM. Its comprehensive enterprise PLM functionality is delivered via a flexible, dynamic product suite noted for its rapid implementation and easy customization.

Securing product data in all formats for both full product history and access to latest revisions, SMARTEAM optimizes processes across the product lifecycle. This includes requirements management, concurrent design and engineering, BOM management, and engineering change.

4. Siemens bets ERP/PLM integration will continue apace

In January 2008, Siemens AG focused its systems-integrator resources by rolling five operating units into its new Siemens IT Solutions and Services (SIS) division. The largest unit thus affected was Siemens Business Services group—one of the world’s largest SAP integrators. The move puts deep systems and industry domain expertise in a one-stop shop aimed at global customers.

Siemens SIS will address opportunities for enhanced integration of ERP; manufacturing execution systems (MES); and product life-cycle management (PLM)—especially relevant given Siemens’ acquisition last year of PLM vendor UGS. “That will be our leading practice,” says William McNamara, Siemens SIS VP for strategy. “With vertical integration of ERP straight down through PLM into MES on the shop floor, PLM provides a full design-to-manufacturing environment. You can execute against ‘design anywhere, manufacture anywhere, and service anywhere’.”

Figure 7. With vertical integration of ERP straight down through, PLM provides a full design-to-manufacturing environment.
Process integration expertise is captured in Live Tools, a business process configuration solution Siemens developed for Siemens’ own global SAP implementation. Live Tools has been used for years by Siemens to facilitate ERP/MES integration. It does so by clarifying industry-specific business process flows across system boundaries, facilitating critical policy discussions that must take place among traditionally siloed departments. It also aids mapping of workflow and specific data elements between the integrated systems.

Work is in progress to add PLM-preconfigured templates to LiveTools to capitalize on Siemens’ “shop floor to boardroom” integration vision.

A large automotive supplier is using Siemens for two projects: a corporate upgrade of its SAP ERP, and design of a green-field production facility in North America. “We're developing new processes for a new product,” says the director of manufacturing systems. “Siemens gives us a framework for looking at infrastructure and applications.

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