

ABI RESEARCH COMPETITIVE RANKING

GENERATIVE DESIGN SOFTWARE SUPPLIERS



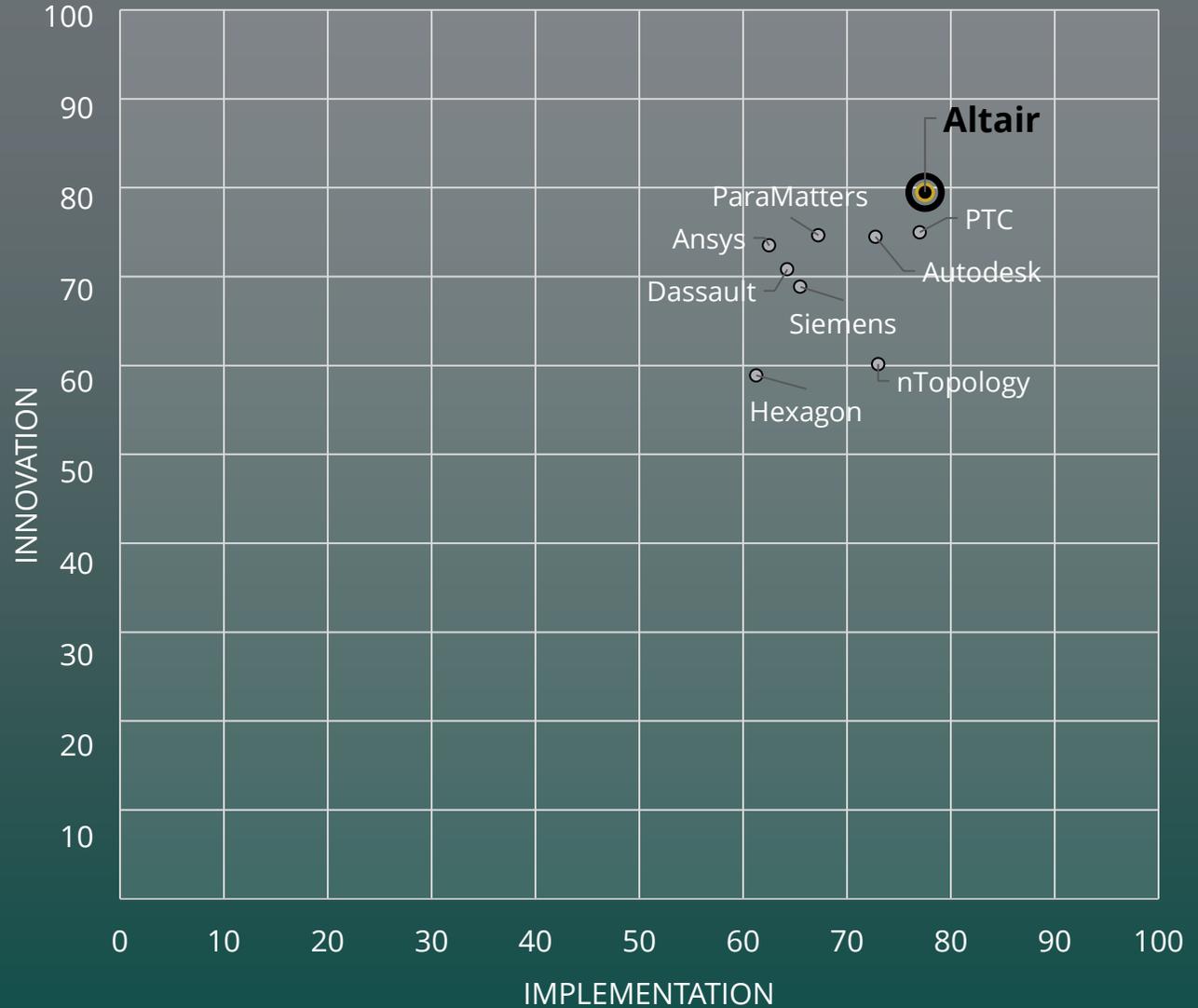
OVERALL: 78.5 | INNOVATION: 79.5 | IMPLEMENTATION: 77.5 | RANK: 1



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ALTAIR
INNOVATION
VERSUS
IMPLEMENTATION
FOCUS



INNOVATION



**INNOVATION
SCORE: 79.5**

INTRODUCTION

Altair Inspire combines generative design and a simulation solution. Altair Inspire integrates Altair OptiStruct (a topology optimization structural design tool to help designers and engineers develop both lightweight and structurally-efficient designs) with Altair SimSolid for analyzing complex assembly configuration and performing structural analysis, while Altair MotionSolve is for multi-body motion simulation.

INNOVATION

Users of Altair Inspire can define both the external and internal clearance, design space, geometrical constraints (such as symmetry and patterns), and manufacturing method. Additional optimization objectives include stress and displacement constraints, acceleration, and gravity. Temperature loading conditions can also be accommodated to validate for Computer-Aided Engineering (CAE).

In terms of key production indicators, users of Altair Inspire can stipulate cost savings, their choice of materials, and the manufacturing processes for producing the item (2.5-axis (extrude) and 3-axis (split/single), 5-axis milling, molding, casting, metal forming, polyfoam, and extrusion, as well as opting for additive manufacturing.

The company's ability to support additive manufacturing is further enhanced by the acquisition of Gen3D in June 2022. Altair customers can design components by specifying the part's functional requirements, such as keep-out zones and ducts for fluid flows. Gen3D also filters out designs that are likely to cause downstream manufacturing issues and the risk of in-print failures.

In terms of generating the design options, OptiStruct can create optimal shape contours, factoring in requirements for strength, vibration, and fatigue. Altair's generative design capabilities include multi-physics simulations, geometric interpretations, and pre-validating the design materials (metals, plastics, rubber, or composites) for manufacturability (including casting, Computer Numerical Control (CNC) milling, injection molding, extrusion, forming, and Three-Dimensional (3D) printing). Users can evaluate options against different criteria in radar dashboards.

INNOVATION



**INNOVATION
SCORE: 79.5**

The topology optimizations take anywhere from minutes to hours depending on the complexity of the part and the amount of surrounding structure that will be included in the analysis. Shape optimizations based on parametric design variables can be run in seconds to minutes.

Altair reports that Inspire is intuitive and easy to learn in just a few hours, as users do not need CAD or other specialist skills. The workflows enable users to familiarize themselves with a few hours of training or self-learning. All the generative design technologies included in Inspire are interoperable between CAD and PLM applications, both from Altair and third parties.

Altair supports the transfer of designs to various digital twins, both physics-driven and data-driven. Altair is also working on projects with many customers to enable their analysts, engineers, and designers to review and realize their models, results, and tests in VR. In addition to full VR, Altair supports stereoscopic 3D (3D TV with 3D glasses) in its high-fidelity modeling and visualization tools.

The company encourages the use of generative design by making the solutions available via Altair Units, the company's licensing systems whereby customers can use any Altair solution. The platform is available both on-premises and via the cloud, and runs on standard laptops and workstations. However, there is not a mobile app for Altair Inspire.

Altair Inspire is updated three times a year with major (content-based) updates, and continuously with minor enhancements and patches.

IMPLEMENTATION

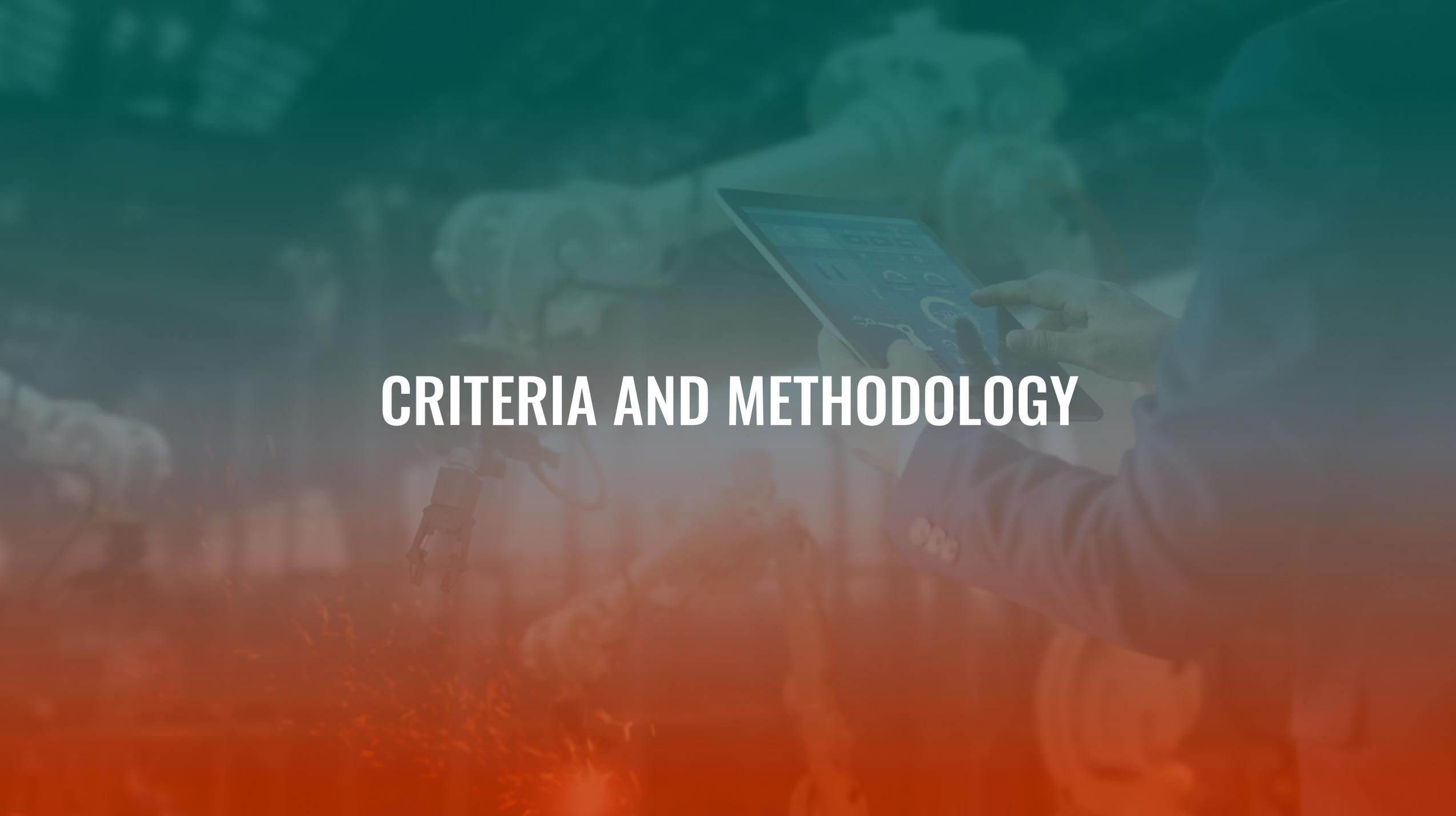


**IMPLEMENTATION
SCORE: 77.5**

Altair reports that the company has more than 10,000 customers (the largest number of customers demonstrated as part of this study) across aerospace, automotive, industrial machinery, medical equipment, and sporting goods verticals that are using Altair's generative design technology through the Altair licensing system (Altair Units).

Altair generative design technologies can be rolled out globally and are available both directly from the firm and via channel partners. Altair's channel strategy consists of resellers that provide routes into a wide variety of verticals (including automotive, aerospace, and chemicals). The Altair Partner Alliance (APA) is for Independent Software Vendors (ISVs) that have made their technology available through the Altair licensing platform. Technology partners include firms with expertise in high-performance computing and cloud, Artificial Intelligence (AI), Machine Learning (ML), data analytics, and/or simulation, such as Amazon Web Services (AWS), AMD, Dell Technologies, and Hewlett Packard Enterprise (HPE). The firms work together on integrations, strategic partnerships, and joint GTM engagements. Finally, Altair works with system integrators, including Tech Mahindra and OTSI (a digital transformation specialist).

Customers gain an understanding of Altair's solutions via pre-recorded content via the firm or YouTube videos. The company also offers in-person instruction either online or via in-person workshops. Furthermore, Altair offers customers the opportunity to commission the company's subject matter experts to work on customers' problems and create designs that meet a brief.

The background image shows a person in a blue suit holding a tablet that displays a data visualization with various charts and graphs. In the background, a robotic hand is visible, suggesting a theme of technology and automation. The image is overlaid with a teal-to-orange gradient.

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 their overall ranking

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

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

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

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

INNOVATION CRITERIA

The innovation criteria focus on how the vendor's generative design solution supports the product design process.



Project Start: Setting the criteria for creating a new item or amending an existing design.

- Evaluation of the range of design constraints, such as setting boundaries for where a component needs to be accommodated in the overall product, that can be incorporated by the vendor's algorithms to produce the design options.
- The key production criteria that the solution can accommodate, such as specific materials, the manufacturing processes (2.5-axis and 3-axis, 5-axis milling, additive manufacturing, Design for Additive Manufacture (DfAM)), and the cost considerations.

Generating the Design Options:

- When creating the initial design, can the user work with mesh or lattice structure designs? Can the solution automatically smooth the design to lower distortions and defects, and improve manufacturability? Does the solution validate the design's geometry from an engineering perspective?
- Furthermore, vendor solutions also need to provide simulation capabilities, such as Finite Element Analysis (FEA), evaluate vibrations and electromagnetics, etc., as part of verifying the performance levels.
- Historically, generating options would take many hours, but today, thanks to high performance computing design, times are down to minutes. Vendors need to illustrate their solutions' performance levels.

INNOVATION CRITERIA

Solution Accessibility:

- Software suppliers are increasingly lowering the barriers to entry for using their solutions. Vendors offering generative design solutions that can readily be used by, for example, a recent graduate will be looked upon favorably, as opposed to a solution that requires knowledge of using equivalent solutions.
- Designers no longer work in a set location. Vendors need to support designers who might be traveling, for example, by making their solution available via cloud platform(s), as well as on-premises. In addition, those vendors that support users with a mobile app will score well.

Utilizing Selections:

- Vendors will score highly if their solutions integrate and exchange designs and data with traditional Computer-Aided Design (CAD) software, PLM software, Internet of Things (IoT) platforms, simulation software, collaboration tools, etc. This includes other solutions available from the vendor and also third parties to ensure interoperability for the customer.
- Also under consideration is whether the vendor's solution supports a customer's efforts to create a digital thread and share product information across the organization (engineering, manufacturing, quality control, distribution, customer service) and other software applications, such as a Manufacturing Execution System (MES), Manufacturing Operations Management (MOM), a Quality Management System (QMS), and Customer Relationship Management (CRM).
- Finally, vendor solutions that can turn the geometric designs into a VR or Augmented Reality (AR) experience, whereby engineers can further test and understand the design from different perspectives or support the creation of a digital twin of the product will score highly.

Update Frequency:

- Software development moves fast, and designers will want new capabilities to be available as quickly as possible. Vendors that can frequently iterate their solution will score well.

IMPLEMENTATION CRITERIA

Current Usage Levels and Revenue:

Vendors will score well if they can show a growing installed base for their generative design solution(s).

Industry Expertise:

Vendors need to show that their solution is being used by multiple sectors and share some notable customers.

Geographic Spread:

Vendors need to demonstrate that their solution is available to designers around the world.

Go-to-Market (GTM) Strategy:

Vendors that can both engage directly with customers directly and have an extensive partner network will score well. A partner network both validates the solution(s) and offers a broader route to market.

Educational Initiatives and Value-Add Services:

Can customers start using the solution out of the box and get more out of it with experience? Does the vendor provide resources, tutorials, and consulting services to enable users to get the most benefit from the generative design tools?



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