

The Forrester Wave™: Product Lifecycle Management For Discrete Manufacturers, Q4 2017

The Seven Providers That Matter Most And How They Stack Up

by Nate Fleming
November 29, 2017

Why Read This Report

In our 20-criteria evaluation of product lifecycle management (PLM) solutions for discrete manufacturers, we identified the seven most significant ones — Aras, Autodesk, Dassault Systèmes, Oracle, PTC, SAP, and Siemens — and researched, analyzed, and scored them. This report shows how each provider measures up and helps CIOs and product development professionals make the right choice when selecting a PLM solution.

Key Takeaways

PTC, Aras, And Dassault Systèmes Lead The Pack

Forrester's research uncovered a market in which PTC, Aras, and Dassault Systèmes lead the pack. Siemens and Oracle offer competitive offerings. SAP and Autodesk lag behind, but meet the needs of certain customers.

Companies Are Looking For Customer-Centric Support, Flexibility, And Openness

The PLM market for discrete manufacturers is growing, as more product development pros see PLM as a way to address their top challenges. Whether starting from scratch or updating a legacy PLM software suite, buyers seek a vendor that values their feedback and requirements and a solution that is flexible and open to their existing enterprise software ecosystem.

Consistent Data Management And Analytics Capabilities Are Key Differentiators

As legacy PLM technology becomes outdated and less effective, the ability to keep product development data consistent across the entire product life cycle and use that data to run robust data analytics were key themes outlined by customer references.

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PLM Is A Core Technology For Manufacturers In The Digital Age

Discrete manufacturing organizations often represent massive, distributed enterprises, and they have long struggled to consistently and effectively manage their product development processes and data. Inevitably, product development data was managed manually or in an array of disconnected systems — slowing down time-to-market, creating risks around product defects or product development errors, and inhibiting efficiency across the organization.¹ PLM always had the potential to alleviate these symptoms, but the implemented solutions have been used primarily as a secure system of record for CAD files. PLM solutions have also been an additional burden on discrete manufacturing customers — often cited as slow to implement, hard to use, difficult to update, and closed in terms of integration capabilities.²

Digital Initiatives Across Organizations Are Amplifying Customer Demands Around PLM

Digital transformation initiatives are top of mind for most enterprise businesses today, with 58% of global services decision makers saying they're in the midst of a digital transformation in 2017.³ While these initiatives often start in IT or a business technology office, the best practices and expectations from digital transformations are bleeding into the product development organization and management of PLM solutions.

At the center of many digital transformation initiatives is the business value of properly gathered data, and this trend has been reflected in customer expectations around PLM. Traditional PLM users and business-side stakeholders are seeking a PLM solution that can be a real-time single source of truth that focuses on product development data, but also integrates with other enterprise systems like manufacturing execution system (MES), enterprise resource planning (ERP), and internet-of-things (IoT) platforms to enable a holistic vision of the product. The following trends indicate customers' desire for advanced data capabilities during the PLM Wave research process:

- › **Concerted efforts in creating a consistent product record across the life cycle.** Customer references who discussed bill of material (BOM) management during the Forrester Wave research process were consistently road mapping or implementing functionality that linked BOM from design through to manufacturing and operation in the field. A lack of cohesion between the engineering BOM from the PLM and the manufacturing BOM from the MES create discrepancies between products as they're designed versus how they're built. Common integrations that customers cited in search of a cohesive BOM included the PLM, MES, and ERP. While PLM vendors frequently market this capability, most customers we interviewed were road mapping toward this functionality. In the past, shortcomings in integration capabilities, as well as their own legacy processes, had discouraged this cohesive BOM across the life cycle.
- › **Disappointment in analytics capabilities delivered by PLM vendors.** Analytics is a place where companies are trying to drive digital innovation today, with 47% of global services decision makers saying they wanted to increase use of metrics to measure success across the organization as part of a digital transformation initiative.⁴ PLM customers references interviewed for this Forrester

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Wave were consistently disappointed in the analytics capabilities that vendors embedded within their PLM solution. Customers described using light dashboard or reporting functionality to monitor product development performance, but they characterized the functionality as not strong and below functionality seen in other enterprise applications. Customers frequently cited using alternative data analytics tools like Tableau to meet their needs instead of the PLM vendor's software. Some PLM vendors are building out new software solutions in IoT or solutions that focus on analytics specifically — according to customer references, these are the most advanced analytics tools PLM vendors deliver.

- › **Cautious, but emerging interest in cloud-deployed PLM solutions.** Cloud is an interesting and emerging topic in the PLM market — in contrast to most enterprise software spaces, where it is already more dominant. In 2016, 16% of North American and European software decision makers were considering a software-as-a-service (SaaS) PLM implementation, and 27% were considering a hybrid approach.⁵ Legacy PLM vendors have invested significantly in cloud PLM capabilities over the last 18 months, but they are primarily targeting small and medium-sized businesses and new verticals with these offerings. Enterprise discrete manufacturers have long been reluctant to consider cloud PLM deployments due to security concerns, but the tide does seem to be slowly turning.⁶ Enterprise manufacturers are asking about cloud capabilities during the RFP process and considering or even implementing single-tenant or private cloud PLM deployments. Adoption of SaaS PLM for large discrete manufacturers will likely unfold over the next several years, at which time, those vendors who have invested heavily in their cloud PLM products will be rewarded handsomely.

PLM Vendors Are Adjusting Their Offerings To Meet New Business Demands

In recent years, PLM vendors have taken to heart the new requirements that legacy customers demand. We sought to capture which PLM vendors were providing the best solutions for their customers — solutions that could easily adapt to unique customer environments, effectively manage product data across the life cycle, and enable the adoption of emerging technology when the client saw fit. To this end, we increasingly see PLM vendors that are:

- › **Solving several legacy user experience issues for PLM.** Recently, PLM vendors and third-party implementation partners have worked hard to design frameworks that make PLM easier to deploy. They identify business needs with customers and design iterative, agile implementation strategies that meet crucial business needs first and build out incremental value from there. PLM vendors have also worked hard to create out of the box functionality and role-based applications that reduce the need for hard-code customization, easing the cost and time required for updates down the road.
- › **Adding collaboration functionality that knocks down organizational silos.** Heeding customer requests around PLM as a potential tool to knock down organizational silos as part of digital transformation initiatives, PLM vendors have added collaboration capabilities that encourage

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proactive project management and innovation on product designs. These tools, which channel social media interfaces, are good for connecting stakeholders from different geographies or parts of the organization.

- › **Providing a real-time single source of truth for product development data.** Cloud deployments and model-based data architectures have allowed PLM vendors to provide more consistent product development data to stakeholders across the organization and in their moment of need. Vendors have been moving away from file-based data structures that require product development pros to check files in and out — leading to potential version control issues and costly potential errors.
- › **Planning for emerging technologies that will affect product development.** PLM vendors have also been proactive in mergers and acquisitions to provide users access to software functionality that meets emerging needs related to technologies like IoT, additive manufacturing, and augmented reality. PLM clients seeking to develop connected products need a PLM solution that can manage mechanical, electrical, and software product specifications. Product companies seeking to take advantage of advancements in additive manufacturing need a PLM that can tighten consistency between CAD files and models generated for 3D printing. And product companies want to use technologies like augmented reality to enable mechanics on the factory floor using tablets.

Product Lifecycle Management Evaluation Overview

To assess the state of the PLM market for discrete manufacturing and see how the vendors stack up against each other, Forrester evaluated the strengths and weaknesses of top PLM vendors. After examining past research, user need assessments, and vendor and expert interviews, we developed a comprehensive set of evaluation criteria. We evaluated vendors against 20 criteria, which we grouped into three high-level buckets:

- › **Current offering.** To assess the breadth and flexibility of each vendor's PLM offering to meet each client's specific needs, we used customer reference feedback to assess an array of core and future-facing technologies that contribute to PLM for digital product development organizations.
- › **Strategy.** To assess each vendor's PLM strategy, we evaluated each vendor's product vision and go-to-market approach as well as their implementation partner ecosystem and cloud offerings.
- › **Market presence.** To establish market presence for each PLM offering, we evaluated the revenue of the PLM product and number of customers using the PLM product.

Evaluated Vendors And Inclusion Criteria

Forrester included seven vendors in the assessment: Aras, Autodesk, Dassault Systèmes, Oracle, PTC, SAP, and Siemens. Each of these vendors has (see Figure 1):

- › A revenue related to the PLM solution that exceeded \$100 million in 2016.

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- › A strong base of discrete manufacturing clients using the PLM solution.
- › Frequent mention in PLM solution vendor selection scenarios from discrete manufacturing clients at Forrester.

FIGURE 1 Evaluated Vendors: Product Information And Selection Criteria

Vendor	Product evaluated	Product version evaluated
Aras	Aras Innovator	11SP11
Autodesk	Fusion Lifecycle	
Dassault Systèmes	3DEXPERIENCE Platform	2017x
Oracle	Agile	9.3.6
PTC	Windchill	11
SAP	SAP PLM	
Siemens	Teamcenter	11.3

Vendor inclusion criteria

A revenue related to the PLM solution that exceeded \$100 million in 2016

A strong base of discrete manufacturing clients using the PLM solution

Frequent mention in PLM solution vendor selection scenarios from discrete manufacturing clients at Forrester

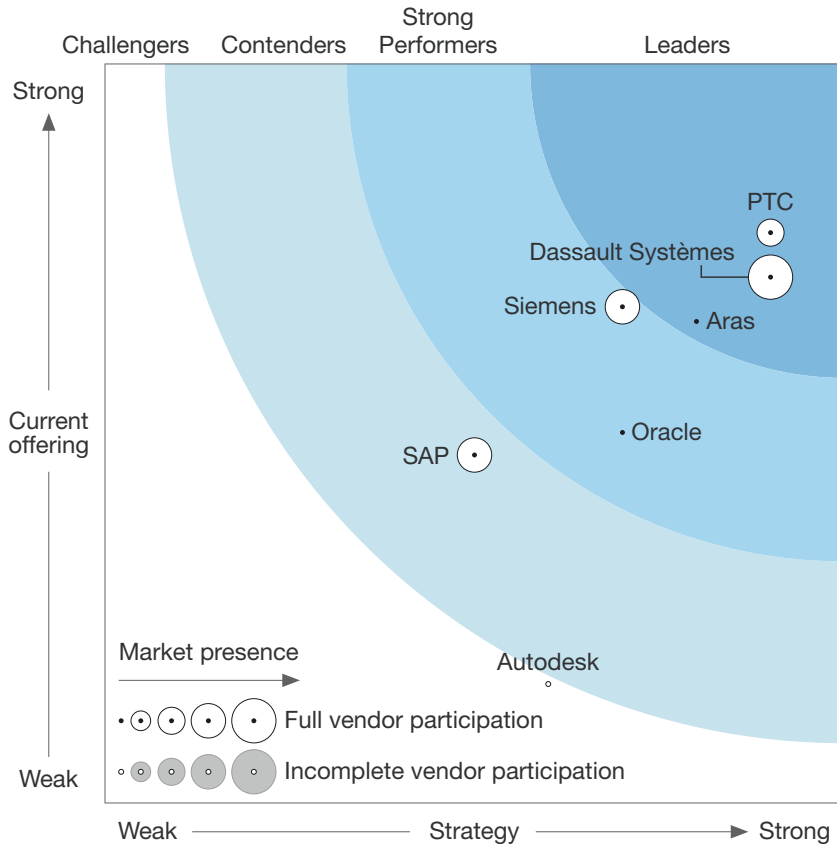
Vendor Profiles

This evaluation of the PLM market is intended to be a starting point only. We encourage clients to view detailed product evaluations and adapt criteria weightings to fit their individual needs through the Forrester Wave Excel-based vendor comparison tool (see Figure 2). Click the link at the beginning of this report on Forrester.com to download the tool.

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FIGURE 2 The Forrester Wave™: Product Lifecycle Management For Discrete Manufacturers, Q4 '17



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Go to Forrester.com to download the Forrester Wave tool for more detailed product evaluations, feature comparisons, and customizable rankings.

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FIGURE 2 The Forrester Wave™: Product Lifecycle Management For Discrete Manufacturers, Q4 '17 (Cont.)

	Forrester's weighting	Aras	Autodesk	Dassault Systèmes	Oracle	PTC	SAP	Siemens
Current Offering	50%	3.25	0.80	3.55	2.50	3.85	2.35	3.35
BOM management	10%	5.00	1.00	3.00	3.00	5.00	5.00	3.00
Quality and compliance	10%	3.00	1.00	5.00	3.00	5.00	3.00	5.00
Supplier management and collaboration	10%	3.00	1.00	5.00	5.00	1.00	3.00	3.00
Manufacturing process planning and management	5%	3.00	0.00	5.00	1.00	3.00	3.00	5.00
Digital twin	5%	3.00	1.00	1.00	1.00	5.00	1.00	3.00
Simulation data management	5%	1.00	1.00	5.00	1.00	3.00	1.00	3.00
Innovation and product portfolio management	5%	1.00	1.00	1.00	3.00	1.00	3.00	1.00
Role-based applications	5%	5.00	1.00	5.00	1.00	5.00	3.00	3.00
Analytics	5%	1.00	0.00	3.00	1.00	1.00	0.00	1.00
IoT platform and usage data mgmt.	5%	1.00	1.00	1.00	1.00	5.00	1.00	3.00
Additive manufacturing	5%	1.00	1.00	5.00	1.00	3.00	1.00	5.00
Mobile	5%	2.00	1.00	2.00	3.00	4.00	1.00	4.00
Integration capabilities	5%	5.00	1.00	3.00	3.00	5.00	1.00	5.00
Implementation and sustainability	10%	5.00	1.00	2.00	3.00	5.00	2.00	3.00
Configurability and flexibility	10%	5.00	0.00	5.00	3.00	5.00	3.00	3.00
Strategy	50%	4.00	3.00	4.50	3.50	4.50	2.50	3.50
Product vision	50%	5.00	3.00	5.00	3.00	5.00	3.00	3.00
Partner ecosystem	25%	3.00	1.00	5.00	3.00	3.00	1.00	5.00
Delivery model — cloud	25%	3.00	5.00	3.00	5.00	5.00	3.00	3.00
Market Presence	0%	1.00	1.00	5.00	1.00	3.00	4.00	4.00
Revenue of product	50%	1.00	1.00	5.00	1.00	3.00	5.00	5.00
Number of customers	50%	1.00	1.00	5.00	1.00	3.00	3.00	3.00

All scores are based on a scale of 0 (weak) to 5 (strong).

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Leaders

- › **PTC adds emerging technology to their core PLM suite.** PTC has been aggressive in their adoption of emerging technologies that touch on their core product development software capabilities and build out on the functionality of their Windchill PLM product. This is most embodied in the firm's addition of an IoT platform — ThingWorx — to their product suite, which scored as a Leader in Forrester's IoT Software Platform Wave evaluation. Their decision to target IoT is logical, as their CAD offering (Creo) and PLM offering (Windchill 11) cover product design and development, while ThingWorx solidifies their presence in industrial settings. The firm has also been aggressive in augmented reality technology that creates dynamic in-the-field mobile experiences for clients that adopt it. Customers were also eager to point out the high level of attention PTC paid to their needs, quickly turning product requests into functionality in Windchill updates.

PTC has done well in adopting emerging technologies and predicting the trajectory of the discrete manufacturing market. Certain product features came up short compared to some of their biggest competitors. The sampling of PTC customer references tended to look elsewhere for software solutions in the simulation and manufacturing execution arena. Windchill users also tended to find the software's analytics capabilities underwhelming and cited lower adoption of supplier management functionality than some competitors. PTC is a great choice for discrete manufacturers looking for an involved vendor with IoT capabilities that can get their PLM solution up and running quickly and flexibly.

- › **Dassault Systèmes' platform approach synchronizes clients' product data.** Dassault Systèmes has been the leader in PLM from a market presence perspective due to their deep capabilities around all facets of product development. These include several software solutions, leading CAD solutions with both CATIA and SOLIDWORKS, simulation, and manufacturing execution — with the 3DEXPERIENCE platform that connects these valuable resources. The firm has centered its strategy on the 2012 introduction of the 3DEXPERIENCE platform, a model-based environment that allows customers to select the product development solutions they wish to use and derive additional value from the unified data model that connects them. Customers have been impressed by the platform, saying that it has really helped in pivoting not just the tooling behind product development, but also the behavior of product development stakeholders. Customization has long been a reality of the PLM space that ultimately hamstring customers as they seek to customize down the road, and Dassault Systèmes seems to have corrected this. Several customers mentioned adapting their business processes to the out-of-the-box capabilities of the 3DEXPERIENCE platform and saw success from that transition.

The 3DEXPERIENCE platform has driven business value for clients willing to go all in, but it involves a major commitment and can be disruptive during implementation and migration. Customers stated that Dassault Systèmes wasn't always receptive to their feature requests or their need for support services during the implementation process. Dassault Systèmes is also known for being more of a closed environment that requires a more complex integration process with third-party

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enterprise applications when compared with some of their competitors. Large discrete manufacturers committed to making a digital transformation in the product design and development organization should consider the 3DEXPERIENCE platform as a good enabler and catalyst for this type of journey.

- › **Aras disrupts the PLM market with a flexible and agile solution.** Aras is an emerging vendor in the PLM space, but has made major inroads to the market with significant discrete manufacturing client wins and customer boasting advanced PLM implementations using their PLM Innovator product. The company uses an open source business model, meaning that basic usage of the software is free with an enterprise subscription option for customers to gain access to Aras' support services. The firm was lauded by customers for fast implementations and a flexible software solution that can quickly adapt to a customer's specific needs while still being upgradable down the road. Customers using Aras' PLM Innovator tool tended to have the most innovative use cases of their PLM systems of all vendors included in the Forrester Wave evaluation — with systems that were meeting engineering's needs, but also building out functionality to business stakeholders and third-party partners.

Aras has rocked the boat for the legacy vendor community in the PLM market, but they are the smallest vendor included in the Forrester Wave. The firm has a few hundred employees, compared with the thousands at the other PLM vendors, but customers cited the firm as a reliable and often strategic partner. Some customers did note that the system had trouble with performance when it was retrieving large amounts of data from servers — causing hiccups in the UI and solution performance. Additionally, Aras is only a PLM platform, with no associative product development or business-side software — this means that connecting to the system must be done through integration, which customers said was relatively easy given the simplicity of Aras' database. Companies looking to make a meaningful change to their product organization and knock down the figurative walls between product development and the business should consider Aras as an agile solution that meets requirements and delivers results fast.

Strong Performers

- › **Siemens' PLM suite uses openness to drive innovation for discrete manufacturers.** Siemens Teamcenter is a strong PLM product that combines core engineering tools in areas like simulation and manufacturing execution with an open PLM solution to drive product innovation for end customers. The firm has been on an acquisition spree recently, spending \$10 billion on technology companies, including electronic CAD vendor Mentor Graphics, which positions them well in a business environment that drives greater demand for development of connected products that require unified management of mechanical, electrical, and software life cycles. Customers stated that the vendor's mobile applications encouraged productivity on the factory floor, and role-based applications were increasing the role of the business in product development processes.

Siemens has been slow to innovate on their product development suite in some areas. The vendor rolled out an IoT platform, MindSphere, in 2016 and has started to introduce portions of Teamcenter, which is delivered through SaaS. However, customers we interviewed hadn't

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considered usage of either product just yet. Customers mentioned that Siemens was also a bit of a distributed organization: If the customer had a Teamcenter implementation across several geographies, it was difficult to line up a united Siemens team to enable the implementation. Siemens Teamcenter can meet the needs of any manufacturer looking for deep product development expertise while also requiring openness and innovation from their vendor partner moving forward.

- › **Oracle Agile provides strong PLM and adds a new cloud-first solution.** Oracle's core PLM product is Agile, an enterprise-grade PLM solution that is widely adopted in the market. The firm has also recently introduced the Oracle PLM Cloud, a separate cloud-native solution that lives on the same architecture as the rest of Oracle's growing cloud enterprise application suite, which adds potential value through the ability to easily exchange data across systems. The vendor has aggressively moved current and potential PLM customers to their cloud offering — a strategy that will enable client wins and innovation down the road. For this Wave, we focused on the Agile product, which is known for its strong capabilities and high-profile client presence in the high-tech and life sciences industries and best-in-class supplier collaboration capabilities.

Oracle is at a crossroads with their PLM solutions. They will continue to support Agile, but their focus and the innovation for Oracle in PLM will emerge from their PLM Cloud offering. Given Oracle's legacy in the business enterprise application space, there was customer feedback that the Agile solution integrated more effectively with business applications like ERP than with product development tools. The firm has made efforts and seen results in shifting this dynamic by replacing PLM vendors in some customer environments where the original CAD tools still run and can integrate with Oracle Agile. For this Wave, Oracle failed to produce customer references for interview, which hurt their overall score, as references were used as a tool to prove the viability of vendor solutions in an environment where PLM must be extremely flexible to meet the varying needs of different customer product development organizations and software ecosystems. Customers looking for a stable PLM vendor that can offer two different solutions depending on customer road maps and needs should consider Oracle a good partner with a bright future in their PLM cloud product.

Contenders

- › **SAP PLM is a strong tool for connecting product data throughout the life cycle.** SAP uses their widespread presence in potential customers' enterprise application ecosystems and their strong vision of digital software through the HANA database and Fiore design concept as the foundation for a solid PLM product. The company's strength is rooted in business-oriented software functionality that adds augmentative value to a PLM system when integrated. SAP business systems that connect to SAP PLM to drive value include innovation management, project portfolio management, product costing capabilities, supplier management, and seamless integration with key native SAP applications like ERP and MES. Customers spoke highly of SAP's work in bringing

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the PLM solution into the fold with the rest of their digital era software solutions, which should drive value for product development stakeholders seeking to integrate their data processes with the rest of the business.

SAP's PLM struggles to meet some of the core needs of R&D and engineering stakeholders. Some customers we interviewed were using additional PLM systems to enable engineering stakeholders while depending on SAP for the business view on product development. Customers can integrate CAD, simulation, and product usage data from the field into the PLM using the new Engineering Control Center, but legacy customers using SAP's PLM haven't necessarily implemented this solution. Potential customers confident in SAP's application suite should use the PLM solution to create a digital product development organization that is seamlessly connected to business-side software solutions.

Challengers

- › **Autodesk brings a solid PLM product deployed from the cloud.** Autodesk declined to participate in the Forrester Wave research process, making it difficult to assess the latest capabilities, road map, and product vision for their SaaS-based PLM solution, Fusion Lifecycle. The firm has a massive product design and simulation application suite that serves as the foundation for their PLM offering. Their client base lies in industrial, high-tech, consumer electronics, automotive supply chain, and medical devices, where their customer base is a 50/50 mix of customers who use Autodesk design products and other clients using third-party design software seeking a cloud product lifecycle management solution. Their SaaS-first deployment approach assures potential customers that the solution will be easy to implement, up-to-date without concern about manual updates, usable for technical and non-technical stakeholders, and flexible in terms of customer needs to scale or draw back PLM users.

While Autodesk has a strong market presence in design and simulation software, it appears that their PLM capabilities and presence in the market is less pronounced. Services firms mentioned that the cloud firm's automatic updates had broken some customers' implementations. The firm noted that they were combatting this through a beta process that introduced clients to releases a month ahead of updates to allow testing of affected functionality. Services partners also mentioned that the solution struggled some with product data management capabilities and that they needed to build their own integrations between the firm's PDM solution — Vault — and the PLM solution. Customers looking for an intuitive cloud-first PLM solution with strong business process capabilities should consider Autodesk.

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Supplemental Material

Online Resource

The online version of Figure 2 is an Excel-based vendor comparison tool that provides detailed product evaluations and customizable rankings. Click the link at the beginning of this report on Forrester.com to download the tool.

Data Sources Used In This Forrester Wave

Forrester used a combination of two data sources to assess the strengths and weaknesses of each solution. We evaluated the vendors participating in this Forrester Wave, in part, using materials that they provided to us by November 14, 2017.

- › **Product demos.** We asked vendors to conduct demonstrations of their products' functionality. We used findings from these product demos to validate details of each vendor's product capabilities.

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- › **Customer reference calls.** To validate product and vendor qualifications, Forrester also conducted reference calls with three of each vendor's current customers.

The Forrester Wave Methodology

We conduct primary research to develop a list of vendors that meet our criteria for evaluation in this market. From that initial pool of vendors, we narrow our final list. We choose these vendors based on: 1) product fit; 2) customer success; and 3) Forrester client demand. We eliminate vendors that have limited customer references and products that don't fit the scope of our evaluation. Vendors marked as incomplete participants met our defined inclusion criteria but declined to participate or contributed only partially to the evaluation.

After examining past research, user need assessments, and vendor and expert interviews, we develop the initial evaluation criteria. To evaluate the vendors and their products against our set of criteria, we gather details of product qualifications through a combination of lab evaluations, questionnaires, demos, and/or discussions with client references. We send evaluations to the vendors for their review, and we adjust the evaluations to provide the most accurate view of vendor offerings and strategies.

We set default weightings to reflect our analysis of the needs of large user companies — and/or other scenarios as outlined in the Forrester Wave evaluation — and then score the vendors based on a clearly defined scale. We intend these default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs through the Excel-based tool. The final scores generate the graphical depiction of the market based on current offering, strategy, and market presence. Forrester intends to update vendor evaluations regularly as product capabilities and vendor strategies evolve. For more information on the methodology that every Forrester Wave follows, please visit [The Forrester Wave™ Methodology Guide](#) on our website.

Integrity Policy

We conduct all our research, including Forrester Wave evaluations, in accordance with the [Integrity Policy](#) posted on our website.

Endnotes

- ¹ See the Forrester report "[The Changing Face Of Product Development In The Digital Era.](#)"
- ² See the Forrester report "[Cloud Reshapes The Legacy PLM Market.](#)"
- ³ Source: Forrester Data Global Business Technographics® Business And Technology Services Survey, 2017.
- ⁴ Source: Forrester Data Global Business Technographics Business And Technology Services Survey, 2017.
- ⁵ Source: Forrester Data Global Business Technographics Software Survey, 2016.
- ⁶ See the Forrester report "[Cloud Reshapes The Legacy PLM Market.](#)"

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