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White Paper

Accelerate innovation with digital PLM

Product companies face tremendous business challenges today, driven by savvy customers demanding constant innovation, new products and new options, and more of a say in what products deliver. As a result, product portfolios are larger and more complex than ever, supply chains are longer and more difficult to analyze and control, and companies have to deliver quality at competitive prices.

Transforming the product life cycle

In the traditional world of manufacturing and product-oriented enterprises, product life-cycle management (PLM) has typically been internally focused and driven by the finite requirements of new product introductions. Time from customer input to product creation was long and processes very serial. In today's digital world, companies recognize the value of faster input and flexibility to adjust to customer sentiment.

To compete and succeed, organizations are looking to a digitally transformed and more integrated PLM — one that supports the collaborative model needed to drive innovation.

In this paper, DXC Technology presents a broad and strategic vision for digital and integrated product life-cycle management that is transformed and extended along two key dimensions:

- Internally, PLM must be integrated with key planning, supply chain and production systems and built with a flexible platform.
- Externally, PLM must foster collaboration among internal groups and with suppliers, design houses, engineering partners and other parties.

Cloud computing and big data information management can help a digital PLM initiative succeed. This paper describes the fundamental requirements and the benefits — including greater innovation and product quality, reduced costs and accelerated time to market — that organizations can realize by adopting this approach.

Imperatives

Product companies today face both serious challenges and significant new opportunities. The entire product life cycle from idea to product is changing rapidly, in direct response to global economic fluctuations, disruption to traditional business models, enormous pressure to accelerate time to market and customers that want differentiated products and commoditized prices.

Key trends now driving the move toward an integrated, digital PLM model include:

Innovation and product portfolios. Consumers demand more variation in product styles, models, configurations and capabilities. Innovation adds value, and to drive innovation, organizations now seek both experienced professionals and more advanced systems for managing product life cycles. By connecting those skills and data-driven insights, organizations gain the qualities needed to create new products with popular functionality and attractive styles.

Consolidation of PLM systems. Traditional product data management and life-cycle management (PDM/PLM) applications were implemented as single instances, usually for specific business units, and companies have struggled to maintain the network of these solutions to meet growing internal and supply chain requirements. Security, network latency and business process demands often dictated the deployment of these individual PLM instances at various sites and supplier locations. Large volumes of PLM data were not easily centralized over wide area networks, making the integration of development environments difficult, costly and time-consuming. Plus, as IT staff retire or move, manufacturers may lose critical support skills needed to maintain and operate these aging PLM systems.

Market shifts. Globalization and digital trends now require a more expansive, integrated approach to PLM, one that supports worldwide sourcing, collaboration and product launch capabilities. After all, emerging markets often require unique product life-cycle management. To reach and hold a knowledgeable and diverse customer base, organizations must continually renew their product and technology capabilities. Connected customers require new and more responsive sales and customer relationship management (CRM) activities. Analytics are required to mine customer sentiment, understand internal development trends and work with connected technologies.

Cost pressures. There is increased pressure to do more with less, and to reduce overall business and IT costs. At the same time, many executives acknowledge they have inadequate oversight of various company investments. They are often unclear on the precise total cost of ownership (TCO) of their IT services and, without business analytics, the cost of their product creation.

Information challenges. Many product-driven organizations lack a formal and extended pipeline for PLM information, and cannot readily share business and product data across design, engineering, manufacturing and service groups. Often, the ongoing investment in vertical business units prevents the creation and use of enterprise-wide data standards. Most lack the ability to efficiently manage large and growing data volumes, very large file sizes, and the structured and unstructured data demands of big data and social media. Customers are giving input into what they want. Successful growth opportunities can be realized with digital capabilities that harness this customer preference information during the development process to adapt to shifting markets between concept creation and product realization.

Security and compliance. Companies are looking to protect their physical assets, personnel, and the intellectual property contained in products, design methodologies and production processes. Organizations are also looking to reduce the time and cost of regulatory compliance and risk management activities. Their goal is to balance security and productivity across the extended enterprise, external partners and the global value chain.

DXC recommends a comprehensive approach capable of delivering closed-loop innovation at every point in business — from market research and the assessment of product requirements, to engineering and design, simulation, procurement of parts and materials, to full manufacturing production. This approach requires a digital transformation.

By pursuing an end-to-end information management model, organizations can streamline product development and production. To do that, they must increase the integration of desktop engineering toolsets with enterprise platforms such as PLM, enterprise resource planning (ERP), manufacturing execution systems (MES), supply chain management (SCM) and other systems. The foundation of this transformation for many companies is re-evaluation of their business processes to harness information from digital platforms and analytics.

This integrated, closed-loop approach allows companies to work more effectively with partners and suppliers. Field data can be synchronized with manufacturing data, allowing organizations to improve product designs. The result can be a more predictable and cohesive “as designed, as planned, as built” final product.

Original equipment manufacturers (OEMs) can also use this new PLM model to create collaborative links between globally dispersed product development and engineering teams. With proper connectivity, those teams can share and organize information across complex partner ecosystems. This encourages the application of globalized IT standards and industry best practices, and helps reduce the risk of misaligned design efforts.

Astute organizations can leverage this digital transformation to create deeper customer relationships. Consumers today are more connected and interactive than ever before. They use social networking to discuss and review products and brand experiences. Any PLM approach should integrate with a cloud-based CRM system, and should harness data on consumer behavior and preferences to improve product designs, quality and value.

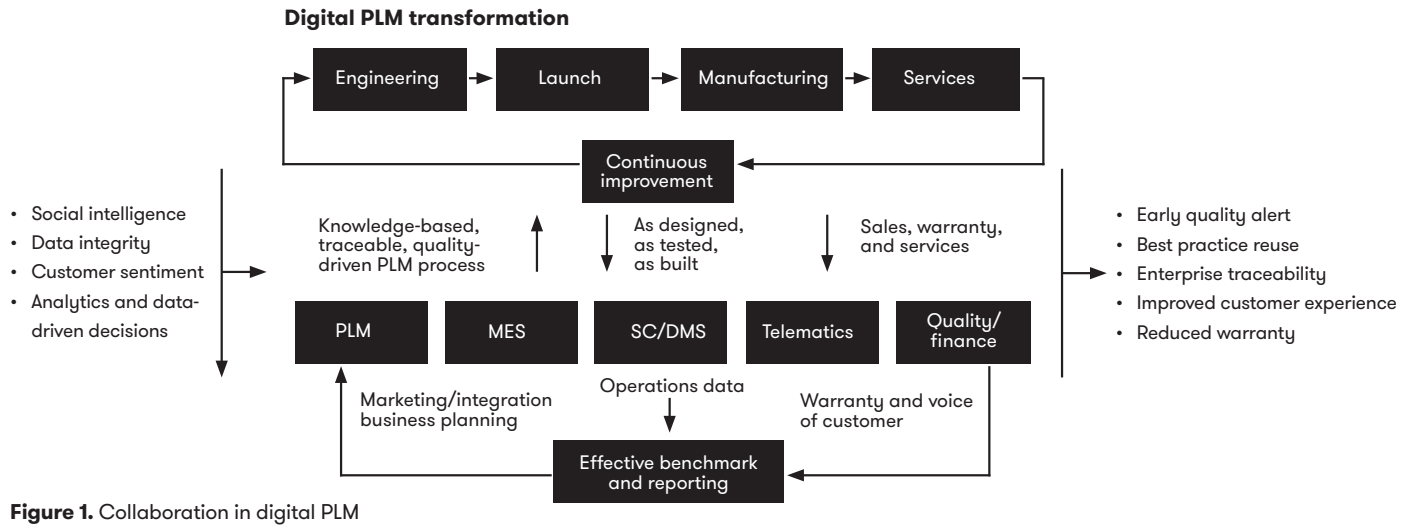

Figure 1. Collaboration in digital PLM

Benefits of digital PLM

- Protect intellectual property
- Help reduce development project startup times and overall time to market
- Enable rapid, cost-effective, global supplier sourcing
- Provide analytics for accurate and current product creation data
- Coordinate processes among OEMs, engineering partners, suppliers and subsuppliers, and joint venture partners
- Provide real-time collaboration between designers and engineers and connect all involved disciplines down the value chain — especially with manufacturing execution, enterprise resource planning, and sales/after-sales
- Enable incorporation of real-time customer sentiment from social media during development

A look at the digitized PLM environment

This more expansive view of PLM encompasses the full value chain — across internal departments, business units or geographic plants, and includes external vendors, partners and business and technical alliances. To fully exploit the promise of digital PLM, organizations must encourage a seamless and natural exchange of information among all constituencies (**Figure 1**).

That is not a simple task. And the concept of enterprise- and ecosystem-wide collaboration may be particularly new and challenging for many global companies that have been site- or organization-driven.

But make no mistake: Collaborative innovation will be a competitive advantage and is a fundamental requirement of any successful organization. That is why forward-looking companies are deploying digital PLM.

How does digital PLM fit into an enterprise framework?

To fully appreciate the value of a digital PLM model, it may help to understand how it fits within the larger context of an enterprise. **Figure 2** depicts DXC's framework for the integrated manufacturing enterprise — spanning sales and services, product development, manufacturing, supply chain and business services.

Within this framework, a digital PLM approach must address product conception, styling and prototyping; design, engineering and analysis; and product testing, release and engineering bill of materials (EBOM) management. Integrated digital PLM encompasses manufacturing process planning, tooling design and process validation. Procurement, service parts management, product recycling, and enterprise-level collaboration also fall within the scope of a digital PLM solution.

This approach can be successfully applied in organizations across a range of industry sectors, from automotive and technology to industrial systems, aerospace, defense, energy and consumer goods. In addition, digital PLM shows benefits for utilities, oil and gas, chemicals, transportation, life sciences and numerous enterprises beyond traditional manufacturing sectors.

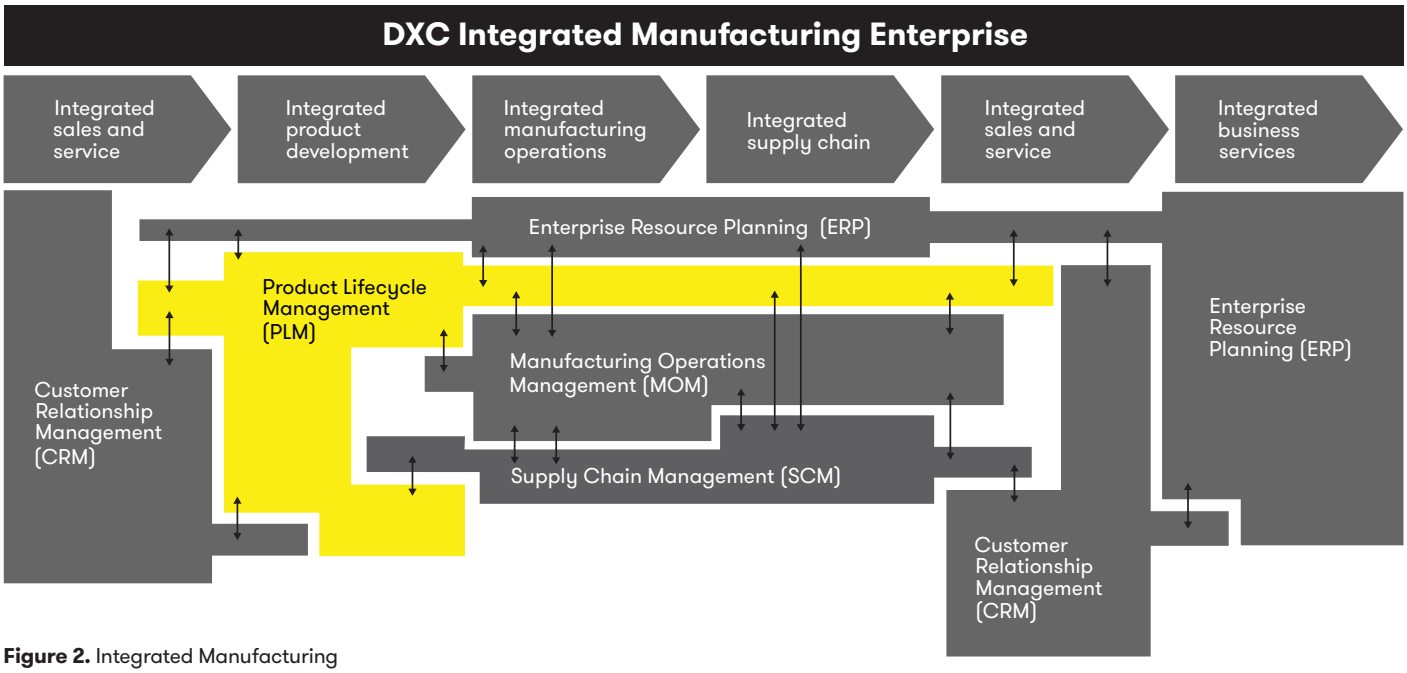

Figure 2. Integrated Manufacturing Enterprise Framework

Leverage emerging technologies

Companies can leverage a broad spectrum of powerful technologies to drive a digital PLM transformation.

Robust application modernization solutions can be used to rationalize software, to migrate legacy systems and to realize a consolidated cloud or a minimum cloud-ready PLM architecture. A modernization effort also provides an ideal opportunity to introduce PLM-oriented mobile technologies, which can greatly extend collaborative and productive activities within the product life cycle.

Advanced systems integration and deployment technologies can simplify data modeling and migration, and can support more-effective analytics, CRM and social intelligence. Organizations should also consider improved security models, testing and performance dashboards.

Digital PLM transformation may allow organizations to create a single, common environment for simulation and validation. By establishing a centralized computer-aided engineering/computer-aided design (CAE/CAD) location, supported by high-performance computing (HPC) and an accessible data pool, organizations can improve data processing, application performance and service levels.

A still-emerging generation of vastly more powerful simulation, digital prototyping and validation technologies is helping to accelerate product innovation. These systems can be augmented with cloud and virtualization capabilities, HPC, and other advances. Teams can leverage these capabilities to design and test product variations and prototypes more quickly, more easily and at a far lower cost. Newer simulation technologies allow manufacturers to identify and fix potential faults or quality issues — at the design and engineering stages — when those adjustments cost far less than in the postproduction environment, as shown in **Figure 3**.

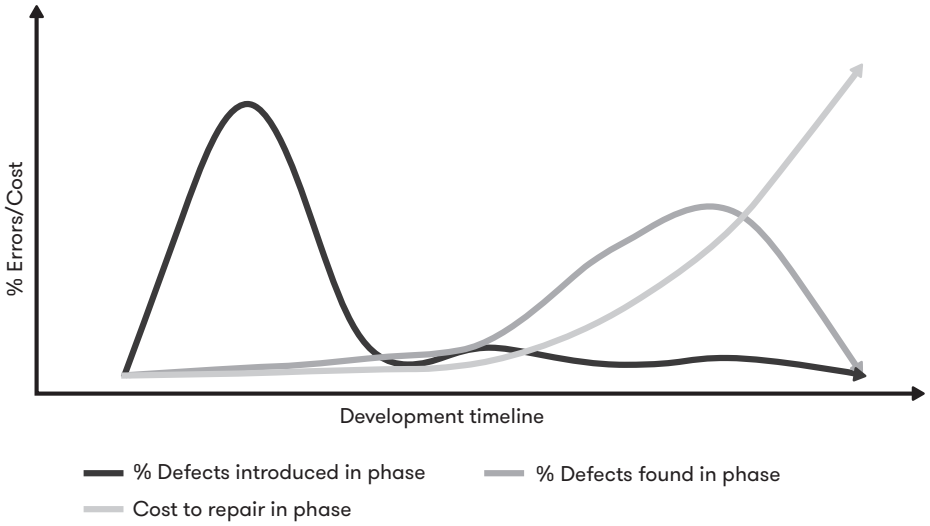

Figure 3. Defect model

Engineering virtual desktop infrastructures, consolidated engineering data management, and centralized license application management systems can provide rapid-deployment capabilities in the product development and engineering ecosystem. Today's 3D printing technologies can strengthen links between internal and external partners, while encouraging more efficient self-service access to product development and engineering (PD&E) workflows.

Astute organizations are working hard to "get customers into the equation" of product design and development. Social media intelligence leverages crowdsourcing and other feedback mechanisms to improve the quality, appeal and value of products.

A more fully integrated PLM model also provides a unified EBOM, including mechanical and electrical components, mechanical and electrical assembly-level information, software and firmware, and top-level assembly. The integrated BOM model allows organizations to move from a fragmented environment to a truly centralized — and more productive — engineering ecosystem. It enables companies to collaborate more effectively with external partners; to manage costs by consolidating hardware, software and management tools; and to streamline and accelerate the design process.

Cloud-based computing and data storage can allow design and engineering groups to leverage dynamic burst capabilities to handle peak loads or large projects. An engineering cloud can be used to create common engineering environments, component libraries, and electronic design automation fabrics to support remote engineering access.

These platforms also allow workers to work anywhere, anytime and gain access to needed information with increased security. That's critical as companies try to attract and retain top talent. The talent pool is no longer local to company locations. Employees in competitive markets do not want to relocate, and they expect mobile capabilities and remote access options. Traditional desktops and laptops in standard cubes are seen as legacy work environments.

Optimizing PLM in your organization

To optimize for innovation and efficiency, PLM should be integrated seamlessly with systems in the overall manufacturing enterprise environment. Key OEM units will leverage transformed PLM in various ways.

PD&E

Designers and engineers are the crucial first link in an efficient PLM system. Development groups need a consistent, centrally managed set of applications, and robust and affordable CAE/CAD solutions. Globally accessible front-end systems for virtualization and visualization help drive both internal and external collaboration. Consolidated and well-managed information on parts and products helps establish a single point of truth accessible by all systems and users. Digital PLM can ensure a more responsive, secure and compliant PD&E effort.

PLM system users

These employees work directly with the PLM system to create and manage data structures for parts and products, to handle application processes and change management, and to ensure the overall quality of PLM system performance. System users can leverage digital PLM to improve transaction traceability and visibility, to ensure rapid access to accurate data, and to support more direct and fruitful interactions between engineers. A strong PLM group can help minimize rework in the design and supply chain and can reduce the time and cost of onboarding vendors.

Enterprise Resource Planning

ERP systems can load, access and mine PLM data to drive efficiencies across even the most complex and extended enterprises. Close PLM-to-ERP integration ensures that product-related information is available to pre-sales, manufacturing, supply chains, and post-sales and service systems and users. PLM data can also be shared, via ERP links, with relevant administrative, human resource, financial, legal and compliance systems.

Manufacturing

Close connectivity between PLM and the MES is critical. The PLM solution should integrate with manufacturing process intelligence, global traceability and genealogy (GTAG) systems, and related manufacturing applications.

This PLM/MES linkage ensures that accurate, up-to-date plant floor data can be easily shared and compared across sites and business units. This PLM/MES integration establishes a closed-loop production ecosystem that supports optimal design, planning and production efforts.

Advantages of a digital approach

Digital product life-cycle management can yield a range of benefits, including:

Time. Organizations can accelerate and streamline product development and resolve problems more quickly and effectively. By more flexibly allocating capacity and bandwidth, enterprises can more effectively respond to market and business changes and integrate customer sentiment from social platforms.

Cost. By consolidating and updating servers, storage and other resources, PLM can help reduce hardware, software and overall IT infrastructure costs. Digital PLM can help reduce changes late in the development cycle and can reduce cost and schedule overruns.

Collaboration. Companies can leverage robust PLM to ensure all supplier types operate in a consistent, closed-loop model. Digital PLM can streamline supplier onboarding, while ensuring that all vendors adopt OEM standards and practices. A globally distributed design and production environment encourages sharing and communication and drives the innovation that creates value.

Performance. Robust digital lifecycle management establishes a single set of best practices for product development, manufacture and distribution. A fully integrated engineering and production system enables secure access to applications and information, anywhere and anytime. Companies are seeing development cycles reduced by as much as 80 percent. Powerful data security protects the overall PLM system from hacking and intrusion and reduces the risk of losing data and critical intellectual property.

Quality. Organizations can leverage virtualization, collaboration and other strategies to improve product quality — thus reducing waste and warranty costs, while enhancing customer satisfaction and loyalty. Strong PLM prevents data flaws from turning into production defects. Data-oriented processes can be used to streamline bill of materials data sharing, better information quality and reduced redundancy.

Connections. CRM, social intelligence, and big data analytics can support a truly connected customer experience. New social media intelligence capabilities can provide fast and valuable customer feedback for product development, and quality and warranty efforts. PLM data traceability can support early product-quality alerts, further strengthening the OEM-customer relationship.

Efficiencies. Cloud-based PLM solutions support real-time collaboration among design, release and manufacturing units. Organizations of all sizes will no doubt shift to the cost and productive efficiencies of an as-a-service model for managing the product life cycle across their enterprises.

How DXC Technology can help

DXC stands ready to help organizations improve efficiencies and cost-effectiveness across the entire product lifecycle. DXC offers the scale and global presence needed to address the most complex PLM transformation challenges.

With more than 500 dedicated PLM subject-matter experts, DXC has the experience and intellectual capital needed to achieve successful PLM outcomes. The company manages 85,000+ PLM seats the world over on CAD visualization, CAE, CAT, ECS and engineer design workstations.

Companies across the industrial spectrum — including automotive, aerospace, product design, engineering, energy, and other segments — can leverage the DXC Integrated Manufacturing Enterprise Framework to ensure a smooth and reliable PLM transition. That approach balances standardized easy-to-manage components with the ability to customize processes, applications, and infrastructure.

DXC complements those unique PLM capabilities with a broader set of services and support, including hardware and software, IT and cost optimization solutions, security and social media, supply chain management, manufacturing execution systems, compliance, customer relationship management, sales, and other offerings.

A digital PLM future

Companies are moving away from traditional, internally focused, business-siloed PLM, and toward a digital PLM model to maximize innovation. This broader PLM vision harnesses new strategies, stronger collaboration and emerging technologies. It encourages communication and sharing across complex product-oriented value chains.

Digital PLM delivers improved quality, cost controls and process acceleration. It enables the collaboration needed to unlock innovation, letting organizations ramp up faster, reduce risk and speed time to market while maintaining the appropriate level of security.

About the Author

Nicholas Holian is a DXC Technology Distinguished/Chief Technologist and the lead PLM consultant responsible for PLM and engineering environment integration, focused on developing solutions that enable clients to build a flexible and scalable engineering ecosystem. His more than 18-year career includes management and technical roles encompassing engineering, software and automation development, operating system testing and quality practices, among others. Nicholas holds several U.S. and foreign patents and has extensive international experience working with and developing teams in EMEA and APJ. Nicholas graduated with honors from Texas A&M University.

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