

Next Generation—Digitally Connected PLM

Digital transformation powered by a modern platform to enable the digital thread and digital twins supporting IoT, machine learning, and advanced analytics

Takeaways

What You Need to Know

Takeaway #1

Modern product innovation platforms are making once lofty PLM visions and strategies achievable. Legacy PDM tools that struggle to manage CAD files and documents through design and release lifecycle processes can't support digital transformation, Industry 4.0, and other similar initiatives.

Takeaway #2

Digital Transformation initiatives must address product definition data to have real business impacts. A complete definition of the Digital Twin enables what-if scenarios and predictive analytics. The end goal is to reduce risk and continuously improve delivery through all phases of a product lifecycle.

Takeaway #3

Connecting quality inspections with operational data via IIoT and predictive analytics drives good decisions for closed loop corrective actions across product, resources, and suppliers.

Takeaway #4

The Oracle PLM Cloud solution enables lifecycle processes from concept through commercialization and supports real-time collaboration across supply chains by leveraging data stored within the enterprise product record.

Takeaway #5

Oracle PLM Cloud capabilities extend well beyond the product innovation platform and are able to support business platform and digital transformation needs across industries and multiple enterprise software domains.

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Introduction

The Evolution of PLM

The creation of CAD software freed us from drafting tables and print rooms but introduced a bigger problem of how to manage, distribute, find, and reuse CAD files. PDM (Product Data Management) was introduced to tackle this problem and has evolved over the years to support ever increasing business needs.

Before 1990, PDM solutions were CAD centric and focused almost entirely on CAD file or document management. This quickly expanded into managing bill of material (BOM) and engineering change processes but remained focused around product development processes and designer and engineer productivity.

In the 1990s, globalization, outsourcing, and time-to-market pressures forced companies to expand their PDM deployments. Early PLM solutions were introduced with robust security and collaboration features, as well as support for many processes and functions throughout the product lifecycle including quality planning, manufacturing, product compliance (e.g., REACH, RoHS, Conflict Minerals), product costing, and many others to address challenges beyond core product development. While PDM is still the core of any PLM solution, legacy tools were neither complete nor user friendly and required expensive and extensive customization.

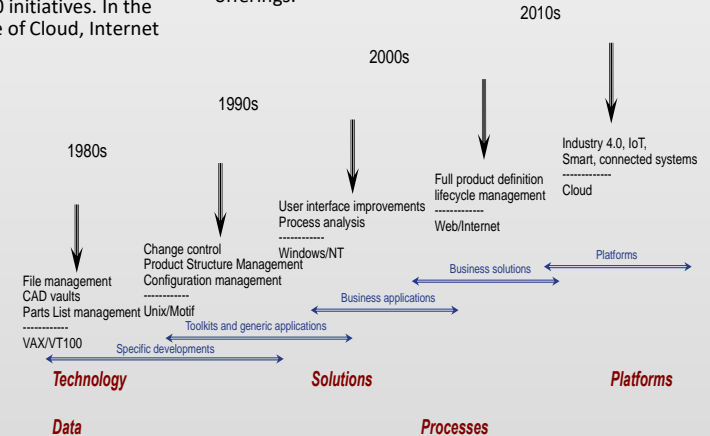
After 2000 PLM emerged, incorporating more capabilities across the lifecycle including

innovation management, requirements management, and improved connections with downstream manufacturing, supply chain processes, and commercialization processes. In many cases these capabilities were acquired and integrated with legacy tools. While companies were able to leverage this new functionality, it was much more complex and still required extensive customization.

Meanwhile, the pressures that drove the initial development of PDM and early PLM solutions grew. Business demanded better solutions to meet their product and process innovation requirements, as well as the latest digital transformation and Industry 4.0 initiatives. In the past few years the convergence of Cloud, Internet

of Things (IoT), Connected Products, Industrial Internet of Things (IIoT), Industry 4.0, Machine Learning, Augment and Virtual Reality (AR/VR) have been enabling companies to transform how they design, manufacture, service, and sell their products. CIMdata recognized the technology shift and identified how PLM solutions were being rearchitected as product innovation platforms that are able to support today's digital transformation and Industry 4.0 initiatives. This eBook examines how companies are utilizing PLM to support various Digital Transformation initiatives and how companies can change from designing unsuccessful products to delivering winning offerings.

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Next Generation of PLM

“Outside-In” —a New Approach to PLM

Traditionally, PLM solutions were toolkits that often required extensive customization to meet business requirements. They were implemented to support an internal, engineering-centric viewpoint. The cost and effort required to get basic capabilities in place within engineering groups meant that initiatives stagnated within the product development department. Product innovation was constrained by the internal walls of the enterprise. This “inside-out” legacy approach focused on part and BOM management, CAD integration, and engineering change management. In the best-case scenario, ERP integration minimal analytics capabilities were also considered in scope.

In today’s fast-paced and customer-centric businesses, leading organizations use analytic, data driven approaches to anticipate customer needs, leverage supply chains, and ensure customer satisfaction. This “outside-in” approach tightly links the voice of the customer with the voice of the product into the digital twin delivering the visibility necessary for smarter innovation. As new technologies like IIoT and predictive maintenance become incorporated into next generation PLM interesting results are happening including improving profitability of service operations, use of guided selling to improve sales efficiency, and even creating new business models for OEMs such as products as a service.



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Digital Transformation

Digital Transformation Without PLM Won't Move the Needle

Products generate revenue, so improving products and related services by improving product creation processes will generate the value customers expect and pay for. This is not a new concept, and it still holds true. The pressures on companies to innovate are not new; globalization, regulation, cost, quality expectations, and product complexity all continue to increase.

Companies must be able to calculate and anticipate the changing demands and evolution of their customers. Increasing complexity means innovations more commonly involve a connected combination of products, software, and services. Meeting customer expectations in the digital age requires fast access to real-time global product data and nimble business operating models.

This fundamental shift in the paradigm provides companies with an opportunity to evolve into a trusted source of business value while increasing collaboration with their customers to feed the innovation cycle. This continuous loop unifies products, services, customers, employees, and partners while helping organizations to deliver ongoing value creating memorable experiences, enable on-demand fulfilment, and provide personalized services.

CIMdata believes that product data is at the core of any successful digital transformation.

What is new is the availability of technology to effectively support digital transformation. Product innovation platforms are able to create, capture, and manage digital twin data. Modern integration technologies enable connections to other platforms including social platforms so social monitoring can be used to define and refine requirements, and IoT can be used to drive predictive maintenance solutions that leverage exact product configuration data stored within the digital twin. Advanced analytics that leverages machine learning and deep learning is also starting to be used to understand how products are used, thus allowing product planners to create new features and remove unused ones, closing the loop between the customer and the product developer. In essence, a product innovation platform has become invaluable when customers demand speed of information, cost efficiencies, and exceptional services.



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Digital Transformation Starts with the Digital Thread

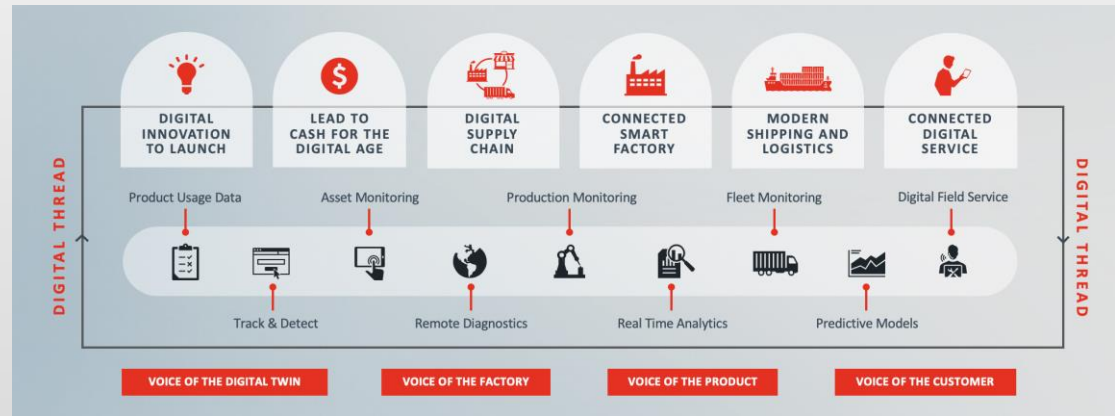
Digital Transformation requires a connected next-generation PLM solution that supports Industry 4.0. PLM implementations need to extend beyond the traditional product master to “digitally thread” data across the entire product lifecycle and through barriers of siloed information. The digital thread provides the true foundation for end-to-end connected digital product chains and delivers the traceability necessary to quickly track the entire lifecycle of a product from initial idea and design through commercialization, in-field use, and service.

Using a digital thread to link the structures that describe the product over its lifecycle is shown in Figure x. Two key dimensions of complexity are context and data. Data from the field is voluminous and noisy and typically needs to be

processed into a useable form. Machine learning approaches are becoming a common solution to this analytics task.

Perhaps the most important issue is understanding the context or configuration of the product that the performance data is collected from. Linking ideas and requirements to raw or processed social listening data supports traceability back to the original source, an especially important concept in regulated environments.

By understanding this data, companies are better equipped to adapt to the volatility of the marketplace, innovate more quickly, respond to insights in real-time, automate processes, and reduce time-to-market.



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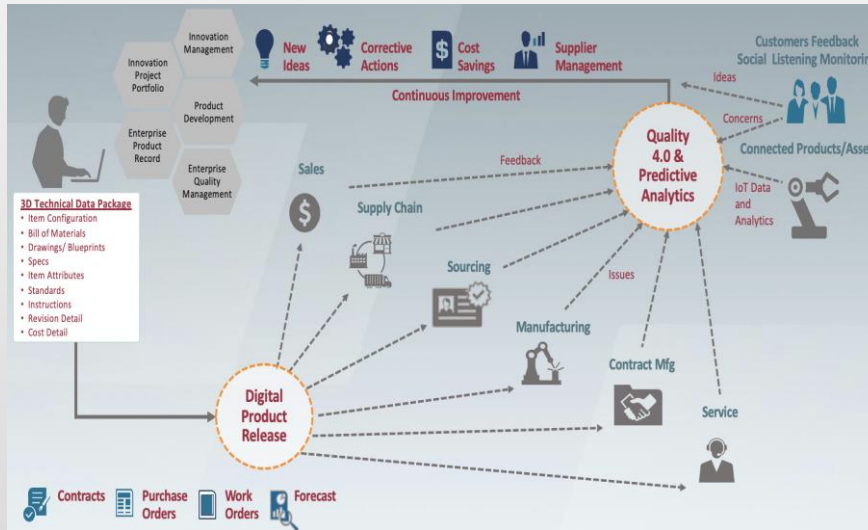
Quality is Key to Successful Products

Getting the Right Things Done Correctly and Faster

Digitalizing the quality processes has been a driver to achieving Industry 4.0 initiatives. Quality touches most processes during the lifecycle as the product matures from design to manufacturing through to service. For many companies each process step represents a data silo consisting of data from disparate systems and sources and analysis assembled with human glue.

With quality management enabled by a product innovation platform, quality planning, control, and compliance processes becomes a streamlined,

collaborative single source of truth that supports capturing, triaging, and managing issues across requirements and part specifications. Quality plans associated with all levels of product configurations define quality inspection requirements and context for IoT data. Connecting requirements configurations and operational data enables predictive analytics. Access to good, real-time quality control data provided by IIoT enables early detection of issues and improves responsiveness to resolve closed-loop corrective actions across the full spectrum of products, requirements, resources, and suppliers.



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Quality is critical to delivering successful products to the market

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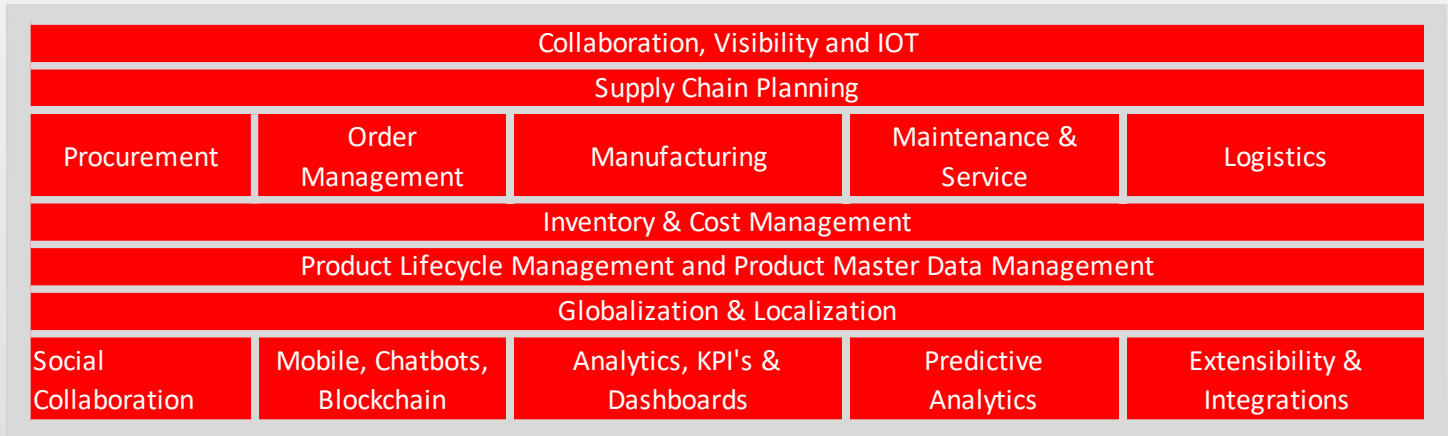


Oracle's Cloud Approach

A Modern Architecture

Oracle supports the end-to-end, unified business processes required by supply chains of the 21st century. Companies deploying Oracle ERP Cloud modules are able to consume data directly from the PLM release process into Project Management, Manufacturing, Planning, and Configure Price Quote solutions.

Oracle has a wide footprint of applications built to address Industry 4.0 transformational initiatives and CIMdata rates them as a PLM Mindshare Leader. Designed for "plug and play," Oracle PLM Cloud and SCM Cloud applications deliver modern features such as chatbots, embedded social networking, and advanced data visualization. The art of possibilities supported by this platform are endless.



Breadth and Depth of Oracle's Cloud-Native Digital Supply Chain Platform

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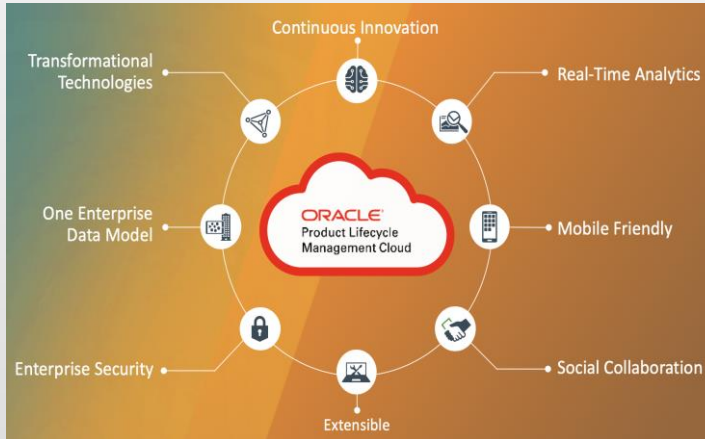


Oracle PLM Cloud

Beyond the Traditional Design to Release Process

In CIMdata's eBook, "[Making the Connection: Path to Cloud PLM](#)," we outlined the key benefits of moving PLM to the cloud. Using the cloud is essential for digital transformation and is the future of product lifecycle management.

Platformization has been an emphasis for CIMdata for years. Oracle Cloud is a business platform capable of supporting a comprehensive set of information capabilities required by today's modern business—well beyond the scope of PLM. Oracle Cloud is a great example of an enterprise business platform approach that can scale to meet the requirements of the largest businesses.



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Oracle PLM Cloud enhanced functionality that supports Industry 4.0 and Digital Transformation initiatives

Oracle's platform technologies that support Oracle PLM Cloud allow product data to be connected to feedback sources across the extended enterprise from supply chain participants through distribution to the end customer and consumer. These connections implement Oracle's concept of a "Digitally Connected PLM" by creating a comprehensive landscape of integrated cloud applications and harmonized enterprise product record supporting digital twins across the entire product lifecycle.

Digital feedback is everywhere, whether it is the voice of the customer from a social page, IIoT based voice of the factory received through asset monitoring, or voice of the product received from in-service monitoring. Oracle PLM Cloud "outside-in" approach connects innovation, enterprise quality, analysis, collaboration, social monitoring, and IoT data and processes with product-development and change management to supply-chain and sales-commercialization operations. This combination has a dramatic impact on reducing risks and shrinking new product development lifecycles by sharing data management best practices across the broader supply chain.

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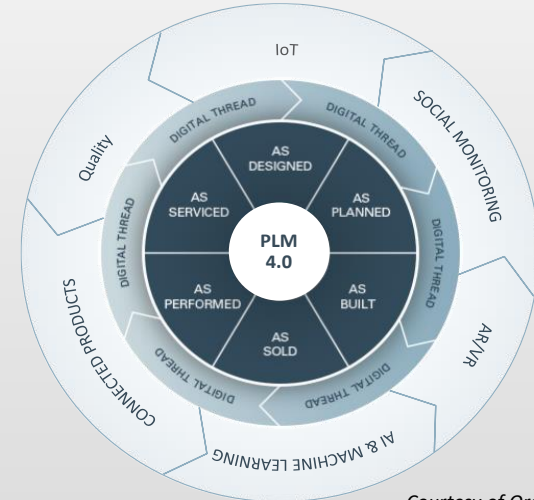
The Final Word

The Oracle Digital Supply Chain Platform is an excellent example of platformization, an emphasis for CIMdata over the last several years. Their enterprise product record, Oracle's term for the digital thread, is at the core of their offerings, and they are bringing today's technologies to bear for their customers, a journey that is just beginning but the early returns are promising. The cloud is essential to the future of product lifecycle management and Oracle has invested more than any of the current players in getting their PLM and vast enterprise offerings to the cloud.

For more information, visit Oracle at:

- [Oracle Product Lifecycle Management](#)
- [Oracle Internet of Things Applications](#)
- [Oracle Cloud Documentation](#)
- [Oracle Cloud Customer Connect](#)

Or contact Oracle at 1-800-633-0738.



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