ptc

arena

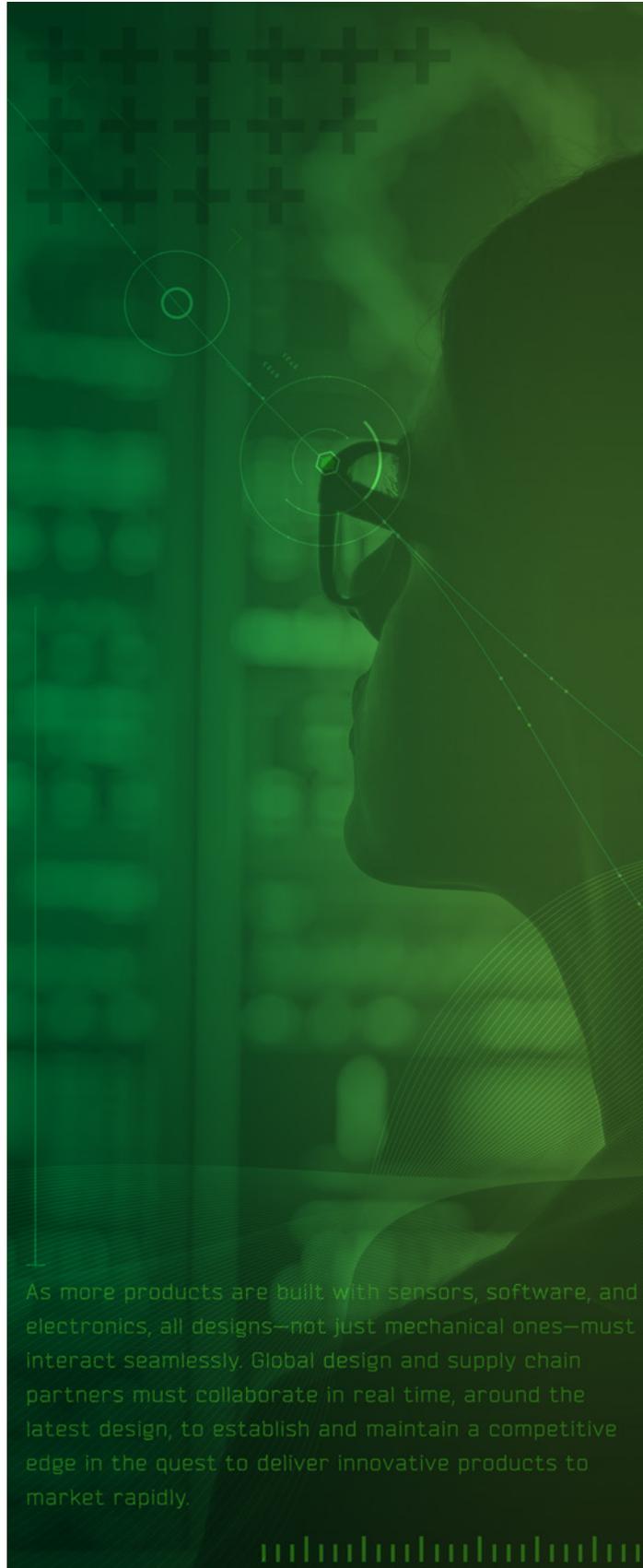# PLM vs. PDM: Why Product Lifecycle Management Is Required Today

Product Data Management Solutions Only Solve Part of the Problem

As more products are built with sensors, software, and electronics, all designs—not just mechanical ones—must interact seamlessly. Global design and supply chain partners must collaborate in real time, around the latest design, to establish and maintain a competitive edge in the quest to deliver innovative products to market rapidly.

WHITE PAPER

MODERN PRODUCT DEVELOPMENT

In the past, mechanical engineers created designs and shared them with internal teams on the shop floor, often within the same building. Iterative changes to the designs were introduced during prototyping, as needed. Throughout the process, mechanical engineering, manufacturing engineering, component engineering, and procurement teams worked closely together to ensure that designs were manufacturable, cost-effective, and compliant to regulations.

> " We had to be able to iterate quickly on designs, track changes, and link related product information to scale and speed marketability.
>
> —Ratana Lee, Senior Manager, NPI Master Archivist, NEXTracker

However, connected technologies have changed product development dramatically. Fewer products involve mechanical-only designs as companies try to leverage many new technologies aimed at connecting people, data, and products. In addition, design teams are more distributed and often involve external partners. As more products are built with sensors, software, and electronics, all designs—not just mechanical ones—must interact seamlessly. Global design and supply chain partners must collaborate in real time, around the latest design, to establish and maintain a competitive edge in the quest to deliver innovative products to market rapidly.

HOW WE GOT HERE

- **Product complexity is greater than ever:** Incorporating electronic and software components into traditional mechanical designs has led to additional requirements, more complex integrations, and the need for interoperability. Mechanical engineering teams must stay aligned with electrical and software design teams to avoid costly design errors and new product development (NPD) delays.

- **The pace of innovation is increasing:** The Internet of Things (IoT), robotics, augmented reality (AR), virtual reality (VR), and other new technologies are pushing the limits to design and manufacturing. Highly dispersed teams must be able to move rapidly through the entire product lifecycle while avoiding product design, quality, and manufacturing issues.

- **Outsourcing is the norm:** Today, most companies heavily outsource with multiple contract manufacturing (CM) partners, suppliers, and design partners. While outsourcing allows for more specialization, it also introduces significant challenges. Without a way to securely manage, share, and collaborate around the entire product design, teams risk confusion that can lead to building or shipping the wrong revision of products.

- **Regulatory and environmental compliance requirements are demanding and evolving:** To ensure compliance with an increasing number of standards or regulations—including ISO, FDA, RoHS and REACH—today's complex product companies need to track and manage compliance effectively.

In this demanding global economy, companies must find innovative ways to optimize the path from design to production to ensure success.

Arena invented software-as-a-service (SaaS) product lifecycle management (PLM). Today, Arena offers a wide-ranging set of solutions to speed product development and launches. We understand the daily challenges companies face in turning designs into real products, and we have sold to more than 1,300 companies in the high tech, consumer electronics, and medical device industries.

THE EVOLUTION OF TOOLS

As the nature of product development continues to evolve, manufacturers must keep pace with technology to deliver innovative, high-quality products fast. There are many tools and solutions used by design and manufacturing teams, including mechanical CAD (mCAD), electrical design automation (EDA/eCAD), product data management (PDM), and enterprise resource planning (ERP). These solutions all play roles in the NPD and new product introduction (NPI) process, but none were designed to aggregate the entire product design comprised of electrical, mechanical, and software components, or the associated suppliers, drawings, specifications, and files. Furthermore, these types of solutions were not created to speed engineering change processes with secure, real-time collaboration among distributed teams and supply chains.

mCAD

Mechanical engineers take product requirements and transform them into effective designs using mCAD software. The design output is managed in drawings, 3D models, and other files. The assembly can also include the bill of materials (BOM), but it's the BOM for mechanical design only.

EDA/eCAD

For products with electrical components, electrical engineers create designs with EDA tools. These designs include schematics, Gerber files, netlists, and electrical BOMs. Ensuring interoperability between mechanical and electronic assemblies is a complex and time-consuming endeavor.

PDM

PDM tools are often employed to manage mechanical designs within a shared engineering workgroup. PDM provides a data repository for mechanical designs by allowing multiple engineers to collaborate, share files, control the checkout and check-in processes, and eliminate overwriting any version of the design accidentally. PDM tools are primarily used by mechanical engineering teams to coordinate efforts with each other during the design phase.

PLM

PLM is designed to speed the entire concept-to-production process by bringing the engineering designs together and sharing these beyond the individual engineering workgroups. As the rest of the product team members get involved—from quality to manufacturing to procurement—everyone can review the entire design and provide their input before releasing the final product and starting the planning and product
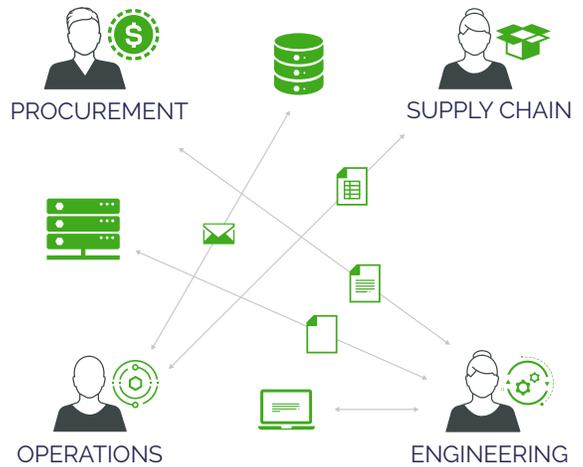
process. The innovative designs, in the form of 3D models, drawings, specifications, and schematics, will be married together in PLM and transformed into products after many iterative design changes have been made. Each member of the product team will do their part to make sure cost-effective and compliant components can be sourced, built, and shipped to meet the customer demand. PLM will manage all items, assemblies (BOMs), engineering change orders (ECOs), approved manufacturers and vendors lists (AML/AVL), and compliance status. For a product to be manufactured at a low cost, on time, and with high quality, mechanical design teams must collaborate with electrical and software design teams, component suppliers, and even contract manufacturers. Everyone involved in designing, testing, and producing the final product must be able to work together in a single system. mCAD, PDM, and other design tools are not cloud-based or intended to be used by non-technical teams outside of engineering.

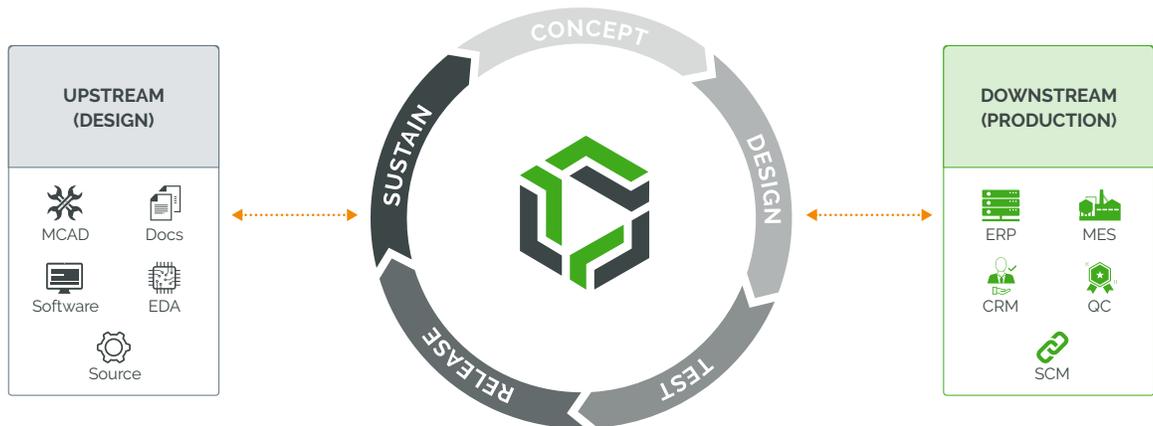| Solutions	Core BOM Definition	Structured Relationship	Pre & Post Production Revisions	Control Files & Documents	Engineering Change Processes	Supply Chain Collaboration	Sourcing & Compliance	Integration to Design & Manufacturing	Extended Processes
Spreadsheets	●	●	●						
CAD	●	●	●	◐					
PDM	●		●	◐	◐			◐	
ERP	●	●	◐				◐		
PLM	●	●	●	●	●	●	●	●	●

THE PROBLEM

Spreadsheets, CAD, ERP, or point solutions are used by engineering and production teams. Companies that rely on patch-quilt solutions, ranging from spreadsheets to documents to social collaboration or file storage apps, find themselves with too many silos that are disconnected from a controlled product record.

PROCUREMENT

SUPPLY CHAIN

OPERATIONS

ENGINEERING

THE SOLUTION

PLM bridges the gap to ensure the entire design works well together with a high degree of quality and under cost targets. Ensuring interoperability is easier when the electrical, mechanical, and software solutions are brought together into a single system for all teams to review.

UPSTREAM (DESIGN)

MCAD
Docs
Software
EDA
Source

CONCEPT
DESIGN
TEST
RELEASE
SUSTAIN

DOWNSTREAM (PRODUCTION)

ERP
MES
CRM
QC
SCM

MANAGING COMPLEX BOMS

A typical BOM comprises thousands of electrical, mechanical, and software components. It is highly relational and includes everything needed (like a recipe) to build the finished product. For complex BOMs, companies need more intelligent BOM management solutions that modern PLM systems can provide. Throughout the development process, the BOM and its components change often, requiring testing between each aspect of the design.

Before cloud-based PLM, product companies relied on spreadsheets, documents, and repositories to manage changes to the BOM and related product information. This information was then shared via phone, fax, or email, with no way to ensure that the data was current and accurate.

This made remote collaboration challenging and slowed time to market considerably.

In addition to spreadsheets, companies also used a variety of other static applications not specific to the needs of manufacturers, such as Microsoft Word, PDF files, and plain text files, to record and share product information. All fell short in effective change control and information sharing.

Though many companies have evolved their processes from that point, there is still a misconception that enterprise resource planning (ERP) systems can be used to manage all product information after design—including changes and communication. Unfortunately, even though the final production BOMs, the item master, and costing information are ultimately loaded into ERP systems, these systems do not have integral processes for engineering change orders (ECOs) or file management. Therefore, they cannot be used to control BOM or item changes or to manage associated files. Furthermore, as a tool primarily for internal groups, ERP systems cannot be used by external partners and suppliers to obtain product information.

Additionally, during the product development and manufacturing process, it is often useful to trace back the changes to specific revisions of the BOM and make design or part comparisons. It is nearly impossible to do so with a collection of BOM revisions in different spreadsheets.

Securely Extend to Your Supply Chain Team

Your product processes involve multiple teams, locations, partners, suppliers, and vendors. These dispersed teams must comply with the latest regulations and standards. They need to work from the same design, stay on budget, and respond to customer demands. Ensure processes are followed and everyone is collaborating.

Worldwide

66%

of customers and their supply chain partners use Arena from outside the United States every day

Industry Standard

92%

of top EMS providers in the industry access Arena customer systems for product collaboration

THE GAP BETWEEN ENGINEERING AND MANUFACTURING

There is a gap between engineering design tools with PDM vaults and the complete product record for all aspects of the design with associated documents, specifications, and drawings. Design systems are not created to enable non-engineering teams and supply chain partners to access information in a way that can be controlled and reviewed easily. When left unaddressed, this gap impedes the process of turning innovative designs into marketable products due to the following issues:

- **Wasted time:** Mechanical engineers have to spend more time looking for and compiling the right design data and product information for the downstream supply chain activities including sourcing, planning, manufacturing, and ensuring environmental and regulatory compliance. This reduces their ability to focus on pure innovative designs. Without a single, shared source of truth (PLM system) to collaborate, engineers have to address many questions.

- **Inability to share with external partners:** Much of the product information resides, and is only accessible, inside the firewall. Suppliers are not able to directly access the latest product and assembly information, making it difficult for them to stay aligned with evolving designs.

- **Lack of visibility early in the design process:** Similarly, without direct access to product information, contract manufacturers lack the necessary visibility required to provide valuable feedback on the manufacturability of a design early in the process. As a result, more costly design changes are made further into the development phase.

- **Building to the wrong revision:** Without a single system for the entire product record and associated ECOs, CMs are not able to source and build the latest revision of the product. This drives up the cost of goods and results in more scrap and rework or field service issues when the wrong revision of products ship to customers.

- **Compliance problems:** Meeting ever-evolving regulatory compliance standards and laws increases the need for greater collaboration between engineering, purchasing, and manufacturing teams. Without the ability to track and ensure compliance, companies take more risks that can result in penalties, fines, lawsuits, and even harm to customers.

BRIDGING THE GAP

Having a single system for the entire product record bridges the engineering design and manufacturing world. For maximum efficiency, systems should be easy to deploy, configure, and access by any member of the supply chain.

Engineering teams, especially those responsible for mechanical design, have relied on many different and sophisticated CAD systems. They have been able to solve problems for shared designs with workgroups through PDM. However, those same teams now understand that with more connected technologies, it's critical to collaborate early and often with electrical and software engineering. Furthermore, they must be able to bring a

complete design to manufacturing quickly. PLM was designed to bridge the gap and provide a clean hand-off from engineering to manufacturing.

PLM helps all key stakeholders in the product development and launch process to better control the design, share ideas, and eliminate delays getting products to market. Here are the keys to speeding product launch time:

- **Access to latest design:** Everyone has the appropriate level of access to the latest design files.

- **Faster reviews and approvals:** Automated change control processes ensure that teams get proactive notice to review and approve changes to the product design. These electronic change processes provide better traceability (or an audit trail) between all revisions of the product, quality issues, and all internal and external teams.

- **Reduced cost and overhead:** With earlier access to the entire product design, CMs can provide feedback on manufacturability issues and/or suggest potential ways to cut costs (e.g., changing suppliers or component sources).

- **Improved compliance:** PLM offers connected information from the company-specific part number to the source AML number, through the AVL (purchased) number. Cloud-based PLM solutions have business-ready integrations to component databases like SiliconExpert and Octopart to make it easy to find, source, and use parts that meet environmental compliance standards like RoHS and REACH.

> " We get terrific feedback from the give and take of the review process. Indeed, partners have provided feedback that helped us avoid making unnecessary, confusing, or costly changes.
>
> —David Sangster, COO, Nutanix

CAD WITH PDM DRIVES DESIGN, BUT PLM SPEEDS COMPLETE PRODUCT LAUNCH

Every design team needs one of several mechanical, electrical, and/or software design tools, but they all need a single solution to bring the design together for sharing with the extended product teams. The days of working in siloed design teams and throwing designs over the wall to manufacturing are gone. With new connected technologies like IoT, AR, VR, and robotics, electronics and software play critical roles in product development. Being able to assemble the design and ensure interoperability at every step of the NPD and NPI process is key to success.

NPD → **NPI** →

CONCEPT — DEVELOPMENT — LAUNCH

NPDI PROCESS

Arena's cloud-based PLM solution was designed to help complex product companies with distributed teams and global supply chains interact in real time anytime and anywhere. Arena invented SaaS PLM and has driven innovation for more than 1,300 companies across the globe. Companies today require systems that are easy to deploy, configure, and maintain. Arena helps small to global-sized companies scale their development and production operations by making it simple to use and connect to existing upstream and downstream systems.

So, if you're tired of trying to get by with yesterday's tools that create team and product silos, check out Arena PLM and learn why the leading innovators rely on us to design, produce, and deliver high-quality products fast.