FROST & SULLIVAN

Entrepreneurial Company of the Year Award

Cloud-based MES Markets

NORTH AMERICA

Contents

Background and Company Performance

Industry Challenges

In the expanding realm of globalization and the Industrial Internet of Things (IIoT), several manufacturers and industries are still using obsolete technologies that fall short of current customer needs; the key challenges these customers face include obsolescence risks and the rising need for demand-driven production networks and supply-chain responsiveness. Moreover, factories are also suffering from the dwindling number of experienced workers and IT talent skilled in maintaining complex production control systems. Especially at a juncture where information architectures are becoming flatter, more advanced, and integrated, Frost & Sullivan notes that the need for IT skills is greater than ever before. Added to this scenario is the aspect of Industry 4.0/IIoT adoption, which further exacerbates the situation. As such, the need to reduce costs and boost competitiveness is at an all-time high.

Customers report to Frost & Sullivan that they are demanding increasing levels of customization; this is resulting in a restructuring of production networks now characterized by interconnected islands of automation. Today's factories and warehouses need to be reconfigurable, easily customizable, proactively responsive, and highly efficient if they wish to adapt and face the competition. In particular, the concept of today's Industry 4.0 ideally revolves around cyber-physical systems, wherein the real and virtual worlds merge to create a platform of interoperability between operations technology and information technology (IT). The concept involves embedding electronics into products, materials, and equipment, which allows them to communicate with each other, enabling computing power for a fraction of the original cost incurred.

Another aspect necessary to modernize today's factories is the decentralized management and maintenance of dynamic shop-floor marketplace activity. However, Frost & Sullivan points out that a key challenge that operators and plant management face in achieving this goal is developing specific capabilities for scaling and shifting to coordinate autonomous plant-floor activity. Though integration of manufacturing execution systems (MESs) provides a strong foundation for managing and monitoring operations on the plant floor, future MES solutions require scalability that accommodates simplicity in deployment, connectivity, mobile, cloud, lower cost of ownership, and advanced analytics to provide a robust solution for clients.

Entrepreneurial Innovation and Customer Impact

Market Disruption

The implementation process of conventional MES demands several steps be followed meticulously, including the detailed development of the system and user requirements, followed by a gap analysis for clearly defining the integration points between numerous layers that encompasses the plant's enterprise architecture, and, finally, the integration of MES software with other production control systems. Apart from these tedious implementation cycle challenges, another major hurdle across industries is the high cost involved. In fact, only an estimated 20% of all customers with a need to implement MES actually do so, purely due to the high cost, complexity, and time involved in the process. Frost & Sullivan agrees that customers ideally need a solution that is scalable, easy to install, and cost-efficient.

Frost & Sullivan believes that 42Q's customer-centric approach reflects an understanding of these critical requirements in the form of a solution package designed specifically for the manufacturing sector. This solution was actually being used by Sanmina Corporation, 42Q's parent company, for internal purposes. However, based on repeated customer inquiries, the company decided to spin-off an organization to drive proliferation and catalyze industry adoption of these best practices. As such, this solution was in the works, tested, and confirmed of its benefits before broader market release.

42Q's decision to move its software offering to the cloud rejuvenates a market that is significantly focused on on-premise implementations. As industries digitize, it is imperative to move to cost-effective and scalable infrastructures to support growth, agility, and responsiveness. 42Q's cloud-based setup does not require a team of experts to maintain the infrastructure, and the cost of capital involved in setting it up is almost less than half of conventional solution start-up costs. This benefit is highly attractive to many industries - ranging from regulated ones to high-speed, low-volume manufacturing entities.

Among the biggest benefits of a cloud-based MES is that it is extremely flexible, viable, and simple to scale either up or down, thereby allowing a rapid implementation cycle. Where setting up of traditional MES takes anywhere from 6 to 9 months or more, the implementation cycle of 42Q's cloud-based MES takes only about 6 weeks, which cuts down upfront costs and time commitments quite significantly. Frost & Sullivan ongoing analysis reveals that this feature is 42Q's unique selling point (USP) and a key differentiating factor when compared to its competition. Further, its on-demand pricing model allows a pay-per-use subscription type - which eliminates the need for upfront capital expenditures.

The out-of-the-box solution and technologically advanced product offering, combined with consistent value addition, has been widely appreciated by customers in the regulated industries market. 42Q's cloud-based MES platform has the potential to dislodge competing

solution installations, while leveraging existing investments. 42Q now runs in over 50 manufacturing facilities, supporting 500+ production lines.

Competitive Differentiation

During a manufacturing setup, a crucial requirement is maintaining consistent, unfailing, easy to install, and up-to-date documentation in real-time. Above all, the key factor that is essential to maintain quality and reduce cost of poor quality (COPQ) is a high level of security and reliability. For example, in the aerospace industry, the accelerated replacement of obsolete aircraft with next-generation, fuel-efficient aircraft has resulted in a huge demand for new commercial aircraft. The industry requires aggressive delivery cycles and complex manufacturing processes - coupled with full value-chain genealogy and traceability functions. In the healthcare industry, stringent regulatory requirements are a main reason for the revenue decline in the medical devices vertical. The cost of development and production of devices that comply with regulations is quite high, and patient protection and tax laws further restrain growth. Customers from different end-user industries that are highly regulated need a solution that can properly address these challenges; too often, companies are able to offer relief for only a few of these issues. However, Frost & Sullivan appreciates the fact that 42Q's solutions has been designed as a one-stop shop that eliminates these prominent challenges, irrespective of the industry from which the customer comes — marking one of the company's most laudable key differentiating factors.

42Q's solution offers component-level traceability and system genealogy to allow plant management high-level maintenance capabilities of vital records; this feature is critical for industries that are extremely regulated (medical, pharmaceuticals, automotive, and aerospace). It ensures that all product information is pre-appended to the electronic device. As a result, operators can efficiently maintain and manage products that are recalled or sent back to the factory for repairs or replacements. In addition, the solution is powered with a "Rich Data Capture Technology" for the meticulous gathering of every product's genealogy and its status in real-time, which adds impressive value to 42Q's customers and is another factor that clearly differentiates 42Q from its competitors. The solution allows operators to sort through massive amounts of historical data stored in the system, making it simple for plant operators to navigate through information at the time of a regulatory audit.

Another benefit of leveraging cloud-based technology in medical factories is compliance to 21 CFR Part 11. If a large pharmaceutical company uses MES solutions for production accounting, weighing, and dispensing regulatory documentation control across 100 of its plants, it will need to maintain regulatory documentation for 100 of those seat licenses. With the cloud model, customers are empowered by 42Q's cloud-hosted solution, meaning it is intrinsically secure and supports data encryption. Customers need only maintain compliance for one such instance. Cloud not only flattens the information architectures, but also data silos, version updates, and costs.

In a marketplace where these features and benefits are absolutely essential for successful deployment of a low-cost and easy-to-install software solution, 42Q's customer-centric products are truly differentiated from the rest of the competition.

Price/Performance Value

For manufacturing industries that are powered by MES, the price, performance value, and return on investment (ROI) are of vital importance to a customer. End users need best-in-class solution providers that have established a strong track record, as lack of efficient servicing leads to a significant drop in plant profitability.

Frost & Sullivan points out that 42Q's pricing strategy perfectly meets the pricing requirements of customers through its creative business model approaches. The company's main objective is to provide customers with the ease to scale up or down and significantly reduce upfront investment and capital spending, coupled with the option to pay only for what they need. This gives the customer the flexibility and room to scale as they expand - without any hassles from a cost standpoint. In addition, when customers' needs increase and scale up, they are not required to purchase or install any further software licenses. As the resources are already available in the cloud, a customer can simply start using the services and functionality required with zero hassle, making the company highly customer-centric in product offerings. Moreover, the multi-tenant cloud feature allows customers to channel and leverage computing power on-demand, rather than dealing with dedicated servers that involve swing cycles based on usage. As multi-tenants share the same database schema, it is very easy to replicate 42Q as a global standard across the manufacturing facilities of any enterprise. Frost & Sullivan agrees this is quite compelling in times of uncertainty. The biggest trend sweeping the MES market is the end-user's shift from site-functional optimization to enterprise-wide optimization. This evolution steers them towards solution and platform consolidation to minimize time to market and achieve key performance indicator (KPI) benchmarks across all plants operated by an enterprise.

The basic pricing model that the company offers its customers is a monthly subscription package based on three parameters: number of sites, input/output (IO) points, and dashboard functionality. The company charges its customers based on the number of IO points rather than the number of operators, allowing companies to run three shifts seamlessly without having to pay three times as much, thereby truly giving the customer clear value for the purchase. Finally, the feature that would be most useful for factory management and administrators is the dashboard functionality and analytics, wherein they can view KPIs to essentially understand the model better for future decision-making processes.

Best Practice Example: 42Q's cloud-based solution offers superior performance, lower upfront costs, and increased efficiency. The company's pricing model demonstrates that the solution pays for itself in under a month's time.

Market Gaps

When deploying MES solutions as an on-premise application in manufacturing facilities, because of the sheer size of investment, customers often have to go to length and define their complete change management and end-to-end scope - as well as give a detailed account on all aspects of how the operations at the unit work. This entire process is extremely intrusive and not always viable for customers, not to mention the heavy costs associated with the deployment of on-premise MES. On interaction with its customers, 42Q gathered that this process is tedious; despite efforts, the average time-to-breakeven is between nine months and a year.

42Q's solutions properly address all of the above challenges that customers generally face by placing key emphasis on quick time-to-market and making it a highly unobtrusive solution. Unlike 42Q's other competitors, the company's cloud-based solution can be deployed immediately due to its robust design scope, pre-template features, and unparalleled functionality - making it an undeniably attractive value proposition for customers.

Clear benefits from using 42Q's cloud-based MES solution include ready-to-deploy, proven functionality; easy configuration of paperless processes; swift tracking; and accurate serialization, routing, and management of work instructions (which are ready to use on the day of deployment). Also, when a customer is looking to expand by adding an additional line or plant, 42Q's solution allows simple replication of existing deployment, thereby bridging the current time-to-market gap.

Best Practice:

42Q served a major market participant in the clean energy industry that required provision of standard batch genealogy and serialization features to allow it to capture real-time data from all of its manufacturing units. However, the key challenge with deployment was that the old MES was not scalable enough to handle the added product lines with heavy volume and higher complexity. The factory also required complete visibility and traceability of chemical modules across the plant, which later needed to be integrated with other facilities for safety and security purposes. The imperative to product selection was the speed of deployment and flexibility of operations.

The deployment of 42Q's cloud-based MES was unique in these ways:

1. No infrastructure to install or maintain; true flexibility in maintaining these systems

2. Complete functionality and seamless integration of serial and batch genealogy

3. Parametric data collection and reporting

42Q proved its unparalleled competence by deploying the solution in under 4 weeks, while assuring complete transparency of genealogy and traceability that enabled field and product analyses in just a few days (as compared to 3 months for traditional software deployment). Furthermore, the solution implementation allowed the customer complete visibility across its global plants.

Brand Equity

42Q demonstrates a strong focus on enhancing brand visibility by expanding its partner ecosystem and consistently reaching out to newer customers. Backed by its solid brand image of manufacturing and developing highly advanced and effective solutions, the company continues to make a mark in tomorrow's production network systems.

42Q functions as a true partner to its clients, unlike some of its other competitors. The company also offers products that are reliable and provide superior performance. Apart from offering the first cloud-based MES software solutions to manufacturing industries, the company also works with its customers to improve the quality of its solutions based on their feedback to strengthen its brand image. For instance, the company contacts its customers on a timely basis to discover and understand the diverse requirements of clients in their respective industries and to address their demands in the most comprehensive way possible. This elevated customer care enhances 42Q's brand image.

42Q has recently witnessed a rise in its customer base, which has given the company a growing market footprint. This rise is the result of unparalleled customer value that the company offers, coupled with its commitment to develop cutting-edge and disruptive solutions for its customers. At this rate of performance, commitment to innovation, and fierce emphasis on delivering value for customers, Frost & Sullivan feels that the company holds promise of becoming fierce competition for established solution providers in the market.

Customer Purchase Experience

42Q once deployed its solution to a leading medical OEM that was expecting an audit from the FDA. The company had to ensure that the manufacturer had built the necessary device history records (DHR) — specifically around the aspect of DHRs for products that were built using integrated circuits from specific lot codes — and that all training records of a work instruction engineering change order (ECO) were in place.

The results of implementing 42Q's solution proved quite successful; the customer was ultimately able to maintain speed of producing the requested information and consistency of records, thereby resulting in an effective audit. As such, by providing customers with solutions that impeccably address their every requirement, 42Q truly enhances the customer purchase experience.

Conclusion

Frost & Sullivan concludes that 42Q's vision of "taking the MES to the cloud" clearly resonates through its solution offerings and service capabilities, breathing fresh air into a market that is awash with point solutions and on-premise installations. As industries digitize, it is imperative that manufacturers move to flatter information architectures and responsive production systems. This juncture is beneficial to 42Q's solutions due to the growth driven by adoption of IIoT, complemented by smart, fast, and simple manufacturing work processes. Finally, the pre-templates and the customizability of the solution made to address customer needs underscore the company's successful track record.

With its strong overall performance, 42Q has earned the 2017 Frost & Sullivan Entrepreneurial Company of the Year Award.

Significance of Entrepreneurial Leadership

Ultimately, growth in any organization depends upon customers purchasing from a company, and then making the decision to return time and again. In a sense, then, everything is truly about the customer—and making those customers happy is the cornerstone of any long-term successful innovation or growth strategy. To achieve these dual goals (customer engagement and growth), an organization must be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

DEMAND
- Acquire competitors' customers
- Generate awareness and interest
- Increase market share
- Grow the total size of the market
- Win more customers than you lose

BRAND
- Increase brand equity
- Foster a strong corporate identity
- Improve brand recall
- Inspire customers
- Adhere to a clear value proposition

Entrepreneurial Company of the Year

COMPETITIVE POSITIONING
- Identify unique selling points
- Offer superior value to customers
- Deliver on the promised value proposition
- Carve out a market niche
- Balance price and value

Understanding Entrepreneurial Leadership

Demand forecasting, branding, and differentiation are part of an entrepreneurial company's larger journey toward forming deep relationships with customers and permanently altering the market with their actions. These two concepts — entrepreneurial innovation and customer impact — are the cornerstones of the Frost & Sullivan Entrepreneurial Company of the Year Award.

Key Benchmarking Criteria

For the Entrepreneurial Company of the Year Award, Frost & Sullivan analysts independently evaluated two key factors — Entrepreneurial Innovation and Customer Impact — according to the criteria identified below.

Entrepreneurial Innovation

      Criterion 1: Market Disruption
      Criterion 2: Competitive Differentiation
      Criterion 3: Market Gaps
      Criterion 4: Blue Ocean Strategy
   Criterion 5: Passionate Persistence

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 Practice Award Analysis for 42Q

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

9–10 Excellent
7–8 Good
4–6 Fair
1–3 Poor
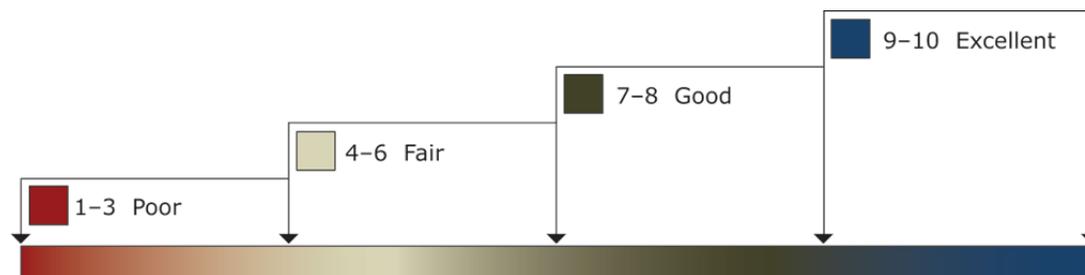
The Decision Support Scorecard is organized by Entrepreneurial Innovation and Customer Impact (i.e., the overarching categories for all 10 benchmarking criteria; the definitions for each criteria are provided beneath the scorecard). The research team confirms the veracity of this weighted scorecard through 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 players as Competitor 2 and Competitor 3.

Measurement of 1–10 (1 = poor; 10 = excellent)			
Entrepreneurial Company of the Year	Entrepreneurial Innovation	Customer Impact	**Average Rating**
42Q	**9.0**	**9.0**	**9.0**
Competitor 2	7.0	7.5	7.3
Competitor 3	8.5	8.0	8.3

Entrepreneurial Innovation

Criterion 1: Market Disruption
Requirement: Innovative new solutions that have a genuine potential to disrupt the market, obsoleting current solutions and shaking up competition

Criterion 2: Competitive Differentiation
Requirement: Deep understanding of both current and emerging competition to create and communicate strong competitive differentiators in the market

Criterion 3: Market Gaps
Requirement: A clear understanding of customers' desired outcomes, the products that currently help them achieve those outcomes, and where key gaps may exist

Criterion 4: Blue Ocean Strategy
Requirement: Strategic focus in creating a leadership position in a potentially "uncontested" market space, manifested by stiff barriers to entry for competitors

Criterion 5: Passionate Persistence
Requirement: A deep belief in the "rightness" of an idea, and a commitment to pursuing it despite seemingly insurmountable obstacles

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 like 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

Decision Support Matrix

Once all companies have been evaluated according to the Decision Support Scorecard, analysts can 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.
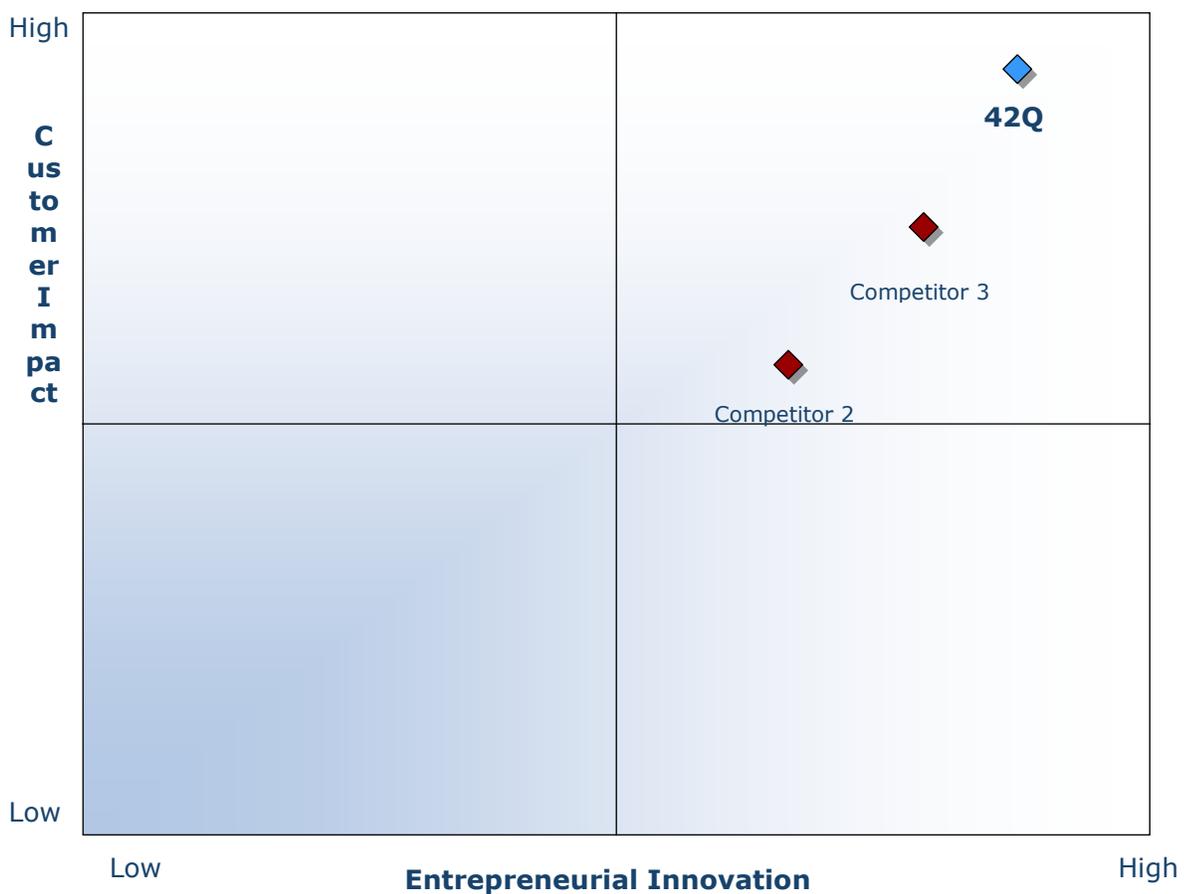
The Intersection between 360-Degree Research and Best Practices Awards

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 players and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan Awards 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	• 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	• Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates	Matrix positioning all candidates' performance relative to one another
3 **Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• 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	• 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	• 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-practice Award recipient	• Review analysis with panel • Build consensus • Select winner	Decision on which company performs best against all best-practice criteria
9 **Communicate recognition**	Inform Award recipient of Award recognition	• Present 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 may share Award news with stakeholders and customers	• 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

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 almost 50 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from 31 offices on six continents. To join our Growth Partnership, please visit http://www.frost.com.