



WINDCHILL

PLM as the Foundation for Digital Transformation

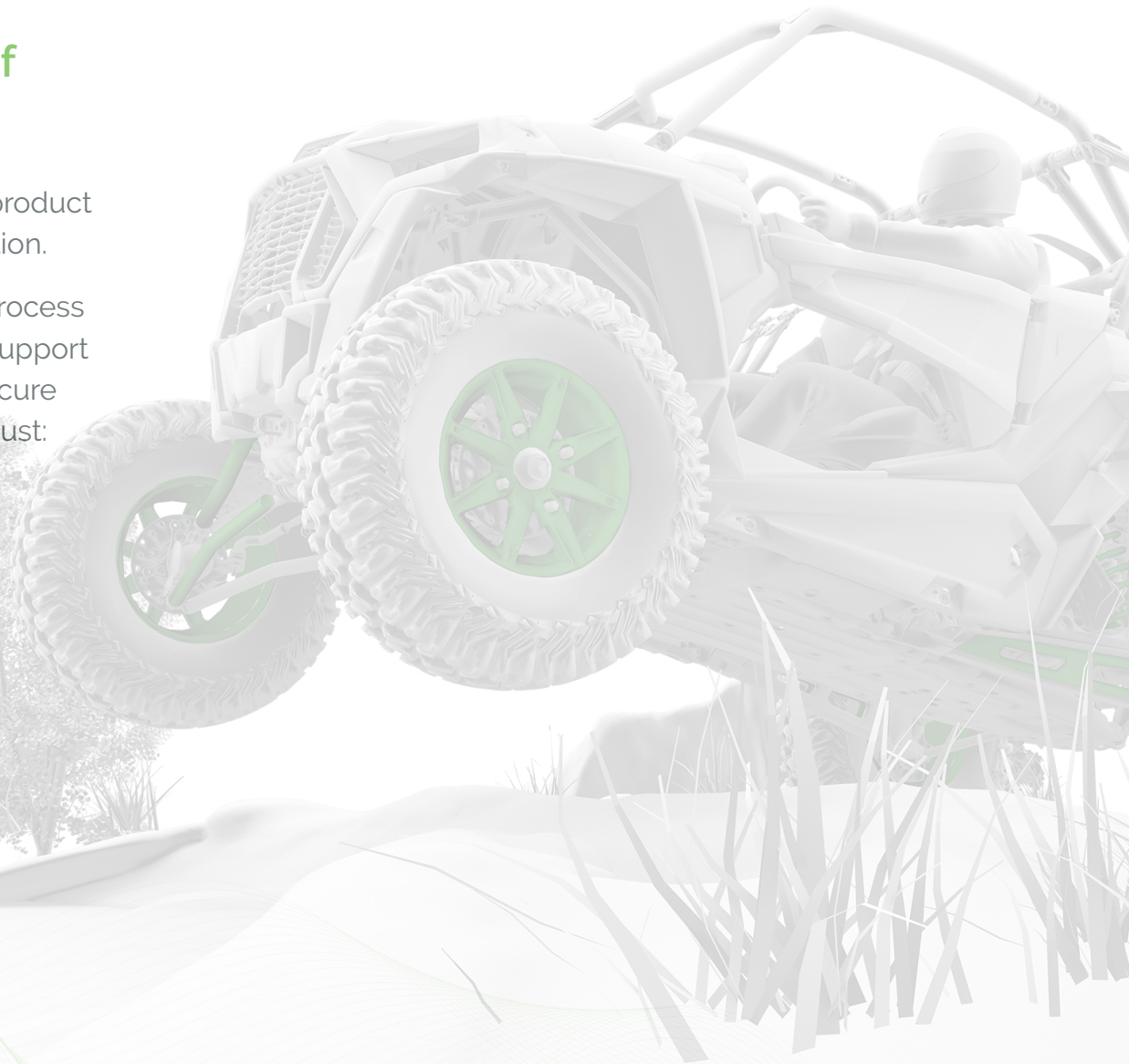
A PTC ebook on the value of Windchill as strategic enterprise software

Enterprise PLM: The Backbone of Your Digital Transformation

These are challenging times. Designing the best product is no longer enough to stay ahead of the competition.

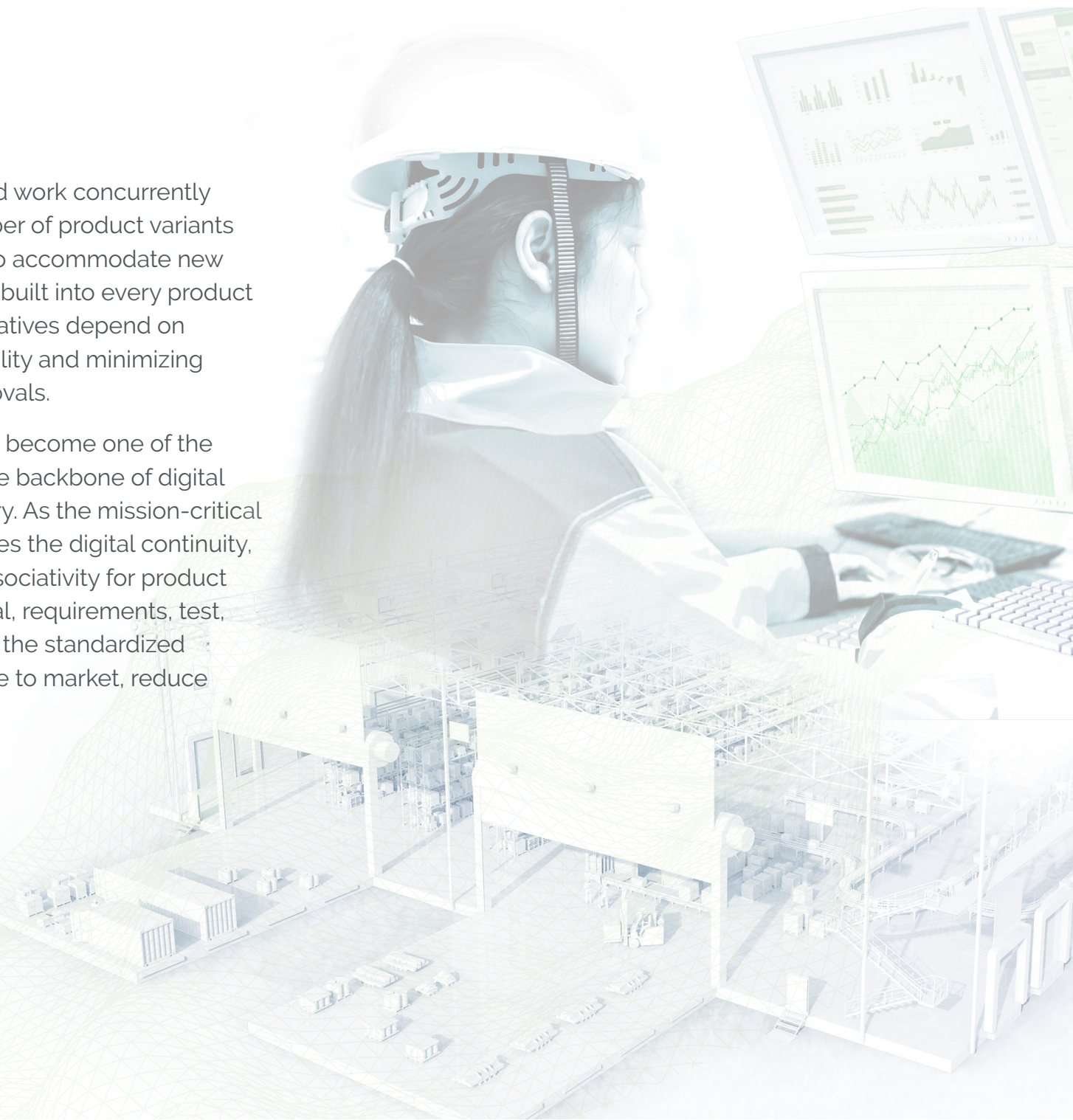
Product developers, manufacturing and service process planners, supply chain managers, and sales and support teams are spread across the globe and require secure access to up-to-date product information. They must:

- Adeptly manage new product introductions and changes to configurations in order to keep pace with advances in technology and fierce competition.
- Seamlessly integrate embedded software into mechanical and electronic designs with traceability and governance -- even though their systems and processes might not be aligned.
- Mitigate risk across the supply chain while optimizing for cost and quality with new levels of operational flexibility.



The factory must be more agile and work concurrently with engineering even as the number of product variants skyrocket and work rules change to accommodate new safety regulations. Quality must be built into every product and process. Enterprise quality initiatives depend on driving down the costs of poor-quality and minimizing delays in securing regulatory approvals.

Enterprise PLM has quickly risen to become one of the key pillars of manufacturing and the backbone of digital transformation across every industry. As the mission-critical collaboration platform, PLM provides the digital continuity, configuration management and associativity for product data (CAD, software, bills of material, requirements, test, simulations, etc.). It also automates the standardized processes that help accelerate time to market, reduce costs, and improve quality.



Windchill: A Modular Approach for Faster Time to Value

PTC recognizes the need for fast, scalable tools to manage your product lifecycle and drive revenue, reduce costs, and stay competitive. With Windchill, the industry-leading PLM software from PTC, you can digitalize and connect your enterprise in this new world. Here's the potential impact across your enterprise:

- Windchill's out-of-the-box functionality can be quickly implemented and scaled to create a seamless data value stream, providing traceability from engineering through quality, manufacturing, sales, and service for both experts and non-experts.
- To increase productivity, product development can unite, distribute, and dynamically visualize multi-CAD models and related information with automation.
- Factories can concurrently source approved parts and plan without errors, reducing time to industrialization.
- Field service can access up-to-date product information with real-time IoT visibility of connected products.

Windchill provides the foundation and continuity of product information across the digital thread, whether deployed on-premises or in the cloud. Our web-based tools connect physical assets with their digital twins for a secure, global, cohesive, and flexible work environment.

The world is changing, but you don't need to transition alone; Windchill is the enterprise PLM application suite that transitions with you.



VALUE IN ACTION

Value in Action

Value realized in Industrial

Nidec Global Appliance, the largest manufacturer of compressors for refrigeration, leverages Windchill for product and process governance and traceability. Its digital transformation project has delivered a 48% decrease in time to market and a 284% increase in the number of large projects, with only 78% of the resources. With better first pass yields, and fewer line failures and warranty claims, the overall cost of non-quality was reduced by 40%.

Value realized in Federal, Aerospace and Defense

The **United States Navy**, an organization with over 300,000 active duty personnel, hundreds of ships, and thousands of suppliers, is leveraging Windchill SaaS to expose an integrated/model-based view of all the information needed to maintain, support, and operate ships. Its enterprise-wide digital transformation project will improve fleet availability and readiness, create efficient processes for logistics, services, and other areas, and reduce IT expenses.

Value realized in Medical Device

Omron Healthcare is a manufacturer and distributor of personal heart health and wellness products available in more than 110 countries and regions around the world. Omron leverages Windchill's Medical Device Package in the cloud for the out-of-

the-box FDA certification support tools and templates based on medical device industry best practices.

Value realized in Automotive

VCST is a world-class automotive supplier of powertrain and brake components. Its strategy was to combine the capabilities of IoT and PLM. VCST recognized that by infusing real-time IoT data and digital solutions across operations, it would speed time to market—delivering more flexibility and faster response times. And by connecting suppliers, people, devices, machines, and customers in unified systems and smart applications, it gained an opportunity to drive more reliable and efficient processes.

Value realized in Electronic and High Tech

iRobot, a global manufacturer of consumer robots, implemented Windchill and ThingWorx to transform its digital practices. The result was better managed supplier negotiations and reduced part proliferation/duplication. In addition, supply chain managers were able to identify the impact of changes early and notify contract manufacturers more quickly accelerating time to market.

What is the Digital Thread?

It is a single source of data truth creating consistency, collaboration, and alignment across functions by real-time data synchronization of related upstream and downstream derivative information. This scalable common set of democratized data enables enterprise-wide accessibility and continuity across products, processes, and people.

Benefits of the Digital Thread

The digital thread creates a “closed-loop” lifecycle system by combining PLM, ERP, CRM, and IOT product related data, capturing all changes and configuration information to improve quality, reduce rework, and expedite new product development and time-to market. Organizations can collect data, monitor processes and machines, and send information back to engineering for root cause analysis and corrective and preventative actions. Across all the complex relationships, departments can share data that they couldn't before. The factory and field can use engineering data for procedural guidance, parts identification, specification verification, numerically controlled (NC) machine diagnostics, and more. In return, engineering can use factory and field activity for data-driven design.

Technology to Grow with Your Business

Whether you're just starting your digital transformation initiative or are implementing advanced PLM capabilities, Windchill offers packages to grow with your business. Windchill's core multi-CAD and product data management (PDM) functionality – along with automated change and document management, business systems integration and project execution – will help you establish your core product development platform. As your PLM initiatives and requirements grow, you can expand your capabilities to include variant management, parts classification, supplier management, downstream manufacturing and service BOM management, manufacturing process plans and work instructions, augmented reality, IoT and more.

Windchill's 100% web-based architecture, which is optimized for agility and flexibility, has been designed to easily integrate with existing IT, internet, and security infrastructures for remote work and multi-site collaboration. PLM deployments with PTC can be on-premises, in the cloud, on a single server for a workgroup, or on a highly scalable clustered system with performance optimized for content distribution. Based on the industry standard J2EE, internet and web services interfaces, and powerful federation for maintaining data with other systems, Windchill seamlessly interoperates in heterogeneous environments with a consistent data model from CAD data management to BOM transformation.

Analysts Endorse PTC as Global PLM Leaders

PTC is the clear market leader in PLM with a strong heritage, expertise and the proven ability to execute.

Windchill has received #1 ranking by top analysts in multiple industry reports for reasons such as:

PLM Leader for Digital Transformation



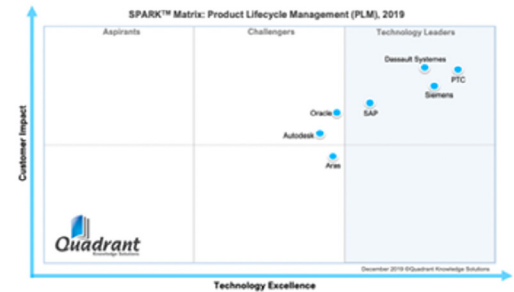
FROST & SULLIVAN

Strongest PLM Solution



FORRESTER

Technology Leader in the Global PLM Market



Quadrant Knowledge Solutions

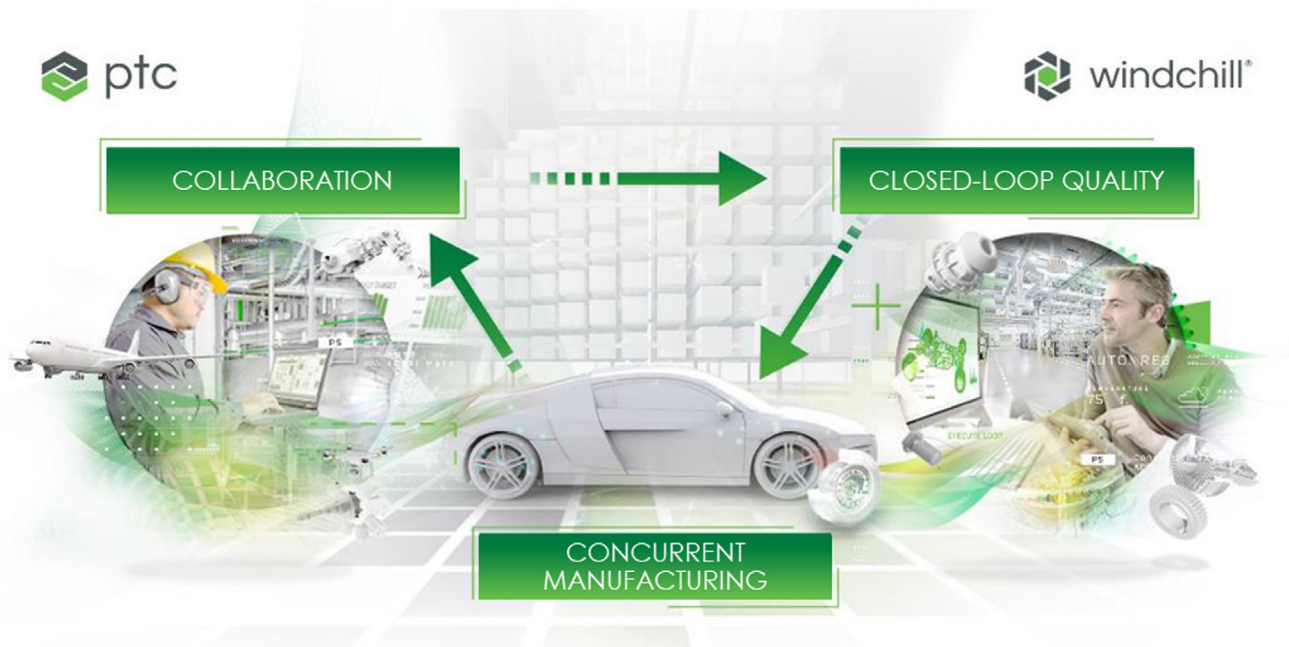
- **Comprehensive out-of-the-box (OOTB) functionality:** Get to value quickly with standardized, OOTB functionality across a comprehensive portfolio of core PDM to advanced PLM solutions.
- **Foundation for the smart, connected enterprise:** Create and manage the digital thread/core that enables smart connected products, people and processes.
- **Open architecture that integrates with enterprise domain applications:** Manage, associate, orchestrate and flexibly deploy product data across enterprise domain systems.
- **Highly configurable role and task-based apps:** Enable expert and non-expert users to view and format product data in the context of their role or task on a simple interface.
- **Visual experiences through augmented reality and 2D/3D visualization:** Merge the digital and physical worlds in a highly consumable way.
- **Secure management of products and configurations, at scale:** Securely manage product data from the simplest to most complex products globally and at enterprise scale.



WINDCHILL CAPABILITIES

Windchill Capabilities

Explore the range of capabilities that make Windchill perfect for driving concurrent manufacturing, enterprise collaboration, and closed-loop quality.



Product Data Management

PDM software helps organizations connect and communicate product information across globally distributed teams where multiple CAD tools may be used.

Windchill can be embedded into all major MCAD systems so users can manage and edit CAD data and related documents (e.g., Microsoft Word, Adobe PDF) without leaving their native MCAD environment. Access to data is optimized for the remote worker by being web-based, accessible from a Windows desktop, and available in the PTC Cloud. Lightweight viewables and self-service access to role-based apps in secure project spaces enable automated sharing of more consumable data to non-CAD users.

Change and Configuration Management

The various teams involved in a product's lifecycle create a range of digital data. Not only does this data span disparate functional systems, it often evolves over time – and quickly.

With Windchill you deliver a real-time view of the most accurate data to all enterprise stakeholders, expanding cross-discipline involvement. Standardizing on PTC's best practices for change and configuration management will drive efficiencies. Better, more informed decisions can drive down the costs of poor quality and enable your organization to implement changes and introduce new products to market faster.

Requirements Management and Validation

Effective requirements and validation practices are more than just an integral part of developing and engineering complex products and systems. They are vital to mitigating risk and ensuring customer satisfaction.

With Windchill you can centrally manage evolving requirements, test assets, and software configurations. By automating the traceability and sharing of data, you enable cross-functional collaboration across applications and throughout the product lifecycle. With holistic visibility into evolving requirements, stakeholders can easily manage test sessions, determine the impact of proposed changes, and verify test results against requirements for better product quality and compliance.

BOM Management and Transformation

Most manufacturers are grappling with speed and agility in the face of growing numbers of product options and variants.

With Windchill's BOM management and BOM transformation capabilities, product designers create and manage a part-centric digital product that can be leveraged at every step of the product lifecycle. Now mechanical, software, electronic parts and related artifacts can be integrated into the engineering BOM. This provides your organization a single interface with which both upstream and downstream teams will collaborate on such domain systems as ECAD, MCAD, Software, PLM and ERP. Windchill ensures that everyone - from the shop floor worker and service technician to a seller configuring a customer order - is using the correct product information.

Product Variability Management

Traditional approaches to manufacturing make it complex to produce variants and configurations. Product diversity breeds higher inventories, lower economies of scale, service inefficiencies, manufacturing errors, and increased risk of non-compliance.

With the product variability management capabilities in Windchill, you can strategically design, create, manage, and validate product variants. Platform options, choices, logic, and configuration rules are directly linked to BOM, 3D visualization, and CAD data to deliver a robust modular solution. You can fully manage platform information across the lifecycle, making it easily available to validate the product and share it with other enterprise tools such as ERP and CPQ.

Manufacturing Process Management

With manufacturing process management capabilities (MPM) you gain the collaboration tools and methodologies needed to manufacture and build products anywhere, 24x7. MPM brings design and the shop floor together with suppliers, logistics, and quality for a more connected, agile enterprise.

With the MPM capabilities available in Windchill, you can feed shop floor data into MPM for greater process efficiencies. End users can access technical work instructions on demand (on a screen or with augmented reality) before performing their own work or assisting in completing another task.

Closed-Loop Quality for the Entire Organization

Innovating with speed, agility, and compliance hinges on quality. Success comes down to high first pass yields, low percentages of scrap and rework,



elimination of line and field failures, and rapid response to corrective and preventative actions (CAPAs).

PTC takes a holistic approach to quality across the organization from ideation to field service. Highly configurable out-of-the-box workflows are associated with products and parts for a complete design master record (DMR) and design history file (DHF). Key data is centrally stored and aligned with engineering, manufacturing, and service bills of materials and process plans. This includes change and configuration management, requirements and test management, CAPAs, non-conformances, customer experience management (CEM), audit, document control, failure mode and effects analysis (FMEA), fault tree analysis (FTA), critical to quality (CTQ), and risk-based design (RDB). By combining PLM and quality into a single platform, PTC helps organizations of all sizes accelerate the delivery of high-quality products.

Project and Design Collaboration

Globalization, outsourcing, and remote work have significantly increased the complexity of product development. Internal teams – operations, engineering, manufacturing, sales, marketing, purchasing, and customer service – can be widely distributed across different offices and time zones. Suppliers and customers are even further removed. PLM project management tools enable extended product teams to securely collaborate regardless of their location.

Track all your deliverables throughout the project lifecycle with detailed status and change management for shared objects such as CAD designs and

documents. With PTC, instead of working in silos, your organization can collaborate in a way that secures data and provides an authoritative source of truth, so teams have access to the right data at the right time.

Model Based System Engineering (MBSE)

As products grow more complex, multiple engineering disciplines need to work together to design, build and maintain them. Designing a system using models enables early visualization and simulation, improving stakeholder buy-in and customer satisfaction.

With PTC's MBSE solution, engineering teams define systems in a modular way, with 'variability modeling' for consideration of product lines much earlier in the product lifecycle. The solution also provides traceability throughout models and with requirements, validations, and parts in BOMs. This helps prove that you are building the right systems and products as well as understanding and managing the potential impact of changes. These capabilities are critical when complying with your industry safety regulations. In addition, you can leverage powerful, visual, system-level co-simulation along with automated system model design review to improve the quality of system designs and ultimately the systems delivered.

Service Process Management

PLM enables companies to centrally manage all service information in relationship to products, systems, and components. The key advantage of this product-centric approach is that it helps maximize the reuse of engineering and configuration-specific information.

Windchill leverages the engineering or manufacturing bill of materials (EBOM or MBOM) to define the parts and kits that will be used in the service environment (service bill of materials or SBOM). From the SBOM, you can automatically generate parts information for specific product configurations to enable consistent and accurate repairs. You can also deliver service information across a comprehensive range of languages and formats (such as service manuals, training documents, augmented reality, and more).

Flexible Delivery Options

In addition to on-premises, Windchill and ThingWorx Navigate can be delivered on your private cloud. Windchill is certified on Microsoft Azure and AWS.

For those customers interested in taking advantage of the additional benefits of SaaS, Windchill's SaaS offering includes a selection of enterprise packages and role-based add-ons for engineering, quality, manufacturing, service, and the extended enterprise with ThingWorx Navigate. These SaaS offerings also meet strict security safeguards and compliance requirements, such as Fedramp and IL5, to accommodate the federal, aerospace and defense, and medical device industries. All upgrades and updates are included, as well as dedicated production and non-production environments.

Digital Deployment

Windchill provides a rich set of deployment capabilities which decrease IT costs by managing upgrades and rapidly deploy configuration changes.

Security

Securing customer data and systems is a top priority concern at PTC. Windchill's approach to security is multi-leveled. Rigorous security controls are built in throughout the software development lifecycle (SDLC) following the OWASP OpenSAMM model. This includes incorporating industry best practices and automated scanning tools. Through PTC's automated support system, we proactively inform our customers about reported vulnerabilities, advise on potential risks, and recommend relevant remediation. From an application security perspective, you can flexibly configure Windchill to meet your business needs. That includes managing IP protection through access control rules, tracking security audit events, and calling upon various authentication mechanisms including Single Sign-On.

Administration and Support

Windchill provides a robust set of business administrative and support capabilities to reduce incident rates with tools for conflict detection and resolution. Always-on system monitoring helps ensure SLAs are met on time. PTC leverages IoT to provide product telemetry insights so that you can detect issues before they become problems. Learn from PTC experts and drive an even faster ROI through self-paced and in-product learning resources, live classes and custom learning programs.

ERP AND PLM SYSTEMS



Choosing the right ERP and PLM systems for the business is crucial, and manufacturers should not have to compromise on the benefits to fully realize the value in both. ERP systems are optimized for transactions. PLM is optimized for iterating design artifacts. ERP should replicate some released PLM information that is used to drive ERP logic (i.e. Manufacturing BOM's for MRP). Most PLM data is not needed in ERP for computations, but instead to assist human decision making. This PLM content is best referenced directly by ERP users, thus avoiding synchronization costs and risks.

Today, many manufacturers are integrating PLM and ERP to improve efficiency and quality. While these organizations may be initially motivated by a desire to eliminate the inefficiency of re-entering data, along with the human error that can accompany it, the benefits go well beyond that. Through PTC's partnerships with SAP, Oracle, and Microsoft for seamless Windchill integration, organizations can also ensure that BOM data and supporting product development data, captured by the PLM system, is made available to all functions that need it. And, because the Windchill can provide routing and manufacturing process plans as well, critical upstream and downstream processes are linked and made more efficient and productive. Through the out of the box integration capability of Windchill with ERP, companies can develop a smooth flow of major innovations such as new and more highly differentiated products, as well as ongoing business innovations like continuous cost and quality improvements.

Additionally, for PLM/IoT data that does not require synchronization with ERP for computations, PTC offers out-of-the-box views into PLM/IoT data real time, purpose-built for ERP users. ERP users view this PLM/IoT information to inform operational decisions. ERP/MES doesn't need to store this content to drive workflow logic, but instead access it directly from Windchill/ThingWorx, particularly for dynamic visualization (e.g. Factory and service workers need work instructions and sensor readings.)

In turn, Windchill users view ERP information to inform design decisions. Windchill doesn't need to store this content to drive workflow logic, but instead access it directly from ERP (e.g. engineers accessing part cost and quantity).



What's New in Windchill 12?

Better collaboration, closed-loop quality, and concurrent manufacturing

Rapidly Develop Role- and Task-Based Apps

ThingWorx Navigate 9.0 enables customers to build their own unique custom apps, leveraging a rapid app development environment with reusable components. Experience 8x faster time-to-value when building a new custom app, going from 3.5 months to under 2 weeks.

Implement Closed-Loop Quality

Application lifecycle management (ALM) and PLM integration delivers proof of traceability for finding and fixing problems early. This new capability is delivered through tight OSLC integration with the PTC toolchain (Windchill RV&S and Windchill Modeler) and third-party requirements management tools (e.g. IBM Doors NG).

Visually Manage Critical to Quality (CTQ) Characteristics

ThingWorx Navigate 9.0 enables customers to build their own unique custom apps, leveraging a rapid app development environment with reusable components. Experience 8x faster time-to-value when building a new custom app, going from 3.5 months to under 2 weeks.

Support Concurrent Engineering with the Factory

BOM transformation tools enable manufacturing engineers to quickly view and reconcile upstream changes to downstream manufacturing and plant-specific BOMs.



Want to Learn More?

For a demo of any of the capabilities listed in this ebook, [please contact one of our PLM specialists](#) to schedule an appointment. To hear from our Product Management team on "What's New in Windchill 12?", check out the [Windchill 12 Virtual Conference](#).

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