DIGITAL TRANSFORMS PHYSICAL

A GUIDE TO CONNECTED SYSTEMS IN DISCRETE MANUFACTURING: PLM, ERP, MES AND BEYOND

WHITEPAPER

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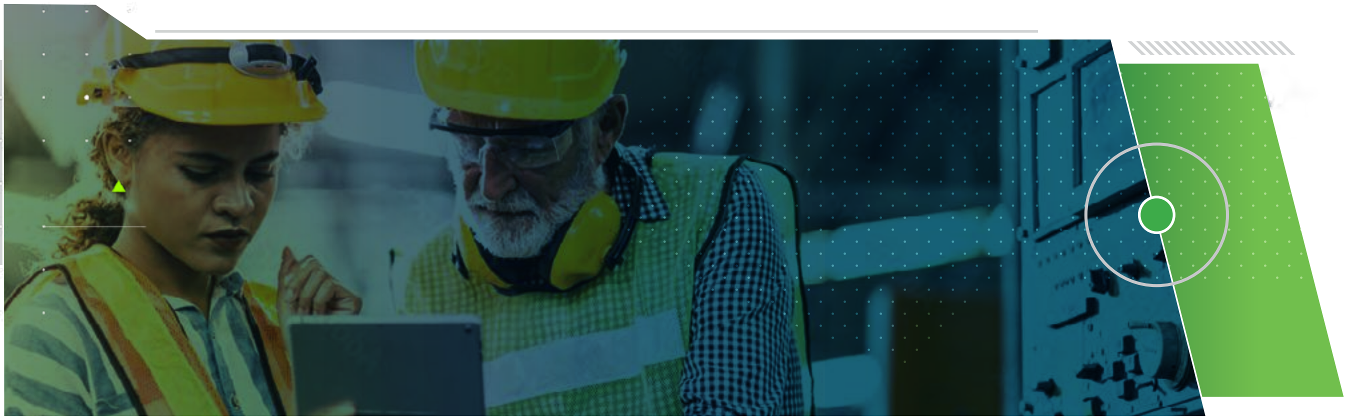
RISING EXPECTATIONS

In every industry, manufacturers are under an urgent and growing array of competitive pressures: to be first to market with more innovative products; to deliver more personalized purchasing experiences; to improve quality in the factory and field; to deliver on time, every time. These competitive challenges must be met while controlling costs, contending with supply disruptions, and responding to demand fluctuations.

To address these demands, a wide variety of new and maturing software technologies are evolving, each intended to help realize the elusive promise of digital transformation. This dynamic places a heavy and complex burden on IT (Information Technology) teams, themselves under constant pressure to support the enterprise and its business goals. Where progress has been made, it's generally been siloed, with work sequestered in a “field-of-action” approach with overlap between improvement initiatives. But the companies furthest along in their overall digital transformations have delivered important capabilities to their organizations through cross-functional alignment with the overall business strategy. Achieving those results required tying together data and processes across their strategic manufacturing support systems, including PLM, ERP, and MES.

This paper is intended to guide IT and business leaders toward that alignment. First, it will discuss how to properly identify the company's collaboration needs based on business model and product complexity. Then, with needs effectively inventoried, it will introduce a proven, step-by-step process for delivering the right tools for integrating and configuring PLM, ERP and MES environments to meet them.

The result will empower R&D with dependable, real-time information, augmented by automation, to fuel fast and seamless global execution. These teams will be enabled to work concurrently, and more effectively than ever, with their counterparts in the factories, in logistics, and in procurement.



CHALLENGES OF MODERN MANUFACTURING – GLOBAL FACTORY PRODUCTION

Global competition has intensified, and product innovation is only profitable if you get to the market first without compromising quality. How can you seamlessly integrate product and process changes (NPI (New Product Introduction) or New Product/Process Improvements) within this legacy IT landscape? It's evident that manual handovers and data duplication in ERP, PLM, and MES systems degrade quality, add costs, and increase lead times and latencies, resulting in mismatching, and impairs meeting customer requirements due to poor traceability. It's hard to scale the business in such an inefficient environment. Shop floor capacity can't be doubled, for instance, without doubling the number of personnel inputting data.

Lack of transparency exacerbates change management issues. The manufacturing systems that exhibit these issues were designed for 30-year manufacturing veterans. But manufacturers today have a workforce comprised largely of three-year veterans, with 30% of frontline employees having less than one year's experience. And this trend is accelerating even as products become more complex, and as rates of change are climbing.

Larger portfolios engender more quality issues. To keep making gains in quality, productivity, and sustainability, manufacturers urgently need to empower the new generation of front-line workers with the most effective product and process insights, when they need them, and where they'll have the most impact. This will eliminate non-value-added time spent on finding information, and also provide frontline workers the tools to continuously identify, prioritize, analyze, and solve the choke points in their daily jobs. Only when they're set up for success can these workers drive continuous improvement.

Weak governance requires frequent, redundant communication. Inefficiency reigns. To achieve those improvements - to reduce cost and improve quality - manufacturers must continuously fine-tune the operational efficiency of their products, processes, and resources, but also evaluate and optimize product and process design on an ongoing basis. The former usually has a bigger impact on labor costs and processing cost while the latter has bigger impact on materials cost. In general, 70% of the cost of any product is determined in the engineering stage.

Where systems are not integrated, engineers must do triple the work, entering the same data in PLM, MES, and ERP. The probability and size of quality problems are impacted by a lack of traceability. For example, manufacturers might have to recall a wide window of possible, suspect product because they didn't know what configuration they were shipping on a given day. Too many sources of information result in low quality and low efficiency. Incorrect configurations are used because when a change takes effect it is not communicated appropriately. Products may then be built incorrectly, resulting in a defect that either the customer or manufacturer needs to catch as the product is prepared for shipment. Even with connected systems, these disruptions can seem to arise without warning.

Faced with any of these issues, how do you handle a modular configurable product throughout the value chain without automation across the network? How does the manufacturer find a supply alternative, while simultaneously addressing shifting business priorities, accelerating time to market, and improving quality? How can they ensure that the latest software version is available on the assembly line without changing the BOM? What's the impact on testing? What if the factory is hacked? How are appropriate levels of cybersecurity and IP protection ensured?

There are real, measurable costs to these challenges, but perhaps the largest – and most intriguing – are the opportunity costs. How much better could the business do – put starkly, how much more money could be made – if these issues were resolved?

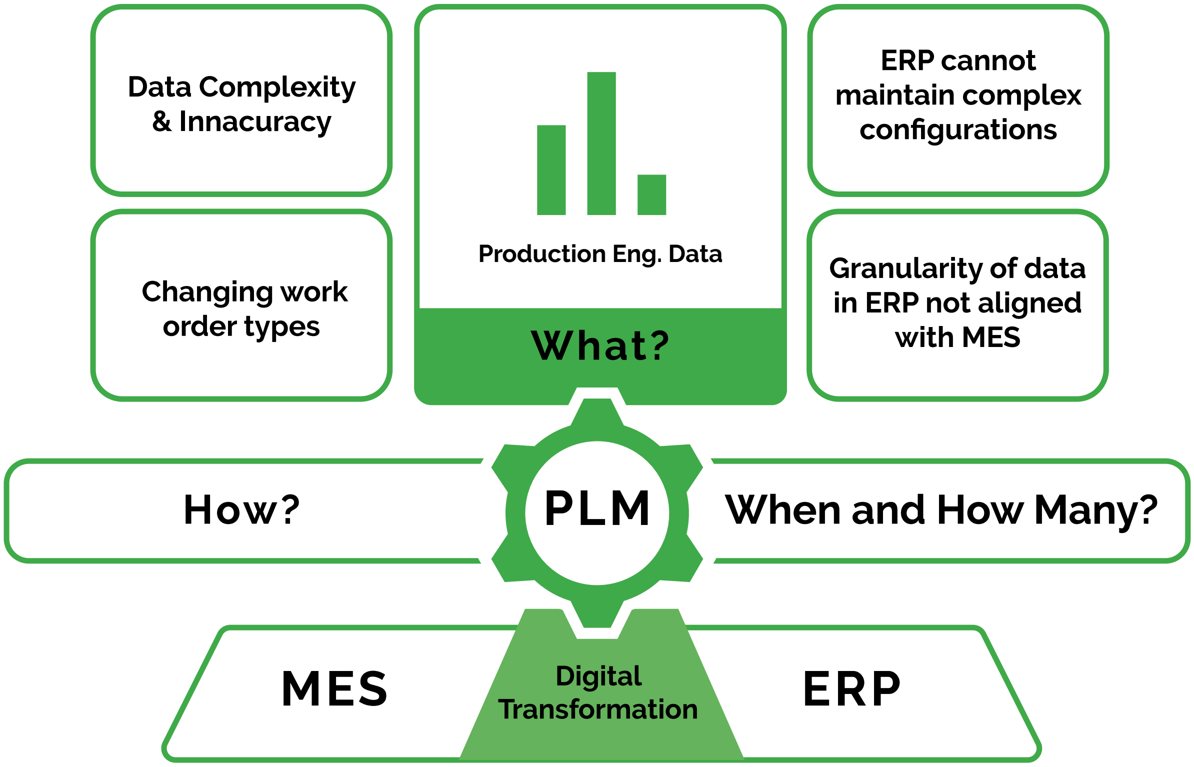
FIXING THE BROKEN TOOL CHAIN AND INFORMATION

To gain speed and synergies, manufacturers need to rethink the automation stack and establish a virtual collaboration platform. This requires that they incorporate PLM from the very beginning of the product innovation process and throughout engineering and manufacturing preparation, rebalance the boundaries between ERP, PLM, and MES, and connect everything that matters in product development and manufacturing via a digital thread. To be future-ready, manufacturers must evolve from point to point to real-time integrations.

Manufacturing engineering generates vital data, ranging from the manufacturing bill of materials, routing/process planning, quality control characteristics, standard work instructions and standard time. This phase of engineering plays an indispensable role not only in product development and manufacturing value chain, where the focus is on time to market, quality, and efficiency, but also in the supply chain logistics value chain ensuring on-time and on-cost delivery.

Equally vital is the seamless synchronization of changes across the product lifecycle, between downstream manufacturing operations and upstream engineering. While traditionally, the management of production engineering data and processes has found its home in ERP systems and been passed to MES systems, the increasing complexity and rate of change requires a transition. `

First, ERP systems are not designed for the lifecycle management of product and manufacturing master data and are not capable of handling the complex configurations and high rate of change management in the discrete environment. Second, the granularity of master data in ERP geared towards a commercial perspective doesn't align with the technological intricacies needed in MES, leading to inefficiencies.

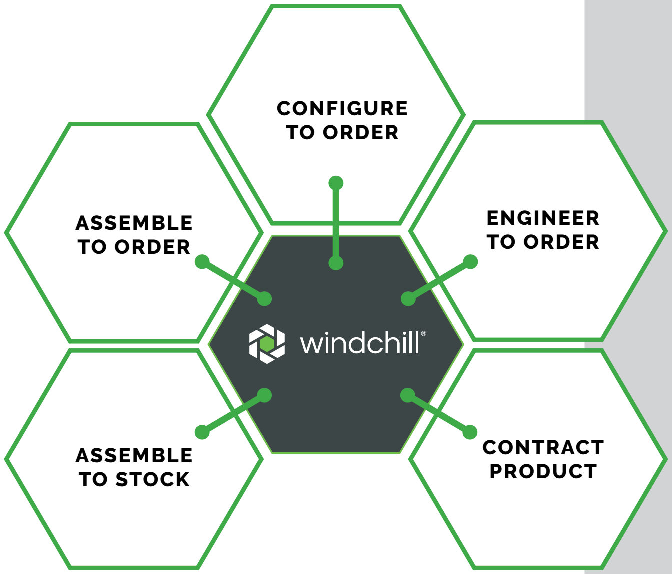


GETTING THE RIGHT DATA IN PLM TO PROPERLY FEED MES AND ERP

Your business model and product complexity will influence the best practice. However, there are always three consistent pillars to consider: where the master data is placed/ curated, configuration management, and change orchestration. Business initiatives specific to the company also have an impact. Where does your organization see key product innovations, product quality, product cost, and product efficiency opportunities?

The implementation of a process over the product, manufacturing, and logistical value chains depends on a complex array of interdependent considerations.

Amount of Order-specific Customer Engineering – Business Model



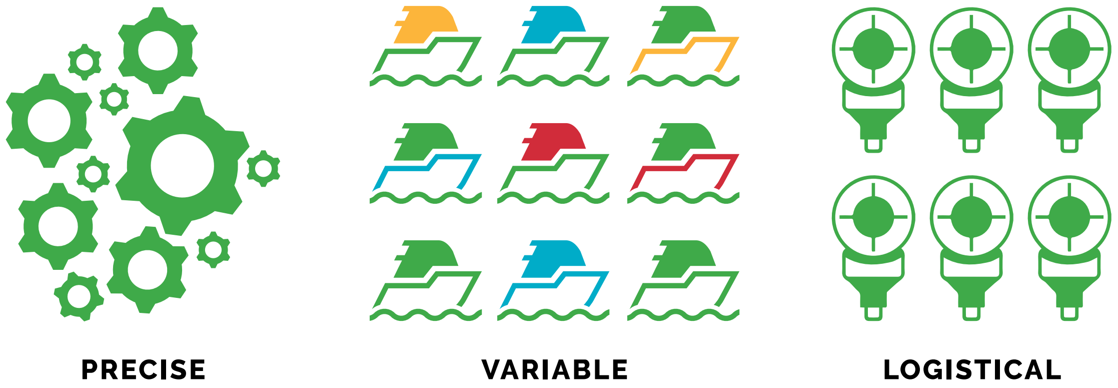
Assemble to Stock
- Products fully designed with identified options
- ERP plans productions of pre-defined options
- Identified product combinations manufactured based on forecast
- Industries: Consumer Products, Hi-Tech

Assemble to Order
- Products fully designed with identified options
- Orders configured and processed by ERP
- Industries: Automotive OEMs (Original Equipment Manufacturer), Hi-Tech, Industrial

Configure to Order
- Products fully designed with rules that allow creation of custom parts
- Each order configured & validated by PLM using rules established by engineering
- Industries: Hi-Tech, Industrial

Engineer to Order
- Significant custom engineering added to generic product
- Each order validated by Engineering and PLM
- Industries: Industrial OEMs, Auto Suppliers, Aerospace

Contract Product
- Designed and produced to meet customer or contract-specific requirements
- Each order designed and validated by PLM and Engineering
- Industries: Defense, Prototypes, Custom Tooling



Product Complexity

Precise - This may not involve a big BOM (Bill of Materials) but does require complex and precise manufacturing. Process plans can involve 25 steps, 1000 lines in process and many quality checks at certain stations. 40 to 50 parameters may be involved. An example of this is automotive gears.

Variable - Due to customization, each product is unique. Without connected systems it's nearly impossible to provide the right information on time to the workers who assemble the unique product with all its options and variants. The product you build today will be different in two days. The instructions must be 100% accurate to customer orders. Design changes for quality require the right part to be procured for the product you are producing. And worker turnover is a factor, where new workers may pick up where former workers leave. An example of this is luxury yachts.

Logistics – Commodity manufacturers must build millions of identical products every day, each meeting quality and price standards, while operating in a safe environment. In this kind of business, the planning team kicks off the supply chain process by developing demand planning and validating it with the Sales team. The planning function includes demand planning, factory supply planning, packaging development, product lifecycle management (PLM), planning process & performance, inventory management, S&OP (sales and operations planning), and more. After a demand planning meeting has occurred, the team develops production plans for the factories; and procurement will then purchase all the materials. An example of this is sensors.

GETTING STARTED: THE CORE ENTERPRISE SYSTEMS FOR PRODUCT DEVELOPMENT

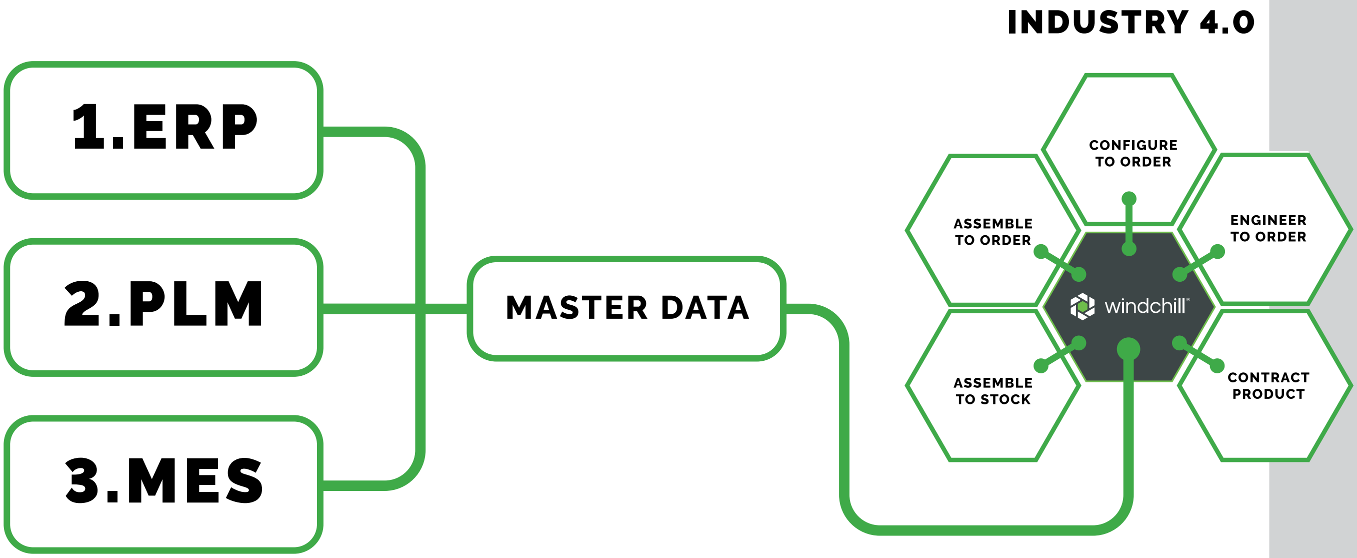
Step 1 – Managing the right data in the right tool with a common product master data approach

The first step in a seamless application integration initiative is to determine where your product master data exists today, identify it, and clean it. This helps to avoid having multiple systems mastering the same data at any given time.

ERP, for example, does not own the upstream of the product and manufacturing information, so has limited capability for creating and defining optimized manufacturing process plans for a product that is complex and that Is changing.

Furthermore, an efficient engineering change management process needs to trace back and reflect the latest changes in product design. A direct, bi-directional change management process between PLM and MES is more efficient and reliable.

Modernization starts with contextual and traceable product information with views across the entire product lifecycle.



1. PLM (Product and manufacturing engineering information-oriented data – digital assets)

a. Part master/iteration
b. Product structure
c. Electrical & mechanical CAD models
d. Software
e. Classification
f. Documents
g. Requirements
h. Simulations
i. Lifecycle state
   - Change process/when a change goes into effect
   - End of life/obsolescence
   - Problem report/change request/ change notice
j. BOM transformation (authoritative source of EBOM (Engineering Bill of Materials), MBOM (Manufacturing Bill of Materials), SBOM (Service Bill of Materials))
k. Process definition
   - Routing
   - Work instruction
   - Tooling
l. Quality specifications /issue management
   - Control characteristics
   - Non-conformance, CAPA (Corrective and Preventive Actions)
m. Resources = tooling and gages (Equipment lifecycle management)
n. AML (Approved Manufacturer List) vendor codes

2. ERP (Production planning, forecasting, sourcing, cost tracking- physical assets/ transaction oriented)

a. Physical and logistics information
   - Plant
   - Storage location
b. Sourcing
   - Approved vendors
c. Financial and accounting
   - Actual product cost
   - Current and projected sales
d. Work orders
e. Production planning
   - Order & shipment status
   - Inventory status
f. Change process that is MES related
   - Problem report (may be initiated here)
   - When change goes into effect (changed here)
g. Procurement
   - Purchased parts
   - Supplier tracking/management
h. Material movement (traceability)
i. Good received to flow stock

3. MES (Production and logistic execution/execution feedback- physical assets/event oriented)

a. Production scheduling (work order management)
b. Genealogy (as built)
c. Work instructions
d. Execution and process enforcement
e. Data collection
f. Tool and calibration management
g. Receiving inspection
h. Quality management
   - Incoming material inspection
   - Shop floor sampling plan
   - Finished good inspection

The principal benefits of first building a solid digital foundation in PLM, ERP, and MES is that as engineering is doing work, their work automatically moves downstream. Engineers can work in a single, familiar PLM system. It's about having the people do the right work in the right systems and not having to cross into different systems and duplicate the work that's already being done in one system.

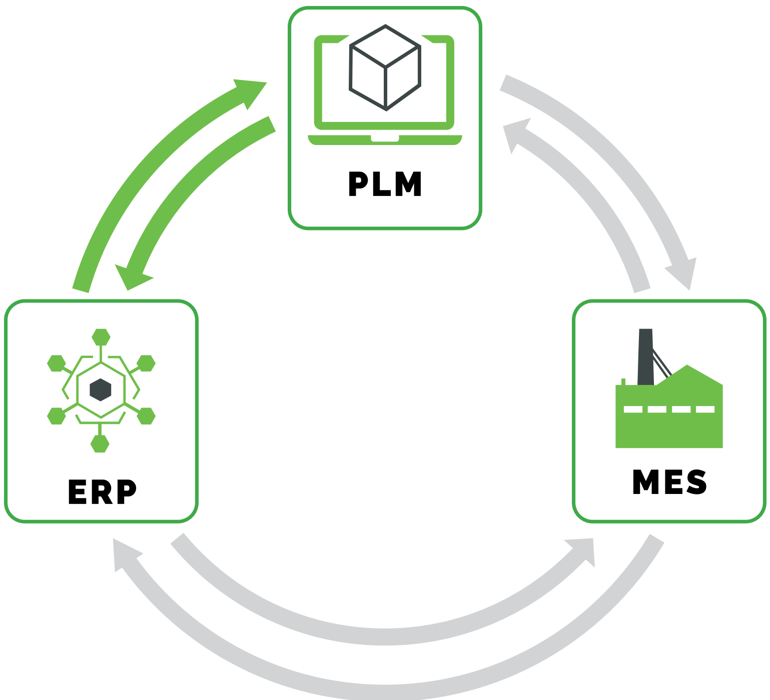
Step 2 –Creating seamless bi-directional process flows

Next, rather than get information from a colleague who has access to a system of record, stakeholders must be able to access all the product information that they need depending on their role in the product lifecycle. For example, Advanced Manufacturing Planners, Detail Process Planners, Plant and Tool Designers, Production Managers, and Shop Floor workers require access to the most up to date information from Engineering. Design Engineers themselves require real-time feedback from Manufacturing.

The ideal future state involves integrating the flows, and not the data, by providing access to PLM data into and from existing MES and ERP systems with a single source of truth. Manufacturers should avoid having multiple systems mastering the same data at any given time. Each system should be provided only with the data it needs to do its work. With connected systems, it's typically important to understand how much definition you plan to pass to each system; where one stops and the next starts. This will allow users to turn data into insights, helping drive aligned decision making and automated process orchestration across engineering and manufacturing. The goal is to close the loop with built in automation and reporting capabilities that covers all phases of manufacturing, especially MES.

Christian Willmann (Vaillant) – Importance of Master Data Quality

Ensuring the quality of master data in both PLM and ERP is critical for Industry 4.0 on both digital and physical items. This must include a maturity definition or status concept across the product life cycle, business rules, reference materials, MRP (Manufacturing Resource Planning) profiles and supply chain patterns. Think about embedding your organization into role-based workflows in both engineering (PLM) and downstream processes (ERP). Based on mandatory PLM and ERP integration only, this step ensures the high quality of part data in PLM as well as automated enrichment of ERP master data. The manufacturer will fail to achieve the full potential added value of a PLM implementation without having an integrated concept of master data quality. Based on Vaillaint's status concept and business rules it could automate 80% of needed material master data - what have been manual (copy/paste/trial & error) work before.

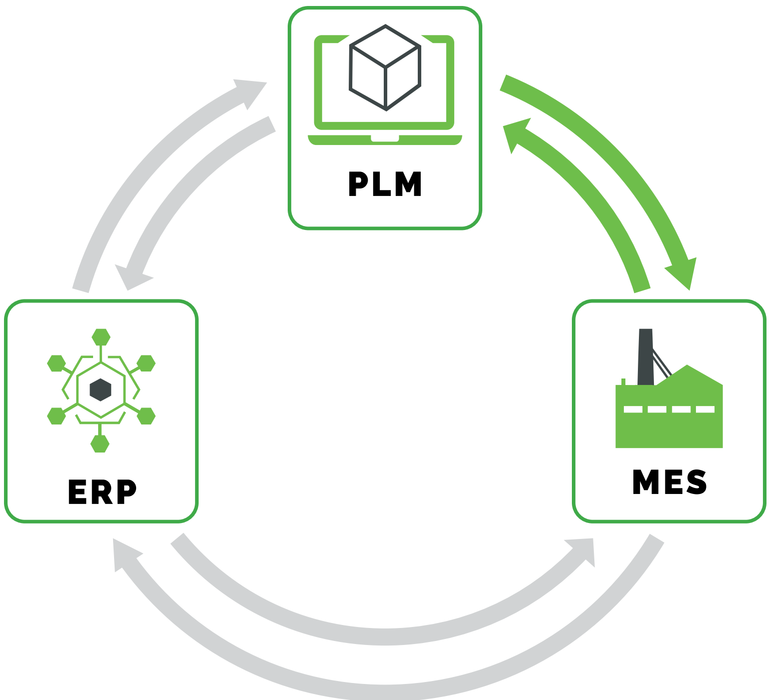


PLM to ERP: ERP to PLM

Once final decisions are made, and designs are tested and validated in digital form, the information is then handed off to the ERP system for the business preparations aspects of manufacturing physical products. Getting the maximum value from your ERP system depends on the quality of the information coming from the PLM system, alleviating the burden on the ERP material enrichment process.

The data that is therefore needed from PLM is mainly high-level information (material master data, bill of material, purchase specifications, etc.), not technical data. Sending a manufactured item from PLM to ERP should provide all the definition needed to auto-cost the item in ERP (if using MPM and process planning) and to send the item BOM for cost and routing information from the process plan for set-up/logistics.

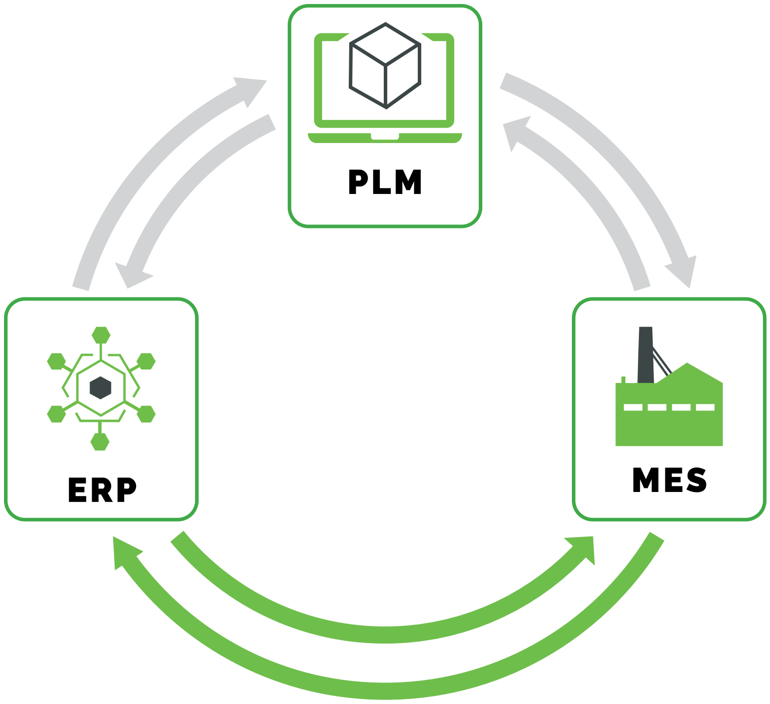
- Automated item setup from PLM (manufactured items)
- Semi-automated item from PLM (purchased items)
- AML, part BOM revisions, lifecycle states, and respective engineering change orders
- Engineering BOM to manufacturing BOM, when an organization-specific part should be used (date and time)
- Product top level assembly (TLA) BOM customer-provided details, weight, volume for pack-ship-freight cost decisions
- In a CTO business model, you might want to transfer your overloaded process plans to ERP to enable more advanced planning options (for example to automate the component allocation process).
- ERP to PLM – ERP feeds cost information to PLM



PLM to MES: MES to PLM

The power of the digital thread eliminates discrepancies between EBOM, MBOM, Process plan, and control characteristics (including substitutes and alternates) with the data persistence needed for execution. Sending a manufactured item from PLM to MES should provide consistent technical data. The work order is created in the ERP, which initiates the MES to make a request from the PLM system for the data it needs to do the work. PLM then sends the item, BOM or process plan to MES.

- Engineering change-order-specific product BOM revisions; make parts list (flat-level BOM or multi-level BOM), customer attributes (product/label/ship)
- First article inspection (FAI) calls, process checkout calls, test builds and mass productions builds
- All build specifications needed for assembly of manufactured Items
- You may also like to transfer your process plan to drive picking operations, enable detailed progress reporting.
- Control characteristics to trigger inspection and control activities
- Numerical control (NC) program
- Software to be loaded into the product in shop floor
- MES to PLM - MES also will provide to PLM “as built” information including non-conformance, which represents a deviation to the standard process done on the shop floor



ERP to MES: MES to ERP

Communications must be bidirectional, allowing for order demand commits and built/finished goods inventory updates. MES should let ERP know what and how many components were consumed to complete a build. MES will also provide production information, such as time, so that ERP can do estimates on overall cost of goods sold (COGS).

Amir Mazoochi on Process Re-Engineering - Integrated Change Management (Change Review Board)

Product & process change orders are inevitable during all phases of the product's life cycle. This mechanism identifies, defines, and tracks those changes in a way that's acceptable to all stakeholders. It can involve design, quality, cost, production, or customer-driven improvements. Small changes in product engineering have a large impact on manufacturing and production.

Best Practices and General Guidelines

Certain best practices and guidelines can promote collaboration while preventing design errors, keeping product development and production on track. Consider the following:

Create a knowledgeable & lean change review board (CRB) team

- Examine the current workflows and optimize the future state processes. Consider having different streamlined workflows for different types of change requests (urgent, fast-track, regular, form fit function & process)
- Build the case inside the change request. Outline all critical attributes during the initial step, such as:
  - Reason for change: high level
  - Detailed change description: Identify the case that needs to be changed
  - Impact of change (departments, customer, factory, or suppliers)
  - Required implementation or cut-in date
  - Expected outcome
  - Required supporting qualification/validation data (if needed)
  - Highlight of customer, factory, suppliers' approval if required
    - Understand the supply chain and organization – communication flow, who needs to be involved for decision making, demand planning, and executing
  - Disposition instructions for existing materials and products made
  - Once the CRB has approved, move to the next level and seek approval from key stakeholders for implementation
  - Track status and monitor progress until complete, always ensuring traceability.

A critical success factor is to create an interface from PLM to ERP and MES. It's important to ensure that those attributes the team is creating on any change order are entered through that interface and are published automatically to the ERP and MES systems. Now, real advantages can emerge, with a functional and well-configured digital thread eliminating the need for redundant, manual data entry, as well as all the attendant risks.

Step 3 – Turning data into digital capabilities to empower frontline engineers and workers

At this point, with data mapped, systems properly integrated, and processes optimized, the features and tools available can enable dashboard views to analyze time and quality of execution. This capability generates a myriad of benefits, including the ability to:

- Democratize product data with a set of apps, ready out of the box, that can easily be tailored to the specific situation, or low-code custom apps for associates from the production manager to the shop floor operator. While this experience can seem simple for the end user, there is still a lot of data behind this interface, which can be pulled not only from PLM, but ERP and MES as well. Simplified and secure access to PLM, ERP, and MES enables real-time collaboration.
- Tie operations back to engineering by reporting problems, issues, or non-conformances in the context of their occurrence (for example in drawings, documentation, work instructions, parts) made available at shop floor terminals.
- Connect work cell use cases to deliver workers a seamless experience, while capturing execution data with access to key control characteristics, smart tools, and machines. Bring the power of visual digital work instructions tailored to the competence level of the worker.
- Compose factory operations – rebalance the shop floor/factory layout

Additional improvements in other areas can be expected as well, including improved data quality and continuity, less time and lower cost, superior supplier integration, and enhanced general system flexibility.

Eric Horn (MicroVention) How to get started:

Getting started on any project can be a daunting task. Or a project may start out seeming simple but then run into endless scope creep. When working on connecting enterprise systems my primary recommendation is to start simple, learn, adapt, then grow. Upon starting off, it's key to create a baseline of what the minimum viable product can be, develop it quickly and put it into production.

Consider one representative scenario for phasing in functionality:

- Send part/Item data from Windchill to the ERP system
- Determine BOM strategy and view version hierarchy
- Update part/item message to include BOM data (1st level)
- Determine missing attributes to properly cost part/item in ERP
- If costing requires routing, determine process plan strategy for creating routing, and work instructions
- Update part/item/BOM message to include costing attributes

It should be clear that starting simply begins to get the systems fully up to date. As the team works toward more functionality, complexity will increase. But the effect of that increased complexity on the process is offset by even greater understanding.

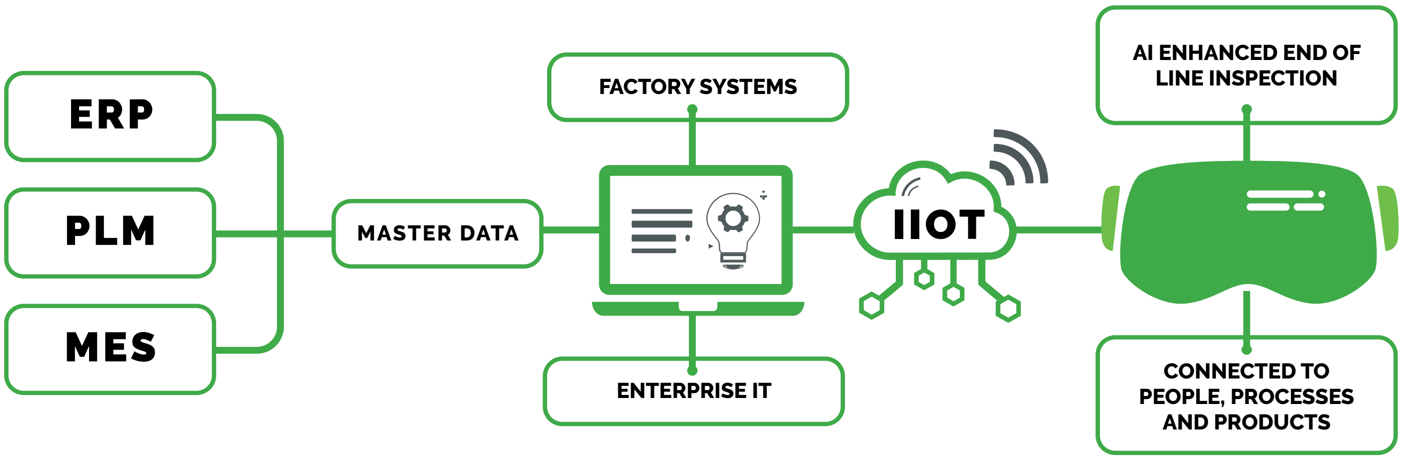
Among the most important lessons learned is the value of having someone at the system architect level who fundamentally understands PLM, MES, and ERP from the system and process levels. Different business teams must come together and negotiate process and system hand-offs, data requirements and individual responsibilities – who does what – as well as which system stores which pieces of information. The designated architect becomes central to the negotiation process, mediating discussions and filtering decisions through his or her own expertise and professional judgment.

At Solar Turbines, by focusing on interfaces and processes, we were able to eliminate "swivel chair" engineering by the manufacturing engineers. They no longer had to work in both the PLM and ERP systems. At Microvention, enabling the digital thread to ERP reduces compliance risk by transfer of the officially approved record to ERP.

The one thing we've done at both companies is eliminate the access by which people can manipulate data in ERP. For example, the BOM can only be published from PLM. We also removed access to create new items. Downstream stakeholders can only create costing items which are of a different type. In this way, we have established the authoritative source of truth for the part/item. So, it's not just about making the interface but making sure people cannot create/modify data downstream. There are many times people try to bypass the system of record because of any business excuse. It could be an "emergency" but those can be very costly to the business if they bypass the process. Quality issues can creep in quickly and cause even more costly errors. There are some words of wisdom in what not to do.

INDUSTRY 4.0 AND BEYOND

You have paved the way for moving fast in implementing the industry 4.0 capabilities at scale such as: Digital augmented work instructions, virtual build, training and ramp-up, AI enhanced inspection forms. Further to this, integrating your digital thread to IIoT platform will bring you the power of enabling the next generation connected worker, who is equipped both with real time information of the equipment and manuals, guides and design data to carry out work autonomously, effectively and efficiently. The connected worker doesn't need to knock on office doors, dust off training manuals, or consult equipment guides and catalogues – all these things are enabled by a single authoritative source of data truth (Connected Systems).



DIGITAL TWIN FOR CONSTANT ANALYSIS

1. IIoT extends MES as a system of intelligence. MES serves as a reliable system of record, consistently handling specific tasks with a focus on seamless execution but does not itself initiate or control change. In contrast, IIoT functions as a nimble system of intelligence that continually enhances processes through dynamic optimization.

2. IIoT extends MES and PLM with role-based applications for shop floor workers (e.g., real-time work instruction delivery and execution, problem reporting, performance analysis, quality inspection). With increasing product complexity and workforce shortage, it is imperative to provide front line workers with the user experience tailored to their specific needs for the jobs or tasks they are performing. A complex product assembly line could easily have 100+ operational steps, and each product can be different - meaning using dissimilar materials, machines, tools, methods, and skills.

3. IIoT extends MES as a substitute for MES if the focus is primarily on monitoring and orchestration. IIoT platforms can serve as a viable alternative with benefits such as faster and more cost-effective implementation. In many cases, especially in the large manufacturers with tens of plants, a hybrid MES approach could be the most efficient and effective, meaning leveraging full-blown MES in the sites where the plant needs all core capabilities especially in execution and is ok with the monolithic implementation, while leveraging IIoT as an MES alternative in other sites.

UNIFICATION OF DESIGN AND MANUFACTURING AT VOLVO CONSTRUCTION EQUIPMENT (VOLVO CE)

PTC Windchill is helping Volvo CE establish an authoritative source of truth—product data that runs throughout the whole product lifecycle. This helps ensure that all work is adding value and building collective knowledge. Volvo removes manual handovers to increase quality and cross-functional collaboration on new and existing products.

Windchill enhances efforts related to the area of 3D model-based design, which will enable Volvo CE to better manage:

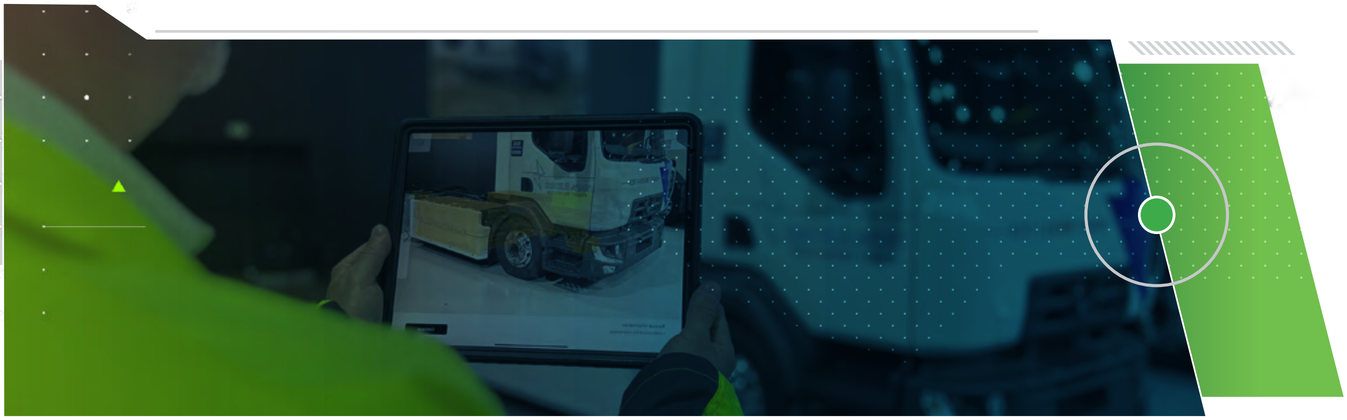
- Product structure: Volvo can manage new product architectures envisioned in the Volvo CE product strategy.
- Communication: The company created a common language—a digital thread of product information—that fosters communication and collaboration.
- Product data: Product knowledge can be more easily captured and retained, with teams now working from a common set of data.
- Data structures: Windchill provides more opportunities to re-use the 3D data already being developed by engineers throughout the whole product lifecycle.

Increased efficiency

While Windchill PLM changes the work process upstream (in establishing the virtual product), work is reduced downstream (in producing the physical product). Volvo's MBOMs show higher success rates and are easier to implement (for product maintenance and projects). Also, added visualization makes it easier to envision, conceive and define a solution.

Windchill PLM also helped decrease the amount of manual work required, and the need for designers to validate the impact of development from a production preparation point of view.

- Volvo established product data controls that happen before manufacturing takes place.
- Products reach maturity in PLM, and then are pushed to ERP and MES.
- Changes to physical products are much more expensive than changes during production preparation.
    - Volvo CE anticipates a 30% efficiency gain on engineering change notices.
    - All stakeholders can collaborate on product changes to assess the downstream impact.



Cost of poor-quality reductions

As mentioned earlier, the likelihood of potentially costly human errors is reduced through the reduction in manual work, and by the increased interaction between designers and manufacturing engineers during development. These formerly siloed teams can now work together to identify issues in early phases and verify whether configuration rules are defined correctly, thus reducing errors. Related to this work, Volvo CE expects:

- A potential reduction of 30% with work instructions compared to the status quo, in which approximately 30% of products are misconfigured due to poor data quality.
- Benefits from brand reputation and lower service costs (warranty and repairs) well after the product is fielded.

Product cost reduction

PLM allows Volvo CE to evaluate systems early on and design cost-effective solutions. In fact, they anticipate that the improved way of working, and preparation could result in a 1.4% improvement in efficiency.

Time to market reduction

Manufacturing engineering takes place in the early phases of the overall process; tasks are clearly connected to the process in a highly structured way. This results in better collaboration with designers—between projects and sites— as related to production preparation activities.

PLM enables system support for virtual builds and for multi-product hubs in preparation work. It is possible for stakeholders to provide feedback throughout the entire development process, through shared data, represented by different views according to the stakeholder's role and needs.

Time is also conserved through the early and continuous collaboration between internal suppliers, external suppliers, export compliance, and other stakeholders across the product's lifecycle.

ABOUT THE CONTRIBUTORS

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I am a PLM professional with more than 20 years of experience in Digital Product Development. Initially he has been working as consultant with various PLM solutions at automotive OEM (Original Equipment Manufacturer) and Tier 1 suppliers as well as in the A&D (Aerospace and Defense) industry. Since 2015 he has been working at Vaillant Group, currently being the business responsible for PLM processes and operation of related PLM software. His background is a diploma in mechanical engineering and a PhD in digital factory.

AMIR MAZOOCHI

Research & Product Development Technologist, Former Seagate Technology

A Technologist leader with experience in overseeing and directing engineering activities, initiatives and personnel of an organization. Extensive background in guiding organizations through innovation strategy, research and product development, life cycle management, process & technology, and driving digital transformation initiatives. Committed to teamwork, accountability and continuous improvement. Brings analytical and problem-solving skills to meet objectives and provide a seamless experience for all customers. Talent for building a multi-functional team while facilitating change management. Proven track record of significant contributions to profit levels and productivity by developing and implementing a successful decision support system and launch of new PLM solution.

ERIC HORN

Enterprise Architect, IT, MicroVention

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