

The logo for Tech-Clarity, featuring the word "Tech-Clarity" in a bold, sans-serif font. "Tech" is white and "Clarity" is yellow, both set against a dark blue rounded rectangular background.

Tech-Clarity

PDM Buyer's Guide

***Ensuring Maximum Value
from Product Data
Management***



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Introducing the PDM Buyer’s Guide

Product Data Management (PDM) is an important tool to help manufacturers overcome the complexities of designing, developing, producing, and supporting today’s products. Manual and ad-hoc approaches such as shared folders, FTP, Dropbox, and hard drives are simply not good solutions to manage critical, complex product information. These approaches may work for very small organizations, but quickly falter as organizations grow and people need to share information outside of a few core engineers. These techniques also fail to manage data relationships and complex file structures common to 3D CAD systems. PDM systems are purpose-built to address these issues. PDM is a structured, collaborative solution that helps manufacturers control, access, and share crucial product data. Selecting the right PDM system for your business has a large impact on productivity, product success, and profitability.

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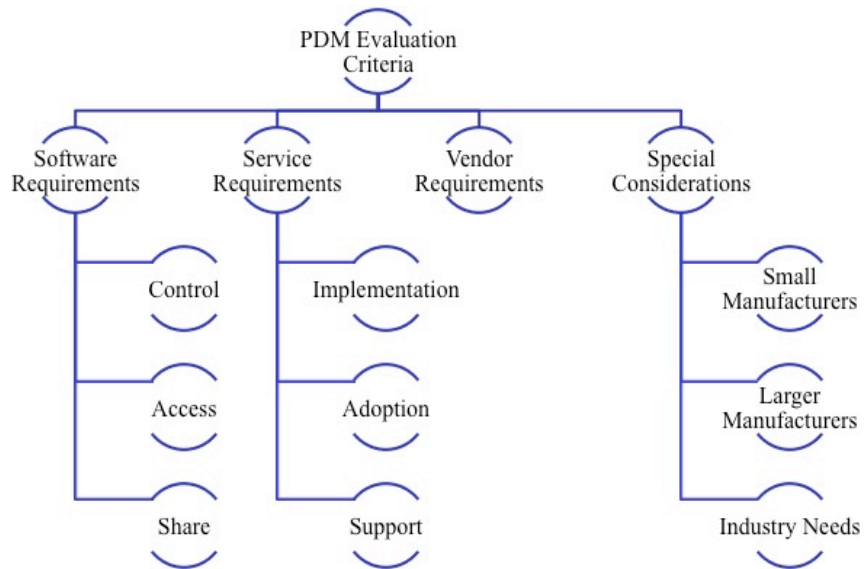


Figure 1: PDM Evaluation Framework

The PDM Buyer’s Guide is a reference tool to guide you on what to look for when selecting a PDM system for your company. The guide is composed of four sections covering software functionality, service requirements, vendor attributes, and special company considerations (Figure 1). Each of these sections includes a checklist with key requirements to investigate when selecting PDM software. The guide focuses on common requirements that form the foundation of PDM for manufacturers:

- Getting files under control so people can find the right revision with confidence
- Making sure concurrent updates don't overwrite each other to avoid "the last save wins" syndrome
- Making information available outside of engineering
- Ensuring Intellectual Property (IP) is captured and accessible regardless of who stored it
- Getting away from complicated shared drive structures that lead to errors
- Making sure people don't manufacture or purchase against the wrong drawing
- Provide "one version of the truth" versus multiple copies of designs

The guide and associated checklists include product, infrastructure, implementation, service, and business requirements – all of which impact the benefits received and total cost of ownership (TCO) of PDM.

Beyond these basics, there are special considerations for smaller companies and for the largest of enterprises. There are also special considerations for some industries. This Buyer's Guide points out some specific items to consider based on company size and offers a few special considerations to look for by industry. The guide goes beyond software functionality to focus on the entire experience of owning and operating the solution. The guide and associated checklists include product, infrastructure, implementation, service, and business requirements – all of which impact the benefits received and total cost of ownership (TCO) of PDM.

Beyond these basics, there are special considerations for smaller companies and for the largest of enterprises

The PDM Buyer's Guide is not intended to provide an all-encompassing requirements list. Instead it covers the high points that manufacturers should look for in a PDM system. Think of this as a "PDM Litmus Test" to see if a solution is a good high-level fit for your business before spending significant time and effort analyzing detailed features and functions.

Although the checklists focus only on PDM requirements, it's important consider more than your current needs when choosing a system. Many companies eventually want to grow beyond basic PDM. These companies start with PDM and evolve through a maturity process to a more full Product Lifecycle Management (PLM) environment. PLM extends the core PDM foundation to support more product development and engineering processes, manage a richer view of products, include more people in product development, and support processes further upstream and downstream from Engineering in the product lifecycle (Figure 2). Consider this potential when selecting your software and ensure that your solution has the capability to expand with your growing needs.



Figure 2: Four Dimensions of PLM Expansion

The Product Data Management Imperative

Let's briefly review the business value of PDM before diving into requirements. While data management may not be everyone's favorite topic, PDM is incredibly important to running a profitable manufacturing business. Benchmark data from Tech-Clarity's Best Practices for Managing Design Data shows that world-class manufacturers – those with the highest revenue and margin growth - were much more likely (30%) to use PDM. Further, the report identifies the tangible value of data management, *“World-class manufacturers are more able to find the data they need, share it with others, manage their design projects, and provide the correct data to manufacturing – and spend 25% less time on nonproductive data management tasks.”*

PDM is incredibly important to running a profitable manufacturing business.

Manufacturers today operate in an environment with unprecedented product complexity, cost pressure, and globalization. At the same time, they are driven to innovate and bring products to market at increasingly faster speeds. PDM helps companies address these challenges and meet aggressive product development goals. As Tech-Clarity's The Business Value of PDM report concludes, *“PDM helps companies achieve business benefits including increased efficiency, improved quality, reduced cost, and the ability to bring products to market much faster.”* PDM does this by allowing companies to:

- Control and secure product-related data
- Improve the ability to quickly find and reuse information
- Share product knowledge with other departments



Analyze PDM Capabilities

PDM product capabilities can be evaluated on the three pillars of Tech-Clarity's PDM Framework, controlling, accessing, and sharing information (Figure 3). These PDM requirements are relatively stable and mature. Later, we will discuss some special considerations, but these are the basics.

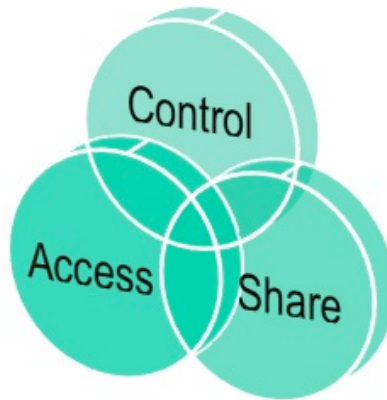


Figure 3: Tech-Clarity PDM Framework

Control

Designing and producing a profitable product is next to impossible if product data isn't under control. Uncontrolled data leads to inefficiency, confusion, rework, and quality problems. According to Tech-Clarity's Managing Engineering Data report, "*The core requirement of (PDM) systems is to get engineering data securely under control and make it easily accessible to those who need it.*" Control comes in different forms. The minimum is file and document control. But PDM systems go beyond simply managing files and documents to manage information in the context of a product structure / bill of material (BOM). An effective PDM system not only vaults information but also manages data relationships by associating drawings, specifications, and documents with the underlying design, helping companies understand and manage the impact of change.

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The basics of control start with properly identifying information. The solution should help create and manage part and release numbers using standard or company-specific approaches. The solution should then be able to store information related to the parts,



including the ability to associate metadata with items either directly or by extracting information from files. Further PDM should recognize state and approval status of items and support change control, approval, and release processes. The lifecycle state of the product should be clearly visible to all, for example indicating whether it has been released to manufacturing.

PDM should be tightly integrated with underlying authoring tools such as 3D CAD.

Control also requires the ability to securely vault design data in a central source. This includes storing documents such as office productivity files, PDFs, images, and more. Vaulting should include file control capabilities such as access control and check-in/check-out to prevent individuals overwriting each other's changes. In addition, PDM should be tightly integrated with underlying authoring tools such as 3D CAD in order to automatically manage the file relationships for assemblies. This is typically a key difference between solutions and should be evaluated closely, considering any multi-CAD control required. Tight integration with authoring tools should enable automatic revisioning, tracking, and traceability of design changes. Integration should include electronic design (ECAD) and software development in addition to mechanical CAD if those are applicable to your products.

Requirement	Considerations
Part identification	Auto part numbering
Release numbering	Auto release numbering
Secure centralized vault	Stores all design data associated with a product, manages data relationships
Check-in/out	Simple and visible process, prevents overwriting
Manage engineering change process	Automatic revisioning, tracking, and traceability of design changes
Manage mechanical CAD designs	Tightly integrated with authoring tools including 2D, 3D. Supports multi-CAD
Document management	Manages multiple document formats
Metadata management	Manages automatic and user-defined metadata
Approval processes	Supports routing and role-based approvals by product state
Manage product states	Manages and communicates state and release status of designs
Manage release process	Automated approval, release, and change processes



Manage product / embedded software	Manages released software code and executables
Manage electronics designs	Manages electronic designs, integrated with ECAD

Table 1: Functional Requirements for Control

Access

Storing data is only part of the battle. Information is of no value if it can't be readily retrieved and applied to the job at hand. Once data is controlled it's important to make sure engineers, designers, and product developers can quickly and efficiently find what they need. Having all relevant data in one source allows people to find the right data and provides confidence in the information they retrieve. With "one version of the truth" for design information people don't have to sort through multiple sources and versions to try to determine what is current. The inclusion of a standard parts library can also provide easy access to common information to improve efficiency and encourage reuse.

There are wide differences in PDM solutions' capability to readily search and retrieve large assemblies.

It's important to be able to organize data in a way that makes sense so people can easily retrieve all relevant information for a product or project. It's critical to have fast and easy search of design data regardless of how information is stored. Search should return relevant information based on metadata and document contents even if the location is not known. It's also important to navigate data by relationships such as conducting "where used" searches. One final consideration for accessing data is that there are wide differences in PDM solutions' capability to readily search and retrieve large assemblies. You should benchmark this capability to ensure the system performs with your products.

Requirement	Considerations
Centralized information access	Provides "one version of the truth," confidence in the information retrieved
Standard parts library	Centralized, easily accessible
Access control	Secure access by role, lifecycle state, product, and/or project
Data organization and classification	Ability to logically organize data
Data retrieval	Fast and easy search, keyword search on metadata and contents of documents
Where-used	Easily find what projects and products use design data

Table 2: Functional Requirements for Access



Share

Downstream departments like Manufacturing need up-to-date, accurate product data to do their jobs. Giving other departments access to released data ensures they act on the latest revisions and prevents mistakes that add unnecessary cost and delays. It also helps reduce the number of data requests that interrupt engineers. This helps keep engineers focused on developing products instead of answering questions and finding information for others. In addition, many companies share designs with downstream departments earlier in product design and development so they can get a jump on their work and provide feedback on design issues such as manufacturability prior to release. Access to designs and changes, however, should be determined by lifecycle state. For example work in process could be made “reference only” data to Manufacturing and Purchasing to avoid confusion with released designs and prevent errors.

Viewing technology should provide non-engineers controlled access to 3D models including the ability to measure, rotate, explode, and cross-section.

One of the most important “sharing” capabilities is self-service. Casual users should be able to rapidly find the information they need even if they use the system infrequently. Displaying thumbnail drawings helps individuals confirm they have found the right information. Another important capability for downstream departments is the ability to easily view and explore design data without having to learn or have access to CAD tools. Viewing technology should provide non-engineers controlled access to 3D models including the ability to measure, rotate, explode, and cross-section. In addition, downstream departments should be able to annotate and markup the viewables to provide feedback to engineers. This information allows teams to collaborate and should provide a stored record of the interaction for future use.

Requirement	Considerations
Access for casual users	Fast, simple search capability for non-power users in organizations like Purchasing or Manufacturing
Easy to identify correct parts	Published thumbnails and viewables
3D visualization	Capability for those without CAD authoring tools to view CAD files
Collaboration capabilities	Ability to share information with others inside and outside of the organization
Markup	Ability to suggest changes by annotating drawings. Markups are captured and communicated

Table 3: Functional Requirements for Sharing



Assess Service Requirements

Selecting the right product is important but does not guarantee a successful PDM implementation. Even if you install the solution and your company “goes live” it doesn’t ensure that you will achieve your desired business benefits. You need to understand your company’s capabilities and then select a software and services combination that meets their needs for implementation, user adoption, and support. You need to recognize how much support is required to implement and maintain the system and be honest about your resources to ensure the solution fits your business.

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Implementation

First, let’s think of the implementation. Most people think about the technical requirements first so let’s start there. PDM requirements on the Information Technology (IT) department or consultants can range dramatically. You must consider how much implementation overhead you really need and can afford. Right-sizing the implementation is critical. For example, some companies have to support their PDM implementation using only Engineering resources. Many companies can accept a simple configuration with a single server, commodity hardware, commodity database, and a common operating system. Some may be willing to explore a hosted or cloud solution. Others may need to consider more complex infrastructure needs such as site replication and more highly performing infrastructure. If the situation allows it, simplifying the technical implementation helps get PDM up and running much faster, reduces the need for highly technical resources, and allows internal IT and third party consulting firms to provide higher-value service such as process change and user adoption.

***Right-sizing the implementation is critical...
Many companies can accept a simple configuration with a single server,
commodity hardware, commodity database, and a common operating system.***

Beyond technical requirements, you should determine how much process change is required to achieve your desired benefits. This depends on how effective and mature processes are and how readily they can be automated. Not all companies take the time to formally document processes in a formal “as is” and “to be” state, but processes can’t be ignored or automation will only make problems worse at a faster rate. It’s important to assess how much investment in process definition is required versus adopting best practices and common approaches found in templates and already inherent in the PDM system. Most manufacturers don’t need to start with a blank sheet of paper, but also want



to be able to configure or tailor processes where it's important and adds value. As The Business Value of PDM recommends, *“Take advantage of PDM systems with pre-configured, best practices for security, part numbering schemes, and other common information required to set up a the system.”* Of course it's best practice to modify PDM systems as little as possible to control cost and ensure upgradeability.

Requirement	Considerations
Right-sized deployment option	Supports single server or distributed implementation as needed. Cloud deployment option as appropriate for your business
Proper hardware options	Commodity hardware compatibility to save cost or match existing standards
Appropriate database software	Commodity database compatibility to save cost, scalability to support business
Familiar operating system	Familiar, common operating system compatibility to save cost
Automated install	Scripts and wizards to aid installation and hide complexity
Best practice templates	Templates for part numbering, user roles, permissions
Standard workflows	Predefined workflows for approvals, release, revisioning, change control
Tailorability	Ability to tailor processes through user configuration

Table 4: Implementation Requirements

User Adoption

“Going live” with software is pointless unless people change the way they work to take advantage of the new system. It's important to assess how much training and adoption assistance your company requires. Considering how significantly processes will change helps you understand how much training is needed. In addition, it's import to recognize how complex the system is to learn and operate. For example, it's important to understand how unnecessary complexity can be hidden from users.

Considering how significantly processes will change helps you understand how much training is needed.



In addition to initial adoption, you should consider how much effort is required for new users to adopt the tool and ramp up to speed. Manufacturers with significant turnover or that frequently use contract resources may need to put additional emphasis on ease of use so short-time employees don't waste time getting up to speed. It's also important to consider what forms of training are available, for example whether computer-based training courses are available so new users can learn at their own pace and on an as-needed basis.

Requirement	Considerations
Ease of use	Ability for users to quickly learn to operate the system without extensive software training
Hide unnecessary complexity	Ability to “turn off” unneeded features / information
Appropriate training and adoption materials	Computer-based training, e-learning, self-paced study

Table 5: User Adoption Requirements

Support

PDM systems require support like any other software solution. It's important to determine what kind of support is needed and where it can be accessed. For example, what resources are available to help develop new processes or implement new capabilities? What technical resources are available to help tune the database or set up additional servers? Using well-established solutions helps ensure that resources will be available. And the simpler the infrastructure is kept – for example running on Windows and SQL Server on a single server – the easier it will be to find technical resources at a reasonable cost.

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Requirement	Considerations
Available functional resources	Proximity, cost, and availability of product experts. The simpler the infrastructure is kept – for example running on Windows and SQL Server on a single server – the easier it will be to find technical resources at a reasonable cost



Available database support	Use of commodity database or company standard to ensure available support resources
Available operating system support	Use of commodity server software and operating systems to ensure available resources for support

Table 6: Support Requirements

Consider Vendor Requirements

The partner you choose will have a strong bearing on the outcome of your implementation and the benefits you achieve. It's important to be comfortable with the vendor relationship for any significant software implementation. In fact, companies can pay more attention to the vendor for solutions such as PDM where basic capabilities are well known and mature. This allows manufacturers to spend less time evaluating product capabilities and more time focusing on the risk management aspects of vendor choice.

Companies can pay more attention to the vendor for solutions such as PDM where basic capabilities are well known and mature.

What should you look for in a vendor? Of course it's important that they are financially secure and invest in the future of their products. You should also make sure that companies like yours are important to them. For example, do they have customers of similar size, in the same industry, the same level of maturity, and in the same geographies as your company? For PDM, you should investigate what your primary CAD vendor has to offer, particularly if your company has a strong relationship with them. At the same time it's important to recognize that most companies need to manage data from multiple CAD solutions, so it's essential to select a vendor that has a proven track record of managing multi-CAD environments.

You should understand the terms of the license agreement to ensure that costs are reasonable and predictable for everyone that will use the system.

There are also purely commercial issues that can have a big impact on value. For example, does the vendor support flexible licensing strategies that support part-time or temporary users such as contractors on a floating basis? Do they offer less costly licenses for casual, peripheral users such as Manufacturing, Purchasing, or Service (non-authors)? You should understand the terms of the license agreement to ensure that costs are reasonable and predictable for everyone that will use the system.



Requirement	Considerations
Financial stability	Profitable, invests in research and development
Strong PDM presence	Strong focus and investment in PDM products
Industry support	Focus on and importance of your industry, including existing customers
Customer size	Focus on customers of similar company size and maturity
Geographical support	Presence or relationships and customers in your geography
Flexible licensing	Floating licensing for temporary or contract workers
Role-based licensing	To allow affordable rollout to casual users
PDM expertise	Implementation and adoption experience and expertise in vendor and vendor ecosystem

Table 7: Vendor Requirements

Identify Unique Company Needs

It's important to recognize needs beyond the core requirements discussed so far. Factors such as company size, industry, product complexity, supply chains, or customers may drive additional considerations. For the purposes of this guide, we'll focus on difference based on company size. For PDM, company size is probably best measured by the number of engineers.

Smaller Companies

Smaller companies (perhaps with less than 25 engineers) may have little or no internal IT resources. For these companies, keeping the implementation simple is likely to be important. Fortunately, they likely require less complicated infrastructure to support their business. For them, a single-server environment running commodity database and operating systems is probably sufficient.

Smaller companies, in general, should look for simple, efficient, low overhead PDM systems.

Fortunately, smaller engineering teams typically require less complex PDM functionality for processes such as approval and change control. For these companies, more complex



PDM systems might add too much overhead. Smaller companies, in general, should look for simple, efficient, low overhead PDM systems. On the other hand, you should consider the likelihood that you will grow or want to expand to a more functional PLM implementation.

Requirement	Considerations
Simple installation	Wizards, self-installation, includes all necessary infrastructure (database, etc.)
Straight-forward configuration	User-based tailoring and configuration
Right-sized processes	Simple, pre-defined approval and change processes
Ease of adoption	Faster ramp-up for contract resources
Low IT support requirement	Single server option, single instance without synchronization, cloud option as appropriate
External resource availability	Ready availability of third party support

Table 8: Smaller Manufacturer Requirements

Larger Companies

Larger companies (for example with 25 or more engineers) have special requirements as well. Some of these are simply based on the complexity of the organization. For example larger companies have more complex organizational and team structures that may need to manage data separately. They may also need to manage data across more engineering sites and want to keep design data locally at each, requiring data synchronization to keep all locations working on the same information. In general, larger manufacturers are more likely to need enterprise-level solution scalability and service capabilities, including requirements for multi-language software and global support.

Larger manufacturers are more likely to need enterprise-level solution scalability and service capabilities.

Larger companies are also more likely to put in place more complex processes. For example, they may have much more stringent requirements for engineering change control and management of engineering change orders (ECO). They may also leverage more platform design techniques and need to manage a larger number of product configurations and variants. They are also more likely to include suppliers and other external resources in their design processes, requiring an extranet approach in addition to enabling internal users. Finally they are more likely to seek out integration with other enterprise systems such as ERP integration to develop more closed-loop systems. These



requirements will likely lead larger manufacturers to more full-featured, enterprise-scale PDM or PLM solutions.

Requirement	Considerations
Organizational scalability	Support for more complex company and program structures
Manage increased complexity	Management of complex product structures, multiple variants
Enterprise-scale processes	More capable and tailorable approval and change processes
Multiple instances	Support for multiple server synchronization
Globalized / localized software	Multi-lingual and multi-currency capabilities
Global support	Support available in all required geographies
Integration	Integration to enterprise systems such as ERP
Scalability	Scalable to support large volumes of data and users

Table 9: Larger Manufacturer Requirements

Industry

There are specific PDM requirements to address the unique ways that different industries conduct business. Some examples of this include:

- Electronic signatures for life sciences companies
- ITAR support for defense-related businesses
- Software management for the high-tech industry
- Simple supply chain access for fashion and apparel companies
- Large assembly support for the automotive industry

These requirements are not in scope for this guide but you should research the unique needs for your industry to include in the evaluation.

There are specific PDM requirements to address the unique ways that different industries conduct business.

Conclusion

PDM helps manufacturers address market complexity and improve business performance. As Tech-Clarity's Managing Engineering Data concludes, "*Product data management is the fundamental building block of any engineering software strategy and helps companies get the most out of their precious engineering resources.*" When evaluating PDM, manufacturers need to take into account:

- Product requirements
- Implementation, adoption, and support requirements
- Vendor / business requirements
- Special requirements based on company size (particularly for very small or very large organizations)
- Special considerations to meet industry needs

The final collection of requirements for any given company will be unique and must be prioritized based on contribution to supporting your implementation and achieving your business objectives. Some evaluation criteria may be critical, while others should carry a lower weight. The key is to select a solution that best fits the needs of the business and can be realistically supported.

Using a high-level list of requirements can help you narrow down potential solutions by providing a quick "litmus test" to determine if a solution and partner are a good fit.

Using a high-level list of requirements such as the ones in this guide can help you narrow down potential solutions by providing a quick "litmus test" to determine if a solution and partner are a good fit before conducting detailed functional or technical reviews. For example smaller companies may want to emphasize ease of implementation and support in their initial evaluation criteria. Larger manufacturers, on the other hand, might emphasize more mature engineering change processes and require a more scalable solution.

It's critical to consider both current and future needs when evaluating potential solutions.

Remember, it's critical to consider both current and future needs when evaluating potential solutions. You should consider the possibility that your company may want to expand into a more full-featured system and look for a PDM system that can serve as a foundation for a broader PLM implementation. You should also consider how likely it is that your business will grow and ensure that the solution you implement can scale to



enterprise capabilities and provide enterprise functionality. From a PDM perspective, it's important to implement what is needed today, but know where the business is going and select a platform that can grow with the business (Figure 4).

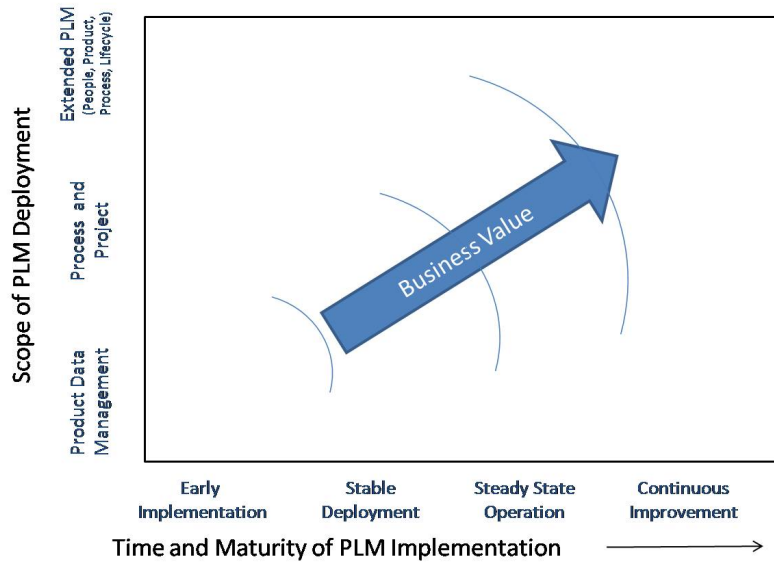


Figure 4: PLM Maturity Framework

Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Identify and weigh PDM requirements based on company needs, company size, industry, and any unique company needs
- Use high level requirements such as the ones in this guide to evaluate solutions based on business fit before engaging in detailed evaluations
- Consider using more simple, commodity technical solutions for smaller companies and those with limited IT resources
- Consider using more full-featured, scalable solutions for larger organizations that have more demanding process and scalability needs and can afford the IT resources required to support capabilities such as site synchronization
- Consider long-term business and process growth needs and the potential to expand to a more capable PLM system when choosing a PDM system, but start small and get value along the way during implementation

About the Author

Jim Brown is the President of Tech-Clarity, an independent research and consulting firm that specializes in analyzing the true business value of software technology and services. Jim has over 20 years of experience in software for the manufacturing industries, with a broad background including roles in industry, management consulting, the software industry, and research. His experience spans enterprise applications including PDM, PLM, ERP, quality management, service, manufacturing, and others. Jim is passionate about improving product innovation, product development, and engineering performance through the use of software technology and social computing techniques.

Jim is an experienced researcher, author, and public speaker and enjoys the opportunity to speak at conferences or anywhere that he can engage with people that are passionate about improving business performance through software technology.

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