



# 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.<sup>1</sup>

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

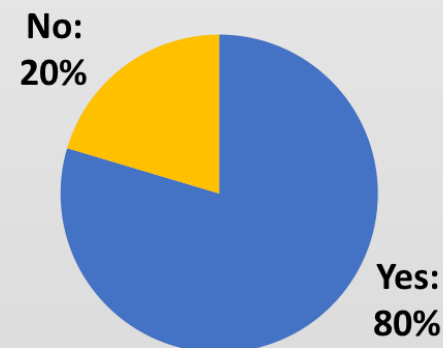
In some cases, cloud services have been introduced by startups seeking to disrupt the market by capitalizing on market niches. Increasingly, however, growth in the cloud services market is coming from established solution providers bringing the benefits of the cloud to enterprise markets.

## 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
- 80% 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, customers have demanding requirements for ERP system availability, security, and integration capabilities. Despite these demands, customer 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 Customer Relationship Management (CRM) and Human Capital Management (HCM).



# The Many Flavors of Cloud

Understanding options is important to identify the right cloud deployment model to fit individual customer 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 models<sup>2</sup>:

- 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 customer instance is logically and physically separated. In *multi-tenant* solutions, multiple customers share a single instance with logical separation of data for security.

## Deployment Models

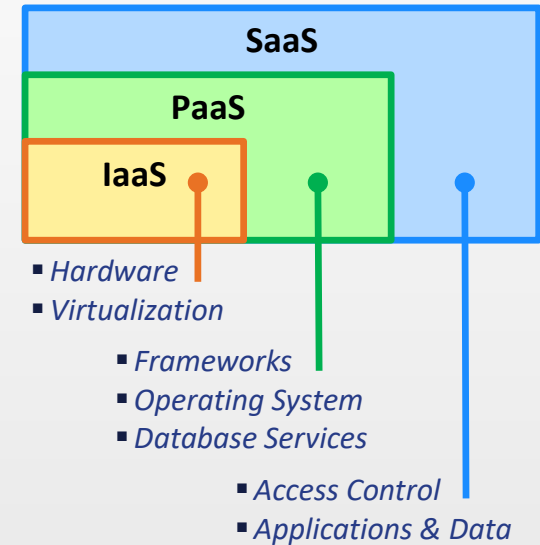
NIST also defines four deployment models:

- 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 at the beginning of a project to acquire hardware and software.



## 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 customers

## 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:

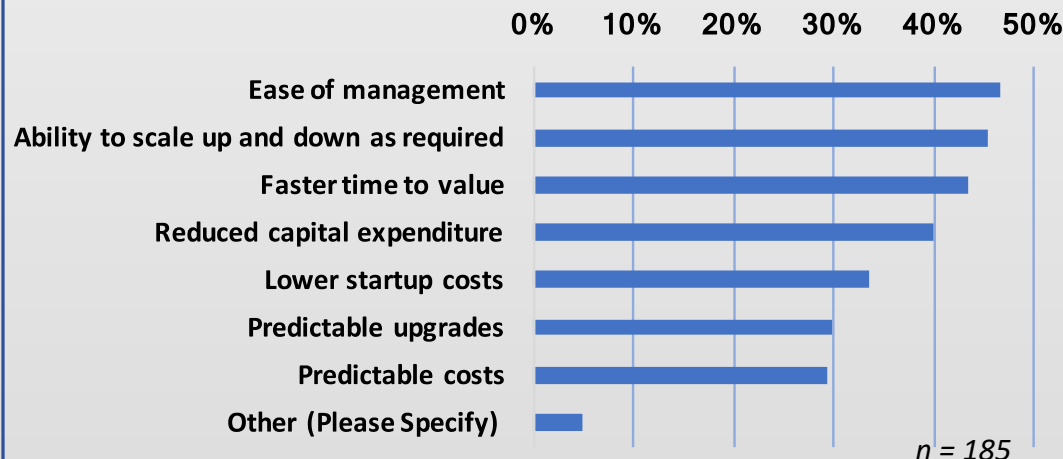
- Lower startup costs and reduced capital expenditures with flexible “pay as you go” pricing models
- Faster implementation and ongoing updates
- Rapid scalability
- Reduced management effort
- Simple and robust enterprise integrations
- Accessibility for remote workers and mobile devices
- Flexible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

## Why Customers are Interested in the Cloud

The CIMdata Cloud PLM study was conducted in partnership with Dassault Systèmes and other solution providers. This study found that customers are very interested in the convenience and economic advantages of the cloud. The top four benefits (respondents could select multiple answers) that customers 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*

“All product and project data is on the cloud,” says Mr. Jerome Julien, project manager at AKKA Research. “Dassault Systèmes regularly backs up and encrypts our data to ensure full security. Everyone has real-time access to the vehicle’s 3D digital mock-up, they can work on it and exchange ideas as if they were working in the same office. The 3DEXPERIENCE platform on the cloud was easy to deploy and the design, simulation, and data management applications are simple and intuitive. In less than two days, we were fully operational at all eight sites.”

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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*, 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.<sup>3</sup>

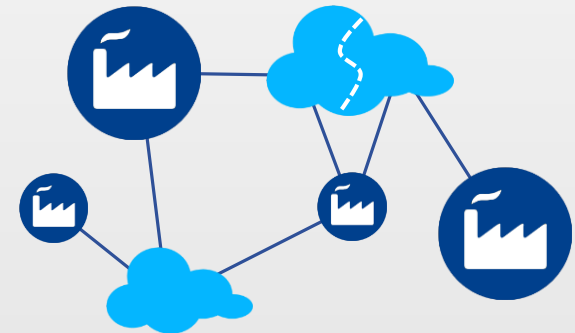
Today, the need for innovation is even greater than it was two decades ago. A 2014 report from McKinsey documented the decreasing tenure for companies within the S&P 500 stock index—and that a prime driver for the disappearance of these companies is the failure to innovate continuously.<sup>4</sup>

## Total Innovation

CIMdata has worked with industrial customers 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.

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



“The benefit of working on the cloud is that the design process is nurtured by people sharing their ideas,” said Mr. Youngse Kim, CEO of INNODESIGN. “In the digital age, the role of a designer is growing. Big data and digital tools open up many new possibilities. I think that combining the two will create something amazing. I call this ‘big design.’ Designers can work together more easily, and this is important for what I believe is a new trend for the future of design. ‘Big design’ allows designers to make better use of shared IT infrastructures and the large amount of data out there. Today’s digital tools on the cloud are definitely a way to do this.”

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# The State of PLM Today

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 customers 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 customers 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

“Working on the cloud enables us to focus on our core activities while letting Dassault Systèmes manage all IT-related tasks for us,” said Mr. Stanislas Maleissye, senior category and trade marketing manager, General Mills France. “Our total cost of ownership is, hence, lower because we don't need to invest in computing and data storage equipment nor in the human resources required to manage them.”

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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 customers 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.

"Using **3DEXPERIENCE** on the cloud makes it easy to work with customers, partners, and suppliers no matter where they are located," says Mr. Javier Glatt, co-founder and CEO of CadMakers Inc., a construction and manufacturing technology company. "On one project in a different market, we were able to just invite our partner to our tenant license. They simply get an email, and with very little IT work they are on the same platform in terms of viewing real-time project data and analyzing 3D graphics. There's governance around the data, and we can share whatever data we need or want to with them."

## 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.

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# Cloud Objections and Obstacles

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

## 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, customers 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 w/ CAD file sizes*

## Addressing Concerns

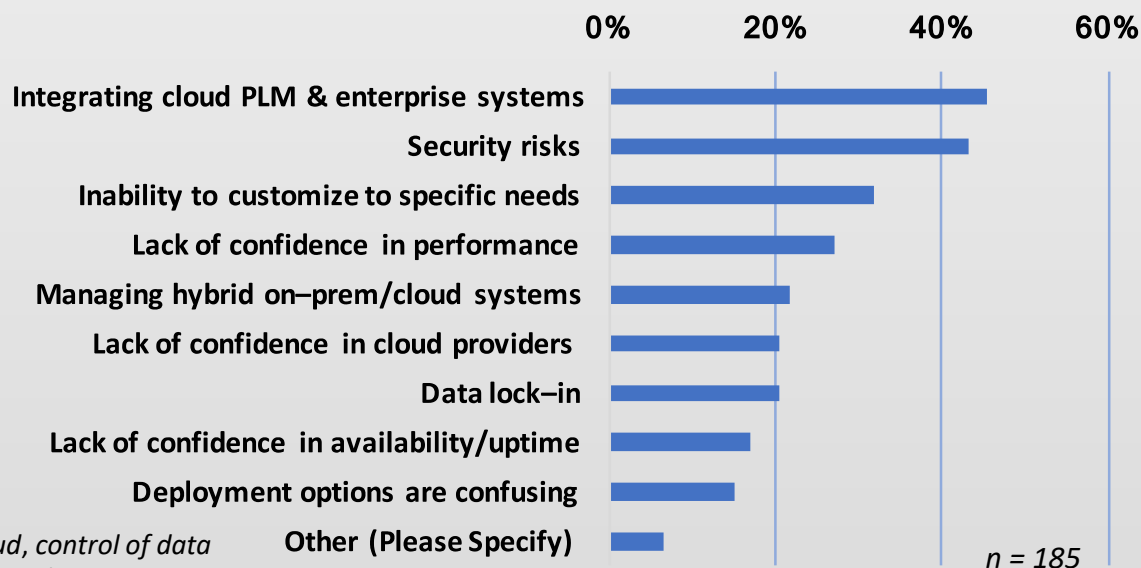
Pre-built and configurable enterprise integrations are already available for many cloud PLM applications, plus solution providers and their partners are continually adding new integration capabilities.

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.

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# Making the Move

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

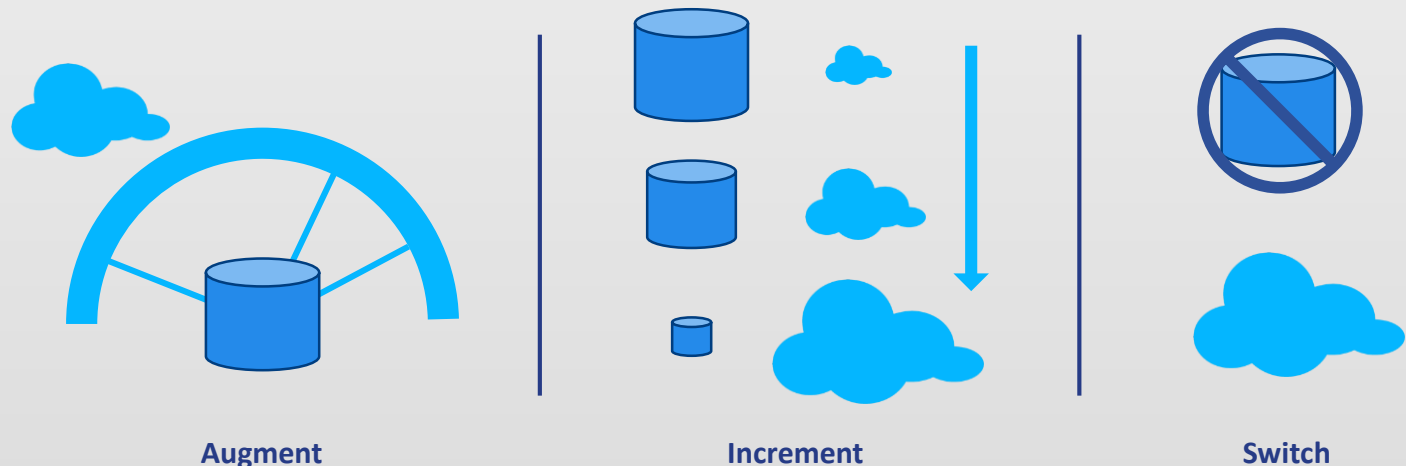
It can make sense to encapsulate and extend an existing PLM system with additional cloud functionality. This option is minimally disruptive and can provide fast payback. Negatives include greater integration complexity. This option can provide flexibility to defer the decision to replace an existing 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 customers, 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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# 3DEXPERIENCE On-Cloud

## Providing Optimal Total Cost of Ownership

Dassault Systèmes' cloud-based solutions on the **3DEXPERIENCE**® platform are at the heart of our business experience strategy. The platform is designed and optimized for cloud and mobility usage, connecting people, data, and resources. The **3DEXPERIENCE** platform serves as the operating platform that allows customers to run world class Industry Solutions supported by next generation applications, roles, and processes. Common platform services such as searching, dashboarding, tagging, social messaging, community sharing, and vaulting are available to everyone connected to the platform.

The **3DEXPERIENCE** platform's single, compass-like interface provides ease of use for all disciplines in the company. The collaborative business platform helps businesses succeed in the experience economy by offering a complete portfolio of product innovation applications, delivered in tailored Industry Solution Experiences created to foster experience-centric innovation.

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.

The **3DEXPERIENCE** Portfolio On Cloud offers a complete portfolio of applications powered by the **3DEXPERIENCE** platform and delivered on the cloud from these brands:

- CATIA: offers the ability not only to model any product, but to do so in the context of its real-life behavior.
- ENOVIA: enables you to plan your definition of success.
- DELMIA: helps global businesses reimagine their engineering, operations, and planning for manufacturing excellence.
- SIMULIA: provides realistic simulation applications that enable users to explore real-world behavior of product, nature, and life.
- NETVIBES: delivers an all-in-one dashboard view, enabling you to compare and analyze internal business metrics alongside web data to measure social impact.



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