FROST & SULLIVAN

BEST PRACTICES AWARDS

STANDARD

2020 NORTH AMERICAN AUTONOMOUS RETAIL CHECKOUT TECHNOLOGY INNOVATION LEADERSHIP AWARD

Contents

Background and Company Performance

Industry Challenges

The global retail industry is undergoing a digital transformation, driven by the proliferation of Artificial Intelligence (AI) and autonomous technologies. Brick-and-mortar retail has been plagued with major challenges, such as long customer waiting queues at checkout counters and lack of data insights on in-store products, that negatively impact the customer experience. Moreover, customer preference is increasingly shifting toward purchasing products through eCommerce retail channels. Typically, in a physical store, large volumes of data and footage are generated over the course of one week. However, Frost & Sullivan recognizes that the real-time processing of data poses a distinct challenge due to the use of traditional systems and limited bandwidth, resulting in operational inefficiency.

Automated solutions for retail stores that are currently available in the market are highly expensive and comprise various hardware and software components such as sensors, smart tags (RFID[1], QR[2] tags), and biometric and facial recognition software. Moreover, these solutions are feasible, to a certain extent, only for large format stores and require complete redesigning of the store layout (in terms of the placement of items), thereby increasing retailers' expenses. As at a store, the sensors used for scanning and reading data are placed on shelves, with an increasing number of shelves, the number of sensors also increases. This adds to the overall cost of retailers.

Traditional approaches, such as employing people or implementing conventional cameras to capture the images of shelves across the store, are clearly ineffective for ensuring proper stocking or preventing pricing errors. Using traditional cameras creates a huge time gap between analyzing store images and notifying retailers about an issue, which can result in revenue losses. Moreover, retailers are unable to constantly keep track of whether the right items are placed at the designated locations, which impacts product performance.

Effective store planning - without affecting the existing infrastructure - and tracking customer movements in a store through the creation of localized maps in a retail environment will empower retailers of all sizes with actionable insights. Frost & Sullivan analysts note that there now exists an imperative need for affordable autonomous solutions that can eliminate the long waiting queues at checkout counters and ensure a seamless shopping experience for customers.

Technology Leverage and Business Impact

Commitment to Creativity

Standard was founded in 2017 in San Francisco, California. While building the U.S. Securities and Exchange Commission's (SEC's) first machine learning infrastructure, its cofounders, Jordan Fisher (Chief Executive Officer) and Michael Suswal (Chief Operating Officer) observed that the lack of frictionless retail checkouts increasingly posed a challenge for participants in the dynamic retail industry. Checkout was a common pain point for customers visiting retail stores daily or multiple times a week. For eliminating retail

[1] *RFID: Radio Frequency Identification*
[2] *QR: Quick Response*

checkout problems and ensuring automation, Standard developed an AI- and computer vision-based autonomous checkout platform.

Standard's technology platform utilizes AI and cameras to enable a seamless in-store shopping and payment experience without the need to scan or stop at checkout counters. Unlike other competing solutions that comprise a gamut of hardware systems, sensors, and scanning software (which increases the cost and complexity of their implementation at the store), Standard's retail checkout infrastructure is made up of cameras that are installed only on the store ceiling. This enables simple integration of the infrastructure into the store's existing layout, thereby eliminating the need for reconfiguration.

Standard's platform enables retail stores to accept payments in both cash and credit. The company has created an alternative automated retail checkout model that can be utilized by all brick-and-mortar retailers, irrespective of store size. Frost & Sullivan recognizes Standard's efforts to enable a seamless integration of AI and computer vision technology into retailers' existing infrastructure with full customization, providing an enhanced shopping experience for customers – all while significantly reducing operating and labor costs for retailers.

Commitment to Innovation and Technology Incubation

Standard has designed and developed its patented autonomous checkout platform in-house with a focus on providing customers with a seamless shopping experience, aided by a streamlined approach and intelligent image capturing. The computer vision cameras can track customers based on their shape and movement, dispensing with the need for scanning, facial recognition, and other biometric identification processes and ensuring customer privacy and security.

Customers within the store are connected through the Standard Store mobile app that enables in-store cameras to map them to their payment methods. The data captured by the cameras is transferred to the AI platform installed at the checkout counter, where machine learning algorithms process it in real time for providing insights and enable a smooth payment experience, thereby eliminating the long waiting time at the payment counter. Standard applies various machine learning and deep learning algorithmic approaches for effective action recognition, cluttered scene comprehension, visual tracking, and mapping of shopper behavior and product performance, ensuring improved operational efficiency for retailers. Customers without the Standard Store app can still shop at a store and pay at a kiosk.

Frost & Sullivan points out that Standard's technology is less expensive than other competing solutions and can be easily retrofitted, as it leverages sensors that are cost-effective and flexible enough to be simply deployed at existing stores. Frost & Sullivan recognizes how this provides the platform with a distinct advantage, as other competing solutions utilize sensors for multiple shelves, involve scanning, and require the customization of the store layout. The process of revamping stores with sensors, smart tags, software, and cameras leads to a substantial cost burden for retailers, affecting their profit margins.

Standard's technology can recognize thousands of different products within a 20-foot range - even in a very crowded store. Using computer vision cameras, the Standard platform ensures full scalability and high efficiency, avoiding errors related to low-intensity image data and reducing the time taken between analyzing store images and sending a notification to the retailer.

With the acquisition of Italy-based Checkout Technologies in 2020, Standard seeks to further enhance and accelerate its autonomous checkout road map and leverage its deep tech expertise to provide novel solutions to customers. Frost & Sullivan observes how this acquisition has strengthened Standard's position in the global autonomous retail checkout industry and helped the company expand its presence in the European market.

Frost & Sullivan sees tremendous potential in Standard's platform, as it provides an improved payment checkout application in the brick-and-mortar retail environment. Its unique value proposition, with a focus on security, scalability, experience, flexibility, and insights, can address the biggest challenges that restrain the widespread adoption of autonomous checkout technology.

Customer Acquisition and Commercialization Success

Standard has designed its AI-based autonomous checkout platform to enable a frictionless experience for customers across physical retailers of all sizes. The company uses a Software-as-a-Service (SaaS) model to successfully demonstrate its platform for global retail customers. In a SaaS-based business model, the cost of the solution is based on subscription charges per store per month. Standard handles the deployment of cameras and software and provides support and service-level agreements, ensuring store data availability and accuracy for all its retail customers.

Initially focused on securing a strong foothold in the United States, Standard has now expanded into Europe, Japan, and other markets around the world. In September 2018, the company opened its first cashierless store, the Standard Store, at 1071 Market Street, San Francisco. The 1,900 square foot store is equipped with Standard's AI-based autonomous checkout solution, including an overhead camera system that enables an autonomous shopping experience for customers. The intelligent cameras powered by AI track shopper movement and mark every customer with different colors (once the customer enters the store and checks into the app). The solution tracks the details of customer behavior (e.g., the products they are picking up and/or putting back and whether they are reading the product labels) and ensures communication with the mobile app.

Standard works extensively with several retailers globally. For instance, the company has collaborated with Paltac Corp., a wholesaler of health and beauty products, and plans to deploy its autonomous checkout solution at 3,000 drug stores stores in Tokyo, Japan . In 2019, Standard received requests from more than 300 retailers for Standard Checkout in stores. Standard's platform has gained traction amid the COVID-19 pandemic, as it eliminates long queues and crowding at retail checkout counters. The technology is expected to record high commercialization in the near future. Standard has successfully enabled the modernization of payment systems through the automation of the checkout process for retail customers - without compromising on their application and data security.

According to Frost & Sullivan, the unique value proposition of Standard in reducing operating costs and increasing profit margins for retailers has helped ensure its commercial success. The ease of integrating the platform into existing store infrastructures is helping the company build a large customer base globally. Moreover, Standard has been able to add exciting value for retailers and customers alike by improving performance efficiency and enhancing the shopping experience through data insights.

Human Capital and Growth Potential

Standard's cofounders have led new product development projects in collaboration with companies such as Pwnee Studios and the SEC. Their extensive experience and strong expertise have strengthened Standard's overall technology development endeavors, leading the way for strategic growth, business culture development, and efficient policy execution. Standard attributes its success to its strong team (comprising more than 100 employees with significant technical experience) that has enabled the company to set a high industry standard and provided it with a competitive edge. Most of its team members have backgrounds in research laboratories and the academia (in the fields of computer vision and AI).

In July 2019, Standard secured $35 million in Series B funding from EQT Ventures. This, combined with the participation of existing investors (Initialized Capital, CRV, and Y Combinator), took its total funding to $86 million. With this funding, the company is strengthening its customer base and product offerings in the United States and Japan, while also focusing on expanding its geographic footprint globally. Moreover, the acquisition of Explore.ai, a mapping and computer vision company, in 2019 has set Standard apart from the competition, helping the company map large stores that are difficult to track and always crowded for autonomous checkouts.

Frost & Sullivan firmly believes that this skillful combination of resources, proven expertise, and affordable technology development has enabled Standard to achieve commercial success and position itself as a trusted partner in the North American autonomous retail checkout industry.

Conclusion

The growing proliferation of eCommerce has compelled brick-and-mortar retail enterprises to redefine their digital strategies for business agility. However, the lack of an effective medium to provide real-time intelligence creates a major challenge for retailers.

Through its first-of-its-kind autonomous checkout solution, powered by AI and computer vision technology that can autonomously capture product data and track customer movements at a store, Standard ensures a frictionless payment process and an improved customer experience. Through this technology platform, Standard leverages a deep-learning-based product segmentation and identification technique to provide real-time intelligence to retailers, resulting in improved customer retention, smooth purchase experiences, and higher profits.

With its strong overall performance, Standard earns the 2020 Frost & Sullivan Technology Innovation Leadership Award.

Significance of Technology Innovation Leadership

Technology-rich companies with strong commercialization strategies benefit from the demand for high-quality, technologically innovative products that help shape the brand, resulting in a strong, differentiated market position.

Understanding Technology Innovation Leadership

Technology innovation leadership recognizes companies that lead the development and successful introduction of high-tech solutions to customers' most pressing needs, altering the industry or business landscape in the process. These companies shape the future of technology and its uses. Ultimately, success is measured by the degree to which a technology is leveraged and the impact it has on growing the business.

Key Benchmarking Criteria

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated 2 key factors—Technology Leverage and Business Impact—according to the criteria identified below.

Technology Leverage

Criterion 1: Commitment to Innovation
Criterion 2: Commitment to Creativity
Criterion 3: Technology Incubation
Criterion 4: Commercialization Success
Criterion 5: Application Diversity

Business Impact

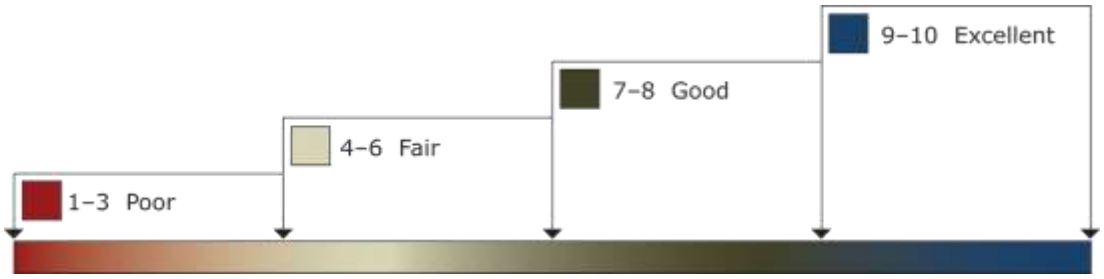
Criterion 1: Financial Performance
Criterion 2: Customer Acquisition
Criterion 3: Operational Efficiency
Criterion 4: Growth Potential
Criterion 5: Human Capital

Best Practices Award Analysis for Standard

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. Ratings guidelines are illustrated below.

RATINGS GUIDELINES



The Decision Support Scorecard considers Technology Leverage and Business 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 2 and Competitor 3.

Measurement of 1–10 (1 = poor; 10 = excellent)			
Technology Innovation Leadership	Technology Leverage	Business Impact	**Average Rating**
Standard	**9.5**	**9.2**	**9.4**
Competitor 2	8.5	8.0	8.2
Competitor 3	8.0	8.0	8.0

Technology Leverage

Criterion 1: Commitment to Innovation

Requirement: Conscious, ongoing development of an organization's culture that supports the pursuit of groundbreaking ideas through the leverage of technology.

Criterion 2: Commitment to Creativity

Requirement: Employees rewarded for pushing the limits of form and function by integrating the latest technologies to enhance products.

Criterion 3: Technology Incubation

Requirement: A structured process with adequate investment to incubate new technologies developed internally or through strategic partnerships.

Criterion 4: Commercialization Success

Requirement: A proven track record of commercializing new technologies by enabling new products and/or through licensing strategies.

Criterion 5: Application Diversity

Requirement: The development of technologies that serve multiple products, multiple applications, and multiple user environments.

Business Impact

Criterion 1: Financial Performance

Requirement: Overall financial performance is strong in terms of revenue, revenue growth, operating margin, and other key financial metrics.

Criterion 2: Customer Acquisition

Requirement: Overall technology strength enables acquisition of new customers, even as it enhances retention of current customers.

Criterion 3: Operational Efficiency

Requirement: Staff is able to perform assigned tasks productively, quickly, and to a high quality standard.

Criterion 4: Growth Potential

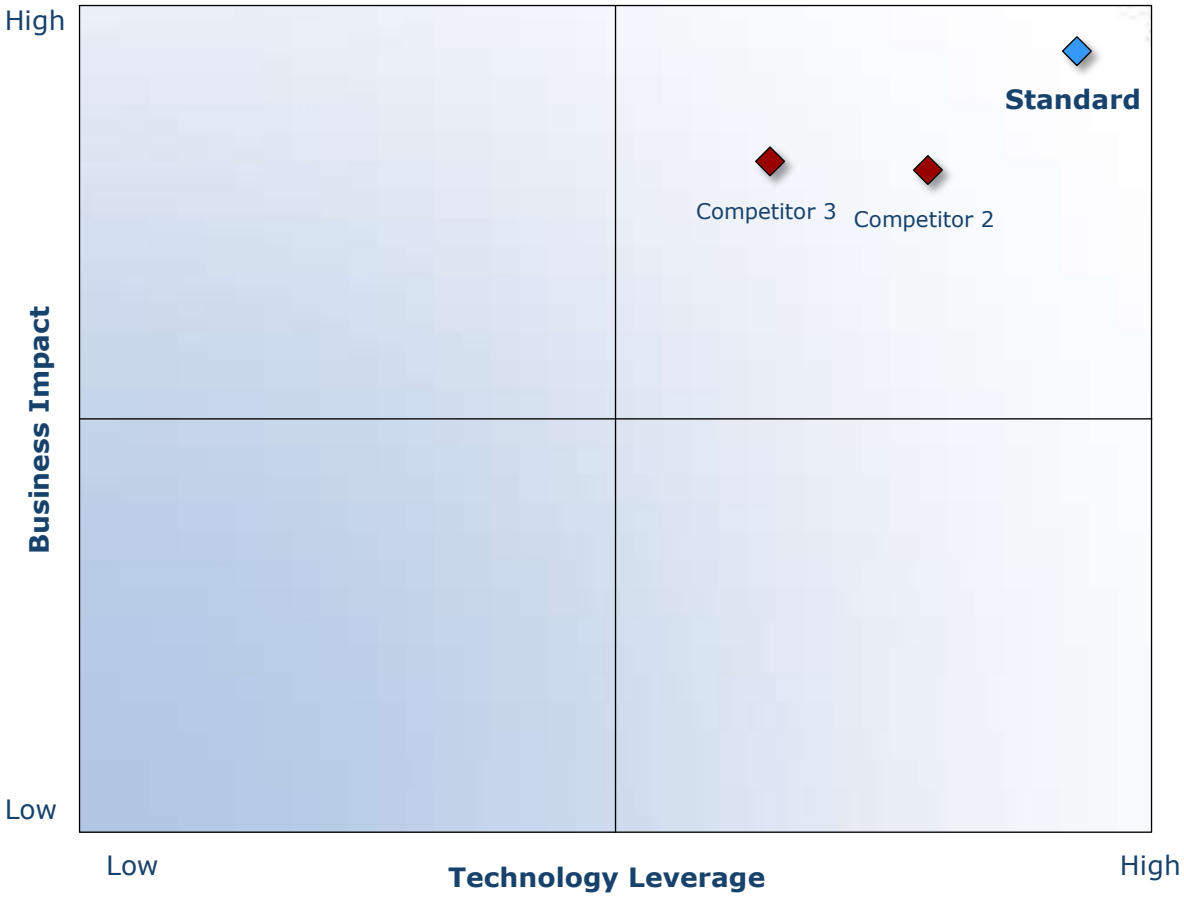
Requirements: Technology focus strengthens brand, reinforces customer loyalty, and enhances growth potential.

Criterion 5: Human Capital

Requirement: Company culture is characterized by a strong commitment to customer impact through technology leverage, which enhances employee morale and retention.

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 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 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 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 recipient can use the Award to enhance the brand
10	**Take strategic action**	Upon licensing, company is able to 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 players 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 practice 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.