

13 Apr 2006



The Product Lifecycle Management

Product Lifecycle Management Overview

Purdue University PLM Center of Excellence

PURDUE

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page 1 • EDS Confidential

Agenda

- Introductions
- Definition of PLM
- The Problem
- EDS' Approach
- Suggestions for PLM Center of Excellence
- Discussions

Product Lifecycle Management (PLM) Definition

PLM is defined as:

- A strategic business approach that applies a consistent set of business solutions that support the collaborative creation, management, dissemination, and use of product definition information
- Supporting the extended enterprise (customers, design and supply partners, etc.)
- Spanning from concept to end of life of a product or plant
- Integrating people, processes, business systems, and information

PLM is not a definition of a piece, or pieces of technology.

Source: CIMdata



Fundamental Concepts of PLM

- Universal, secure, managed access and use of product definition information
- Maintaining the integrity of that product definition and related information throughout the life of the product or plant
- Managing and maintaining business processes used to create, manage, disseminate, share and use the information.



The Scope of PLM





The Challenge for PLM



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It has been difficult to document impact of PLM on companies financial performance

This example opportunity and gap analysis identifies the specific operations improvements and associated opportunities.





Technology Modernization



The technology modernization process enables the transformation from the function specific applications and data stores to an enterprise view of data and a services-based approach toward business applications.

The "Re-" steps used modernize the technology set the foundation for a services approach toward the technology layers of an organization's solutions.



Levels of Optimization

Level 1 – Siloed Optimization



Level 2 – Aggregated Optimization



Level 3 – Cross Functional Optimization



Level 1 – Siloed Optimization

• Business processes are optimized and work well during normal operations. "Like" operations require duplicative systems and data

Level 2 – Aggregated Optimization

 Business processes are grouped together to reduce duplication; and work well during normal operations. Does not solve enterprise investment & irregular operations issues

Level 3 – Cross Functional Optimization

page 9 • EDS Confidential

 Business processes are grouped together; data is shared in context of the business situation. The customer & supplier views are optimized as well as the internal business structures



There are several stages of maturity within an product development organization's IT environment

IT Element	Level 1 Initial	Level 2 <i>Repeatable</i>	Level 3 Defined	Level 4 Managed	Level 5 <i>Optimized</i>
Infrastructure	•Disconnected, slow, narrow pipe	Area solutions developed to manage increased load	•Regional solutions developed to manage increased, integrated load	•Common architecture developed	•Single common, high- speed, wide bandwidth, high availability, flexible architecture deployed •Full supplier integration
Applications Architecture	 Disconnected, uncoordinated, no version control Limited to no integration 	 Major applications choices limited to a handful Proliferation of applications as IT gains acceptance 	 Applications become more and more integrated – complexity ensues Integration with suppliers commences 	 Single Bill of IT decided but not totally implemented Varying versions of same application still deployed Supplier integration more robust 	Single integrated Bill of IT with common versioning implemented Full supplier integration
Data	Individually developed and stored data files, formatted per engineer preference (hard copy included)	 Virtually all data moves to electronic Site-specific data format, storage and retention promulgated File naming conventions absent Data availability across engineers limited 	 File naming conventions promulgated Data format, storage, retention and availability standardized across regions 	 File naming conventions, format, storage, retention and availability standardized globally Tagging conventions immature but burgeoning 	 Single formatting design, integrated and globally accessible Common tagging for easy search capability Relational tagging to associated dies, jigs, cost, test, sourcing, financial, etc. Full supplier integration
Applications development	•CMMi 1	•CMMi 2	•CMMi 3	•CMMi 4	•CMMi 5
Operations	 Unique ops processes by site No metrics developed or captured No common ops tools deployed 	 Each site has documented ops processes Metrics developed at site level No common ops tools deployed 	 Common metrics developed and deployed Tools and processes continue to be site- specific 	 Global common processes, tools and metrics developed Delivery transformation commences 	•Fully deployed ITIL processes



EDS' Approach



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page 11 • EDS Confidential

There are natural dependencies in moving towards Level 5 product development IT maturity



Complex applications and data architecture subverts movement towards an agile and easily maintained base upon which companies can transform critical product development processes



The journey from the current PLM state and the future has several challenges



Challenges

- **Requires significant funding**
- Has long project lead times
- Subject to inherent risk of large COTS deployments
- Must drive business value along the way



Requires substantial business involvement



Balancing global and regional needs

Future State



- Global, standard solutions
- Primarily COTS based systems based on industry best practices
- Highly rationalized Bill of IT, Bill of Architecture, Bill of Infrastructure
- High degree of uptime and minimal cost to change



- Regionally developed systems with hardwired business rules
- Partially rationalized Bill of IT, Bill of Architecture, Bill of Infrastructure
- High degree of uptime but costly to change

Actual client example



EDS has learned that comprehensive portfolio transformation requires a long term view and some guiding principals to be effective

- <u>Client Ownership</u> The client must take ownership and drive the transformation
- <u>Global and Common Processes</u> IT is the key enabler. IT transformation must be focused on driving globalization while balancing key regional needs
- <u>Agility is the name of the Game</u> Creating an agile IT environment (SOA – A3) is the foundation for driving and keeping complexity out of the IT portfolio.
- <u>No Quick Fix</u> Requires comprehensive approach to the entire IT portfolio (applications, infrastructure, etc.) to effectively transform the IT portfolio to enable business improvements while driving out sustain cost
- <u>Transformation Roadmap</u> A multi-year transformation plan that comprehends all key elements (business, applications, technology, organization and governance) is required to cost effectively transform an IT portfolio
- <u>IT partner manages the IT transformation</u> Portfolio transformation takes time and is most effectively executed by IT vendors



EDS has developed a world-class product development architecture blueprint upon which we base transformations



Point Solutions

What is a Framework?

Available by industry segment, EDS' **Industry Frameworks** are the lens through which we analyze the current state and chart the course to the future state. EDS' Industry Frameworks help **chart the path for transformation**.



A successful framework... DESCRIBES what changes are needed. PRESCRIBES how the changes should occur.

13 Apr 2006



What is a Framework? (cont'd)

In short, we're trying to assess and describe how to make change happen for our customers within the context of their competitive world.



- Architectures
- Best practices



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How does a Framework guide the process?

We have an evolving view of how to engage in the transformation process with our customers. Industry Frameworks help accelerate existing approaches.





Global Manufacturing Trends

	Trends & Implications
uring	 Globalization for competitive advantage Pricing pressures / market volatility Customer demands increasing Accelerated product innovation
e	 Cost reductions & flexibility / visibility of supply chain Consolidation – M&A of all tiers Fewer and larger customer orders/contracts Product Innovation
ve	 Industry consolidation throughout tiered structure Manage costs to protect margins Improve customer and dealer relations to increase market share Product development and innovation
	 Reduce time to market Innovation and growth Manage operational cost Asset productivity Manage operational cost and
	flexible supply chain

- Asset productivity
- Reduce time to market
- Innovate rationally

Possibilities

- Integrated, performancebased portfolio planning & execution
- Global design acceleration
- Reusable designs
- Inter-connected design centers
- Complete product visualization
- Virtual validation & performance simulation
- Design for manufacturability and service
- Network based manufacturing
- Supply chain integration
- Asset lifecycle management
- Performance based operations management
- Integrated maintenance, repair and service operations
- Knowledge enabled maintenance & repair
- High touch customer experience
- Digitally connected & synchronized business ecosystem
- Information integration
- Interdependent business processes streamlined for performance



Design Anywhere Build Anywhere Service Anywhere

Marketing & Sales

Integrated Product Development

Digital Manufacturing Operations

Aftermarket Services

Manufacturing Ecosystem

Detailed TIPS by segment can be found in Appendix B

Industrial

High Tech

Manufact

Aerospac

Automoti

Overall

EDS Manufacturing



There are six core business processes indigenous to a typical manufacturer.





Manufacturing Industry Framework Solutions all solutions impact Automotive, Industrial, High Tech and Aerospace & Defense

Manufacturing Industry Solutions		Business Drivers	Solution Components	
1	Market Analysis & Portfolio Planning	Time to market; Sales Growth; Margins, ROI, RONA; ROE	Product Portfolio Planning	
		Time to market; Sales Growth; Margins, ROI, RONA; ROE, Product Returns, Customer Satisfaction	Product Lifecycle Data Management	
2			Integrated Product Design & Validation	
	Integrated Product		Product Development Process Management	
	Development		Collaborative Digital Design	
			Manufacturing Process Planning	
			Knowledge Based Engineering	
3	Digital Manufacturing Operations	Margins; ROI; RONA; ROE; SG&A/Revenue, Inventory Turns; Asset Turns; Receivable Turns; DSO, Revenue or Income / Employee	Production Operations	
			Asset Lifecycle Management	
			Manufacturing Operations Visibility & Decision Support	
			Production Support	
			Supply Chain Operations Support	
			Supply Chain Warehousing & Distribution	
4	Sales & Aftermarket Services	SG&A/Revenue; Revenue or Income / Employee, Customer Satisfaction,	In-Service Product Maintenance	
			Incident Management	
		ROE	Sales Manager	
			Create Product Demand	
5	Manufacturing Ecosystem	Time to Market; Sales Growth; Product Returns; Customer Satisfaction	Knowledge Center	



EDS PLM Solution Suite

Description			
The Product Lifecycle Data Management Solution architects, implements and provides hosting support for As-Designed, As-Built, As-Tested and As-Maintained Bill of Materials that are maintained through a consistent configuration and change management control system. The architecture is scalable to support centralized and decentralized models. The solution includes product data vaulting, engineering release, manufacturing release, aftermarket service release, and integrated configuration and change control.			
The Integrated Product Design and Validation solution provides mathematical information, engineering analytics and product definition artifacts necessary to more effectively design and validate products. The solution enables product development personnel to initiate design and validation processes including new product development, design review, product validation, configuration management, engineering change management, and design and validation release.			
The Product Development Process Management solution provides a seamless environment (leveraging best-in-breed processes, tools & information) to monitor, control and report product development productivity. Product development productivity is defined by scheduling, standard product development process control, program/project management, and time tracking.			
The Collaborative Digital Design solution takes design information including multi-CAD data into a seamless "global secure network" environment that facilitates product and process decision making. The solution provides the basis for bringing together the knowledge, experience and skills of multiple team members, partners, suppliers, and global sites, for idea sharing and decision making that contributes to concurrent business integration. The collaborative environment integrates the processes and tools that connect multi-site Design Centers, and global Design Partners & Suppliers.			
Manufacturing Process Planning solution provides the real-time information, business processes and workflows for manufacturers to digitally design, test and simulate production environments. The solution includes manufacturing data management, visual 3-D design of facilities, tools, equipment and plant layout; material flow optimization; and computer-aided process planning.			
The Knowledge Based Engineering (KBE) Solution provides a hosted environment integrating Computer-Aided Design, Computer-Aided Manufacturing, Computer-Aided Engineering, Computer-Aided Test into an end-to-end process. The solution enables knowledge capture and re-use with specific emphasis in the capture of corrective action. A set of services are provided to customers to support the proper application of KBE software within their business environment			



Suggestions for the PLM Center

- Emphasize cross-discipline teams in a concurrent product/process/service development environment
 - Systems engineering
 - Mechanical engineering
 - Electrical engineering
 - Software engineering
 - Manufacturing engineering
 - Industrial engineering
- Emphasize the link of the student's individual discipline into the enterprise and the lifecycle of a product/process/services
- Develop the interoperability between tool sets
- Document the impact on a company's financial performance



Discussion



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page 24 • EDS Confidential



13 Apr 2006



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Manufacturing Industry Framework





EDS Legacy Modernization Initiative



EDS Legacy Modernization Initiative



EDS Manuracturing

Enabling the An agile enterprise reacts

changing customer demar must permeate the enterp information technology.

EDS is committed to building an a EDS has a defined road map to gai EDS and its pattners are aniquely