

Making the Connection: The Path to Cloud PLM

Growth and adoption of cloud PLM services in the manufacturing industry

The Cloud Wave

Cloud services have swept across the landscape, fundamentally changing the market in several domains—and PLM is poised to be next

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Rapid Growth

The market for public cloud computing services is estimated to exceed US\$125B in revenue for CY 2017, representing more than 500% growth from 2011.¹

The adoption of cloud services has spread from industry to industry as companies recognize the advantages that cloud services can offer when compared to traditional on-premise solutions. From customer relationship management (CRM) to human capital management (HCM) and financial technology (FinTech), cloud service adoption has grown rapidly in multiple domains.

New Entrants and Familiar Names

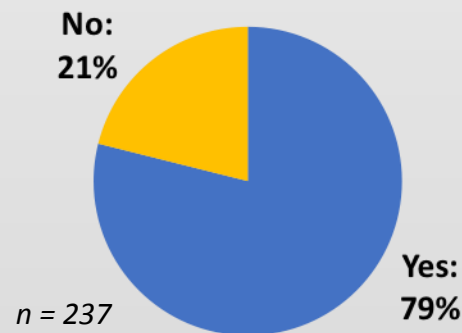
In some cases, cloud services have been introduced by startups seeking to disrupt the market by capitalizing on market niches. Increasingly, however, growth in the cloud services market is coming from established solution providers bringing the benefits of the cloud to enterprise markets.

PLM and the Cloud

Compared to some other markets, the adoption of PLM in the cloud has moved at a more measured pace. In March and April 2017, CIMdata conducted a survey of current and prospective cloud PLM customers, and data from this study shows that companies are open to cloud PLM:

- 73% of respondents indicated interest in cloud-based PLM
- 79% of respondents indicated that their companies have already deployed enterprise applications in the cloud (most commonly CRM and ERP)

Companies Using Enterprise Cloud Solutions Today



Growth of Cloud in the Enterprise

Companies are increasingly adopting the cloud for mission-critical applications. An example is Enterprise Resource Planning (ERP) systems, which contain some of the most sensitive information businesses possess. As a result, these companies have demanding requirements for ERP system availability, security, and integration capabilities. Despite these demands, interest in cloud ERP has continued to grow, driven by cost advantages and simplified management of the cloud model.

More recently, that interest has translated into rapid growth. A number of cloud ERP providers, including Epicor, Oracle, and Plex Systems, now serve multiple industry verticals. Some of these providers extend their cloud ERP offerings with additional enterprise capabilities including CRM and HCM.



The Many Flavors of Cloud

Understanding options is important to identify the right cloud deployment model to fit individual company needs

Defining the Cloud

Cloud services can be characterized across multiple dimensions:

- Service models
- Architecture models
- Deployment models
- Pricing models

Service Models

The US National Institute of Standards and Technology (NIST) defines three cloud service models²:

- Software as a Service (SaaS) delivers turnkey applications
- Platform as a Service (PaaS) provides hardware and software services on which applications can be developed and delivered
- Infrastructure as a Service (IaaS) delivers hardware computing capabilities, often with a virtualization layer

Architecture Models

With *single-tenant* solutions, each company's instance is logically and physically separated. In *multi-tenant* solutions, multiple companies share a single instance with logical separation of data for security.

Deployment Models

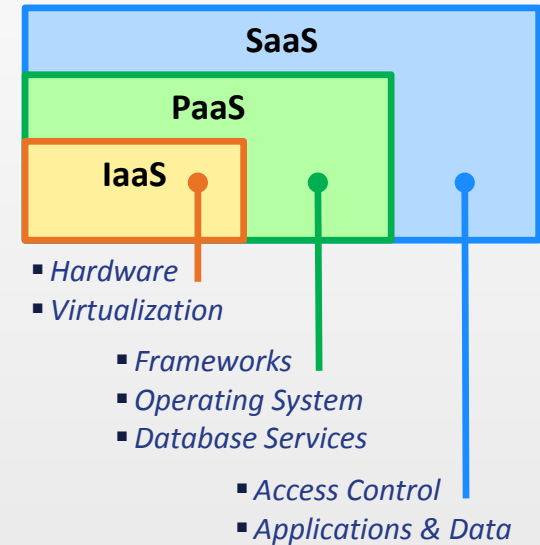
NIST also defines four deployment models:

- Private clouds provide dedicated resources with perimeter security for a single organization
- Community clouds are similar to private clouds, but serve multiple organizations
- Hybrid clouds distribute data and processes between private and public clouds
- Public clouds provide shared resources with managed access via the public internet

Flexible Pricing Models

Flexible pricing models are common for cloud services. These models include metered usage ("pay as you use"), term subscriptions of varying lengths, or project-based pricing. More attractive pricing is sometimes available for fixed long-term commitments.

One common theme is avoidance of capital expenditures to acquire hardware and software at the beginning of a project.



PLM in the Cloud

When delivered using the SaaS model, cloud PLM applications commonly use multi-tenant architectures to take advantage of economies of scale, however single-tenant architectures are also used.

Some cloud PLM providers focus exclusively on one deployment model, which others offer options for private/community, hybrid, and public deployment.

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Drivers of Cloud Adoption

Growth in cloud services is underpinned by significant economic and operational advantages for industrial companies

Foundational Advantages of the Cloud

The continued growth in cloud services is the clearest indicator of the attractiveness of the cloud model. The mix of benefits varies by application, but frequently includes:

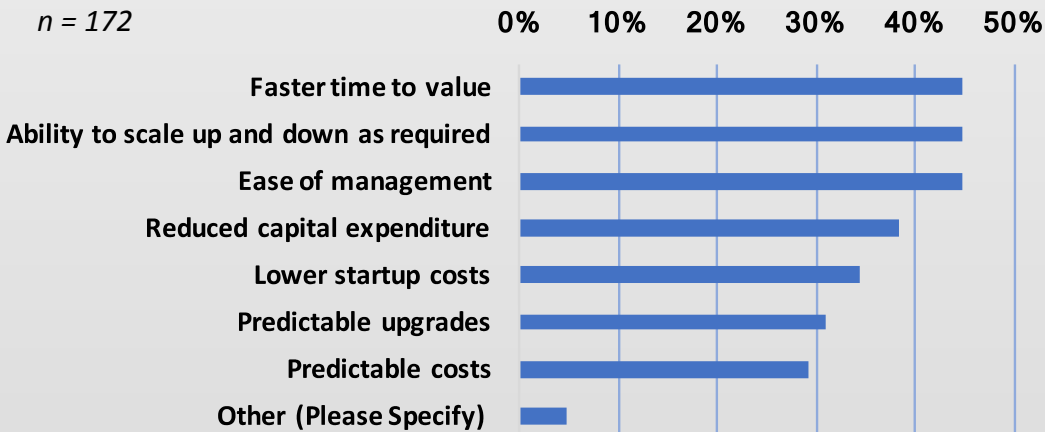
- Lower startup costs and reduced capital expenditures with flexible “pay as you go” pricing models
- Faster implementation and ongoing updates
- Rapid scalability
- Reduced management effort
- Simple and robust enterprise integrations
- Accessibility for remote workers and mobile devices
- Flexible collaboration across the extended enterprise

Why Companies are Interested in the Cloud

The CIMdata Cloud PLM study was conducted in partnership with PTC and other solution providers. This study found that companies are very interested in the convenience and economic advantages of the cloud. The top four benefits (respondents could select multiple answers) that industrial companies hope to achieve from cloud-based PLM are:

- Faster time to value (45%)
- Ability to scale up and down as required (45%)
- Ease of management (45%)
- Reduced capital expenditure (38%)

Cloud Benefits



“Other” benefits included *supplier integration, pervasive access, and reduced time and effort to upgrade*

“For us, cloud is a time-to-value solution. With on-premise software we have to purchase hardware, test it, and manage our data center. With the cloud, we can get started quickly—and scale rapidly as well. When we need to add or adjust users and functionality, PTC Cloud Services provides us with a convenient way to do that.”

– Senior Director, IT Applications, North America-Based CPG company

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The Innovation Imperative

Innovation has always been important, but today innovation involves extended enterprise collaboration—something the cloud inherently supports

Disrupt to Survive

In his classic 1997 book *The Innovator's Dilemma*, Mr. Clayton Christensen described how the need to sustain business success in the face of technology changes can, if not managed deliberately, undermine the long-term outlook for an organization.³

Today, the need for innovation is even greater than it was two decades ago. A 2014 report from McKinsey documented the decreasing tenure for companies within the S&P 500 stock index—and that a prime driver for the disappearance of these companies is the failure to innovate continuously.⁴

Total Innovation

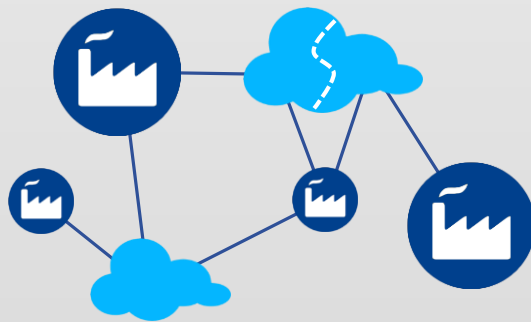
CIMdata has worked with industrial companies for more than thirty years, with much of this effort focused on effective strategies and implementation of PLM to enable innovation. One lesson is clear above all others—innovation is not merely the domain of engineering or R&D.

Continuous innovation requires engaging the extended enterprise, including external partners in addition to multiple functional areas within the enterprise. Cloud services are built for just this kind of extra-enterprise collaboration and innovation.

Connected Service Innovation

Ingersoll Rand is a diversified industrial manufacturer with market-leading brands serving customers in global commercial, industrial, and residential markets. The company is focused on accelerating innovative efforts to drive comfortable and sustainable solutions for their end customers.

Ingersoll Rand continues to innovate and serve growing world markets by relying on globally distributed product development teams. The company uses PLM solutions from PTC to connect all areas of the product lifecycle—across engineering, manufacturing, and service. With earlier, greater value chain collaboration, Ingersoll Rand is seeing improved operational excellence with reduced change related costs, and is now more efficiently producing the high quality, innovative products its customers need to be competitive.



A cloud PLM platform can provide an accessible and secure way for companies and their business partners to collaborate and innovate

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The majority of PLM implementations today are traditional on-premise solutions focused on managing engineering data

Shadows of Past Decisions

Most PLM applications in use today grew from efforts to manage change processes and engineering data revisions, starting in the 1980s and with steady growth over the following two decades. Inevitably, these implementations relied on client-server architectures, reflecting prevailing practice at the time.

Early PLM systems focused on the needs of product data management (PDM) for discrete manufacturing. Since then, solution providers have expanded PLM capabilities into other product related areas such as quality systems, sourcing, project and portfolio management, analytics, and aftersales service. Providers have also added support for process and hybrid manufacturing. Despite these advances, PLM is still often associated with its PDM roots.

This has led the vast majority of existing PLM implementations to be on-premise, based upon traditional client-server architectures.

Patching the Foundation

As companies have extended their PLM implementations beyond PDM, they have run into the need to adapt these applications to integrate with other enterprise systems and to fit company-specific needs. This has in turn led to significant development effort to customize systems and create client-specific integrations.

While companies clearly see value in these customizations—they wouldn't invest in them otherwise—there are implications.

Each upgrade, whether to a PLM application, or to an enterprise system, requires revisiting connections to other enterprise processes and then rigorous testing prior to deployment. When issues occur, more investment is needed before the upgrade can be released. The time and investment needed to maintain systems can be considerable and can take away from efforts to innovate and deploy new capabilities.

Sustainable PLM in the Cloud

The cloud provides a more sustainable model for PLM. Compared to on-premise solutions, PLM in the cloud simplifies the upgrade process so that a customer can focus on processes and depend on the solution provider to deliver functionality. With SaaS cloud PLM, the provider is typically responsible for hardware, upgrades, maintenance, patches, backup, and recovery.

According to the Global PLM Manager at a major provider of mining equipment and services, "When we moved to support from PTC we had a heavily customized system. Previously my team had to maintain customized behaviors. Now PTC does it through their Extended Cloud Services."

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The Case for PLM in the Cloud

Cloud PLM represents a fundamental shift in architecture and creates new opportunities for collaboration and integration

Economics and Flexibility

The most obvious benefits of cloud PLM are tied to its scalability. The economics of SaaS implementations (as well as IaaS and PaaS) can be appealing to companies of any size. Economic benefits aren't limited to capital expenditure reductions and per-user cost savings, however. Cloud PLM can simplify access management, especially for external collaborators. The flexibility of the cloud is another major advantage. For project-based work, it is much more efficient to scale up a cloud PLM instance for usage peaks, then scale down later in the project.

Integration and Innovation

The primary means of integration for cloud PLM is through web services, typically using RESTful APIs (REST is an industry standard for web services). Abstracting integrations through stable API calls simplifies integration development and reduces the effort required to upgrade systems.

With cloud PLM, the time and investment that otherwise would have gone into basic integrations and maintaining systems can instead be invested into enabling new organizational capabilities and efficiencies.

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“Our main objective when deciding for PTC Windchill on the Cloud was to have a central repository of up-to-date product information and efficient delivery of that data to customers and technical support staff, but at the same time to minimize the burden on IT while maintaining a predictable monthly cost.”

— Vinny Guercio, VP Engineering,
RAB Lighting



Cloud PLM Enables Richer Solutions

An additional advantage of cloud PLM is the ability for solution providers to create new offerings that are not feasible with an on-premise architecture.

For example, a provider can switch on access to additional functionality such as predictive analytics or reporting dashboards. These additional services may come directly from the provider or from third-party integrations.

This approach provides customers with more options, and dramatically reduces the investment in time and money required to implement new capabilities.



Cloud Objections and Obstacles

Although cloud PLM offers a number of advantages, there are real and perceived issues that may slow adoption by some companies

What's Holding Back Cloud PLM

Not surprisingly, the issue of security risks ranked highly among the factors that respondents selected as concerns with cloud PLM—it was the second-highest ranked factor.

The other top risks centered on the ability of cloud PLM to meet the specific integration, capability, and performance needs of each organization. Overall, the top four concerns (respondents could select multiple answers) were:

- Integrating cloud PLM with enterprise systems (45%)
- Security risks (41%)
- Lack of ability to customize to our specific needs (33%)
- Lack of confidence in performance (26%)

In summary, companies are looking for secure, scalable, and configurable systems that integrate readily with other enterprise systems.

“Other” concerns included *IP in the cloud*, *control of data in the cloud*, and *bandwidth limitations with CAD file sizes*

Addressing Concerns

Pre-built and configurable enterprise integrations are already available for many cloud PLM applications, plus solution providers and their partners are continually adding new integration capabilities.

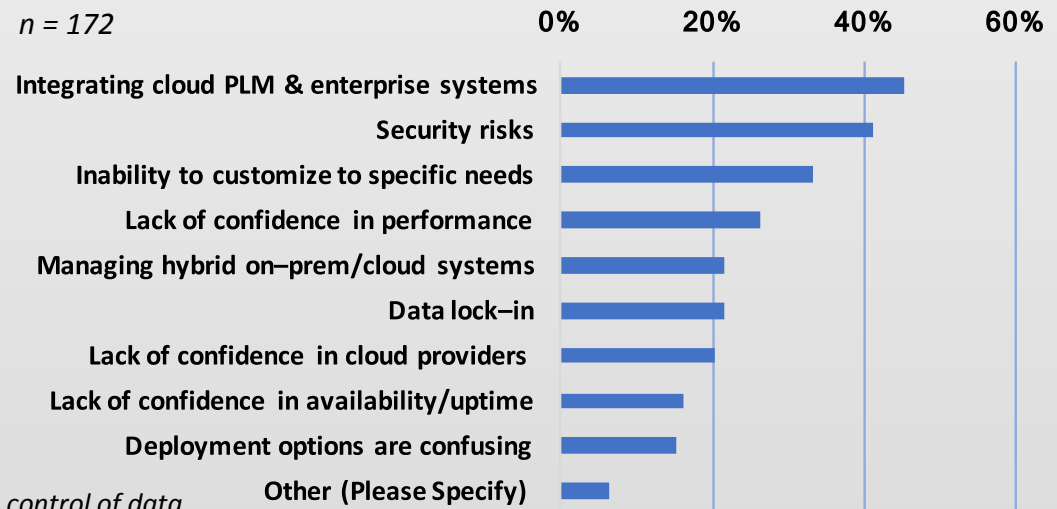
Security is not a simple cloud-or-no-cloud question. Securing a cloud PLM system requires a layered security model and partnering with a provider that maintains industry-recognized security certifications.

Cloud PLM can also improve security by eliminating the need for insecure “shadow IT” practices commonly used for sharing data externally.

Customization (or configuration) and performance concerns can be directly addressed using well-defined requirements, proof of concept projects, and simulated system loading tests.

Cloud Concerns

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The question is not *if* the cloud will be part of your future PLM strategy, but instead *how* the cloud will fit into that strategy

Different Paths to the Cloud

Adopting cloud PLM doesn't necessarily mean replacing an existing PLM implementation all at once. There are multiple paths to the cloud—the key is to identify the best path for your company. For a company without a legacy PLM system, it may make sense to start in the cloud.

Augment

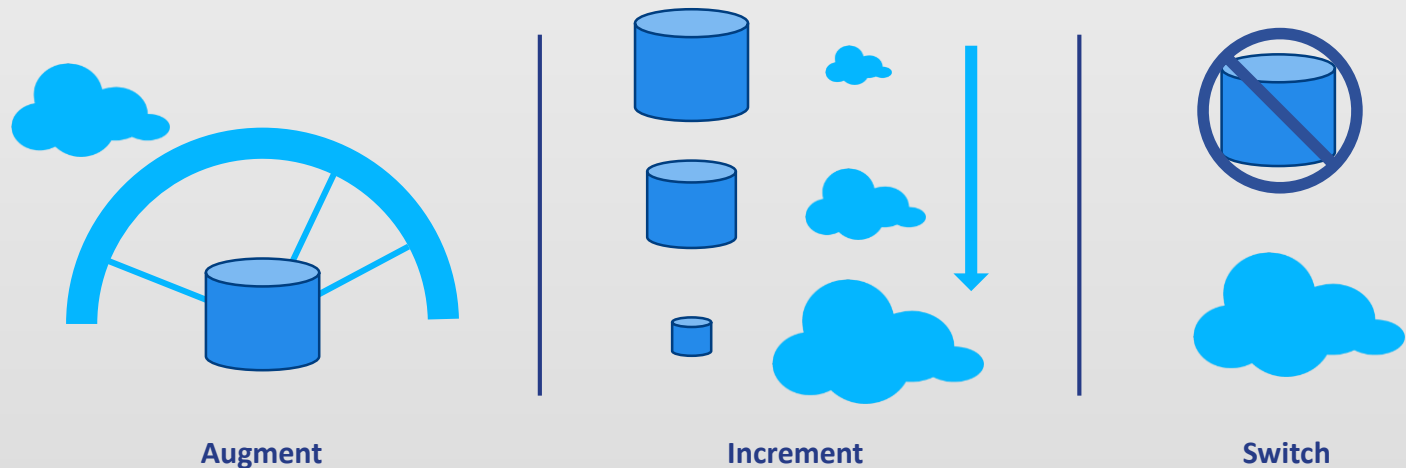
It can make sense to encapsulate and extend an existing PLM system with additional cloud functionality. This option is minimally disruptive and can provide fast payback. Negatives include greater integration complexity. This option can provide flexibility to defer the decision to replace an existing PLM implementation.

Increment

An incremental approach can take two forms. It's possible to incrementally migrate and turn off functionality in an existing system as capabilities are brought online in the cloud. Alternatively, decentralized organizations can roll out implementation incrementally across business units.

Switch

A wholesale switchover may make sense for some companies, especially if there is a compelling driver for change. However, this model contains the highest degree of risk and requires extensive implementation planning.



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The PTC PLM Cloud

PTC PLM Cloud instantly provides you with a broad set of PLM capabilities in a secure cloud environment

The PTC PLM Cloud Solution

PTC's PLM Cloud solution offers increased enterprise collaboration, rapid time-to-value, lower IT costs, and seamless maintenance:

- PLM SaaS or PLM Enterprise SaaS
- Pay-as-you-Go Pricing Model
- Cloud Migration Service
- Enterprise-Grade Security
- Amazon Web Services Tolerance and High Availability

Built on Windchill, PTC's PLM software with over 1.5 million seats deployed, PTC's PLM Cloud is a flexible, SaaS solution for companies looking to increase collaboration, manage product data and improve workflows without heavy IT overhead or hardware commitments.

The PTC PLM Cloud is pre-built and configured with enterprise systems (i.e., ERP) and a comprehensive set of capabilities, allowing organizations to scale up (or down) based on their growing business needs.



¹ "Total size of the public cloud computing market from 2008 to 2020." Statista. Accessed March 15, 2017. <https://www.statista.com/statistics/510350/worldwide-public-cloud-computing/>

² *The NIST Definition of Cloud Computing*. NIST Special Publication 800-145. <http://csrc.nist.gov/publications/PubsSPs.html#800-145>

³ Christensen, Clayton M. *The Innovator's Dilemma*. Boston, MA: Harvard Business Review Press, 1997.

⁴ Chan, Vanessa, et al. "Meeting the innovation imperative: How large defenders can go on the attack." McKinsey & Company. June, 2014.

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