Perceptron, Inc. Recognized for

2021

Enabling Technology Leadership

Global Automated Assembly Inspection
and In-Line Metrology Industry
Excellence in Best Practices

FROST *&* SULLIVAN

Contents

Background and Company Performance

Industry Challenges

Many manufacturers are struggling to find the right inspection solution to ensure quality processes, high yields, and reduced costs. New inspection solutions are needed that can enable higher speed, accuracy, and resolution while conducting a complete and rapid inspection on the manufacturing line. Specifically, there is a need for a flexible production line that can efficiently integrate data, including technologies utilized throughout the manufacturing process, coming from various sources.

Moreover, an increasing trend towards full automation of manufacturing plants is fueling in-line inspection. Near-line, in-line, or fully integrated systems are increasingly deployed to ensure quality control close to the point of production or at the manufacturing site. The impact of social distancing norms in the wake of COVID-19 is further spurring the need to reduce dependency on manpower, thus driving the adoption of automated manufacturing processes. In-line metrology equipment is thus becoming embedded in the manufacturing process, with inspections conducted within the production cycle time.

Traditionally in-line measurement systems have been correlated and offset to a coordinate measuring machine (CMM). However, this is a time-consuming process as the initial correlation required to generate accurate data often requires multiple and repeated procedures. Automated in-line measurement solutions for process control have evolved to provide an absolute accurate measurement. The transition increases customers' productivity by eliminating the need to use off-line metrology equipment, thereby improving response time from problem identification to resolution. Employing accurate systems that eliminate the need to purchase and maintain a CMM is occurring within original equipment manufacturers (OEMs) and Tier 1 automotive manufacturers.

Hence, end-users are increasing their efforts to improve production efficiencies by integrating metrology inspection technologies into their production lines. Cost-effective automated metrology solutions are needed that simplify the logistics and minimize the steps required to ensure part and process quality. The industry also requires an increasing number of measurement points in the inspection process. Existing robotic offerings face difficulties achieving CMM level accuracy and measuring all required features in a fast-paced production setting.

While such technology poses significant benefits, OEMs in the current economic scenario are expected to keep their capital expenditure low. Acquiring both an in-line system and an off-line measurement solution can represent a huge financial risk for end users, thereby restraining the demand for in-line metrology devices. Providers that can cost-effectively address the aforementioned challenges will be best positioned to capture the growing revenue potential of the global automated inspection and in-line metrology equipment market in the coming years.

Technology Leverage and Customer Impact

Founded in 1981 and headquartered in Plymouth, Michigan, Perceptron is a leading provider of next-generation in-line, near-line, and off-line automated metrology and 3D scanning solutions. The company's key products include advanced automated measurement solutions, robot guidance solutions, coordinated measuring machines (i.e., Gantry, Horizontal Arm, and Bridge), 3D laser scanners, and advanced analysis software.

Perceptron builds its value proposition by delivering breakthrough technologies to improve manufacturing throughput and efficiency. With 2700 installations across more than 200 manufacturing plants worldwide, the company supports high-end applications sectors such as automotive, heavy machinery, heavy truck, white goods, aerospace, and general manufacturing. The company helps customers efficiently manage complex manufacturing processes and shorten product launch times. The company is a leading market participant in the automotive metrology segment and enables the integration of automated robotic assembly and full inspection capabilities into the manufacturing line.

Commitment to Innovation and Stage-Gate Efficiency

While price is a significant driver for customers, a company's commitment to innovation is a key factor in securing long-term customer loyalty. Perceptron was one of the first companies to make a laser triangulation sensor for industrial measurement and manufactures its sensing technology in-house. The company further differentiates itself by providing superior non-contact sensors with a range of laser colors to conduct reliable measurements on several materials (e.g., carbon fiber and painted metal) at high production speed. Perceptron's innovative and rugged sensors can withstand manufacturing plants' hostile environmental conditions, including exposure to oil and dirt.

In 2019, the company introduced AccuSite Optical Tracking (AccuSite) to allow automated in-line systems to achieve CMM level accuracy on the plant floor.

AccuSite's architecture can support 10 trackers and up to 8 robots in a cell. The robots and trackers are connected, enabling maximum flexibility in system design. A four-robot AccuSite system can accurately measure the whole car body. In contrast to traditional robotic measurement solutions, which are influenced by the robot's mechanical drift and temperature, AccuSite eliminates such factors and thus provides accurate measurements in real-time. Moreover, AccuSite removes the need for CMM correlation as it provides traceable measurement results according to ISO-10360 standards.

Frost & Sullivan commends Perceptron for offering significant value with its AccuSite offering as it can increase the overall throughput of the manufacturing inspection process.

AccuSite enables Perceptron to overcome long-standing industry challenges (i.e., developing an automated and contactless metrology solution capable of maintaining high inspection quality at full production speed), thus positioning it as the de facto provider of automated inspection solutions. Unlike competitive offerings, the company's AccuSite Optical Tracking technology enables stakeholders to achieve CMM-level accuracy for in-line inspection on the shop floor.

AccuSite is easy to deploy and can achieve, in combination with the use of a Helix-evo sensor, a system-level accuracy of less than 0.150 mm. With the launch of AccuSite, Perceptron is delivering high throughput without the need for time-consuming data processing, thus shortening product launch times. As a result, AccuSite receives high praise from customers.

Commercialization Success and Application Diversity

Perceptron is a fast-growing global company, with a footprint in Japan, Italy, the United Kingdom, Brazil, China, the Czech Republic, France, Germany, India, Slovakia, and Spain. More than 75% of its business comes from outside of the Americas, and the company has installed more than 2,700 systems at approximately 200 plants worldwide. The company's customer base also includes a highly concentrated group of automotive manufacturers in North America, Western Europe, and Asia. The company has a particularly strong customer base in the automotive industry, representing 85% of net sales in 2020. Perceptron is currently working with all 14 major automotive companies for applications ranging from a single part to final assembly inspection. The company is also gaining traction in the electrical vehicle market (e.g., supporting manufacturing processes such as battery tray inspection). Perceptron sells more than 50% of its in-line measurement products to the automotive industry, with Volkswagen Group and the General Motors Company as some of its most prominent customers.

Increasing customer demand for its AccuSite product is spurring its use across a large number of high-end applications. Moreover, the company is gaining traction from Tier suppliers and industries such as heavy machinery (e.g., measuring cabs, castings, and subassemblies) and general manufacturing sectors. The company is also currently supporting the consumer appliance sector by providing white goods component measurements across several stages in the build process.

Frost & Sullivan finds that Perceptron has gained significant new customer orders for in-line fixed and robot-mounted laser-based solutions as well as in-line laser-based, non-contact robot guidance systems. The company has been working on the next generation of AccuSite hardware to achieve higher accuracy.

Brand Equity

Customers have a positive view of the Perceptron brand and exhibit brand loyalty. Even though the company experienced an approximate 18% sales decline in the first three quarters of 2020, mainly attributed to the COVID-19 pandemic, Perceptron continues to witness significant year-over-year (YoY) growth. Increasing customer demand in Asia and Europe is extending its market leadership position in the automotive vertical, and the company anticipates an increase in activity levels in the Americas. Major growth opportunities are coming from China, with strong YoY growth in bookings. The company is also focused on introducing a broad array of solutions for Japanese automotive OEM partners.

AccuSite's ability to provide metrology-grade accuracy for automated inspection and robot guidance solutions is spurring strong growth opportunities for in-line and near-line

applications. Perceptron's goal is to expand its existing customer base by further extending its support for industries where 3D inspection is required. The company's sophisticated 3D algorithms enable accurate inspections with high-quality images and production speeds, which customers highly praise.

Additional growth opportunities are coming from the launch of the company's Vector software, which works in conjunction with AccuSite to make system installation faster and more efficient. The software allows AccuSite to be easily maintained by end-users and provides fast and easy setup programming through auto-tuning and process simplification. The company also provides an automated path generation (APG) module for remote setups and existing measurement systems based on computer-aided design. Vector provides a full reporting suite with an AI-grade analysis tool that can easily convert data into insights. Vector further provides a user-friendly software display that appears seconds after the sensor scan data analysis is completed. Future analysis based on historical data is supported by a database that stores all of the measurement results.

Customer Purchase Experience

The key to success for any company lies in offering the best customer purchase experience. Perceptron's in-line and near-line measurement solutions exhibit striking differentiation from competing solutions, and hence provide superior value among high-precision inspection products.

Frost & Sullivan commends Perceptron for offering significant value through its new AccuSite tracking solution. The offering is one of the world's first in-line systems that enable customers to conduct 3D measurements that can cover complex geometries, address part shape and position variation, and capture high-volume scans. The company has expanded the solution's capabilities to conduct holes, edges, and corner measurements. AccuSite provides high-quality results and, therefore, is gaining traction and market recognition.

The company also understands that, as the industry shifts from research and development to production regarding the addition of metrology during the in-line process, providing flexible and customizable solutions is critical. Customers are hence choosing Perceptron's in-line and near-line measurement solutions based on their versatility and ability to support multiple applications. The company also demonstrates a high level of customer collaboration when developing custom solutions. For instance, customers can customize their systems based on a wide range of parameters used on an in-line basis, including the major and minor diameters of threaded holes, threaded studs, and grounding studs measurements.

With AccuSite, Perceptron provides one of the industry's fastest and most optimal solutions to address customers' current needs. Instead of taking repeated measurements and correlating and offsetting to an external device such as a CMM, accurate measurements can be conducted in minutes. The product is easy to program and eliminates the need for complex and time-consuming correlation.

Conclusion

Perceptron has developed next-generation and industry-leading in-line and near-line inspection solutions. Frost & Sullivan commends Perceptron for offering significant value by increasing the overall throughput of the manufacturing inspection process. With the introduction of Perceptron's AccuSite offering, the company has made significant inroads by removing the need for coordinate measuring machine correlation as it provides traceable measurements during the production process. Customers are choosing Perceptron's versatile and flexible solution due to its ability to support multiple applications. Since its introduction in the market, AccuSite is gaining traction with automotive OEMs, automotive Tier suppliers, and white goods manufacturers.

With its strong overall performance, Perceptron earns Frost & Sullivan's 2021 Enabling Technology Leadership Award in the global automated assembly inspection and in-Line metrology industry.

Significance of Enabling Technology Leadership

Ultimately, growth in any organization depends on customers purchasing from a company and then deciding to return time and again. In a sense, then, everything is truly about the customer. Making customers happy is the cornerstone of any successful, long-term growth strategy. To achieve these goals through enabling technology leadership, an organization must be best in class in three key areas: understanding demand, nurturing the brand and differentiating from the competition.

- Acquire competitors' customers
- Increase renewal rates
- Increase upsell rates
- Build a reputation for value
- Increase market penetration

- Earn customer loyalty
- Foster strong corporate identity
- Improve brand recall
- Inspire customers
- Build a reputation for creativity

DEMAND

BRAND

Enabling
Technology
Leadership

COMPETITIVE
POSITIONING

- Stake out a unique market position
- Promise superior value to customers
- Implement strategy successfully
- Deliver on the promised value proposition
- Balance price and value

Understanding Enabling Technology Leadership

Product quality (driven by innovative technology) is the foundation of delivering customer value. When complemented by an equally rigorous focus on the customer, companies can begin to differentiate themselves from the competition. From awareness to consideration, to purchase, to follow-up support, organizations that demonstrate best practices deliver a unique and enjoyable experience that gives customers confidence in the company, its products, and its integrity.

Key Benchmarking Criteria

For the Enabling Technology Leadership Award, Frost & Sullivan analysts independently evaluated Technology Leverage and Customer Impact according to the criteria identified below.

Technology Leverage

Criterion 1: Commitment to Innovation
Criterion 2: Commitment to Creativity
Criterion 3: Stage-Gate Efficiency
Criterion 4: Commercialization Success
Criterion 5: Application Diversity

Customer Impact

Criterion 1: Price/Performance Value
Criterion 2: Customer Purchase Experience
Criterion 3: Customer Ownership Experience
Criterion 4: Customer Service Experience
Criterion 5: Brand Equity

Best Practices Award Analysis for Perceptron

Decision Support Scorecard

To support its evaluation of best practices across multiple business performance categories, Frost & Sullivan employs a customized Decision Support Scorecard. This tool allows research and consulting teams to objectively analyze performance, according to the key benchmarking criteria listed in the previous section, and to assign ratings on that basis. The tool follows a 10-point scale that allows for nuances in performance evaluation. Rating guidelines are illustrated below.

RATING GUIDELINES
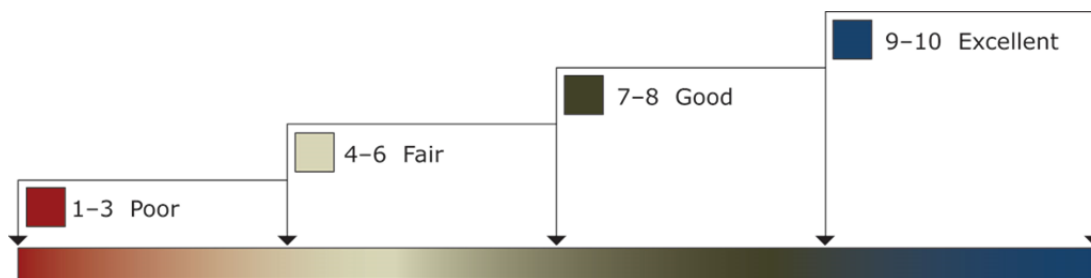
The Decision Support Scorecard considers Technology Leverage and Customer Impact (i.e., the overarching categories for all 10 benchmarking criteria; the definitions for each criterion are provided beneath the scorecard). The research team confirms the veracity of this weighted scorecard through sensitivity analysis, which confirms that small changes to the ratings for a specific criterion do not lead to a significant change in the overall relative rankings of the companies.

The results of this analysis are shown below. To remain unbiased and to protect the interests of all organizations reviewed, Frost & Sullivan has chosen to refer to the other key participants as Competitor 1 and Competitor 2.

Measurement of 1–10 (1 = poor; 10 = excellent)			
Enabling Technology Leadership	Technology Leverage	Customer Impact	**Average Rating**
Perceptron	**9.0**	**8.9**	**9.0**
Competitor 1	8.4	8.3	8.4
Competitor 2	8.2	7.9	8.0

Technology Leverage

Criterion 1: Commitment to Innovation

Requirement: Conscious, ongoing adoption of emerging technologies that enable new product development and enhance product performance.

Criterion 2: Commitment to Creativity

Requirement: Technology leveraged to push the limits of form and function in the pursuit of white space innovation.

Criterion 3: Stage-Gate Efficiency

Requirement: Adoption of technology to enhance the stage-gate process for launching new products and solutions.

Criterion 4: Commercialization Success

Requirement: A proven track record of taking new technologies to market with a high rate of success.

Criterion 5: Application Diversity

Requirement: The development and/or integration of technologies that serve multiple applications and can be embraced in multiple environments.

Customer Impact

Criterion 1: Price/Performance Value

Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience

Requirement: Customers feel they are buying the optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience

Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

**Criterion 4: Customer Service Experience**

Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity

Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

Decision Support Matrix

Once all companies have been evaluated according to the Decision Support Scorecard, analysts then position the candidates on the matrix shown below, enabling them to visualize which companies are truly breakthrough and which ones are not yet operating at best-in-class levels.
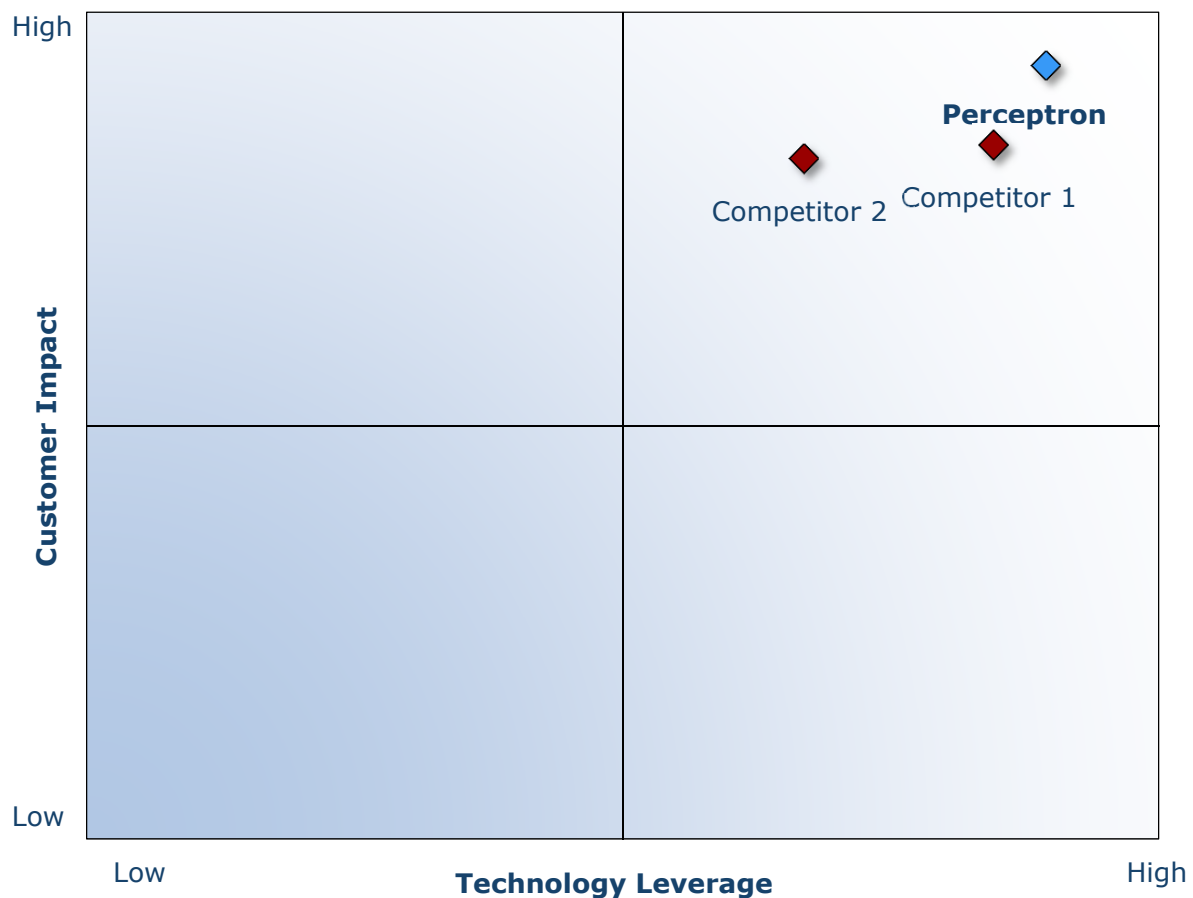
Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate award candidates and assess their fit with select best practices criteria. The reputation and integrity of the awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 **Monitor, target, and screen**	Identify award recipient candidates from around the world	• Conduct in-depth industry research • Identify emerging industries • Scan multiple regions	Pipeline of candidates that potentially meet all best practices criteria
2 **Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best practices criteria • Rank all candidates	Matrix positioning of all candidates' performance relative to one another
3 **Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best practices criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4 **Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best practices positioning paper
5 **Assemble a panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized award candidates
6 **Conduct global industry review**	Build consensus on award candidates' eligibility	• Hold a global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible award candidates, representing success stories worldwide
7 **Perform quality check**	Develop official award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8 **Reconnect with a panel of industry experts**	Finalize the selection of the best practices award recipient	• Review analysis with panel • Build consensus • Select recipient	Decision on which company performs best against all best practices criteria
9 **Communicate recognition**	Inform award recipient of recognition	• Announce award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of award and plan for how the recipient can use the award to enhance the brand
10 **Take strategic action**	Upon licensing, the company can share award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess award's role in strategic planning	Widespread awareness of recipient's award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of the research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, resulting in errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, helps clients accelerate growth and achieve best-in-class positions in growth, innovation, and leadership. The company's Growth Partnership Service provides the CEO and the CEO's growth team with disciplined research and best practices models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages nearly 60 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on 6 continents. To join Frost & Sullivan's Growth Partnership, visit http://www.frost.com.