

Windchill®

Quality Solutions:

Manage product performance, reliability, and safety.



PTC®

Where product
quality begins.

QUALITY LIFECYCLE MANAGEMENT SOFTWARE

Track and manage quality throughout the product development lifecycle.

In a marketplace teeming with increasingly complex technologies, broadening global competition, and heightened customer expectations, product quality is paramount. Quality, defined as a product's ability to meet its established requirements for reliability, safety, and performance, has the potential to make – or break – significant business drivers including customer satisfaction, repeat business, and brand reputation.

Nearly all companies embrace some kind of corporate quality initiative. But today's business environment – where globally dispersed teams, greater cost constraints, and shorter time-to-market are all status quo – raises important questions around the issue of quality management:

- Does your company plan for product quality and reliability?
- Does your company have a systematic process for analyzing product risks?
- Does your company manage product verification to ensure requirements are met?
- Does your company protect critical-to-quality product characteristics during processes like manufacturing, assembly, installation, or service?
- Does your company track, aggregate, and analyze test and field failure data?
- Does your company audit product quality?
- Does your company effectively communicate lessons learned from product testing and fielded use to prevent repeat quality issues?



QLM – Quality Lifecycle Management – is an enterprise-wide, cross-functional solution to ensure that product performance, reliability, and safety are aligned with the requirements set for them over the course of a product’s development and use. As a fully integrated software solution, QLM connects the work of the numerous teams across an organization responsible for the various facets of product quality as it evolves throughout the product lifecycle. QLM recognizes that quality management is not limited to product quality only: organizational processes can impact and influence product quality, and must therefore be managed to ensure efficiency, automation, repeatability, and traceability.

Windchill Quality Solutions

Build quality, reliability, safety, and process control into every part of the product lifecycle.

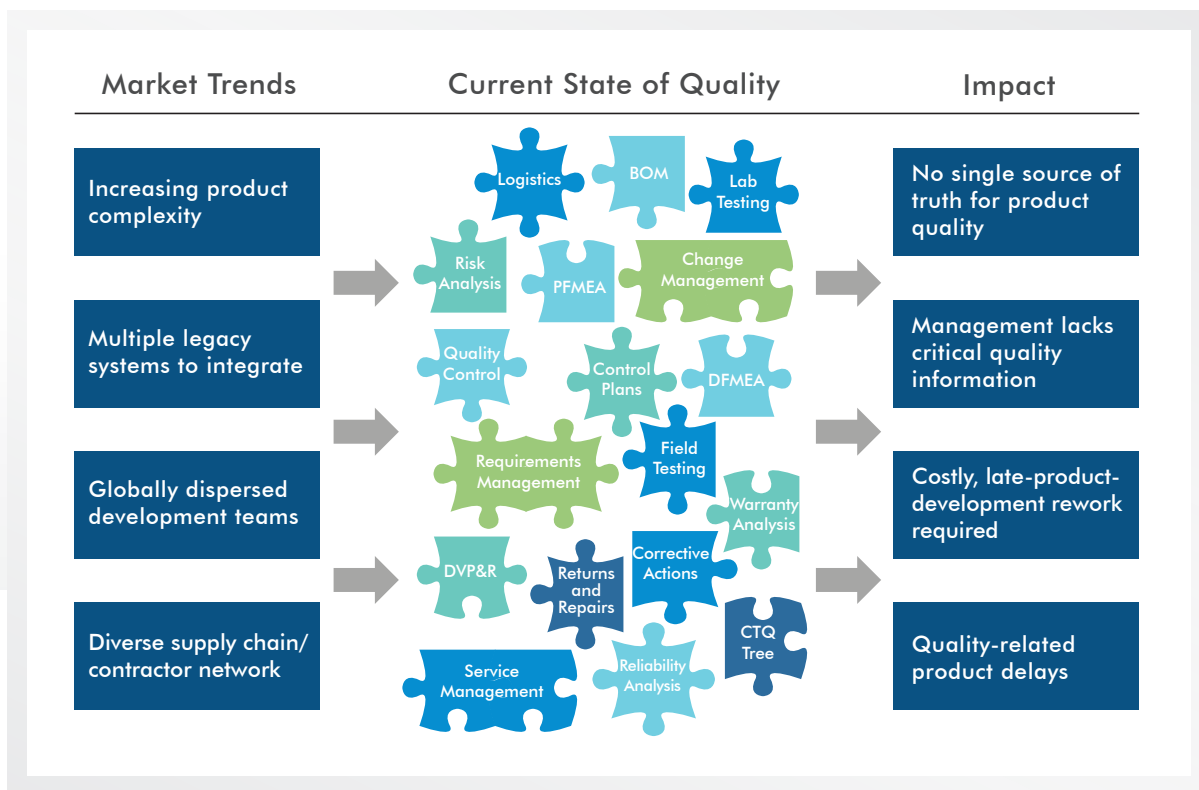
Windchill Quality Solutions provide a fully integrated approach to managing all aspects of product quality, reliability, and risk using methods that are:

- Fully integrated into the product development lifecycle
- Extensible to PLM and other enterprise-level solutions
- Structured, automated, traceable, and repeatable
- Highly visible to key decision makers and to all personnel with a stake in product quality

Empower your quality management processes.

Many companies today employ multiple, disparate “point solutions” in the various departments responsible for aspects of product quality, reliability, and safety. Yet these tools seldom – if ever – communicate with one another, resulting in disjoint processes that can create inefficient redundancies, quality errors, and gaping holes in an overall picture of product quality.

With multiple, department-specific software tools storing the quality, reliability, or risk information relevant to one limited facet of quality or one specific phase of development, no comprehensive picture of product quality can be obtained at any point in the product lifecycle. And when these tools do not communicate with one another, key aspects of product quality are not communicated from one lifecycle stage to the next – or if they are, this communication relies on inefficient, time-consuming, and error-prone manual processes. Without the communication of quality information, and without high-level management visibility into product quality metrics and issues, critical errors are often missed, key requirements cannot be traced, and companies suffer the consequences.



The challenges of mounting economic pressures and the current, disjoint state of product quality management can have a devastating impact on companies.

The ROI of Quality Lifecycle Management

The numbers are in. A fully integrated software solution for quality, reliability, and risk management earns companies an unbeatable ROI, while helping to protect against staggering losses from cost of poor quality (COPQ), warranty claims, and declining market share when quality issues go uncorrected.

300% return on investment: the suggested ROI for a CAPA management system over a two-year implementation period

5-20% of revenue: the predicted cost of poor quality (COPQ) for businesses experiencing repeat quality issues

\$25B annually: total warranty costs for the top 50 US manufacturers, or as high as 2-4% of revenue

0.5-1% of market share after a quality-related recall: the estimated "soft costs" of quality issues, including sinking brand reputation, decreasing customer satisfaction, and the loss of repeat business

Sources: "Taking Appropriate Action: An effective CAPA system integrates with other key business processes," [Quality Digest](#), 2006; "What is Your Company's Cost of Poor Quality?," [Quality Digest](#), 2004; "Warranty Claims & Accruals in Financial Statements," [Warranty Week](#), 2009; "IDC Manufacturing Insights Unveils New Warranty Management Maturity Model," IDC, 2010; "How Toyota May Lose U.S. Market Share, Fall Behind Ford," [Bloomberg Businessweek](#), 2010

Solutions for quality planning.

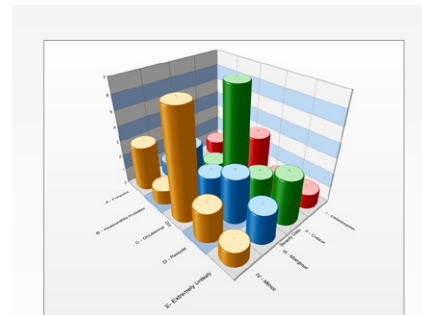
Proactively design in product quality

Quality, reliability, and safety analyses performed early – during product planning and design – can prevent costly rework, repair, warranty/replacement, and product recalls later.

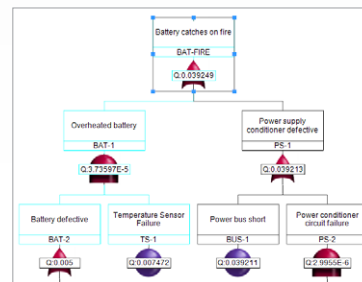
Integrated quality planning

QLM begins in the earliest planning phases of product development, as product requirements for performance, reliability, and safety are clearly defined and managed before a physical product even exists. Through tightly integrated analyses, this plan is communicated to product testing, manufacture, and service teams – ensuring that each lifecycle stage is accountable to upholding the quality standards established during planning. Quality planning involves:

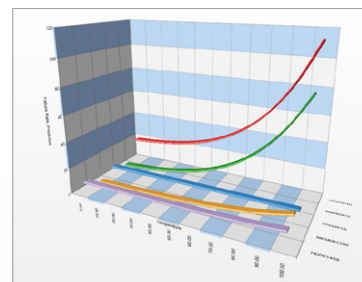
- Defining and balancing product requirements for function, safety, performance, and cost
- Analyzing product reliability and risk against requirements early during system design, to identify and correct potential quality issues before they emerge
- Identifying areas where product testing is needed, and specifying a test plan based on costs and resources
- Establishing controls to mitigate or eliminate potential risks from manufacturing, assembly, or installation
- Planning for service and maintainability needs to ensure quality throughout fielded use
- Establishing a mechanism to collect feedback on product performance and safety from testing through fielded use
- Communicating a quality plan by efficient, automated, and traceable means to teams responsible for execution
- Establishing a feedback loop from quality execution teams to track whether product requirements are being met
- Improving the quality plan by incorporating feedback from other lifecycle stages



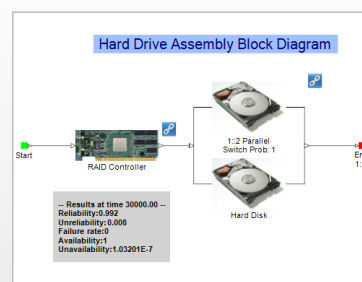
Evaluate and manage product risks with [Windchill FMEA](#) (Failure Mode and Effects Analysis) and trend key, risk-related metrics like criticality, priority, and the effectiveness of risk control measures.



Analyze product risks as they relate to high-level functions with [Windchill FTA](#) (Fault Tree Analysis), identifying the minimum combination of events necessary to experience a failure.



[Windchill Prediction](#) links directly to a system's BOM (bill-of-material), ensuring that the latest failure rate information for each part or subsystem is readily accessible.



Advanced system designs considering spares, maintenance, and cost are created and analyzed using [Windchill OpSim](#) (Optimization and Simulation), which includes sophisticated Reliability Block Diagrams (RBDs).

Solutions for quality execution.

Fulfilling the quality plan

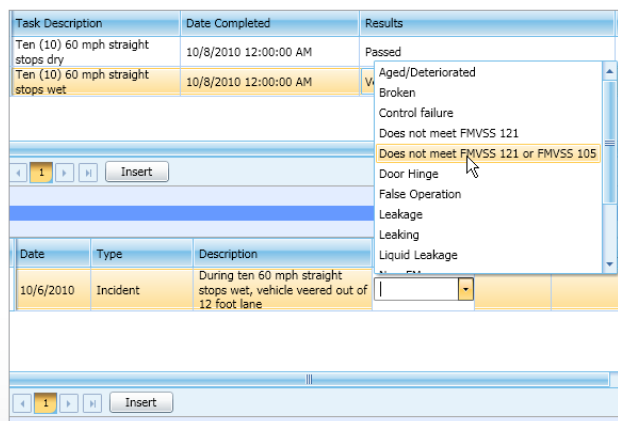
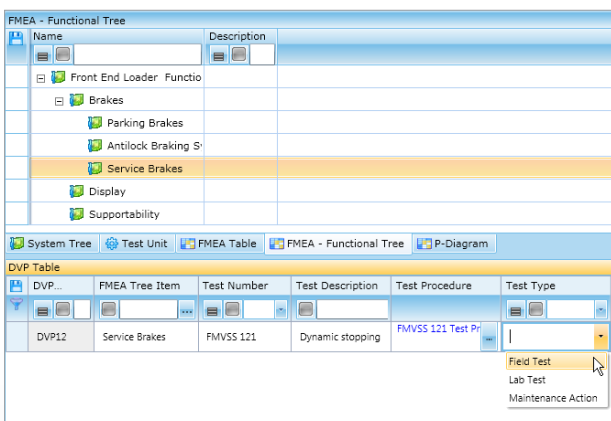
The execution phases of the product lifecycle—testing, manufacture, and service—are all responsible to meet the requirements established in the quality plan. But they’ve got help. Through powerful software automation, QLM ensures the constant, instantaneous flow of quality-related information between teams responsible for design, testing, manufacture, and service.

Enterprise-wide integration of quality management processes

The test plan defined during quality planning—including specifications, pass/fail requirements, resource needs, and scheduling—is communicated through automated software integrations to the team responsible for product testing. Upon completing the test, results are communicated, through the same means, back to the design analysis on which the test is based—alerting the design engineer as to whether the part or product in question passed or failed the test.

Likewise, during the quality planning process, critical product characteristics are identified to help pinpoint which manufacturing, assembly, or installation processes may pose risks to product quality, reliability, and safety. To control these processes and protect product quality, specialized manufacturing control plans are output directly from the design to manufacturing teams through software-driven integrations. These plans define benchmarks, tolerances, work and assembly instructions—ensuring that production fulfills the strict quality requirements established during planning.

Finally, service planning activities completed as part of the quality planning phase of product design are communicated to the teams responsible for servicing products. Where maintenance activities are found that could either improve or threaten product reliability, relevant service instructions are communicated and service plans are implemented. Valuable cost analyses completed during quality planning inform service activities like maintenance, spare parts purchasing, and so on to optimize both cost and quality.



Critical software integrations communicate the test plan from design engineers – created in [Windchill FMEA](#) (at left) – to test engineers working in [Windchill FRACAS](#) (Failure Reporting, Analysis, and Corrective Action System), where results are captured and sent immediately back to the design analysis from which the test plan was created.

Solutions for quality improvement.

Quality improvement is an ongoing process that takes place throughout the product lifecycle. Critical insights gained from test results, nonconformances experienced during manufacture, and real-world product performance observed during fielded use all hold the key to improving product quality for current and future designs.

Collecting Feedback

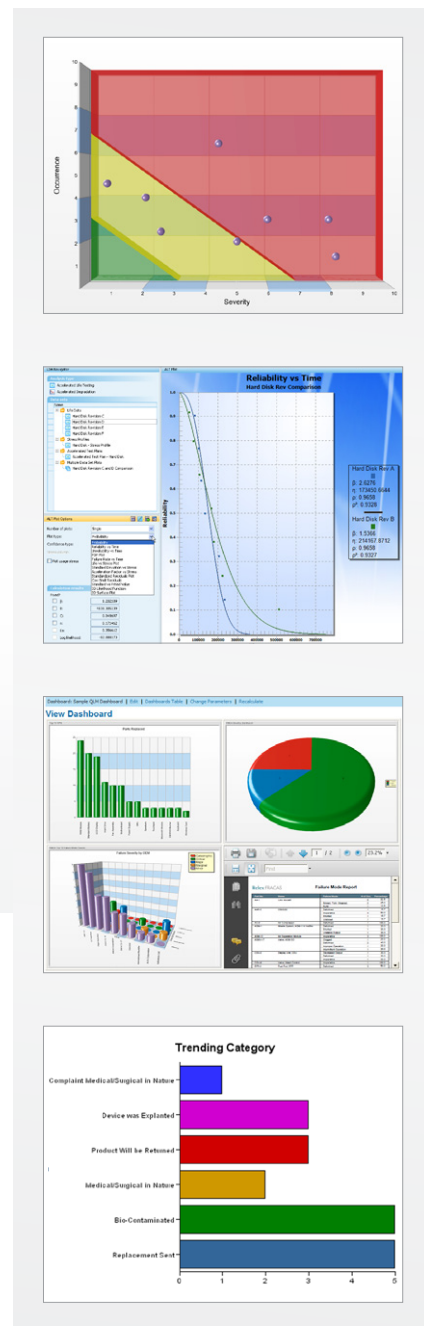
QLM doesn't end with quality execution. As test plans are carried out, products are manufactured, and service planning is implemented, real-world results are captured from each stage in a uniform, intuitive software solution that is flexible enough to accommodate a wide range of failure information.

Identifying Corrective / Preventive Actions

Once quality issues are captured, they may be advanced through powerful, closed loop software workflows incorporating any relevant personnel across the enterprise. All quality issues undergo a rigorous process of trending and evaluation to identify criticality, root cause, and corrective or preventive actions to resolve nonconforming results in current and future products.

Communicating Best Practices and Lessons Learned

Identifying corrective or preventive actions to address a quality issue one time is not enough. Best practices and lessons learned are also captured, stored, and communicated through QLM in order to establish a new knowledge baseline to effectively improve current and next-generation products and services. Powerful, software-enabled integrations deliver this knowledge directly to the lifecycle stage where it is relevant: planning, design, test, manufacture, or service.



Powerful graphing and reporting functionality quickly outputs up-to-date quality, reliability, and risk metrics – like this Risk Matrix from [Windchill FMEA](#) – to key stakeholders in product quality across the organization.

Dynamic probability plots from [Windchill Weibull](#) and [Windchill ALT](#) (Accelerated Life Testing) analyses help engineers visualize real-world data from test or field failures captured in [Windchill FRACAS](#).

Dashboards place key quality metrics right at the fingertips of executive-level management across the organization via the web-based technology available in [Windchill FMEA](#) and [Windchill FRACAS](#).

Interactive ad hoc reports and graphs in [Windchill CAPA](#) enable trending, drill-down, and visualization of quality issues.

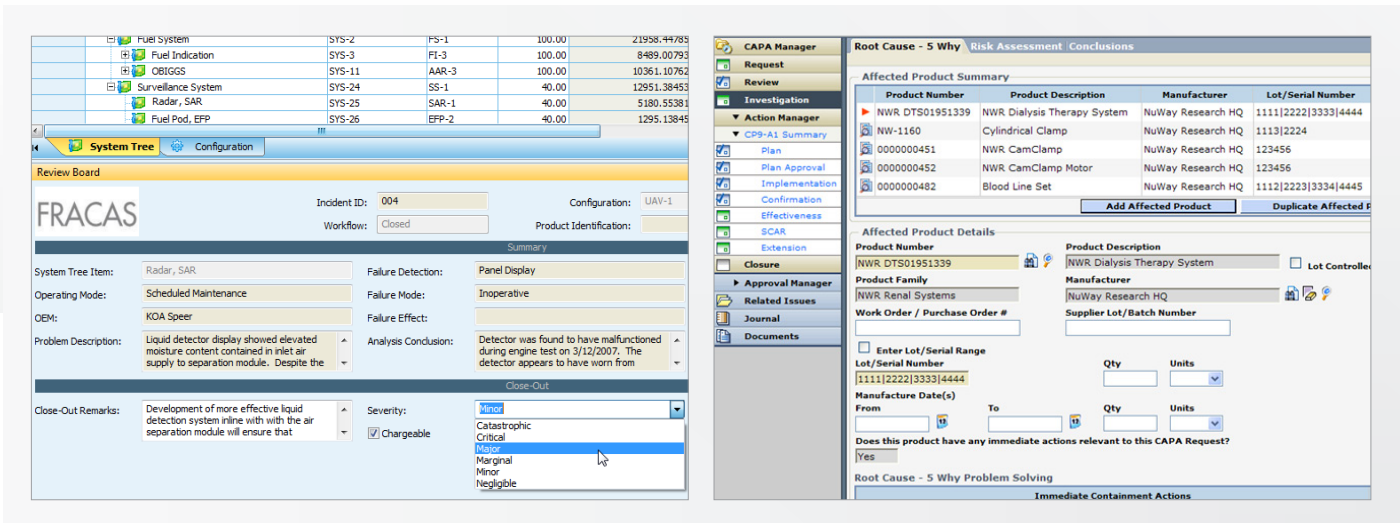
Solutions for quality governance.

Executive-level quality governance

As with any large-scale business initiative, QLM is only effective with leadership support, planning, and guidance throughout its implementation. By establishing enterprise-wide quality guidelines and standards, monitoring and trending the effectiveness of these quality improvement efforts, and communicating audit results to key management teams throughout the organization, quality governance oversees the business processes used to ensure product quality.

Quality governance is often required in regulated industries like medical devices, as well as in companies that embrace quality initiatives like Six Sigma, APQP, CMMI, and ISO 9000 / 9001. Powerful software solutions that integrate seamlessly as a part of QLM are used to capture and manage process quality data, provide high-level management insight into product and process performance metrics, complete highly structured audits and reviews, and connect these to vital company-wide training efforts.

Windchill Quality Solutions uniquely combine quality planning, execution, improvement, and governance in a single, fully integrated software suite, ensuring that every level of the organization is equipped to manage and improve product quality.



Within Windchill FRACAS, manage internal review board processes to ensure corrective actions are approved and implemented; likewise, assign review and approval workflow steps within Windchill CAPA to ensure compliance with a wide range of regulatory standards.

Quality and the product development lifecycle: the PLM connection.

Ensuring product quality is an enterprise-wide effort. Therefore, delivering critical quality information where it is needed across the multitude of departments, teams, and services responsible for the product lifecycle is no small task. PLM – or product lifecycle management – is designed to manage the whole product development process from inception to end of life. And since the issue of product quality touches nearly every lifecycle stage and key stakeholder, QLM is a natural extension of PLM.

A single source of truth

Windchill Quality Solutions extend the PLM functionality of the proven Windchill platform to include QLM. This provides companies with a single source of truth for product data that connects vital product development information with critical quality information relevant to every lifecycle stage.

Highly visible

With product information—including critical quality data—stored in a single, widely accessible database solution, teams around the corner or around the globe are connected to the information they need, to support decision-making at any level that impacts quality: from product development through high-level management.

Critical information

Information related to potential product risks is essential when designing or redesigning those products. Likewise, up-to-date product design information is critical to effective product testing efforts. And without receiving crucial feedback related to test results, refining the product design to address any issues encountered in testing cannot proceed. And so on throughout the lifecycle of any product. Product development is a tightly woven fabric, with each stage inextricably linked to results from other stages. Making these connections dynamic, interactive, and automated across the organization is key to supporting critical decision-making at any level—engineer through executive.

Interoperable

Windchill Quality Solutions supply a single software platform for fully integrated risk and reliability analyses that utilize the most up-to-date version of the BOM in Windchill PDMLink and Windchill MPMLink, connecting quality information directly to the Windchill BOM. As product quality improves over the course of development, this evolution is directly linked to the evolution of the BOM in PLM. Additional integrations via robust API functionality ensure connectivity with alternate PLM systems and other enterprise-scale software products.

Scalable

Standalone modules of Windchill Quality Solutions may be used independently to address risk, reliability, and/or quality analysis needs. And when implemented together on an enterprise-wide scale, these solutions help companies manage multiple aspects of product quality in an integrated way. Windchill Quality Solutions may also be incorporated within a global PLM system to add the critical dimension of quality to product development activities.

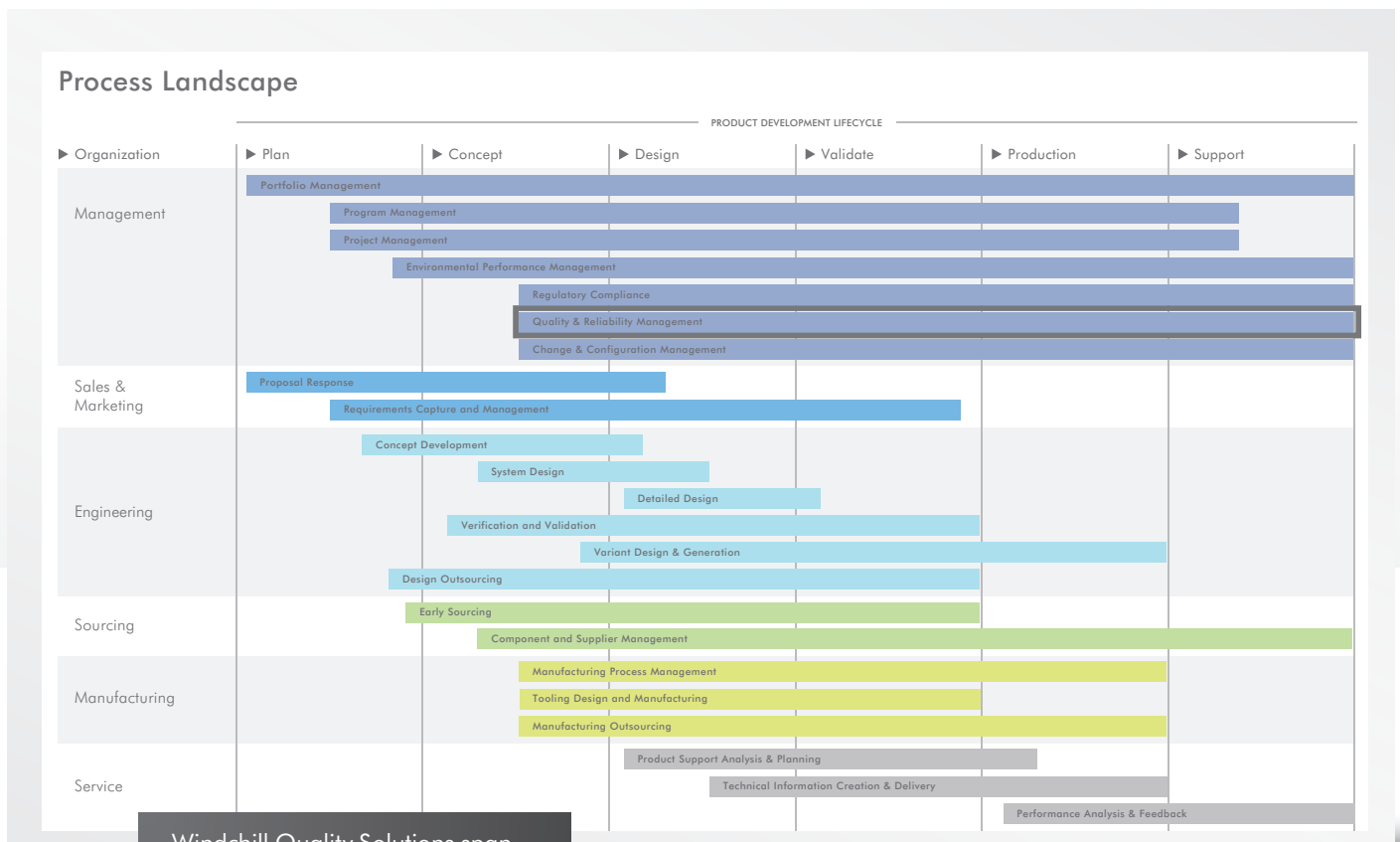
Process landscape.

Quality and reliability management is essential to supporting product development, and ultimately to helping drive business success.

PTC has a comprehensive point of view of product development, as represented in the process landscape below. This process landscape recognizes that product development is a set of highly cross-functional and distributed processes that span the life of any product, from planning through support.

Windchill Quality Solutions span nearly every product development lifecycle stage and organizational role related to:

- Planning for product reliability, maintainability, and safety
- Managing, mitigating, or eliminating product risks
- Verifying and validating product and process quality throughout test, manufacture, service, and use
- Improving next-generation products with performance analysis and feedback from every lifecycle stage



Windchill Quality Solutions span the product development lifecycle.

The power of PTC

PTC PROVIDES LEADING PRODUCT DEVELOPMENT SOLUTIONS TO MORE THAN 25,000 CUSTOMERS WORLDWIDE.

Software products

- Broadest integral suite of solutions that enable companies to:
 - Create product information
 - Collaborate in a globally distributed environment
 - Control product development processes
 - Configure product content
 - Communicate product information to multiple systems and audiences
- Rigorous testing to ensure that products work together – and work for you
- Designed for incremental deployment to ensure successful adoption

Product development processes and initiatives

- Unique process-oriented approach to product development to deliver maximum value
- Technology-enabled process optimization to advance defined customer business initiatives
- Product Development System supports end-to-end processes to accelerate deployment time and reduce cost

Industry solutions

- Extensive expertise across a broad range of industries
- Demonstrated customer success in providing tailored solutions for specific industry needs
- Solutions support industry-specific business processes both within the enterprise and across the supply chain

Services & support

- Product development consulting to define and develop best-in-class processes
- Assessments and implementation services to deploy technology with minimum disruption

- Education curricula to accelerate adoption and boost productivity
- Global maintenance support that delivers the right team, tools and technology – available anytime, anywhere you need them for product development success

Windchill Quality Solutions enable companies to connect the quality processes throughout an organization and align product performance, reliability, and safety with the internal or external requirements set for them, while recognizing that product quality is closely related to process quality. With over 4,000 customers and 50,000 licenses worldwide, Windchill Quality Solutions have been helping customers advance product quality throughout a wide range of industry verticals.

To learn more, please visit our website at: PTC.com/products/windchill/quality.

Complete Product Development System

PTC's integral Product Development System delivers the key capabilities manufacturers need to realize more value from product development. And our proven, incremental implementation approach can help companies of any size accelerate adoption, minimize risk, and speed time-to-value.

Creo™ Elements/Direct™

Direct CAD & PDM Software

Creo Elements/Pro™

Integrated 3D CAD/CAM/CAE Software

Creo Elements/View™

Visual Collaboration Software

Windchill®

Product Lifecycle Management (PLM) Software

Arbortext®

Dynamic Information Delivery Software

Mathcad®

Engineering Calculation Software

Windchill Product Analytics (formerly InSight)

Product Analytics Software

Windchill Quality Solutions (formerly Relex)

Quality Management Software



Windchill Quality Solutions

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