

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, box, 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 must share information beyond 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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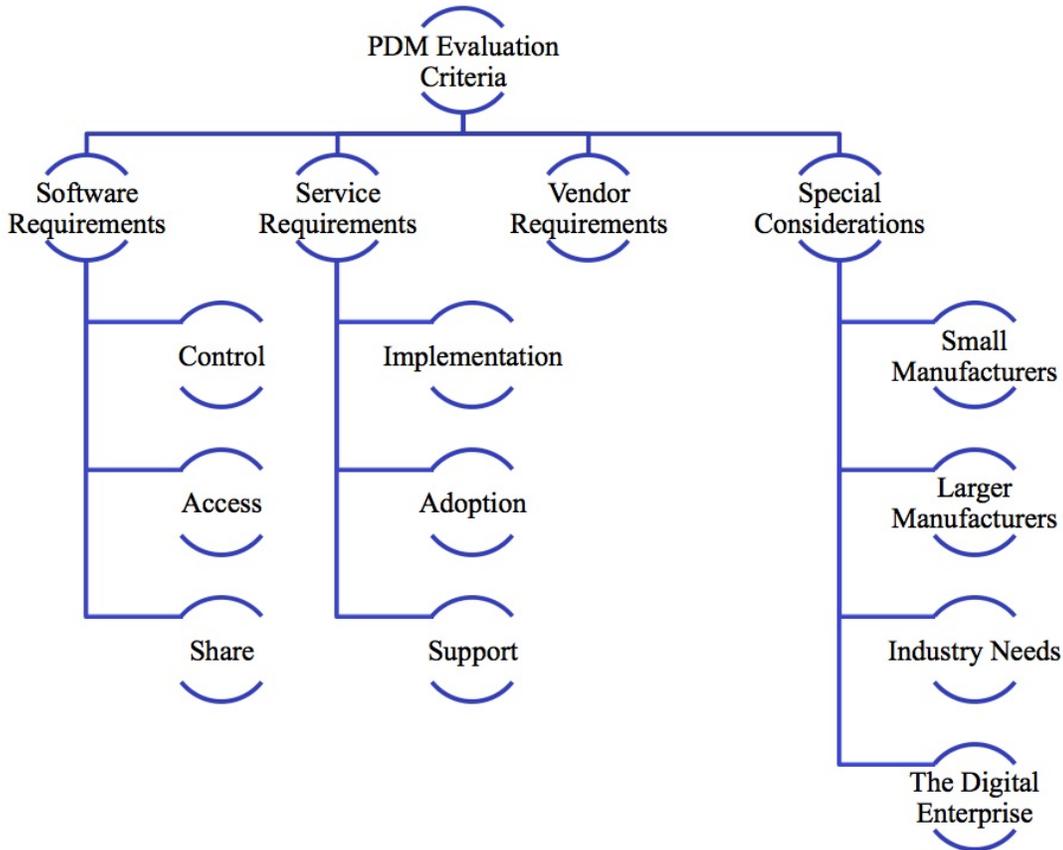
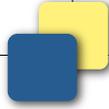


Figure 1: PDM Evaluation Framework



The PDM Buyer’s Guide is a reference tool to provide direction about 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 easily accessible and consumable to teams outside of Engineering for reviews and downstream processes
- Safely sharing information with customers, partners, and the supply chain
- Ensuring intellectual property (IP) is captured and securely 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
- Providing “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. The guide addresses these and then 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 to 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 complete 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).

In addition, PDM is becoming the core 3D foundation for the digital enterprise, supporting advanced initiatives like the Internet of Things (IoT), model-based design (MBD), and three dimensional augmented / virtual reality. Modern PDM / PLM systems should enable a product digital twin that can serve as the central foundation on which to consolidate (or view) a variety of product-related data captured in systems across the enterprise. It's important to consider these needs 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 the 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 - are 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 increased product complexity, cost pressure, and globalization. At the same time, they're 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 teams outside of Engineering, including partners, customers, and the supply chain to facilitate collaboration, reviews, and beginning downstream work in parallel with design

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'll discuss some special considerations, but these are the basics.

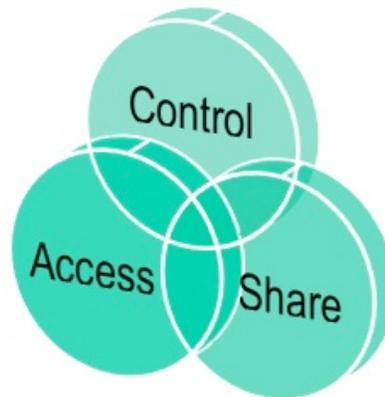


Figure 3: Tech-Clarity PDM Framework

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. More mature implementations may associate more advanced information such as requirements or test criteria and provide links to information found in other systems. These relationships are critical, particularly to allow companies to understand and manage the impact of change.

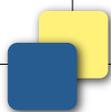
An effective PDM system not only vaults information but also manages data relationships by associating drawings, specifications, and documents with the underlying design.

The basics of the control pillar 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.

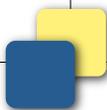
Control also requires the ability to securely vault design data in a central source. This includes storing documents such as office productivity files, PDFs, images, and more. Vaulting should include file control capabilities such as access control and check-in/check-out to prevent individuals overwriting 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. Ideally, PDM capabilities should be embedded in the CAD system so designers don't have to leave their environment to keep data under control. Tight integration with authoring tools should enable automatic revisioning, tracking, and traceability of design changes.

When evaluating CAD integration capabilities, it's important to recognize the need to manage CAD files from multiple vendors. Beyond just storing files of different formats, PDM should be able to support and provide visualization of multi-CAD assemblies. This is typically a key difference between solutions and should be evaluated closely.



It's also important to recognize the increasing need to support smarter products. The increased inclusion and reliance on electronics and software as an integral part of the product is typically addressed more fully in PLM, however it has impacts on PDM as well. For example, PDM should have integration to the physical representation of electronics at a minimum, including wiring and placement of printed circuit boards (PCBs) in an assembly. Integration should ideally 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. |
| Support multi-CAD | Manages CAD files including all required CAD formats |
| Support multi-CAD assemblies | Support and visualize assemblies consisting of different CAD formats |
| 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, workflow-driven release, and change processes |
| Manage product / embedded software | Manages released software code and executables |
| Track revision history | Provide an audit trail to detail changes between revisions for traceability and control |
| Manage physical representations of electronic designs | Include wiring and physical representations of electronics including |



| | |
|----------------------------|--|
| | PCBs |
| Manage electronics designs | Manages electronic designs, integrated with ECAD |
| Managed data associations | Mange relationships between product data within the PDM system and referencing other systems including CAD, ERP, CRM, and others |

Table 1: Functional Requirements for Control

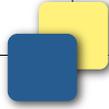
Access

Storing data is only part of the battle. Information is of little 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, enforce standards, 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. This is not just a technical performance issue, however. Search techniques including proximity search and visual filtering can help engineers narrow in on the designs they're looking for. It's important for designers to be able to visually interrogate and navigate assemblies in addition to text-based searches so they can find the information they need in a natural, visual context.



| Requirement | Considerations |
|--|--|
| Centralized information access | A single system of record for information retrieval |
| 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 |
| Publishing of viewables | Publishing of lightweight viewables for review/consumption outside of engineering at scale through 3D visualization and augmented reality technologies |
| Visualization and visual search techniques | Capability to view and search for information visually through techniques like proximity search and filtering |
| Where-used | Easily find what projects and products use design data |

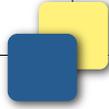
Table 2: Functional Requirements for Access

Share

Non-Engineering downstream departments such as Manufacturing, Service, and Procurement need up-to-date, accurate product data to do their jobs. Giving other departments access to 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 early in product design and development so they can get a jumpstart 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. The same is true for sharing and collaborating with 3rd parties including suppliers, partners, and customers.

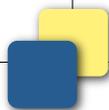
Viewing technology should provide non-engineers controlled access to 3D models including the ability to measure, rotate, explode, and cross-section.



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. One of the key differentiators in PDM systems today is the ability to simplify the interface for non-technical users. Casual users should have simplified access with information tailored to their job function and uncluttered by excess data so they require little or no training to access the information they need. In addition, they should have access to reports to provide visibility to consolidated PDM information.

Another important capability for downstream departments is the ability to easily view and explore design data without having to learn or operate 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. They should be able to focus on 3D visual representations of products that are easier for them to interpret and interact with than tabular data and 2D drawings. More advanced solutions may also include access to augmented reality (AR) experiences to allow people to better understand the design. These capabilities allow 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 |
| Simplified apps for non-technical users | Role-based access to more tailored information in a less cluttered, role-based interface |
| Easy to identify correct parts | Published thumbnails and viewables |
| 2D and 3D visualization | Capability for those without CAD authoring tools to view and interact with CAD files |
| Augmented reality visualization | Capability to interact with 3D designs at scale with augmented reality (AR) experiences to quickly understand design intent |
| Collaboration capabilities | Ability to share information with others inside and outside of the organization |
| Manage, share, and view CAD data | Manage, share and view CAD data in different native formats |
| Manage review and release process | Automated, workflow-driven multi- |



| | |
|--|--|
| | CAD model/drawing approval, review, release, and change processes |
| Markup | Ability to suggest changes by annotating drawings. Markups are captured and communicated |
| Easy 3 rd party involvement | Straight-forward way to invite 3 rd parties like design partners, suppliers, and customers to collaborate on designs in a controlled workspace |
| Secure 3 rd party collaboration | Selective access control to ensure 3 rd parties access only data they are authorized to |
| Reporting | The ability to share PDM data through standard, configurable reports |
| Multi-device, mobile-ready support | Makes data accessible on devices of choice with adaptive layouts based on device resolution, screen size, and aspect ratio based on the preferred platform |

Table 3: Functional Requirements for Sharing

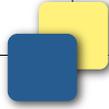
Assess Service Requirements

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 your company will achieve your desired business benefits. You need to understand your company’s capabilities and then select a software and services combination that meets implementation, user adoption, and support needs. You have 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.

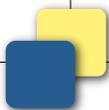
Of course others may choose to adopt a cloud approach as opposed to a traditional deployment. As Tech-Clarity's [PLM License and Deployment Flexibility](#) eBook finds, companies are changing the way they implement solutions like PDM. They're exploring cloud options ranging from Software as a Service (SaaS), to managed services, to Infrastructure as a Service (IaaS) in order to "*eliminate the need for the company to put servers, networking, and other resources in place and provide storage and processing elasticity.*" The cloud can also help companies start fast and reduce risk, among other benefits.

Companies are exploring cloud options ranging from Software as a Service (SaaS), to managed services, to Infrastructure as a Service (IaaS) in order to “eliminate the need for the company to put servers, networking, and other resources in place and provide storage and processing elasticity.”

Some companies that prefer an onsite implementation can accept a simple configuration with a single server, commodity hardware, commodity database, and a common operating system. 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*



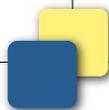
information required to set up the system.” Of course it’s best practice to modify PDM systems as little as possible to control cost and ensure upgradeability.

| Requirement | Considerations |
|-------------------------------|--|
| Right-sized deployment option | Supports single server or distributed implementation as needed |
| 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 |
| Cloud offerings | The ability to choose from a range of cloud deployment options including Software-as-a-Service or Platform-as-a-Service, instead of on-premise installations |
| Integration | Look for integration and connectivity to other systems that contain product data and support product-related processes |

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 important 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 who 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.

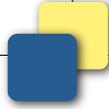
Companies should also consider adoption by non-technical users and third parties. In many cases, these users will need to be enrolled very quickly and be able to use the system with little or no training. This requires simplified user interface options that expose only what they need, and provide it in the right context. These users should be able to interact visually with the data as much as possible to reduce the need for them to interpret engineering data. This will become increasingly important as PDM is adopted more broadly beyond Engineering.

| 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 |
| Easily enroll 3 rd parties | The ability to quickly add new, casual users |
| Minimal learning curve | Simplified interfaces that require little or no training to use |
| Remote access | The ability to access information easily regardless of location or device, significantly simplified by cloud deployments |

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,

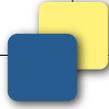


what resources are available to help develop new processes or implement new capabilities? What technical resources are available to help tune the database or set up additional servers? Using well-established solutions helps ensure that resources will be available. And the simpler the infrastructure is 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. In addition, some companies may benefit from cloud or managed services offerings where the software provider or a qualified partners takes responsibility for much or all of the technical support including backup, disaster recovery, performance, and security.

The simpler the infrastructure is kept the easier it will be to find technical resources at a reasonable cost.

| 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 |
| Cloud or managed services | The opportunity to outsource the daily operations and maintenance of the system to the vendor or a qualified partner in a managed service mode or other cloud offering |
| Remote system access | Accessibility to the solution by vendor or qualified partners to support, configure, update, or manage the system (such as via the cloud) |

Table 6: Support Requirements



Some companies may benefit from cloud or managed services offering where the software provider or a qualified partner takes responsibility for technical support including backup, disaster recovery, performance, and security.

Consider Vendor Requirements

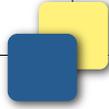
The partner you choose will have a strong bearing on the outcome of your implementation and the benefits your company achieves. It's important to be comfortable with the vendor relationship for any significant software implementation. In fact, companies can pay more attention to the vendor for solutions 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 and their partner ecosystem? Of course it's important that they're 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. As Tech-Clarity's [PLM License and Deployment Flexibility](#) explains, "*The way companies buy enterprise software is changing.*" 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)? Some vendors are now offering more flexible, subscription-based options that provide more options for how software is procured and paid for. You should understand the terms of the agreements 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 strong partnerships 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

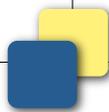
It's important to recognize needs beyond the core requirements discussed so far. Factors such as company size, industry, product complexity, supply chains, or customers may drive additional considerations. For the purposes of this guide, we'll focus on difference based on company size and industry. For 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. While this advice may apply to many small companies, it's important to recognize that even small companies may need advanced capabilities due to product complexity. As *Best Practices in Managing Design Data* finds, *“product complexity is a larger driver of data management issues than company size.”*

| 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 |

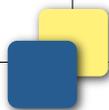
Table 8: Smaller Manufacturer Requirements

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), or be pursuing a Model-Based Design (MBD) strategy. 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 (or cloud) approach in addition to enabling internal users. Smaller companies may also adopt these approaches, of course, and may require more advanced solutions to support them.

Finally, they are more likely to seek out integration with other enterprise systems such as ERP 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 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
- ECAD and software integration for the high-tech and electronics industries
- 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.

Prepare for the Digital Enterprise

Looking beyond today, the manufacturing industry is undergoing a major transformation. Business is becoming more digital and today's smarter products are playing a key role in enabling the digital manufacturing enterprise. Companies are beginning to connect their products via the IoT and explore more advanced ways to communicate product information ranging from manufacturing instructions to service procedures. Today's more connected business relies on well-controlled PDM data to serve as the three-dimensional backbone for the product digital twin, providing the physical representation and configuration to associate digital information with products. While this may not be a requirement for today's PDM implementation, it should be considered as a need for potential future expansion.

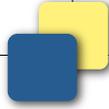
Today's more connected business relies on well-controlled PDM data to serve as the three-dimensional backbone for the product digital twin.

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
- Future requirements as business continues to digitalize

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. 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 and support your company’s digitalization objectives. 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 5).

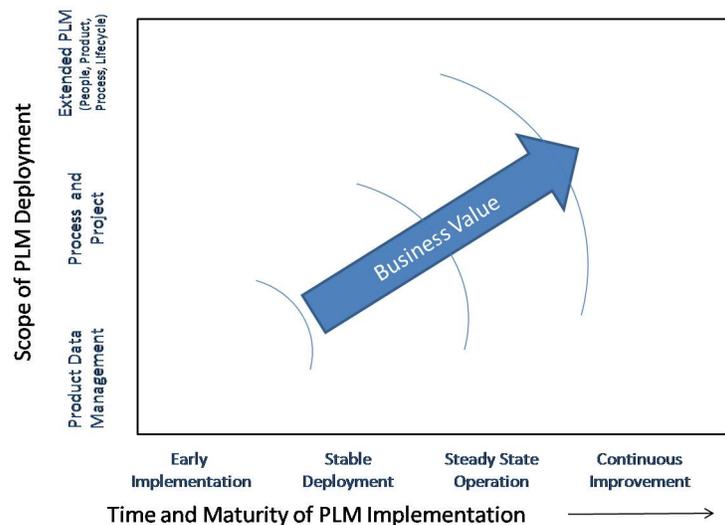


Figure 5: PLM Maturity Framework

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 like cloud or managed services solutions for smaller companies, companies that wish to move quickly, or those with limited IT resources
- Take user adoption into account, including simplified access and increased visualization for non-engineering 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
- Take into account long-term business and process growth needs including digitalization and IoT initiatives
- Consider 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 analyzes the business value of software technology and services. Jim has over 25 years of experience in software for the manufacturing industries. He has a broad background including roles in industry, management consulting, the software industry, and research. His experience spans enterprise solutions including PLM, ERP, quality, service, manufacturing, supply chain management, and more. He is actively focused on researching new initiatives and technologies including cloud computing, digitalization, smart manufacturing, AR, VR, and the IoT. Jim is passionate about improving product innovation, product development, and engineering performance through digitalization and the use of software technology.

Jim is an experienced researcher, author, and public speaker and enjoys the opportunity to speak at conferences or anywhere he can engage with people with a passion to improve business performance through digitalization and software technology. Jim can be reached at jim.brown@tech-clarity.com. You can read additional research, watch Tech-Clarity TV, or join the Clarity on PLM blog at www.tech-clarity.com. You can also follow Jim on Twitter at [@jim_techclarity](https://twitter.com/jim_techclarity), or find Tech-Clarity on Facebook as TechClarity.inc.



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