

ABI RESEARCH COMPETITIVE RANKING

MCAD SAAS FOR LARGE ENTERPRISES & MANUFACTURING AT SCALE



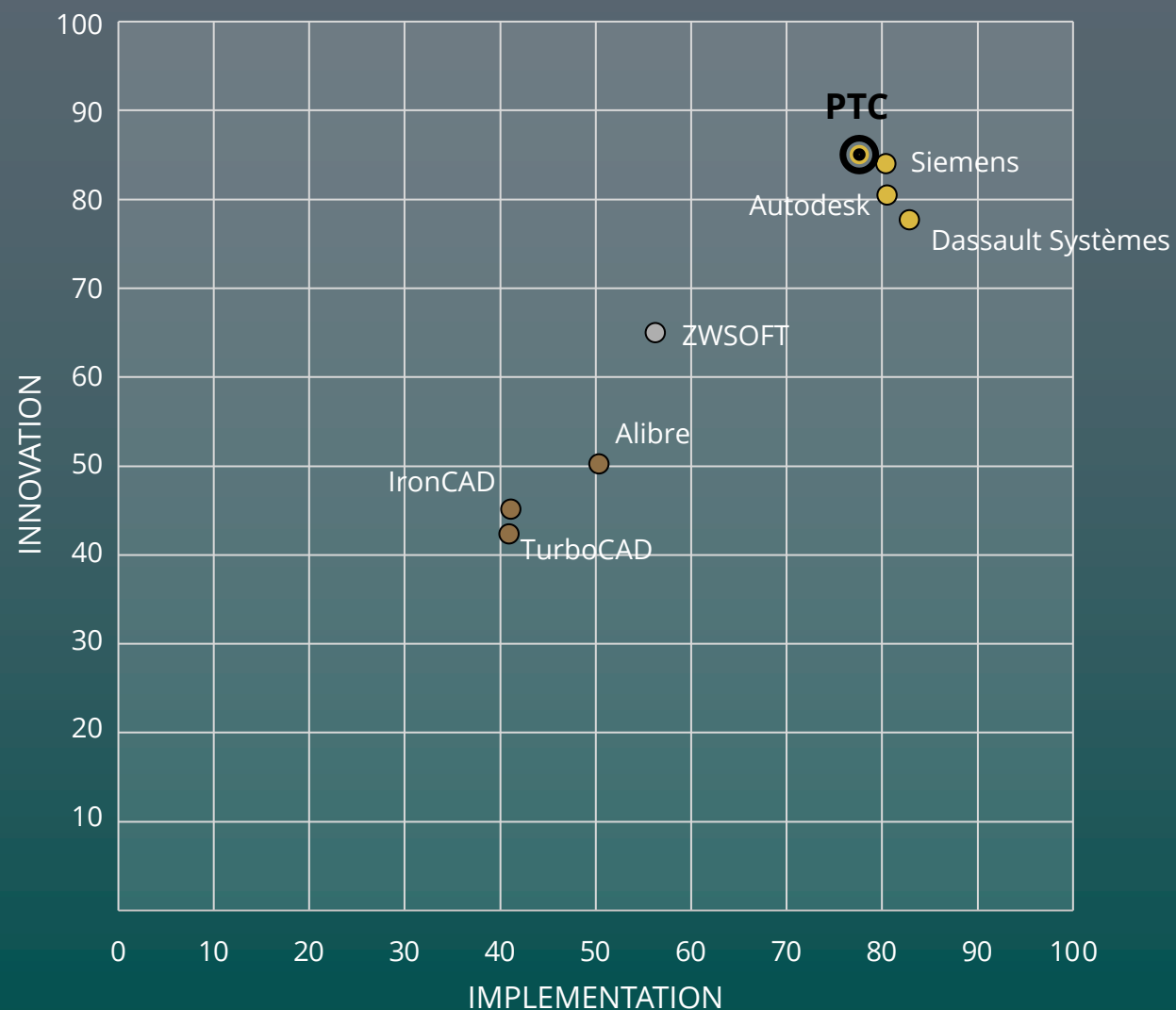
OVERALL: 81.4 | INNOVATION: 85.0 | IMPLEMENTATION: 77.7



PTC
INNOVATION
VERSUS
IMPLEMENTATION
MATRIX



OVERALL: 81.4 | INNOVATION: 85.0 | IMPLEMENTATION: 77.7



INTRODUCTION



PTC is a Boston-based software provider with 6,000+ employees globally. The company focuses on providing software for industry and manufacturing with core products being Creo, Creo+, Onshape, Arena, Windchill, Windchill+, Codebeamer, Vuforia, ThingWorx, Kepware, Kepware+, and ServiceMax. PTC is an established CAD provider with large-scale manufacturers remaining customers for over 35 years. This competitive assessment focuses on Creo and Creo+.

PTC leads in innovation with Creo and Creo+ due to both software offering the best service for integrated functions such as a fully-fledged CAx model, embedded computer-aided additions, and extended functionality in the form of cloud usage, generative design, and AR/VR viewing. Specific areas of CAD in which PTC provides a better solution are for parametric surfacing, MBD, mechanism design, and BIM. With this robust CAD toolset, along with simulation integrated through Ansys, Creo, and Creo+, are the overall strongest offerings for industrial-scale manufacturers. PTC is a top implementer with its best-in-class customer support and easy-to-use interface for new users.

PTC is a leader and close second with its Creo and Creo+ offerings and achieves the highest innovation score and fourth place in the implementation ranking. For innovation, PTC has built out the most comprehensive offering suite of computer-aided additions, with strongpoints coming from native inclusion of Computer-Aided Engineering (CAE) features such as Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD), mechanism dynamics analysis, tolerance analysis, and parameter-driven optimization, along with Computer-Aided Manufacturing (CAM) provided through three avenues: subtractive, additive, and tool design. Creo and Creo+ offer further advanced computer-aided additions such as process planning that includes functionality that extends to cost-estimation and production scheduling, along with computer-aided quality for final part and product dimensions.

PTC's Creo and Creo+ are the strongest CAD offerings for innovation. Creo and Creo+ both excel in assessment criteria of traditional CAD functionality and computer-aided additions. Additional strongpoints from Creo and Creo+ come from customer support, frequency of updates, and end-user feedback, where PTC as a smaller company can offer faster support compared to larger incumbent providers.

INNOVATION



**INNOVATION
SCORE: 85.0**



For industrial-scale manufacturers, PTC offers Creo as an on-premises solution. Creo offers a broad array of CAD capabilities, including but not limited to 2D/3D design, parametric and freeform (i.e., subdivisional) surfacing, MBD, mechanism design, ergonomic design, plastic part design, and assembly management and performance analysis. Additionally, Creo houses a comprehensive composites database for material properties and usage. For CAE, Creo is equipped with features such as FEA, CFD, mechanism dynamics analysis, tolerance analysis, and parameter-driven optimization, all of which are integrated directly into the software without the need for external solution providers. This integration is the norm for incumbent providers; however, is not the case for CAD providers, which fall into the mainstream or followers category. When it comes to CAM, Creo provides three perspectives: subtractive, additive, and tool design. Through these three perspectives, Creo encapsulates all manufacturing styles from injection molding to die casting. Creo offers a robust suite of tools for CAPP such as cost-estimating and production scheduling. In the realm of quality assurance, Creo leverages computer-aided verification to validate final part dimensions, making sure products are uniformly built and up to manufacturing standards. For AR/VR, PTC acquired Vuforia in 2015, an AR platform designed to take product models directly from CAD for viewing in VR. PTC's Vuforia, when integrated with Creo, allows users to freely view finished products in real-world environments to check for defects and quality concerns.

PTC launched Creo+ in 2023, a SaaS version of Creo, which is upward-compatible with the on-premises version of Creo. Creo+ includes all the capabilities of Creo, plus cloud-based real-time collaboration and license deployment tools. When making the transition to Creo+, users can be up and running using their original on-premises Creo data files.

PTC's simulation capabilities are driven by a partnership with Ansys, notably providing Ansys' flagship structural solver to offer powerful, high-accuracy simulation, which is directly integrated into Creo and Creo+. Ansys-powered Creo Simulation Live offers real-time design guidance to engineers during the design phase and follows the Modeling and Simulation (MODSIM) design paradigm for a unified data model. For rendering, Creo uses the Creo Render Studio for scenes, lighting, and real-world settings, along with Luxion's KeyShot for achieving photorealistic rendition models. Creo+ leverages cloud-enabled technology, facilitating real-time collaborative work, reviews, and edits. Creo+'s use of the cloud is the industry standard compared to incumbent providers, as users can save data and files in the cloud to increase productivity for global operations, as well as external customers and suppliers. Additional functionality for Creo+ is accelerated, rendering and simulation through cloud computing, further streamlining design processes and bridging the latency gap between on-premises and cloud SaaS.

Creo's integration of Frustum's technology offers AI-driven generative design tools to deliver design solutions that validate the full product design at scale, including the use of materials, load and boundary conditions, and customizable design goals.

IMPLEMENTATION



**IMPLEMENTATION
SCORE: 77.7**

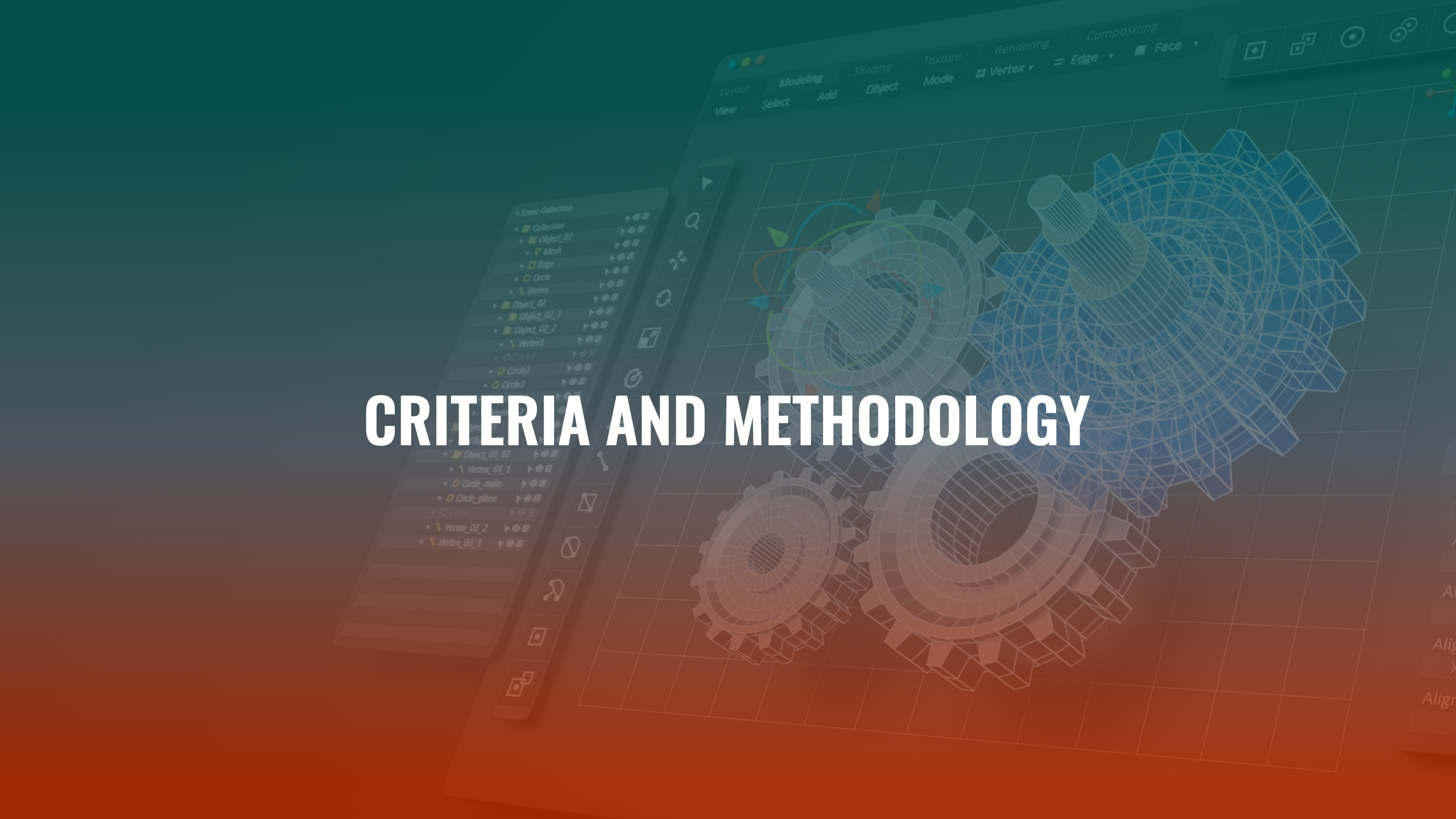


Creo and Creo+ offer an intuitive model-based approach that takes users from the initial stages of product design to downstream in manufacturing. Creo and Creo+ associatively integrate all of the technical capabilities in the design process so that an engineer can model, dimension, simulate, render, and production plan complex assemblies within the digital thread. When a design revision is made, the changes are automatically propagated to all the downstream deliverables, improving time to market, expense, and quality. The easy-to-learn solutions cater to both new users and experienced CAD professionals. The ease of transition has been acknowledged by customers that have migrated from other solutions as a key differentiator such as LIXIL and Hill Helicopter. Creo and Creo+ provide online instructional courses, and 24/7 customer support to enhance learning and speed up time to value for new users. Additionally, Creo and Creo+ both receive quarterly updates to keep performance and operability at the highest standards.

While Creo and Creo+ are most prominent in the heavy industrial equipment industry, there are customers in all major verticals. Notable users of Creo and Creo+ include Cal International, LIXIL/American Standard, Raytheon, Toyota, Samsung, John Deere, iRobot, and GE Healthcare.

Creo is available with on-premises deployment options, through various subscription tiers, making it suitable for both smaller users and large-scale manufacturers. Creo+ uses a subscription purchasing model such as model-based purchasing, exclusively available through SaaS. PTC has a strong partner ecosystem, with industry leaders such as Microsoft (smart manufacturing), Rockwell Automation (Smart Connect Operations (SCO)), Ansys (simulation), Dell (edge solutions), Ericsson (connected Internet of Things (IoT)), and Hewlett Packard (edge-to-cloud), strengthening its capabilities in CAD and overall product design.

CRITERIA AND METHODOLOGY





VENDOR MATRIX

Methodology: After individual scores are established for innovation and implementation, an overall company score is established using the Root Mean Square (RMS) method:

$$\text{Score} = \sqrt{\frac{\text{innovation}^2 + \text{implementation}^2}{2}}$$

The resulting overall scores are then ranked and used for percentile comparisons.

The RMS method, in comparison with a straight summation or average of individual innovation and implementation values, rewards companies for standout performances.

For example, using this method, a company with an innovation score of nine and an implementation score of one would score considerably higher than a company with a score of five in both areas, despite the mean score being the same. ABI Research believes that this is appropriate as the goal of these matrices is to highlight those companies that stand out from the others.

RANKING CRITERIA

Leader: A company that receives a score of **75 or above** for its overall ranking.

Mainstream: A company that receives scores **between 60 and 75** for its overall ranking.

Follower: A company that receives a score of **60 or below** for its overall ranking.

Innovation Leader: A company that receives a score of **75 or above** for its innovation ranking.

Implementation Leader: A company that receives a score of **75 or above** for its implementation ranking.



INNOVATION CRITERIA

Core Functionality: Ranking of overall CAD software functionality to assist in the design of models. Assessment of core MCAD functionality to design products from Two-Dimensional (2D)/3D modeling to meet parametric, direct, and model-based definitions. To assess MCAD capabilities, the best scores are directly correlated with solution offerings that implement areas of manufacturing such as, but not limited to, sheet metal design, BIM, industrial machinery, and assembly creation.

Computer-Aided Additions: Integration of computer-aided additions into the CAD software to create a CAx software. This includes but is not limited to, CAE, CAM, CAPP, and CAQ.

Extended Functionality: This criterion evaluates to what extent software providers are using new features such as generative design and Augmented Reality (AR)/Virtual Reality (VR) technology, along with complementary functionality such as rendering and model simulation. For AR/VR technology in CAD, no providers have made the leap to enable editing, so assessment will be based on the capabilities of AR/VR viewing.

Cloud Capabilities: Assessment of cloud utilization for CAD software providers such as cloud computing, real-time collaborative workspaces, file sharing, and data storage.



IMPLEMENTATION CRITERIA

New User Experience: How easy is it for a new user to pick up the software? What options are solution providers offering to educate engineers on full-use capabilities?

Deployment for Large Industries: What companies are using CAD software of the vendors, with an emphasis on company size (employee) and manufacturing vertical?

Payment Structures: Identify the purchasing options for CAD software, including perpetual licenses, subscriptions, model-based, and token purchasing.

Market Share: Based on revenue generated from software seats across regions: Americas, Europe, and Asia-Pacific.

Solution/Technology Ecosystem: Looks at functions that are integrated into the CAD software such as simulation from specialized providers. Additionally, this criterion identifies partnerships between CAD providers and specialized software providers to locate in-house functionality versus exported functionality.



August 2023

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