

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

FROST & SULLIVAN BEST PRACTICES AWARD

5G INFRASTRUCTURE - GLOBAL

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# Enabling Technology Leadership 2019



**Hewlett Packard**  
Enterprise

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

2019

BEST  
PRACTICES  
AWARD

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## Background and Company Performance

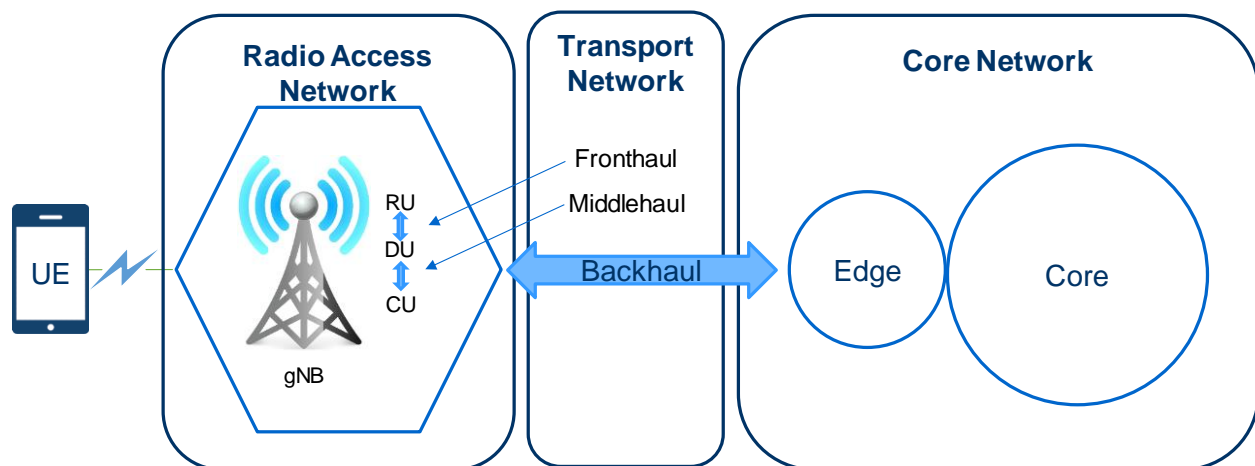
### Introduction

The 5G New Radio (NR) era is officially upon us. While the communications industry has hyped 5G for many years, 2019 marks the formal launch of 5G NR rollouts around the world. 5G progress, however, will be gradual. According to figures released by the Global mobile Suppliers Association (GSA), of the 769 communications service providers (CSPs) operating 4G LTE networks in 225 countries globally, only 39 CSPs in 16 countries have offered limited 5G NR service launches as of August 6, 2019. However, 296 CSPs in 100 countries have 5G NR “engagements” which the GSA defines as “launched with limited availability, deployed, demonstrated, are testing or trialing, or have been licensed to conduct field trials of mobile 5G or FWA 5G.” Additionally, 56 CSPs in 32 countries have deployed some 5G NR within their live networks.

Frost & Sullivan recently released a *2019 5G Global Infrastructure study*. For this report, Frost & Sullivan defines 5G NR Infrastructure to include the following:

- Radio Access Networks (RAN)
- Transport Networks
- Core Networks, which may include one or more Edge Networks

A simplified view of the 5G NR Infrastructure is shown below.



Source: Frost & Sullivan

User Equipment (UE) communicates with the RAN, which in turn connects to the Core Network via the Transport Network. One of the biggest changes in the 5G RAN is that it is architected to be more distributed and more cloud-ready from the start. In the figure above, the logical designation for the base station is gNB, which stands for Next Generation Node B.<sup>1</sup> gNB has a three-tier architecture with the Radio Unit (RU), the Distributed Unit (DU), and the Central Unit (CU). While hardware remains important for

<sup>1</sup> The base station in 3G was designated Node B, whereas the base station in 4G was named Evolved Node B (eNB).

the RU (which include active radio antenna(s)), the rest of the RAN, the transport network, and the core/edge networks are software, designed to operate in a cloud environment.

The report examines the 5G NR Infrastructure market along with 10 key suppliers that make up a significant portion of that market. HPE, the recipient of this award, is profiled within this report (and within this award.)

## *Industry Challenges*

### **New Generation, New Technologies, New Standards, New Everything**

When a new “generation” of wireless communication technology comes about—in this case, the fifth generation or 5G—the changes are significant enough to require updated devices to access this new technology. In other words, a 4G LTE device cannot access a 5G NR network. A 5G device, however, is ‘backward compatible’ and can access both a 5G network as well as previous generations of network technologies. 5G is designed to use the radio frequency (RF) spectrum differently and more efficiently; for this reason, 5G is referred to as 5G New Radio.

5G is designed to build upon 4G. In fact, the first iterations of 5G NR that are now being released in select areas around the world require existing 4G LTE infrastructure—the correct term for this is 5G NR Non-Standalone (NSA). The standards upon which 5G is being built define 5G NR NSA as an interim step, but one that may be around for quite a while. Deployments of 5G NR Standalone (SA), which does not require 4G LTE legacy infrastructure, will follow in the coming months and years. 4G LTE networks are prevalent and established, which will likely lead CSPs to leverage that strong foundation and deploy both 5G NR NSA and 5G NR SA networks as they roll out 5G over the next decade.

Global standards are the basis for 5G. The 3rd Generation Partnership Project (3GPP) unites seven telecommunications standards development organizations and is the face of the 5G standards. Work on 5G standards began in 2012 and includes the contributions of many suppliers and CSPs. Recent accomplishments related to the 3GPP 5G standards efforts include:

- December 2017 – Initial freeze of non-standalone 5G specifications (5G NR NSA)
- June 2018 – Freeze of standalone 5G specifications (5G NR SA)
- March 2019 – Completion of the first 5G release of standards—Release 15

The 5G era is in its infancy, really kicking off with Release 15 of the 3GPP standards. As noted in the introduction, only approximately 5% of the world’s CSPs that currently have 4G LTE networks have introduced even limited 5G NR service launches as of August 6, 2019. (All of these 5G NR service launches are NSA, meaning they still require 4G LTE.)

To utilize 5G communications, a 5G device is needed and those are still relatively rare.<sup>2</sup> Even if one has a 5G device, like a new 5G smartphone, finding a 5G signal could be difficult (if not impossible), depending on where in the world you are.

In this rapidly evolving environment, it is possible that early experiences with 5G NR may not initially live up to the hype. Most mobile users are now accustomed to very stable 4G LTE networks, but often do not remember the early road-bumps (over a decade ago) when 4G was the new generation of wireless technology.

### **Managing the Customer Experience**

Consumer and business customers are a staple for CSPs throughout the world. While 5G is set to penetrate a wide variety of industries with exciting new uses cases, 5G NR still has a strong initial play into consumer markets.

While recent history indicates that average revenue per user (ARPU) for voice, text, and even data services, continues to decline; the cost for supporting new technology evolution is rising; and network data volumes are expanding. Is 5G the answer? Perhaps...

5G NR was designed to be more efficient, handle larger data volumes, provide increased bandwidth, and enable new use cases that were not possible with 4G LTE. To get where 5G NR promises will require massive investment in new networks (the 5G Infrastructure covered in the report) and time. The novelty of 5G and the promise of increased speed may provide an initial increase in revenue for CSPs—depending on how they market it—but CSPs must manage the customer experience, especially early on when all the bugs may not yet be worked out.

Improving the customer experience has been a mantra of most CSPs in all regions of the world, primarily because past mistakes in this area have proven to be expensive lessons. Most customers have a choice of operators today; and a poor experience with a CSP's service(s) often leads to churn. Customers also have choices for certain services outside of traditional network operators. Improving the customer experience leads to an improved CSP bottom line, as customer needs are met and churn is prevented. This was true in 4G LTE and will continue to be true as the new 5G NR rolls out.

### ***Hewlett Packard Enterprise Profile***

The publicly traded Hewlett Packard Enterprise (HPE) is a global technology company, headquartered in Palo Alto, California. Formed in 2015 when the former Hewlett-Packard spun off HPE, the company is now “focused on developing intelligent solutions that allow customers to capture, analyze, and act upon data seamlessly from edge to cloud.” While HPE as a legal entity is new, the company has been involved with the communications service provider market for many decades. The company also supports many industries outside of communications. In the 5G Infrastructure market, HPE's customer base is global.

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<sup>2</sup> For example, Apple, one of the largest suppliers of smartphones globally, will not release a 5G version until 2020.

HPE maintains a fiscal year (FY) that ends on October 31. For FY 2018, the company reported total revenue of US \$30.85 billion. HPE also reported they employed approximately 60 thousand people at the end of FY 2018. For the first nine months of FY 2019 (ending July 31), the company reported overall revenue of US \$21.92 billion.

HPE organizes its business into four segments: Hybrid IT, Intelligent Edge, Financial Services, and Corporate Investments. According to the company, "Hybrid IT provides a broad portfolio of services-led and software-enabled infrastructure and solutions including secure, software-defined servers, storage, data center networking and HPE Pointnext Services, thereby combining HPE's hardware, software, and services capabilities to make Hybrid IT simple for its customers." The Hybrid IT segment includes the solutions that make up 5G infrastructure as defined by this report.<sup>3</sup> HPE reported FY 2018 revenue for the Hybrid IT business segment of US \$25.03 billion or 81.1% of total revenue. For the first nine months of FY 2019, the company report Hybrid IT revenue of US \$17.16 billion.

On the R&D front, HPE reported R&D expenditures totaled US \$1.66 billion in FY 2018 or 5.4% of total revenue.<sup>4</sup> In the first nine months of FY 2019, R&D expenses were up to \$1.40 billion or 6.4% of total revenue.

## 5G Core Network

HPE is different than the other suppliers profiled in the recent Frost & Sullivan report in that the company supplies the "infrastructure for the infrastructure." What this means is that HPE provides both the hardware that the telco cloud operates on and the software that enables the various cloud-based networks to function and be managed—the NFV infrastructure (NFVI). Put another way, NFVI is a telco cloud platform which network functions and other applications are deployed on. In addition to hardware and NFVI, HPE supplies network function software, including network functions that are part of the 5G core and edge networks. (In this way, HPE does compete more directly with other suppliers in the report. The company provides the infrastructure behind 5G RAN, transport networks, and core (and edge) networks, but also provides network software that makes up the 5G core networks.)

HPE partners with a number of other suppliers, including many that are profiled in the report, both publicly and behind the scenes. For instance, HPE has publicly announced a partnership with Samsung where the companies work together on 5G RAN and 5G Core solutions. In this partnership, Samsung will offer a 5G vRAN solution that leverages Samsung's RAN software and HPE hardware and NFVI. The hardware involved with this partnership is the HPE Edgeline EL8000 Converged Edge System which, according the HPE, "delivers high performance and low latency in a compact and ruggedized form factor, equipped with edge-optimized serviceability and remote systems management." Samsung and HPE will also offer joint 5G Core solutions, that feature both Samsung and HPE 5G Core network functions along with HPE hardware and NFVI.

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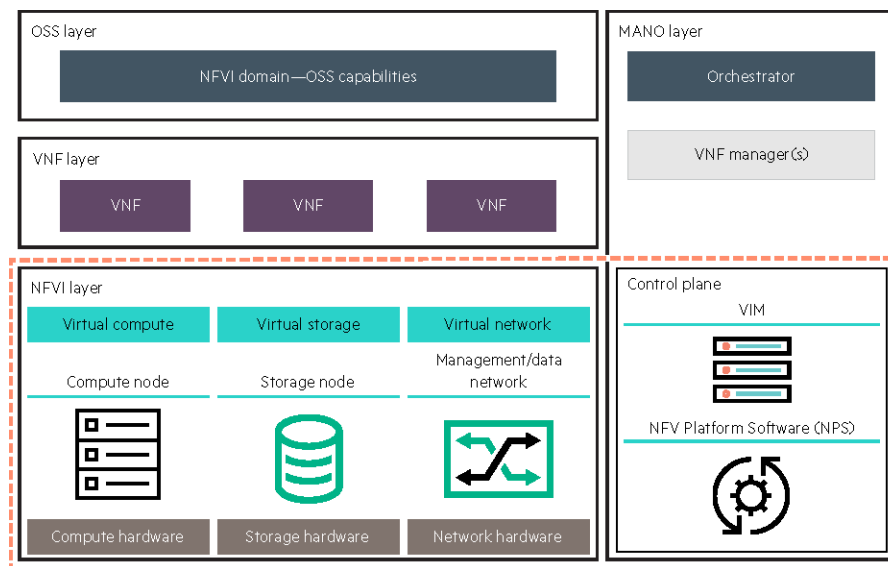
<sup>3</sup> At this point in time, 5G Infrastructure likely makes up a small fraction of this business segment but should increase over the coming months.

<sup>4</sup> This includes R&D well beyond that related to 5G infrastructure.



Examples of behind the scenes partnering include deals where a supplier gets a 5G infrastructure deal, but awards HPE with the hardware and/or NFVI contract that underlies the other supplier's software solution.

To help its customers design their 5G-ready networks, the company offers what it calls HPE Telco Blueprints; a high-level view of the architecture is shown in the figure below. These blueprints are "reference designs validated by HPE telecommunications experts leveraging infrastructure as code principles and HPE NFV best practices". Additionally, the company reports: "Designed to enhance every layer of the NFVI stack, HPE Telco Blueprints enable scalability via modularity, reliability with no single point of failure, and accelerated performance."



Source: HPE

The company provides several Core blueprints and Edge blueprints, each with networking nodes, control nodes, storage nodes, and management software. The blueprints outline the recommended HPE hardware and software needs for specific NFV use cases. The blueprints include toolkits and documentations to simplify the creation of the NFVI stack. According to the company, their telco blueprints coupled with HPE's ecosystem of system integration, software vendors, and network equipment providers "provide CSPs with the broadest portfolio of options to deploy enhanced NFV solutions," including 5G core and edge solutions.

5G requires more than NFV and NFVI; it requires Control and User Plane Separation (CUPS) and a service-based architecture. The service-based architecture requires a different approach for storage needs. To support this, HPE offers a Shared Data Environment architecture that supports storage needs for 5G user plane services and control plane services, while also supporting legacy (3G, 4G) needs.

HPE offers a set of key 3GPP-compliant 5GC network functions that are cloud native and based on a container- and microservices-based architecture. HPE offers a full suite of

orchestration and management solutions, including its Service Director orchestration solution, which enables key 5G needs such as network slicing.

The company recently announced a new corporate strategy. In the next three years, HPE plans to become a “consumption-driven” company; everything the company delivers will be available as-a-service. They are calling this strategy HPE GreenLake. While this is not directly related to 5G Infrastructure, it will eventually include the company’s 5G Infrastructure offerings.

### **Frost & Sullivan Insights**

HPE is different than the other suppliers profiled in this report in that the company supplies the “infrastructure for the infrastructure.” The company is essential to the success of the 5G Infrastructure market, even though it could be said that HPE operates ‘under the hood’ in the grand scheme of 5G.

HPE has spent the last few years defining what the company is and what it is not. The company, a spin off itself, has spun off multiple companies and thousands of employees to be “focused on developing intelligent solutions that allow customers to capture, analyze, and act upon data seamlessly from edge to cloud.”

The beginning of the 5G era is a perfect time for HPE to demonstrate to the world that it now has the right pieces in place to succeed. Frost & Sullivan expects the company to be successful in the coming years providing the infrastructure that makes 5G work; in other words, providing the enabling technology underlying the 5G Infrastructure.

### ***Technology Leverage and Customer Impact***

The 2019 Global Enabling Technology Leadership Award in 5G Infrastructure is judged based on ten criteria described later in this document. The following details a selection of the comparisons from the ten criteria.

### **Technology Leverage: Commitment to Innovation**

Global standards are the basis for 5G. The 3GPP unites seven telecommunications standards development organizations and is the face of the 5G standards. Work on 5G standards began in 2012 and includes the contributions of many suppliers and CSPs.

To leverage technology with regard to 5G NR, a supplier must be actively involved in the standards organizations. In addition, as HPE provides the “infrastructure for the infrastructure”, HPE must be involved in, and in some cases lead, those standards organizations that define the lower level networking and information technology infrastructure.

To support its commitment to innovation, HPE is involved in a long list of standards organizations. HPE is actively involved with the 3GPP and its efforts with 5G. An example of involvement with lower level standards is HPE involvement with DMTF which was formerly known as the Distributed Management Task Force; HPE is a board member of this organization. DMTF “creates open manageability standards spanning diverse emerging and traditional IT infrastructures including cloud, virtualization, network, servers and



storage. Member companies and alliance partners worldwide collaborate on standards to improve the interoperable management of information technologies.”

By actively engaging with the 5G NR and other standards organizations, HPE has been involved with emerging technologies that it has used to enable new products and enhance its products performance.

### **Technology Leverage: Commercialization Success**

This criterion requires “a proven track record of taking new technologies to market with a high rate of success.” While HPE as a legal entity is new, the company has been involved with the communications service provider market for many decades. The company also supports a range of industries outside of communications and has for a very long time. Decades of success in telco and outside of telco provide a convincing track record.

In the telco infrastructure market, Frost & Sullivan believes HPE is at or near the top of a number of market segments with over 450 thousand shipments of servers worldwide.

HPE also has a consulting and services organization (HPE Pointnext Services). The company shared that HPE Pointnext Services has engaged in over 11,000 projects that resulted in 99.8% “satisfied engagements;” an exceptionally high rate of success.

### **Technology Leverage: Application Diversity**

HPE is different than the other suppliers profiled in the recent Frost & Sullivan report in that the company supplies the “infrastructure for the infrastructure.” What this means is that HPE provides both the hardware that the telco cloud operates on and the software that enables the various cloud-based networks to function and be managed—the NFV infrastructure or NFVI. Put another way, NFVI is a telco cloud platform which network functions and other applications are deployed on.

The requirement for this criterion is the “development and/or integration of technologies that serve multiple applications and can be embraced in multiple environments.”

HPE’s NFVI is not just for 5G and not just for telco. HPE has many enterprise customers in other industries that utilize its NFVI offerings. In the telco world, HPE offers NFVI solutions that support 4G LTE networks, as well as previous generations.

In addition to hardware and NFVI, HPE supplies network function software, including network functions that are part of the 5G core and edge networks. (In this way, HPE does compete more directly with other suppliers in the report. The company provides the infrastructure behind 5G RAN, transport networks, and core (and edge) networks, but also provides network software that makes up the 5G core networks.)

### **Customer Impact: Customer Ownership Experience**

Customers that have a good ownership experience tend to remain as customers, and often buy more goods and services from a supplier they know can deliver on the promises made at the time of contract signing. This is true if one is talking of relatively inexpensive consumer products, and it is definitely true within the telecom network world where price tags often run into the millions of dollars.

To be a leader in network infrastructure, leadership is only maintained if a company keeps its existing customer base happy; continuing to spend money, year after year. The 5G era is just beginning. When a service provider chooses to invest in 5G Infrastructure solution with the company that provided their 4G LTE solutions, that tends to indicate a positive customer ownership experience. In addition, the CSP community and the analyst community are both relatively small and unhappy service providers are noted throughout the industry, sometimes for an extended time.

HPE has a long list of customers, both for 5G Infrastructure and for previous generations of infrastructure needs, as well as for industries outside of the communications industry. Frost & Sullivan's knowledge of the HPE's customer ownership experience is well founded based on several customer testimonials, continued press from the company that identifies CSPs by name, and the ongoing discussions Frost & Sullivan has had with both HPE and its competitors. Together, these facts indicate that HPE is keeping its existing customers happy as it continues to gain new ones.

### **Customer Impact: Customer Purchase Experience**

These two criteria strongly correlate with the Customer Ownership Experience criterion above. More precisely, when a supplier delivers good service to its client customers (including during the purchase process), such clients tend to continue to do business with that supplier. The purchase experience starts the ownership experience—for good or for bad—and the service experience directly colors the ownership experience, positively or negatively.

If customers are satisfied with what they have received from an existing supplier, for instance 4G LTE Infrastructure needs, they are more likely to procure new solutions like 5G NR Infrastructure solutions from the same supplier.

The ownership experience is negatively affected if the customer has a poor purchase experience or if the customer's service experience proves to be much less than expected. A company must keep its existing customer base happy in order to convince its customers to spend on new solution upgrades or service enhancements.

Satisfied customers also serve as a positive force when explaining to new prospects why they are satisfied with a particular solution suppliers' capabilities. For new customers to sign up for solution delivery, and then remain existing customers, all facets of the engagement are important—the initial purchase experience, the ongoing service and ownership experience and the positive market experience that comes when multiple customers with the same business needs and solution capabilities talk with each other.

With regard to HPE, Frost & Sullivan's knowledge of the customer ownership experience, and by correlation the customer service experience and customer purchase experience, is well founded. The company continues to report CSP clients by name in press releases, has shared with Frost & Sullivan a number of in-depth case studies that identify details about its relationships with its customers and the solutions they have deployed, and continues to actively engage with the analyst community, including Frost & Sullivan. These facts, and

others, provide a strong indication that HPE is managing its existing customer base well as it continues to show the value it can provide with new ones.

HPE also has a consulting and services organization (HPE Pointnext Services). The company shared that HPE Pointnext Services has engaged in over 11,000 projects that resulted in 99.8% “satisfied engagements;” an exceptionally high rate of success.

### *Conclusion*

Frost & Sullivan recently completed its assessment of the 5G Infrastructure market and of 10 key suppliers that control a significant portion of that market. Frost & Sullivan defines 5G NR Infrastructure to include the following: radio access networks, transport networks, and core networks, which may include one or more edge networks.

HPE’s focus is somewhat unique compared to the other suppliers profiled in the report in that the company supplies the “infrastructure for the infrastructure.” The company is essential to the success of the 5G Infrastructure market and, in fact, provides enabling technology crucial to its realization.

In recognition of HPE’s accomplishments in providing the foundations for 5G NR Infrastructure needs around the world, Frost & Sullivan awards the 2019 Global Enabling Technology Leadership Award in 5G Infrastructure to HPE.

## Significance of Enabling Technology Leadership

Ultimately, growth in any organization depends on 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. 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.



## 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**

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.

## 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 <b>Monitor, target, and screen</b>	Identify award recipient candidates from around the world	<ul style="list-style-type: none"> <li>Conduct in-depth industry research</li> <li>Identify emerging industries</li> <li>Scan multiple regions</li> </ul>	Pipeline of candidates that potentially meet all best practices criteria
2 <b>Perform 360-degree research</b>	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> <li>Interview thought leaders and industry practitioners</li> <li>Assess candidates' fit with best practices criteria</li> <li>Rank all candidates</li> </ul>	Matrix positioning of all candidates' performance relative to one another
3 <b>Invite thought leadership in best practices</b>	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> <li>Confirm best practices criteria</li> <li>Examine eligibility of all candidates</li> <li>Identify any information gaps</li> </ul>	Detailed profiles of all ranked candidates
4 <b>Initiate research director review</b>	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> <li>Brainstorm ranking options</li> <li>Invite multiple perspectives on candidates' performance</li> <li>Update candidate profiles</li> </ul>	Final prioritization of all eligible candidates and companion best practices positioning paper
5 <b>Assemble panel of industry experts</b>	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> <li>Share findings</li> <li>Strengthen cases for candidate eligibility</li> <li>Prioritize candidates</li> </ul>	Refined list of prioritized award candidates
6 <b>Conduct global industry review</b>	Build consensus on award candidates' eligibility	<ul style="list-style-type: none"> <li>Hold global team meeting to review all candidates</li> <li>Pressure-test fit with criteria</li> <li>Confirm inclusion of all eligible candidates</li> </ul>	Final list of eligible award candidates, representing success stories worldwide
7 <b>Perform quality check</b>	Develop official award consideration materials	<ul style="list-style-type: none"> <li>Perform final performance benchmarking activities</li> <li>Write nominations</li> <li>Perform quality review</li> </ul>	High-quality, accurate, and creative presentation of nominees' successes
8 <b>Reconnect with panel of industry experts</b>	Finalize the selection of the best practices award recipient	<ul style="list-style-type: none"> <li>Review analysis with panel</li> <li>Build consensus</li> <li>Select recipient</li> </ul>	Decision on which company performs best against all best practices criteria
9 <b>Communicate recognition</b>	Inform award recipient of recognition	<ul style="list-style-type: none"> <li>Present award to the CEO</li> <li>Inspire the organization for continued success</li> <li>Celebrate the recipient's performance</li> </ul>	Announcement of award and plan for how recipient can use the award to enhance the brand
10 <b>Take strategic action</b>	Upon licensing, company is able to share award news with stakeholders and customers	<ul style="list-style-type: none"> <li>Coordinate media outreach</li> <li>Design a marketing plan</li> <li>Assess award's role in strategic planning</li> </ul>	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>.