

F R O S T & S U L L I V A N



2018 Global Data Analytics Solutions for
Communications Service Providers Customer Value Leadership Award



2018
BEST PRACTICES
AWARDS

Contents

Background and Company Performance	3
<i>Industry Challenges</i>	3
<i>Customer Impact and Business Impact</i>	3
<i>Conclusion</i>	11
Significance of Customer Value Leadership	13
Understanding Customer Value Leadership	13
<i>Key Benchmarking Criteria</i>	14
Best Practice Award Analysis for EXFO	14
<i>Decision Support Scorecard</i>	14
<i>Customer Impact</i>	15
<i>Business Impact</i>	15
<i>Decision Support Matrix</i>	16
Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices	17
The Intersection between 360-Degree Research and Best Practices Awards.....	18
<i>Research Methodology</i>	18
About Frost & Sullivan	18

Background and Company Performance

Industry Challenges

A number of trends are disrupting the communications industry, thereby requiring service providers to transform themselves. Growing demand for bandwidth and capacity is increasing the pressure on the transmission network, driving service providers to deploy more fiber. At the same time, the next generation of cellular technology, 5G, is on the horizon, and service providers must implement strategies to address the low bandwidth and latency requirements from 5G applications, such as the Internet of Things (IoT) and the connected car. In addition, network virtualization continues to progress, thus making networks more dynamic. While network function virtualization (NFV) increases operators' flexibility, the highly dynamic nature of these networks spurs the need for testing, monitoring, and analytics solutions.

These disruptive trends are happening in the context of extreme network complexity and shifting the focus of service providers' operations from the network to customers. Over the years, operators have built networks on top of networks and multiplied the number of tools their organizations use; however, they are struggling to understand what is going on in their networks and gain the customer insights they need to differentiate themselves and fuel their revenue and profit growth by bringing attractive offers to subscribers.

Facing intense competition, service providers need service assurance and analytics solutions that can help them optimally manage their networks and deepen their knowledge of their customer base. Moreover, service providers must maximize the return on each network investment because of new technologies requiring large investments in network infrastructure and the decreasing average revenue per user (ARPU).

Service providers need to cherish existing customers to retain them and succeed in the future. To that end, these providers need a good understanding of their equipment's location and configuration, which is a task that has become more difficult over time, with network overlays and the move to virtual and hybrid networks. In addition, service providers need tools to minimize the impact on customers, in terms of maintenance and upgrade activities, as well as find and resolve faults in their networks as efficiently as possible to prevent customer churn.

Customer Impact and Business Impact

EXFO's Platform Delivers Benefits across Teams in Service Provider Organizations

Headquartered in Quebec, Canada, EXFO has evolved over the past 30 years into a leading provider of testing, monitoring, and analytics solutions for communications service providers, positioned to support them in the face of tremendous disruption from new technologies, such as 5G, NFV, and artificial intelligence (AI). With hundreds of use cases

under its belt, the EXFO team has demonstrated a superior capability to support customers across the entire service provider lifecycle, including testing engineers in laboratories, network engineers and field operations during service rollout, network and service operations and customer care for service assurance, and marketing personnel throughout the service lifecycle.

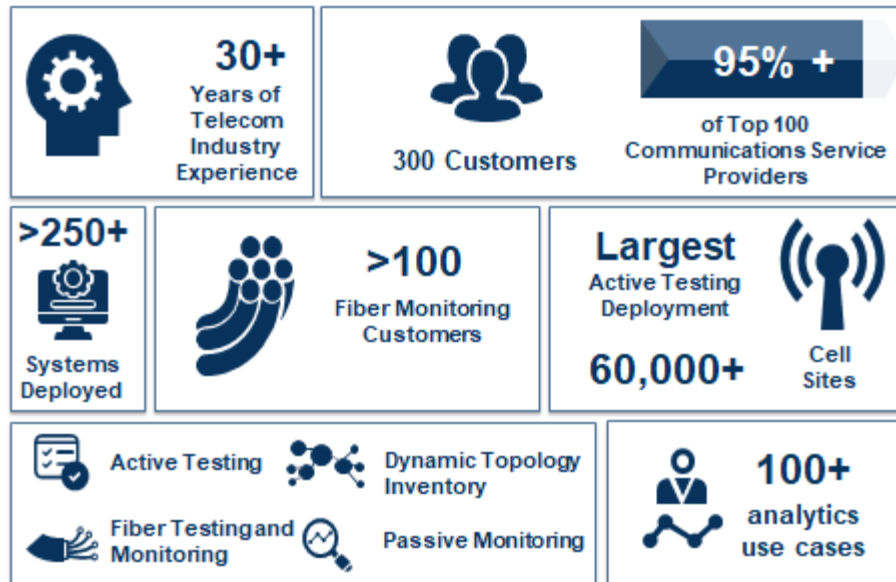
With deep telecom and analytics expertise, EXFO utilizes AI technologies such as Machine and Deep Learning to support customers in descriptive, predictive and diagnostics use cases, such as anomaly detection, automated diagnostics and key performance indicator (KPI) forecasting, and advanced use cases that use customer experience and behavioral data, such as churn prediction, fraud detection and net promoter score (NPS) modeling.

By delivering both operational and business insights to customers through analytics, EXFO aims to deliver the prescriptive solution that communications service providers are ultimately looking for to manage their operations optimally, while increasing customer satisfaction.

EXFO works actively in Network Function Virtualization (NFV) domain and is actively working with various network and service orchestrator partners to provide NFV test, monitoring and analytics functionality for closed loop service assurance. EXFO has recently announced with Orange the first integration of on-demand monitoring function with ONAP Beijing release.

EXFO also help CSPs with automation to help safe-guard the operations of their networks by uncovering and flagging the causes of severe disruptions that impact multiple customers dramatically speeding up the detection, diagnosis and troubleshooting of problems that affect subscribers.

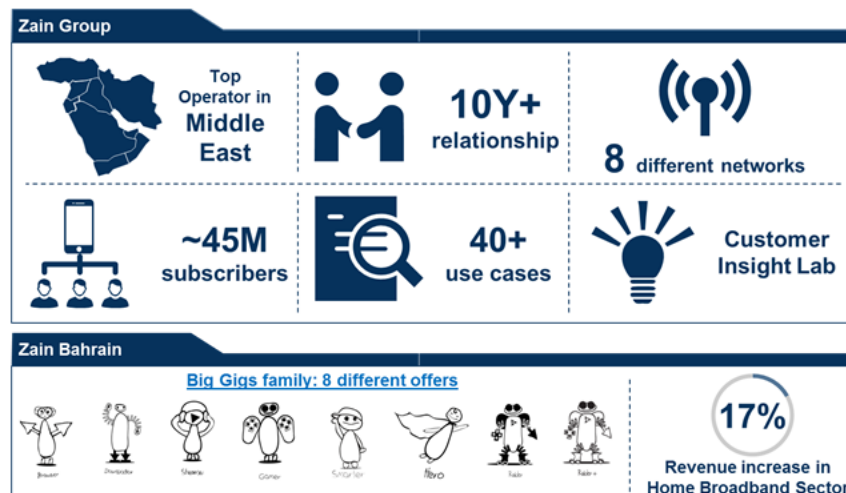
EXFO Analytics Credentials



EXFO Partners with Zain to Increase Relevancy to Subscribers and Customer Loyalty

With more than 300 customers, including 95% of the top 100 communications service providers, and more than 250 systems deployed, EXFO is a leading partner for testing, monitoring, and analytics solutions for network operators worldwide. Zain Group, one of the most important network operators in the Middle East, with operations across the region, is a key customer that EXFO has been supporting over the past 10 years. EXFO helps Zain monitor eight different networks that use multiple wireless technologies and support close to 45 million subscribers. The EXFO solution used by Zain has grown over the past 10 years and caters to the needs of various teams within the Zain organization.

EXFO-Zain Group Partnership Highlights



The Customer Insight Lab, created five years ago by the EXFO and Zain teams to achieve a deep understanding of subscriber behavior and data usage and increase synergy between network management, marketing, and customer service teams, is a key initiative demonstrating EXFO's prowess in terms of providing value to customers with the use of analytics solutions.

While many projects have been implemented since the lab's inception, the project with Zain Bahrain focused on customer segmentation that enabled the operator to create adapted offers for its subscribers is noteworthy. Historically, the operator performed customer segmentation using social demographic information; however, this methodology showed no difference between subscribers, thus preventing Zain Bahrain from creating customized offers. Using EXFO's platform and data science experts, Zain Bahrain created a more granular segmentation based on usage data.

Combining their understanding of the market drivers and dynamics in the region and Zain Bahrain's customer base, EXFO scientists developed algorithms that analyzed subscriber behavior and applications, laying the foundation for more thorough customer segmentation. Using a clustering algorithm to identify micro segments, Zain Bahrain then developed a full range of adapted offers now called the Big Gigs family, consisting of eight different plans: Browser, Streamer, Downloader, Gamer, Smarter, Hero, Raider, and Raider Plus. In particular, the Downloader offer was well received by subscribers that share files because of peer-to-peer (P2P) services as the plan provides lower rates for downloading at night, thus creating a win-win situation for both customers and the operator because network utilization is lower at night as well.

EXFO's success lies in its ability to provide a highly differentiated solution based on each end user's specific requirements, in specific market environment. A one-size-fits-all solution does not work because each network has its own characteristics, and each user group has its own challenges. The EXFO solution's power lies in the ability to support its customers through Professional Services and leverage the same set of solutions in a case-by-case approach, thereby delivering tangible benefits.

The successful implementation at Zain Bahrain is testimonial to this approach because by using EXFO's solution, the customer drastically increased customer satisfaction and registered a revenue increase of more than 30%.

EXFO Helps Three UK Manage Its Fully Virtualized Network

Three UK, part of the Hutchison group of companies, is another operator that has deeply benefited from EXFO's expertise in monitoring, and analytics. Three UK is the first operator to launch a complete cloud-based virtual network in Europe, allowing it to be more flexible than its competitors in service creation and launch effectiveness. For the past three years, EXFO has supported Three UK's network transformation in service assurance.

With a fully virtualized infrastructure, Three UK requires support in network infrastructure, performance management, and analytics to achieve its key goals, such as effective customer segmentation. EXFO's service assurance solution addresses this need by using virtual probes and different data sources, including subscriber traffic, data from network elements, content from devices, and external data, such as customer surveys.

EXFO – Three UK Partnership Highlights



Developed closely with Three UK, the fully-virtualized platform is being integrated into the operator's network to be used to monitor network traffic and trigger alarms when issues are identified. Interconnecting the lifecycles of the network, services, and subscribers, the platform designed to support various teams such as network performance management, field operations personnel, customer care, and the marketing department. With the EXFO solution, Three UK is well positioned to make sound decisions on network investments when the need to increase capacity or coverage arises.

To ensure Three UK derives the maximum benefits from the platform, EXFO experts are integrated into Three UK's team to manage the solution and to create and implement use cases. EXFO is actively working with the Three UK team to develop use cases that answer multiple needs across the organization.

EXFO Enables Leading Nordic Tier 1 Operator to Reduce the Mean Time to Repair (MTTR) through Integrated Capabilities

Frost & Sullivan research finds that the benefits experienced by customers, such as Zain and Three UK, are the direct result of EXFO's testing and monitoring solutions' innovative capabilities and the human resources that EXFO dedicates to its customers.

A leading Nordic Tier 1 Operator and longtime customer of Ontology, which EXFO acquired in 2017, is yet another example demonstrating EXFO's commitment to providing solutions

that bring the utmost value to its customers. The company's analytics team supports the operator in common cause analysis by integrating real-time monitoring information from EXFO's active testing solutions, with the dynamic topology inventory capability of its Ontology solution.

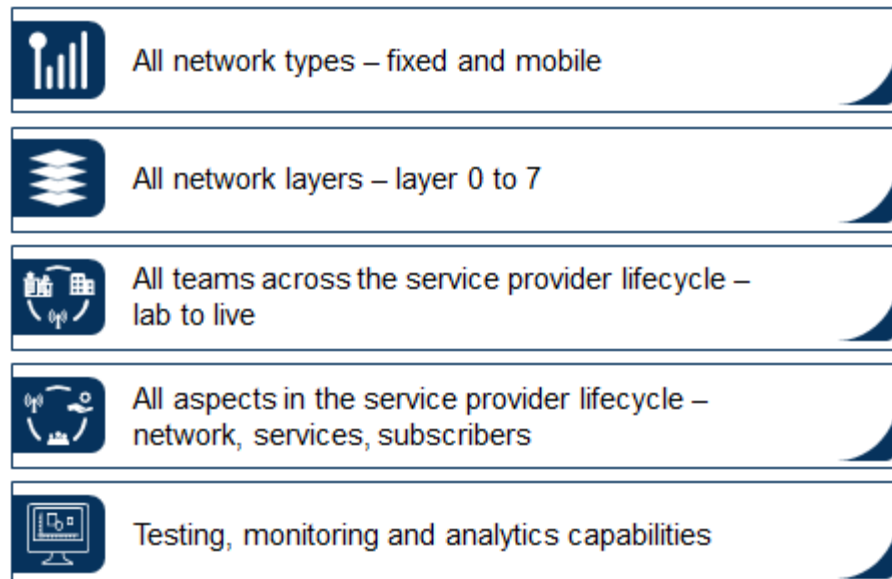
EXFO - Nordic Tier 1 Operator Partnership Highlights



With the ability to put together information from various sources of semi-structured and unstructured data, the Ontology solution creates graphs of operators' networks, enabling them to see how individual network elements or functions are connected to one another and discover the configuration for providing services to customers. Historically, using Ontology to help with scheduling maintenance and upgrades with a minimum impact on customers, the Tier 1 Operator expanded its use of the solution to common cause analysis; thereby eliminating the manual troubleshooting required to find and resolve faults in its network and dramatically reduces its MTTR. Such benefits are the direct result of EXFO's ability to integrate its solutions' capabilities to create added value for customers. The EXFO solution consists of EXFO's active monitoring solution EXFO Worx, active analytics solution EXFO Xtract, and Ontology, communicating mostly through standard interfaces to find and isolate problems and automatically identify likely causes of these issues.

Unique Market Positioning

EXFO's Unique Positioning in Data Analytics Solutions Market for Service Providers



EXFO benefits from a unique positioning in the global data analytics solutions market for service providers based on its coverage of all types of networks (fixed and mobile), all layers of the network stack (layers 0 to 7), and all users and lifecycles within the service provider lifecycle, including lab testing and marketing as well as network, services, and subscribers.

EXFO leverages this comprehensive end-to-end (E2E) data further by using Artificial Intelligence (AI) and specifically Machine Learning (ML) in its analytics applications. EXFO's analytics applications are designed for monitoring, troubleshooting, engineering, customer care and marketing use, and they include automated use cases for network and service operations, such as diagnostics or predictions, and customer operations such as segmentation, churn prediction and fraud detection. Wide range of professional services is available to further tailor the AI & ML use cases in co-development mode with customers.

EXFO has designed its solutions portfolio around the service provider lifecycle and includes also simulators to perform stress and compliance testing; fiber optic test equipment and monitoring solutions that enable field technicians to install and maintain optical networks and manage them over time by generating performance statistics and alarms when there are issues; active testing probes, dynamic topology inventory, passive monitoring probes, and RAN optimization tool for operations; and analytics solutions for optimization purposes.

Furthermore, the company has made several strategic acquisitions to develop its portfolio of solutions for network operators, starting with Brix Networks in 2008, which provided active testing capabilities. Ontology Systems was acquired in March 2017, which added the dynamic topology inventory capability for physical, virtual, and hybrid networks, and Astellia was acquired in February 2018, which added passive monitoring capabilities.

With EXFO's platform, service providers can look at the network and service performance in near real time as well as the subscriber experience. The platform's individual components are independent and can be used by customers on a standalone basis; only the Big Data framework combines all of the pieces together to deliver superior value to customers. The platform uses network data for root cause analysis, operations, and process automation and customer data for customer experience indexes and predictive analytics. Using topology information, EXFO's platform can map information coming from different network layers, from the physical layer to application layers.

EXFO's analytics platform takes into consideration the interconnecting lifecycles of the network, services, and subscribers within the service provider lifecycle. While these domains are usually managed separately, EXFO differentiates its approach by understanding all of these lifecycles because they impact each other. For instance, service providers must ensure their network can support a new service or that the new service being designed is one that its customers need and will use. While linking all operators' data is a tedious and likely impossible task, Frost & Sullivan finds that understanding phases and lifecycles of networks, services, and subscribers is sufficient to providing an optimal solution that can serve as the basis for automation.

Frost & Sullivan believes that integrating different solutions will accelerate EXFO's growth prospects because its single platform addresses multiple issues faced by operators' teams navigating through the lifecycles of network, services, and subscribers.

EXFO, a Leading Partner for Communications Service Providers

EXFO by the Numbers



Since it was founded in 1985, EXFO, the communications industry's test, monitoring and analytics experts, has grown tremendously and will likely achieve more than \$280 million in revenue in 2018 through organic means and strategic acquisitions. As a public company listed on the Toronto Stock Exchange, EXFO is expected to register year-over-year growth of more than 15% in 2018. With a number of acquisitions, including Ontology Systems and Astellia, EXFO has significant scale, with around 1,900 employees.

EXFO serves about 300 customers worldwide, including AT&T, Verizon, Bell, British Telecom, Telefónica, Vodafone, Deutsche Telekom, and China Mobile. The company is particularly focused on helping service providers overcome the challenges brought by the ever-increasing demand for bandwidth and increased competition as well as disruptive technologies such as 5G, NFV, and AI, thus requiring significant investments in research and development (R&D) to bring innovative capabilities to customers. EXFO excels at innovation, investing more than \$55 million in R&D annually, which represents more than 20% of its revenue. As a leading partner for communications service providers, EXFO is present in more than 25 countries worldwide and has more than 20 service centers. The company generates slightly less than half of its revenue from the Americas; about one-third of its revenue from Europe, the Middle East, and Africa (EMEA); and 17% from Asia-Pacific. Because Astellia had a large customer base of 120 network operators, most of which are based in EMEA, EXFO's presence across this region has increased considerably in 2018.

Conclusion

EXFO is unique in the data analytics solutions market for service providers as it offers a differentiated solution, based on automation, data science, co-development with customers. Integrating organic strengths in fiber testing and monitoring with active testing, dynamic topology inventory, passive monitoring, and analytics from strategic acquisitions, EXFO has developed a testing, monitoring, and analytics platform that covers all types of networks and the complete network stack; understands the network, service, and subscriber lifecycles; and can be leveraged by teams across service providers' organizations. EXFO is committed to providing superior value to its customers and allocating resources to help them reap the maximum benefits from the solutions they choose to deploy.

For its strong overall performance, EXFO has earned Frost & Sullivan's 2018 Customer Value Leadership Award in the global data analytics solutions market for communications service providers.

Significance of Customer Value Leadership

Ultimately, growth in any organization depends upon customers purchasing from a company and then making the decision to return time and again. Delighting customers is, therefore, the cornerstone of any successful growth strategy. To achieve these dual goals (growth and customer delight), an organization must be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.



Understanding Customer Value Leadership

Customer Value Leadership is defined and measured by two macro-level categories: Customer Impact and Business Impact. These two sides work together to make customers feel valued and confident in their products' quality and long shelf life. This dual satisfaction translates into repeat purchases and a high lifetime of customer value.

Key Benchmarking Criteria

For the Customer Value Leadership Award, Frost & Sullivan analysts independently evaluated two key factors—Customer Impact and Business Impact—according to the criteria identified below.

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

Business Impact

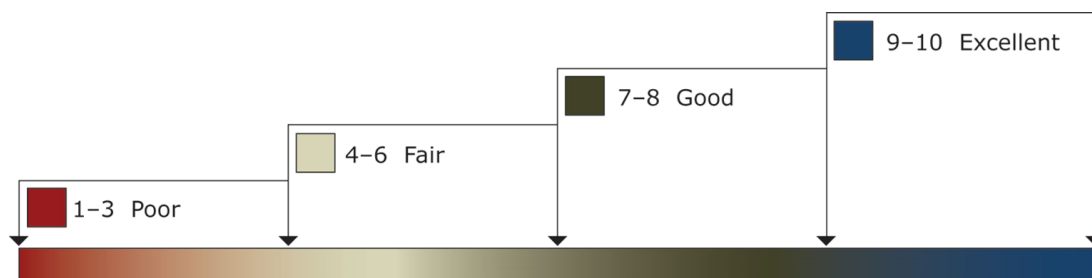
- Criterion 1: Financial Performance
- Criterion 2: Customer Acquisition
- Criterion 3: Operational Efficiency
- Criterion 4: Growth Potential
- Criterion 5: Human Capital

Best Practices Award Analysis for EXFO

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 our 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 is organized by Customer Impact and Business Impact (i.e., these are 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, we have chosen to refer to the other key participants as Competitor2 and Competitor3.

<i>Measurement of 1–10 (1 = poor; 10 = excellent)</i>			
Customer Value Leadership	Customer Impact	Business Impact	Average Rating
EXFO	9.1	9.2	9.2
Competitor2	8.2	8.0	8.1
Competitor3	8.1	7.7	7.9

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 most 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.

Business Impact

Criterion 1: Financial Performance

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

Criterion 2: Customer Acquisition

Requirement: Customer-facing processes support the efficient and consistent 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

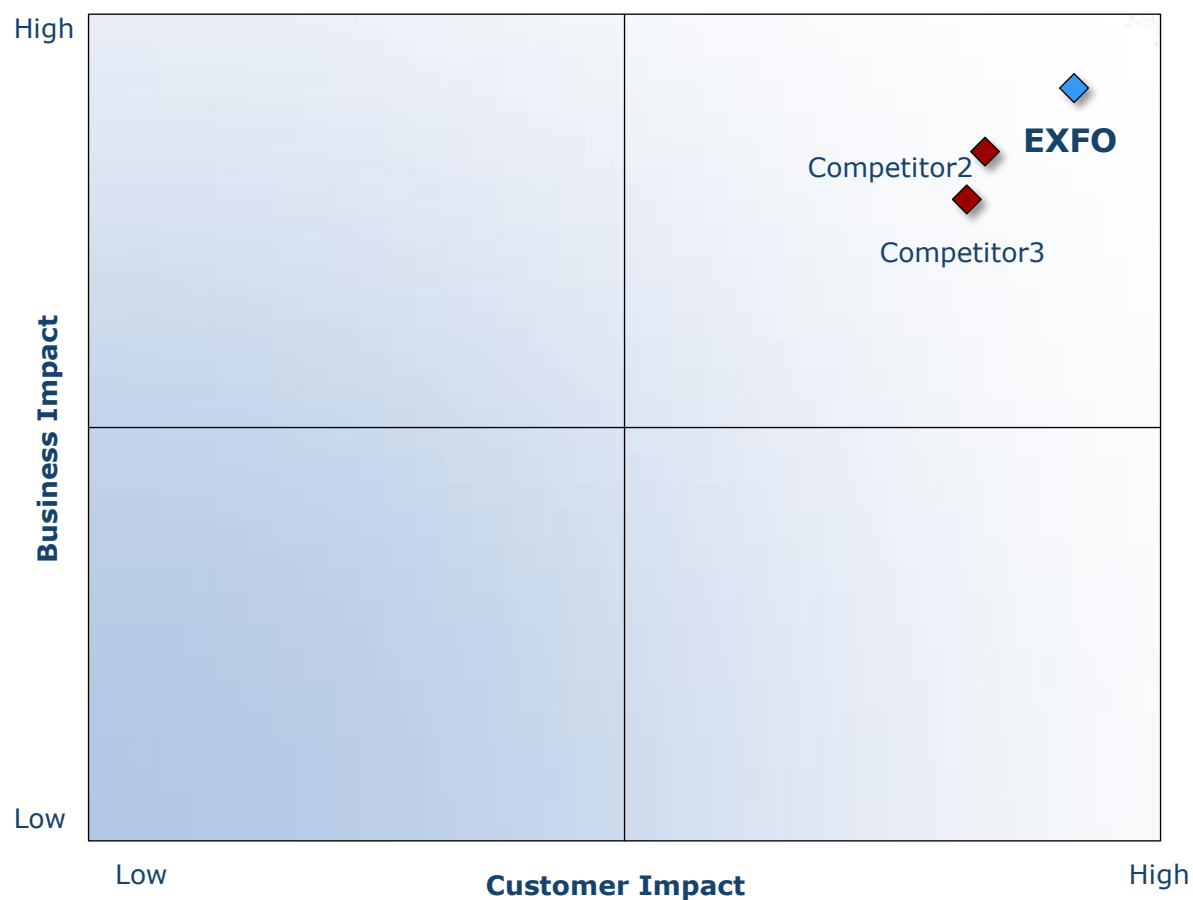
Requirements: Customer focus strengthens brand, reinforces customer loyalty, and enhances growth potential.

Criterion 5: Human Capital

Requirement: Company culture is characterized by a strong commitment to quality and customers, which in turn 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 practice 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 globe	<ul style="list-style-type: none"> Conduct in-depth industry research Identify emerging sectors Scan multiple geographies 	Pipeline of candidates who potentially meet all best-practice criteria
2 Perform 360-degree research	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> Interview thought leaders and industry practitioners Assess candidates' fit with best-practice 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	<ul style="list-style-type: none"> Confirm best-practice 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	<ul style="list-style-type: none"> Brainstorm ranking options Invite multiple perspectives on candidates' performance Update candidate profiles 	Final prioritization of all eligible candidates and companion best-practice positioning paper
5 Assemble panel of industry experts	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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-practice Award recipient	<ul style="list-style-type: none"> Review analysis with panel Build consensus Select recipient 	Decision on which company performs best against all best-practice criteria
9 Communicate recognition	Inform Award recipient of Award recognition	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Coordinate media outreach Design a marketing plan Assess Award's role in future 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 our 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, leading to 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.



About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to 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 more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit <http://www.frost.com>.