PDM Buyer's Guide

Choosing the Right Solution for Your Business

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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 and product development processes. Manual and ad-hoc approaches such as shared folders, cloud storage, and hard drives are simply not effective 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 can have a large impact on productivity, product success, and profitability. Further, the right solution can provide the digital backbone needed to support digital transformation and today's remote work environments. How can you ensure that you choose the right software and partner for your business?

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Using the PDM Buyer's Guide

Structure of the Guide

The PDM Buyer's Guide is a reference tool to provide direction on what to look for when selecting a PDM system. This guide is composed of four sections covering software functionality, service requirements, vendor attributes, and special company considerations (Figure 2). 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 remote workers, customers, partners and the supply chain

- 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 authoritative source of the truth" versus multiple copies of designs

Beyond these basics, there are special considerations for smaller companies and for the largest of enterprises. There are also special considerations to support digital transformation and industry-specific needs. 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.

FIGURE 1: FOUR DIMENSIONS OF PLM EXPANSION

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FIGURE 2: PDM EVALUATION FRAMEWORK
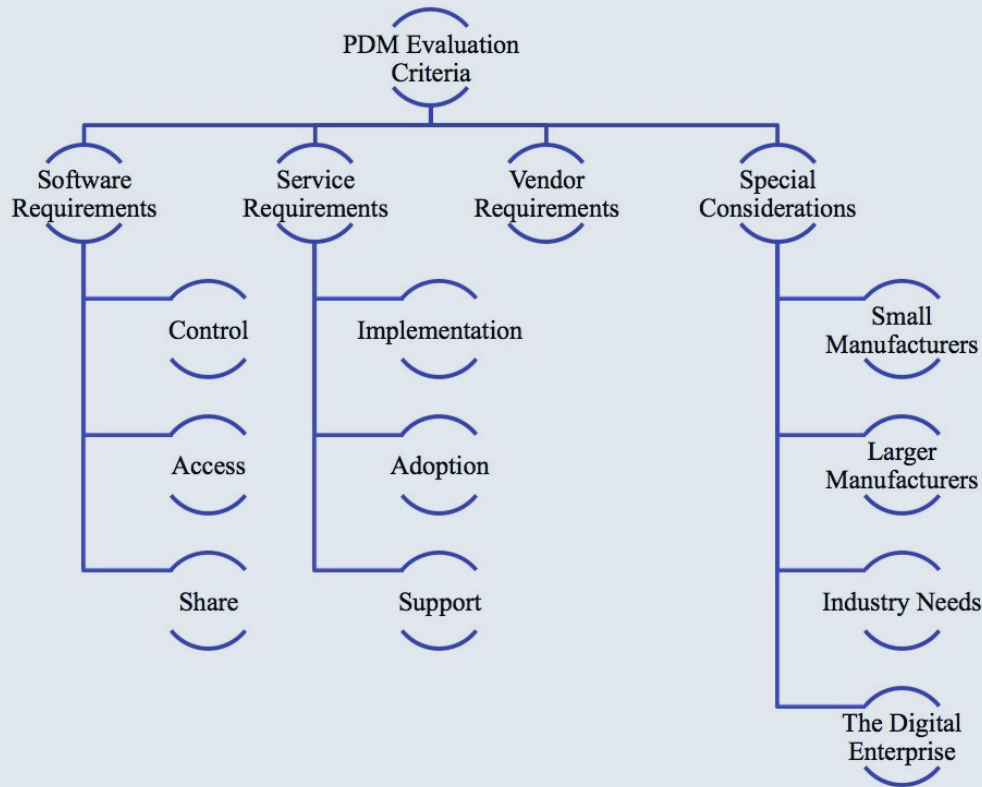
Purpose of the Guide

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.

Consider Broader Requirements

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 to a more complete PDM system. These more advanced capabilities are covered in our *Expanding Beyond Your Outgrown PDM System Buyer's Guide*. Other companies may 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 1).

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 (AR / VR). 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. Whether your company is upgrading and de-customizing PDM in the cloud or selecting PDM for the first time, it's important to consider these needs to ensure that your solution has the capability to expand with your growing needs.

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.

The Product Data Management Imperative

Let's briefly review the business value of PDM before diving into the requirements. PDM is incredibly important to running a profitable manufacturing business. It delivers value ranging from individual productivity to supporting strategic digital transformation initiatives. 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."

Recognize Strategic Value

Manufacturers today operate in an environment with increased product and program complexity, cost pressure, globalization, and new ways of working. 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. Our research and experience show that PDM helps companies achieve business benefits including increased efficiency, fewer errors, 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
- Quickly find and reuse information
- Share product knowledge with remote workers and teams outside of Engineering, including partners, customers, and the supply chain to improve collaboration and begin downstream work in parallel with design

It's important to remember that PDM value goes beyond these basics by creating a single, authoritative source of truth for product data. It can serve as the modern digital product backbone to support digital transformation initiatives including the digital twin, the digital thread, and smart manufacturing.

PDM is incredibly important to running a profitable manufacturing business. It delivers value ranging from individual productivity to supporting strategic digital transformation initiatives.

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Analyze PDM Capabilities: Control

The Basics: Control, Access, and Share

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 and extended considerations, but these are the basics.

Establish 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.

Instill Data Governance

But PDM systems go beyond simply managing files and documents to instill product data governance 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 and provide traceability.

FIGURE 3: TECH-CLARITY PDM FRAMEWORK
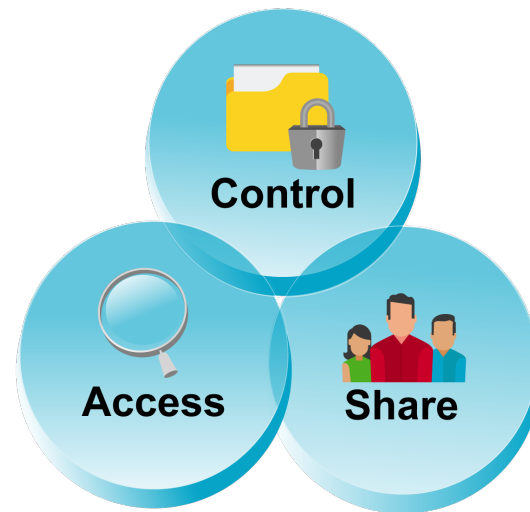
The basics of the control pillar start with properly identifying information. The solution should help create and manage part and release numbers using standard or company-specific approaches. The solution should then be able to store information related to the parts, including the ability to associate metadata with items either directly or by extracting information from files. Further, PDM should recognize the state and approval status of items and support change control, design review, 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.

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Control also requires the ability to securely vault design data in a central source, whether on-premise or in the cloud. 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 from 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, native integration with authoring tools should enable automatic revisioning, tracking, and traceability of design changes.

Support Multiple Authoring Tools

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.

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

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 (MCAD) if those are applicable to your products.

An **effective PDM system** not only vaults information but also manages data relationships by associating drawings, specifications, and documents with the underlying design. PDM should be integrated tightly with underlying authoring tools such as 3D CAD.

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TABLE 1: FUNCTIONAL REQUIREMENTS FOR CONTROL

REQUIREMENT	CONSIDERATION
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	Supports and visualizes 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

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TABLE 1: FUNCTIONAL REQUIREMENTS FOR CONTROL (CONTINUED)

REQUIREMENT	CONSIDERATION
Manage product / embedded software	Manages released software code and executables
Track revision history	Provides an audit trail to detail changes between revisions for traceability and control
Manage physical representations of electronic designs	Includes wiring and physical representations of electronics including PCBs
Manage electronic designs	Manages electronic designs, integrated with ECAD
Manage and visualize data associations	Captures and visualizes the relationship between parts, assemblies, design flies, and other product-related documentation
Manage cross-platform data relationships	Manages relationships between product data within the PDM system and referencing other systems including authoring tools, ERP, QMS, MES, SLM, MES, CRM, and others
Provide traceability	Supports a cohesive digital thread that integrates product data and history across all product-related data and systems
Support MBE	Supports model-based engineering by incorporating additional product details including GD&T

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Analyze PDM Capabilities: 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. Today, this must be easy even for an increasingly remote workforce. 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.

Enable Efficient Search

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.

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.

Support Scalability

One final consideration for accessing data is that there are wide differences in PDM solutions' capability to readily search and retrieve large CAD 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.

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

TABLE 2: FUNCTIONAL REQUIREMENTS FOR ACCESS

REQUIREMENT	CONSIDERATION
Centralized information access	A single system of record for information retrieval
Standard parts library	Centralized, easily accessible

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TABLE 2: FUNCTIONAL REQUIREMENTS FOR ACCESS (CONTINUED)

REQUIREMENT	CONSIDERATION
Access control	Secure access by role, lifecycle state, product, and/or project
Data organization and classification	Ability to logically organize data including parts and documents
Data retrieval	Fast and easy search, keyword search on metadata and contents of documents
Data visualization	Ability to display data visually, including visual previews or thumbnails, in the context of data relationships across all objects
Document viewing	Capability to show document contents for common file types including authoring tools and PDFs
Publishing of viewables	Automated publishing of lightweight, watermarked viewables and PDFs for review/consumption outside of engineering at scale through 3D visualization and augmented reality technologies
Extend product visualization to AR / VR	Creates and displays product data in augmented and virtual reality
Visual search techniques	Capability to search for information visually through techniques like proximity search and filtering
Where-used	Easily find what projects and products use specific design data

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Analyze PDM Capabilities: Share

Collaborate with Downstream Departments

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.

Provide Self-Service

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.

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Make Engineering Data Approachable

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 with controlled access to 3D models including the ability to measure, rotate, explode, cross-section, and manipulate in AR / VR without requiring file transfers or access to the authoring CAD tool. 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 AR / VR 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.

Protect Product Intellectual Property

Collaboration requires a balance between sharing enough information with others so they can contribute while still protecting company knowledge and know-how. Manufacturers must be able to easily control and track which information is shared with whom. Access rights should be based on needs. PDM must be able to support access rules that take into account user information such as role and organization, respect product information like lifecycle states and metadata, and enable program rules to ensure regulatory compliance.

TABLE 3: FUNCTIONAL REQUIREMENTS FOR SHARE

REQUIREMENT	CONSIDERATION
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 including out-of-the-box apps for common use cases
Easy to identify correct parts	Published thumbnails and viewables

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TABLE 3: FUNCTIONAL REQUIREMENTS FOR SHARE (CONTINUED)

REQUIREMENT	CONSIDERATION
2D and 3D visualization	Capability for those without CAD authoring tools to view and interact with CAD files
AR / VR visualization	Capability to interact with 3D designs in context with augmented and virtual reality 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	Manages, shares and view design data in context across different native CAD 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 CAD files and other documents including PDF. Markups are captured and communicated
Easy 3rd party involvement	Straight-forward way to invite 3rd parties like design partners, suppliers, and customers to collaborate on designs in a controlled workspace
Secure 3rd party collaboration	Selective access control to ensure 3rd parties access only data they are authorized to
Reporting	The ability to share PDM data through standard, configurable reports

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TABLE 3: FUNCTIONAL REQUIREMENTS FOR SHARE (CONTINUED)

REQUIREMENT	CONSIDERATION
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
Data access rules	Provides access rules based on product, program, and user information
Select data access	Supports different levels of access rights and design fidelity based on access rules

Viewing technology should provide non-engineers with controlled access to 3D models including the ability to **measure, rotate, explode, cross-section, and manipulate** in AR / VR without requiring file transfers or access to the authoring CAD tool.

Assess Service Requirements

Ensure Implementation Success

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. It's important to assess your company's capabilities and then select a software and services combination that meets implementation, user adoption, and support needs.

Companies must recognize what level of support is required to implement and maintain the system and be honest about their resources to ensure the solution fits your business. In many cases, a cloud-based solution will significantly reduce service complexity and cost. Some companies also have specific mandates stating, for example, that they must use a cloud solution if one is available.

In many cases, a cloud-based solution will **significantly reduce** service complexity and cost.

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Service Requirements: Implementation

Right-Size the 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 implementation using only Engineering resources.

Consider Cloud

Some companies may choose to adopt a cloud approach as opposed to a traditional deployment. Many 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. At this time, it's important to ensure that your PDM solution has a cloud option in order to ensure that the solution will maintain market acceptance, whether or not your company is ready for the cloud.

Consider a Commodity Software Approach

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.

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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. We recommend taking 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.

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.**

TABLE 4: IMPLEMENTATION REQUIREMENTS

REQUIREMENT	CONSIDERATION
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

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TABLE 4: IMPLEMENTATION REQUIREMENTS (CONTINUED)

REQUIREMENT	CONSIDERATION
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	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	In addition to earlier requirements, look for an open architecture that supports integration and connectivity to other systems that contain product data and support product-related processes
Integration Security	Ensure a mechanism to support data access rules across systems boundaries, respecting integration

It's important to **ensure that your PDM solution has a cloud option** in order to ensure that it will maintain market acceptance, whether or not your company is ready for the cloud.

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Service Requirements: User Adoption

Consider Training

"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 essential to recognize how complex the system is to learn and operate. For example, investigate how easy it is to hide unnecessary complexity from users.

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.

Consider Non-Technical Users

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.

TABLE 5: USER ADOPTION REQUIREMENTS

REQUIREMENT	CONSIDERATION
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

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TABLE 5: USER ADOPTION REQUIREMENTS (CONTINUED)

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

Service Requirements: Support

Ensure Help is Available

PDM systems require support like any other software solution. It's important to determine what support is needed and where it can be accessed, considering vendor and third-party service providers.

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. Many companies are turning to the cloud or managed services offerings where the software provider or a qualified partner takes responsibility for much or all of the technical support including backup, disaster recovery, performance, and security.

TABLE 6: SUPPORT REQUIREMENTS

REQUIREMENT	CONSIDERATION
Available functional resources	Proximity, cost, and availability of product experts
Available database support	Uses commodity database or company standard to ensure available support resources

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TABLE 6: SUPPORT REQUIREMENTS (CONTINUED)

REQUIREMENT	CONSIDERATION
Available operating system support	Uses commodity server software and operating systems to ensure available resources for support
Cloud or managed services	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 of qualified partners to support, configure, update, or manage the system (such as via the cloud)
Performance and security	If selecting a cloud solution, look for Service Level Agreements (SLAs) that support your performance and security needs, including specific standards to be adhered to

Many companies are turning to the 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

Choose the Right Partner

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.

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?

Consider Your CAD Vendor

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.

Also remember that your needs may expand beyond basic PDM to extended PDM or PLM, so investigate whether there is a migration path to adopt broader capabilities.

Consider Commercial Issues

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)? Some vendors are now offering more flexible, subscription-based options that provide more options for how software is procured and paid for, even for on-premise software. You should understand the terms of the agreements to ensure that costs are reasonable and predictable for everyone that will use the system.

TABLE 7: VENDOR REQUIREMENTS

REQUIREMENT	CONSIDERATION
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

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TABLE 7: VENDOR REQUIREMENTS (CONTINUED)

REQUIREMENT	CONSIDERATION
Geographical support	Presence or strong partnerships and customers in your geography
Flexible licensing	Floating licensing for temporary or contract workers
Role-based licensing	Licensing that allows affordable rollout to casual users
PDM expertise	Implementation and adoption experience and expertise in the vendor and vendor ecosystem
Cloud software strategy	Ensure that your chosen partner has a cloud strategy to prevent creating a partner viability risk as market conditions continue to shift

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

Identify Unique Company Needs

Consider Unique Requirements

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 differences based on company size and industry. For PDM, company size is probably best measured by the number of engineers.

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

Smaller Companies

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

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

For them, more complex PDM systems might add too much overhead. Smaller companies, in general, should look for simple, with fewer engineers should look for simple, efficient, low overhead PDM systems.

On the other hand, companies with fewer engineers should consider the likelihood that they will grow or want to expand to a more functional PLM implementation. It's also important to recognize that even small companies may need advanced capabilities due to product complexity. Our experience shows that product complexity is a larger driver of data management issues than company size.

> Smaller companies, in general should look for simple, efficient, low overhead PDM systems including cloud solutions.

TABLE 8: SMALLER MANUFACTURER REQUIREMENTS (CONTINUED)

REQUIREMENT	CONSIDERATION
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

PDM BUYER'S GUIDE: CHOOSING THE RIGHT SOLUTION FOR YOUR BUSINESS

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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 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 as described in *Expanding Beyond Your Outgrown PDM System Buyer's Guide*.

TABLE 9: LARGER MANUFACTURER REQUIREMENTS

REQUIREMENT	CONSIDERATION
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

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TABLE 9: LARGER MANUFACTURER REQUIREMENTS (CONTINUED)

REQUIREMENT	CONSIDERATION
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

Industry

There are specific PDM requirements to address the unique ways that different industries conduct business. These requirements are not in scope for this guide but you should research the unique needs for your industry to include in the evaluation. Examples include:

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

TABLE 10: INDUSTRY REQUIREMENT EXAMPLES FOR PDM

REQUIREMENT	CONSIDERATION
Life sciences	Electronic signatures, design control support including DMR, DHF
Defense-related businesses	ITAR support
High-tech and electronics	ECAD and software development integration
Fashion and Apparel	Simple supply chain access
Automotive	Large assembly support, ECAD and software development integration to support autonomous and electric vehicle programs

Support the Digital Enterprise

Look to the Future

Looking beyond today, the manufacturing industry is undergoing a major change. Business is becoming more digital and today's smarter products are playing a key role in enabling the digital manufacturing enterprise. Recent COVID-related disruptions have further accelerated this digital transformation. Digital thread and digital twin initiatives are now a high priority for many manufacturers. For example, our *Choosing the Right Enterprise PLM to Support the Digital Thread* finds that "Over three-quarters of companies say that the digital thread is either important or critical to achieving their business strategy."

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

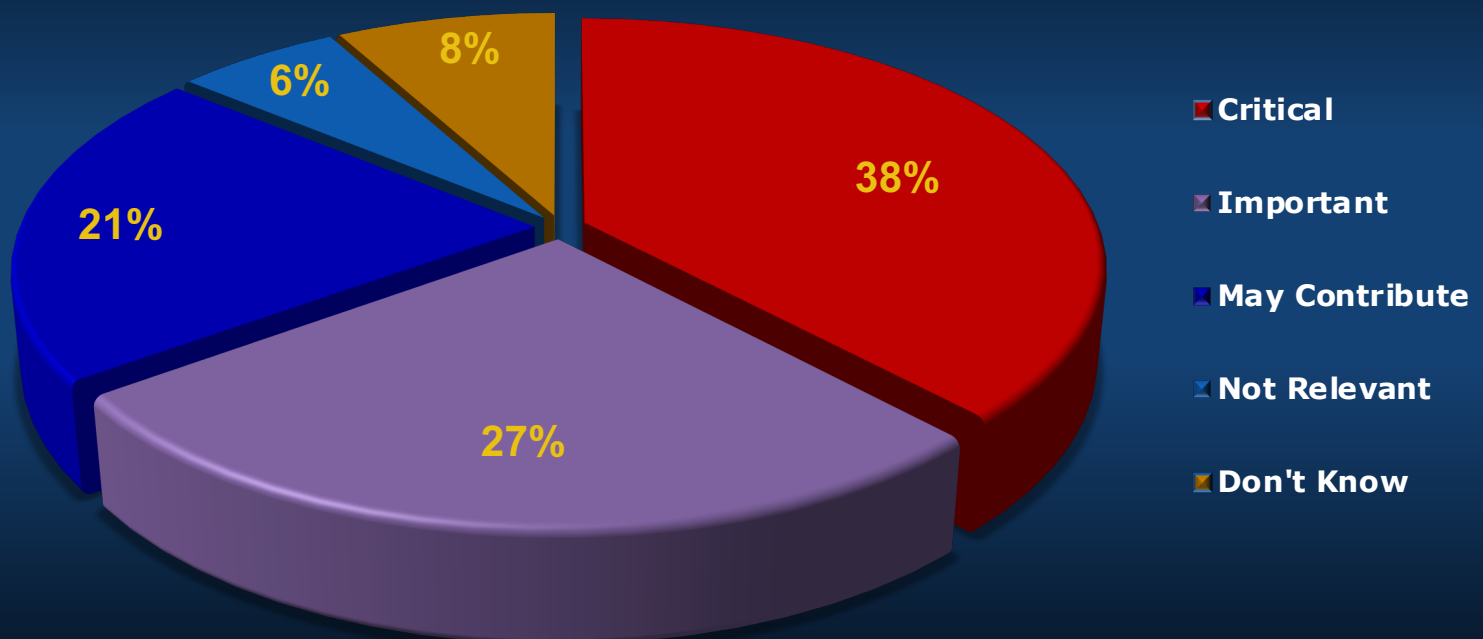PDM BUYER'S GUIDE: CHOOSING THE RIGHT SOLUTION FOR YOUR BUSINESS

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Companies are also increasingly connecting their products via the IoT and exploring 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 digital capabilities may not be a requirement for today's PDM implementation, it should be considered as a need for future expansion. Our research shows that about two-thirds of manufacturers believe that digitalization is important to achieving their business strategy, and over one-third believe digitalization is critical (Figure 4).

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

FIGURE 4: DIGITALIZATION IMPORTANCE TO BUSINESS STRATEGY

- 38% Critical
- 27% Important
- 21% May Contribute
- 6% Not Relevant
- 8% Don't Know

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Conclusion

Adopt Common Requirements for PDM

PDM helps manufacturers address complexity and improve business performance. 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 the manufacturing industry continues to digitally transform

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 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 like extended PDM.

Plan for the Future

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). Lastly, it's important to consider the cloud a requirement regardless of whether your company is ready for the transition.

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

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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, technical evaluations
- Consider using the cloud or managed services solutions for companies that wish to move quickly, have limited IT resources, want to reduce overhead, or want to modernize their IT infrastructure
- Take user adoption into account, including simplified access, increased visualization, and task-specific apps for non-engineering resources
- Take into account long-term business and process growth needs including digital transformation, AR / VR, and IoT initiatives
- Consider the potential to expand to a more capable extended PDM or PLM system, but start small and get value along the way during implementation

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Acknowledgments

About the Author

Jim Brown founded Tech-Clarity in 2002 and has over 30 years of experience in the manufacturing and software industries. Jim is an experienced researcher, author, and speaker and enjoys engaging with people with a passion to improve business performance through digital enterprise strategies and supporting technology.

Jim is actively researching the impact of digital transformation and technology convergence in the manufacturing industries.

Tech-Clarity is an independent research firm dedicated to making the business value of technology clear. We analyze how companies improve innovation, product development, design, engineering, manufacturing, and service performance through the use of digital transformation, best practices, software technology, industrial automation, and IT services.

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