

Whitepaper

# PLM Implementations: Between Best Practices and Business Processes

## Product Lifecycle Management – An Overview

A fundamental part of product development and manufacturing is product lifecycle. You can think about product lifecycle as a sequence of product stages from early product introduction through growth, maturity and decline. As a product goes through these stages, it requires a variety of activities: product requirements, new product introductions, engineering changes, manufacturing, re-fabrication, disposal, and other adjustments. Some products have a short lifespan (consumer goods, electronics) and others stay in active operation more than 50 years (aircraft and defense systems).

When it comes to systems and practices to manage product lifecycle over decades, it is imperative to indelibly capture an enduring—and product record centric—single version of the truth. And achieving this single version of the truth depends on adherence to the best practices of Product Lifecycle Management (PLM) implementations. A PLM business strategy focuses on the management of data and processes across all stages of product development, and varies according to the product, industry, and type of manufacturing. A PLM strategy might have differing requirements related to service, operation and disposal. Some of these processes are strictly regulated while others are not.

Product lifecycle management is an attempt to gain control over the full scope of stages related to the business of product business—business models, sales, customer requirements, engineering, manufacturing, support, retirement, and recycle, all of which vary according to each industry. This is where it starts to become interesting.

How different is product lifecycle management across various companies and industries? Is it possible for a product lifecycle management system to be adopted by manufacturing companies of all sizes and different industries? These are questions to ask when selecting a PLM system for different companies—large OEMs and small hardware manufacturers alike.

### Why Follow PLM Best Practices?



PLM Software has consistently shown results superior to those achieved by paper-based methods or keeping product data in a spreadsheet.

A best practice is the process of developing something and following some kind of “standard” way—consistently. Often consulting and service companies use the term “best practice” to describe templates created before implementations and applied based on a company, industry and/or situation. Success results from employing a previously successful, repeatable, definable process.

In PLM, the meaning of best practice is usually related to a common approach and rules for successful PLM implementation or templates that are used by companies and service providers to install, configure and customize PLM products. While the first explanation is similar for most of IT projects, the second reason is especially interesting because it can make PLM implementation more predictable, save deployment time and ensure that a company follows standard processes. The last example has a potential negative context within engineering and manufacturing environment and this will be covered later in this whitepaper.

So, in a nutshell, a PLM best practice explains how a PLM system can be deployed, how to manage data and how to organize and optimize product development processes. So, where are the roots of PLM best practices and why do they survive?

The original PLM (and even PDM) systems started as a glorified data management toolkit with elements of CAD and ERP integrations. To get such a system was very expensive and it required a lot of time and expensive implementation services. The reason is simple: every manufacturing company is different. It takes time for the service provider to understand the company landscape, processes, data requirements, and legacy systems and hone in on which of their various modules are deemed appropriate.

Back in the day, it was customary to put a heavy price tag on this activity. Think about this process as something similar to organizing a mass production assembly line. It was costly and complicated. Once it was done, the objective was simple: don't change it. Run it without re-configuration. Without tinkering. The same happened with the first large PLM implementations.

Utilizing best practices allows you to move from a heavy, brittle and complicated PLM assembly line type system to a more configurable and flexible PLM system. Technologically, a toolkit approach was an underlying product foundation. PLM companies and PLM consultants alike appreciated this approach.

To create OOTB (out-of-the-box) pre-configured environments was relatively easy based on the best practices gathered from existing large forward thinking customers. However, to get it to the field and implement wasn't as simple. Marketing and sales used OOTB environments to demonstrate and make their sales. However, implementations and fine tuning were failing to consistently apply it. The implementation devil was in the details, and service teams were required to wrestle this beast and bring it to production. Similar to manufacturing mass production environments, customizing services gave way to standardization as an answer to solve product and requirement diversity.

PLM best practices are controversial. While best practices are not considered evil, many engineering and manufacturing companies are concerned that switching from their methods to standard best practices will eliminate the uniqueness of their business practices and impact their competitiveness. While there is some logic to that, as a practical matter, standardizing PLM business practices can be quite helpful.

## Companies and Business Processes



Every organization is driven by processes. Even if a company did not implement a system to manage processes, processes are already in place. Some companies manage processes using paper-based methods, while some manage using email and Excel spreadsheets. Manufacturing companies that operate solely with Excel are attempting to drive innovative product design from tools that were released in the last century.

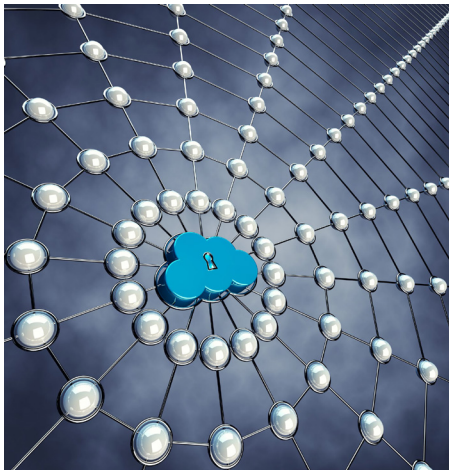
PLM is a business strategy that can help manufacturing companies organize and improve engineering, manufacturing and other related business processes. It is a fundamental way to create and manage complex, interdependent, end-to-end processes involving customers, sales, marketing, engineering, manufacturing, support and operation. When used correctly, precious few other solutions have the broad reaching cross-functional impact that PLM does.

Many companies ask how to make process management more efficient. They complain that traditional process management systems are too complicated, expensive, and inflexible, requiring lots of preparation and upfront planning. Very often, the process definition is not clear. There is an advantage in having a system that can achieve a modicum of flexibility to adapt to existing user needs and requirements such that ‘patient compliance’ is heightened as the enterprise adapts to a new solution.

Company business processes are foundational. They are core. They define the way the company designs, manufacturers products and supports customers. A few key characteristics are overarching and, in fact, define business processes: product and industry, type of manufacturing and customers. The development of discrete products can be markedly different from industry to industry. Airplanes are different from medical device equipment, which in turn are different from IoT (Internet of Things) wearables. Mass production is different from built to order or engineering to order products. B2B is different than B2C and so on.

Thinking about the diversity of options leads to the variety of business processes that companies need to align and support product development, manufacturing and customer support.

## PLM Paradigms, Data Models and Implementations



The product lifecycle management paradigm developed in the last 10-15 years is comprised of two fundamental elements: data models and lifecycle processes.

PLM systems provide a way to model data about a product and its related information. It can be completely flexible or hard coded, but it doesn't change the paradigm. The data model allows information to be defined about a product in terms of data elements—products, configurations, documents, bills of materials, manufacturers, suppliers, engineering change orders (ECOs) and other elements. Some systems can support an enormous level of flexibility to define data models and some systems have a predefined model or template. When data modeling is done, users can import or create the data about product and related organizational processes.

Lifecycle process, at a high level, is a way to define how information about product can be changed. Imagine the development of a specific product from prototype stage to design, engineering, and manufacturing support. To imagine a lower level definition of lifecycle process, think about product prototypes, products done for functional tests and products done for customers. Lifecycle process defines a product's maturity. At an even more detailed level, think about product versions, releases and changes. If all of this minutia is not tracked, monitored, controlled and tied to the product record, then the process will run roughshod over the developers.

To support lifecycle process, PLM systems often use a workflow mechanism that allows the user/admin to define data elements and possible routing of information between people and organizational departments.

A typical PLM implementation is a bridge between real product information and the very processes that breathe life into their creation. It includes meticulous data elements and workflow diagrams or schematics that define change processes and rules.

## All Hail the Product Record

But PLM alone will not solve the project manager’s dilemma nor keep teams from operating in their own worlds. A project management solution that connects with PLM provides visibility into the product record and, importantly, links schedules and assignments to the product record. Every time.

With project schedules linked to the product record at all schedule levels, managers can see what’s going on across the development process and development teams can see where they fit into the big picture—in real time. Further, schedule notes and detailed status reports linked with the product record keep teams aligned and facilitate global collaboration, reducing the chances that one team charges off down a barren path.

Project managers and company executives benefit from tools that track development progress through the design, test and redesign phases by schedules, assigned tasks and milestones. Project managers, for example, can assign tasks to teams and individual team members that have built-in notifications and reminders that keep everyone, project managers and team members alike, focused on the job at hand and abreast of changes, gates and milestones achieved and other critical developments in real time.



In practice, this means project managers can readily identify teams and individuals falling behind or surging ahead. With this real-time knowledge, you can tweak schedules and re-allocate resources to accommodate exculpatory situations or exploit better than estimated circumstances. Further, with the ability to reference links to items, changes, files, requests, and related data, project managers can easily confirm tasks are completed and approved by simply seeing updates to the product record in context.

Project management linked to the product record provides project managers additional benefits such as comprehensive reporting capabilities of all project data across teams. This enables you to generate detailed project metrics as well as cross-project analyses on demand. It encourages you to stay buttoned-down.

With all of your development activities tracked in your product record and linked with a product management solution, project managers can leverage that visibility into all project data as well as a suite of management tools which reside in an advantageous locus. This, in turn, empowers project managers to drive the NPD cycle and meet its technical and business goals in ways not possible before. Moreover, when your new product passes final validation and is ready for release, its consistent numbering schemes and well-managed BOMs, AMLs, documentation and supplementary data is up-to-date, you are well positioned for a smooth transition to manufacturing and new product introduction.

## How to Map Your Organization to the PLM Paradigm?

One of the most challenging steps during a PLM implementation is to align and define an abstract model of your organization using the tools supported by the PLM software.

When implementing PLM there are 5 main areas to consider:

1. People and organization. Includes users, groups, access rights and related pieces of information about how an organization is using PLM.
2. Product data. Includes information about the product: items, part numbers, identification, bills of materials, documents and related information such as specifications, and quality documents.
3. Interface. Defines the way product development and manufacturing are connected to other parties and the PLM software itself. It may contain data about suppliers—or suppliers' suppliers—manufacturers, contractors and communication processes.
4. Change processes. Describes the way the organization makes product changes. It includes mostly ECO processes and the related aspects of engineering change request (ECR) and engineering change notification (ECN). It defines who can initiate a change, and who should approve it. Changes also provide a mechanism to create an enduring electronic audit trail to communicate within the organization and with external parties.
5. Reporting and traceability. Determines what type of reporting mechanism and scope should be used and how information will be distributed. Among the variety of different reports, those that define product information traceability are very important. Reports can help validate that products conform to specific requirements and are not violating any rules and regulations.

### Why Following Best Practice is a Good Thing for PLM Implementations

Best practices can help kickoff PLM implementation and make it a faster process with less effort. There are three reasons for this:

1. Best practices set the foundation for how you'll manage product data. Very often PLM best practices are used by company marketing departments to outline and showcase product functionality. That's a good thing, since it can show what the PLM system can do and what the advantages are to following these processes. For inexperienced customers, it is a way to learn how to organize data and manage product development processes. So learn about best practices and see how to use them as a starting point for your PLM implementation journey.



2. Best practices streamline processes by providing known templates. Very often existing company processes are untidy and are a result of layer upon layer of many historical decisions, legacy systems and practices. So, in that instance, don't start customizing the PLM system during the implementation with the current processes. Best practice templates can be a way to help clean up the mess and start afresh.

3. Best practices lower total cost of ownership of PLM. A significant part of implementation is to plan and align data and processes cross-functionally in advance. Adopting existing best practice templates can be a significant time saver and result in a more efficient use of time during the actual implementation.

### What are Potential Dangers of a Best Practice Application?

Applying a best practice can sometimes create a conflict between company product development processes and other functional areas, particularly when alignment was previously non-existent. Each company has to decide how far to take it. When designing space shuttles or medical devices there is no such thing as gilding the lily with too much precision, but this may not be the case for all industries.



For example, it is potentially jarring with unique product development and manufacturing processes created by companies over the years. Product development processes and practices are often part of a company's competitive advantage, part of their very DNA. The way a company manages product identification, product configurations, build-to-order and engineering-to-order processes often helps speed up product delivery, improve ordering process and reduce cost. Each organization needs to determine in advance how much PLM cross-functionally to adopt. This is also true of downstream suppliers.

Changes of best practices can be more challenging than a new PLM implementation. It is not unusual for a company to have a clear vision for how to implement PLM, define data and map processes. For such situations to change best practice templates provided by the PLM system can be more cumbersome than starting afresh and implementing everything from scratch.

One of the most painful things for any company is to make a change of consequence. It is not impossible that initially some best practices may force changes in previously well optimized processes. As such, there may be initial internal rejection and hand wringing by the 'old guard'. This is to be expected. PLM implementations are not perfection—but they get you closer. And, if you do what you've always done, you'll get what you've always gotten.

### Conclusion and Recommended Next Steps

The main goal of PLM implementations is to streamline/align business processes, improve communication and track product records, button down and collaboratively share all changes and have a single version of the truth. All together this should improve the decision making process. There is a potential for initial conflict between PLM best practices and existing business. Anticipate it. Embrace it. Hear everyone out. Best practices will ultimately, after the angst and hand-wringing stage is done, greatly simplify the PLM implementation process.

So what is driving PLM implementation—best practices or existing company processes? It must be decided from the onset which will trump the other. If the old guard has too much ethos and are resistant to any/all changes it will not be successful. Or, perhaps it might be time to enlist the aid of a 'new guard'. Following best practices will cause initial pain before the everlasting improvement and calm. The highest priority during each PLM implementation is to define how to map organizational processes to the PLM software—in advance.

These challenging, sometimes political discussions must occur well in advance of the actual implementation with cross-functional agreement rather than shuttling them all to the side until later and fantasizing that a single big bang will fix it all.

The first priority of each and every PLM implementation should be a laser like focus on data identification (parts, documents, bill of materials) and cross-functional organizational management of changes. The next priority can be focused on specific processes, cost, quality and compliance.

Customization is not an absolute evil and can be quite useful. However the nod should go towards the standardized templates that have carried the day many times previously if they will in fact do the job. The biggest value of customization is usually related to two areas: legacy data import and integration with other systems. These are implementation zones that cannot always be covered by best practices, but are essential for a successful PLM implementation.

Finally, well-organized data provides a solid foundation for data analytic and process benchmarking. You cannot improve process without measurement. PLM data foundation and process management is a way to measure product development and manufacturing, and a way to feed the organization with data that can be used for decision making and process improvement.



## About Arena

Arena, the inventor of cloud PLM, provides an all-in-one product development platform that unites PLM, ALM, supply chain collaboration, and QMS for the design and manufacture of complex electronics. With Arena, electrical, mechanical, software and firmware engineers can collaborate with manufacturing and quality teams to manage their bill of materials, facilitate engineering change orders, and speed prototyping. As a result, Arena customers can better meet standards while they ensure regulatory compliance, improve training management, reduce costs, increase quality, and collapse time to market. Arena has been ranked a Top 10 PLM provider and won the coveted Design News Golden Mousetrap Award in 2016. For more information, please visit <http://www.arenasolutions.com>.

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