



# HfS Blueprint Report

## Aerospace Engineering Services

Excerpt for QuEST Global

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# Executive Summary

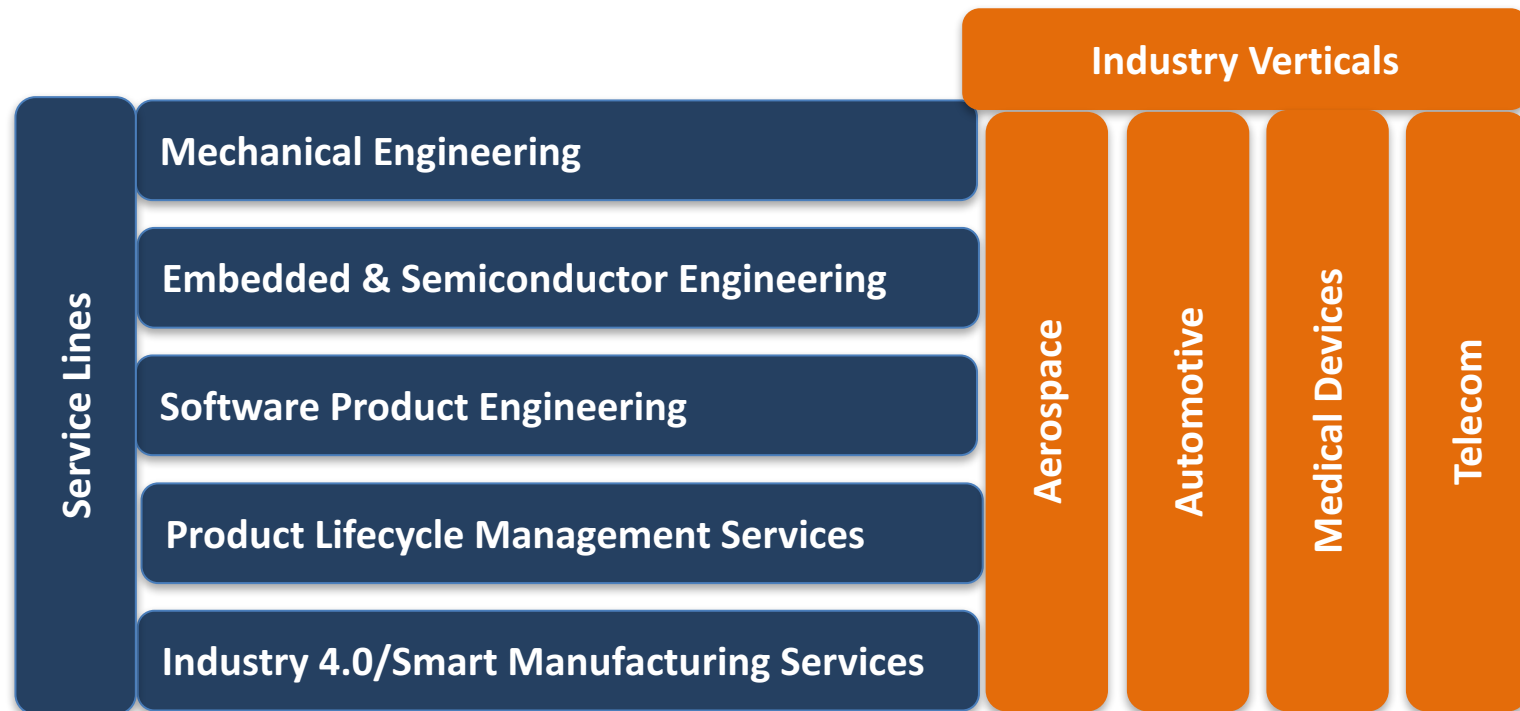


# Introduction to the HfS Blueprint Report: Aerospace Engineering Services

- The Aerospace Engineering Services HfS Blueprint Report is the first application of the HfS Blueprint methodology to the aerospace and defense engineering services marketplace.
- The Aerospace Engineering Services HfS Blueprint Report reviews the aerospace and defense engineering services market across the value chain for new product development, product sustenance, manufacturing support, testing and certifications, MRO/aftermarket services, and software implementation services.
- The HfS Aerospace Engineering Services Blueprint includes profiles and assessments of 20 service providers of aerospace engineering services.
- Unlike other quadrants and matrices, the HfS Blueprint identifies relevant differentials between service providers across a number of facets in two main categories: innovation and execution.
- For this report, HfS has increased the attention paid to innovation criteria in particular, and adopted the new 2017 Blueprint Grid layout to assess service providers. This Grid now recognizes up-and-coming service providers (High Potentials) that score higher on innovation criteria than on execution criteria as the providers build these practices. This is in addition to the existing rankings for highest overall performance (Winner's Circle) and strong combined innovation and execution performance (High Performers).

# HfS Engineering Services Coverage

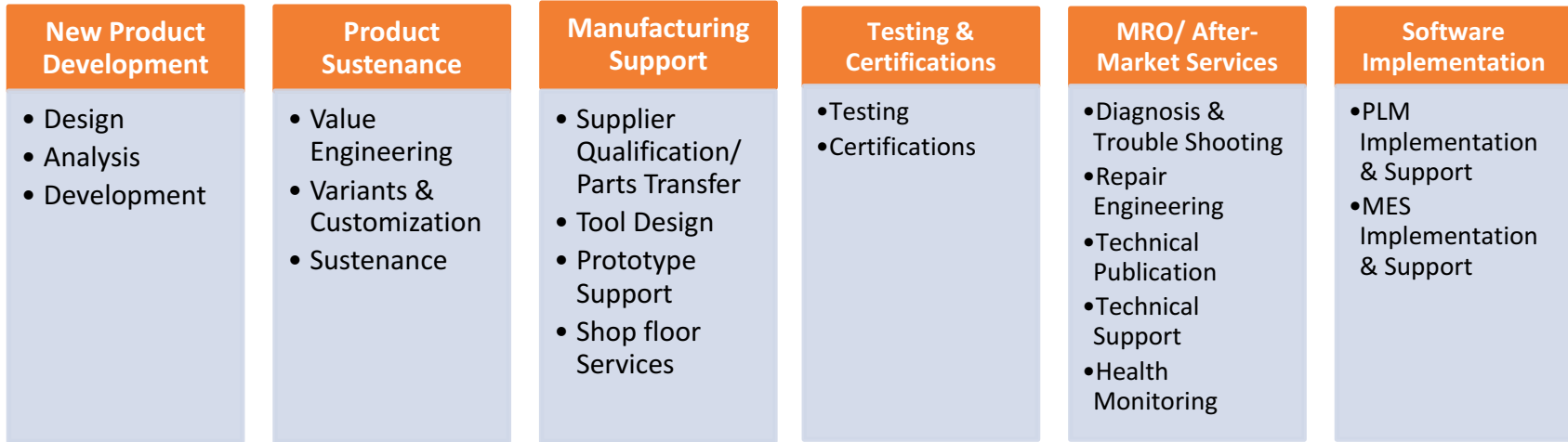
*Comprehensive and unvarnished coverage of the rapidly evolving engineering services that allows clients to take smart decisions*



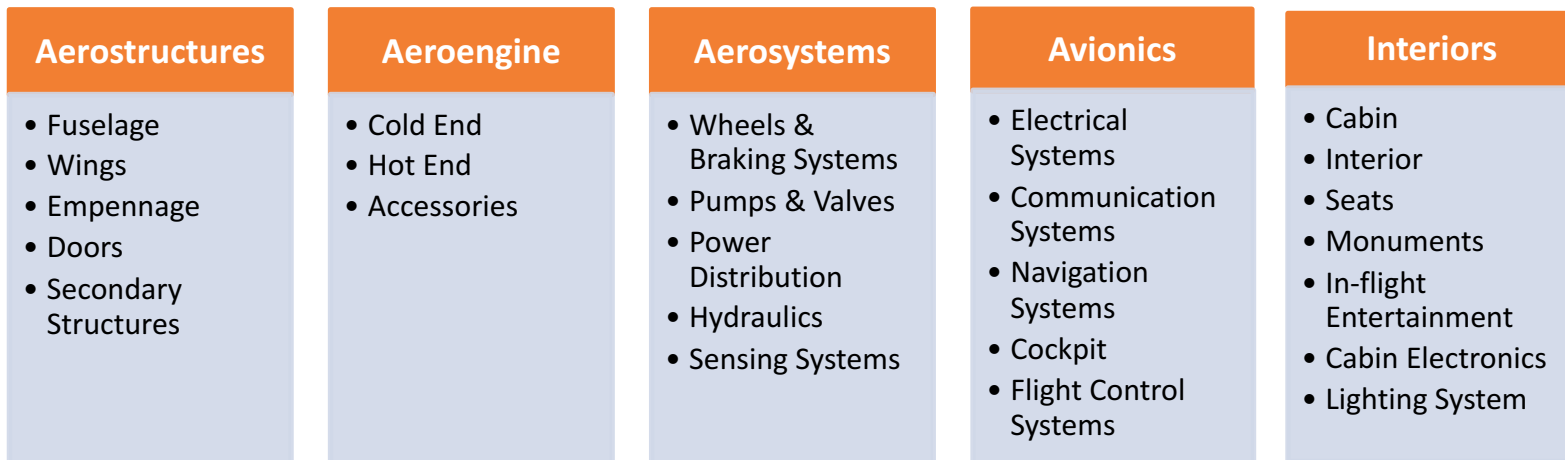
Repository of 50+ research reports including Blueprints, PoVs, and Market Analyses  
Coverage across 200+ engineering services providers  
Database of 2000+ engineering engagements and expanding  
Research methodology driven by tales from the trenches  
Experienced team of practitioner analysts

# HfS Definition: Aerospace Engineering Services Value Chain and Aero Segments

## Value Chain



## Aerospace Segments



Source: HfS Research, 2017

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# Key Highlights: State of the Aerospace Engineering Services Market

■ **Interesting time for the aerospace industry:** The major civil aircraft development programs are coming to an end and the focus is shifting on avionics, in-flight entertainment, manufacturing, and MRO segments. The defense sector is picking up fast with major demand coming from developing countries such as India, the Middle East, and so on. The 10 key trends driving the aerospace engineering services market are as follows:

1. Emerging need for end-to-end services and solutions portfolio
2. Advanced defense engineering capability
3. Focus on manufacturing engineering, value engineering
4. Capability development for digital technologies
5. Expertise in design and testing capabilities
6. Investment in emerging areas such as electric aircrafts, advanced communication systems, etc.
7. Strong partnership ecosystem
8. Defense compliance management and certifications
9. Strategic collaboration with clients
10. Growth in the APAC region

# Key Highlights: State of the Aerospace Engineering Services Market

- **Different aerospace engineering approaches by service providers:** The 20 service providers we evaluated for this Blueprint approach this market in three ways: (1) Service providers with strong defense expertise focus more on certifications, UAV, and warfare systems. (2) Service providers with strong IT offerings focus more on integrating digital offerings with aerospace engineering in the areas of IoT, AI, 3D printing, etc. (3) The pure-play engineering service providers focus on solutions across segments such as aeroengine, aerosystems, interiors, and others. (4) A few large service providers are focusing on all segments and can offer end-to-end services across value chain, including PLM and MRO.
- **Increasing digitization in aerospace engineering:** New technology areas such as AR/VR, IoT, AI, and 3D printing are influencing different areas of aerospace engineering, including avionics, aftermarket services for better monitoring, efficiency, and safety.
- **Challenges in aerospace engineering services:** Some of the challenges in aerospace engineering services are the following:
  - Vision and investment for solution and IP development
  - Specialized resource capabilities in the areas of defense, avionics
  - Onshore resource deployment for government regulations and compliances



# Research Methodology



# Blueprint Research Methodology

## Data Summary

- Data was collected in Q3 2017 and Q4 2017, covering buyers, providers, and advisors/influencers of aerospace engineering services.
- More than 800 data points were collected, covering 20 major service providers.
- Revenue distribution of industry, value chain, and solutions is estimated by HfS.

## Participating Service Providers



## This Report Is Based On:

- **Tales from the Trenches:** Interviews were conducted with buyers who have evaluated service providers and experienced the services. Some contacts were supplied by service providers, but many interviews were conducted by leveraging HfS' extensive network.
- **Sell-Side Executive Briefings:** Structured discussions with service providers to evaluate innovation, execution, market share, and deal counts.
- **Publicly Available Information:** Evaluations also include financial data, website information, and presentations given by senior executives, as well as other marketing collateral.

# HfS Aerospace Engineering Services Blueprint Scoring Percentage Breakdown

## EXECUTION

100%

Quality of Customers and Customer Relationships	20%
Solution and Delivery Capabilities	40%
Geographic Spread and Scale	15%
Applicability to Different Segments	25%

## INNOVATION

100%

Strategy, Innovation, and Investments	35%
Technology, Tools, Patents, and IP Business	30%
Pricing and Business Outcomes Measurement	20%
Emerging Areas	15%

# Execution Criteria Definitions

EXECUTION	How well does the service provider execute on its contractual agreement, and how well does the provider manage the client-provider relationship?
Quality of Customers and Customer Relationships	How engaged is the executive and management team in defining and managing the delivery of business services? What is the scale of client engagements? What is the quality of service providers' clients? How many of the top 100 aerospace and defense companies are convinced of the service providers' capabilities? How strong are customer relationships?
Solution and Delivery Capabilities	What are the clients' and the market's overall impression of the quality of service across the value chain from this service provider? How deep is the aerospace engineering domain expertise (talent and solutions) in understanding and then addressing issues? Is the delivery capability widespread across the value chain? How are delivery capabilities developed and nurtured?
Geographic Spread and Scale	How does this service provider use a global delivery footprint to meet clients' needs? Do service providers have the scale to make investments in delivery?
Applicability to Different Segments	How deep is the expertise in delivering solutions across aerospace segments, such as aerostructures, aeroengine, aerosystems, avionics, and interiors? How do their segments mix compare with that of the industry?

# Innovation Criteria Definitions

INNOVATION	How well does the service provider innovate its offering(s) in response to market demand, client requirements, and its own vision for how the aerospace engineering services market will evolve?
Strategy, Innovation, and Investments	What is the service provider’s vision for the evolution of aerospace engineering services? Is there a clear strategy for delivering aerospace engineering services, and are there identifiable investments in place to realize this strategy today? Do customers rate the services as innovative? Are there examples of innovation in engagements shared by customers and service providers? How are service providers leveraging the external ecosystem? Are service providers leveraging thought leadership to educate and influence customers and stakeholders?
Technology, Tools, Patents, and IP Business	What is the role of tools and platforms in the service provider’s offering strategy? Are the selected platforms developed in-house, or are they provided by third parties? Is there a demonstrable intent to maintain and enhance the in-house platforms? What is the role of patents and IP solutions in the service provider’s offerings?
Pricing and Business Outcomes Measurement	Does the provider have a clear understanding of what business outcomes exist for aerospace customers and how will the service provider deliver these business outcomes using collaborative engagements? How flexible and competitive is the service provider when determining the pricing of contracts? How does the service provider’s pricing mix compare with that of the industry?
Emerging Areas (AI, IoT, 3D printing, Composites, Drones, AR/VR, etc.)	How is the service provider looking at emerging areas? Does it have plans to leverage these emerging areas and integrate them into its solutions? Examples include AI, IoT, 3D printing, Composites, Drones, AR/VR.

# Key Market Dynamics



# Key Trends Driving the Aerospace Engineering Services Market (1)

- **Emerging need for end-to-end services and solutions portfolio:** Clients are increasingly looking for a single aerospace engineering service provider for an end-to-end solutions portfolio. The scope includes design, testing, manufacturing, and customer services, including industry- and local government-specific environmental, regulatory, and security challenges.
- **Advanced defense engineering capability:** The defense sector presents a lot of growth opportunities for the future. The advanced defense engineering capability in the areas of UAV, fighter aircrafts, helicopters, and missile systems acts as a differentiator in this space. European engineering services providers lead this area with some prominent engagements with Dassault, Airbus, and other government programs. They are also building a pool of certified defense engineers for more capability development.
- **Focus on manufacturing engineering, value engineering, MRO:** As the major civil aircraft programs are entering into production, the next service offerings focus is on manufacturing and value engineering in the areas of additive manufacturing, product cost optimization, sustenance engineering, etc. In the coming years, the global aircraft fleet size will be doubled.
- **Expertise in design and testing capabilities:** Aero OEMs and tier-1 enterprises are increasingly asking for end-to-end aero systems and subsystems development capabilities that include expertise in design and testing (D0178, D0160). In many cases, service providers also manufacture certain mechanical and embedded hardware components for clients.

# Key Trends Driving the Aerospace Engineering Services Market (2)

- **Capability development for digital technologies:** Increasing digitization in aerospace engineering in the areas of IoT, AI, 3D printing, and industry 4.0 is ensuring better control, efficiency, and safety. The connected aerospace systems help in real-time monitoring and predictive analytics capabilities in different aero segments including aero engines, aero structures, and so on, ensuring the overall health prediction of an aircraft.
- **Investment in emerging areas:** Service providers are increasing their R&D spend in the next trends of aerospace engineering such as electric aircrafts, advanced communication systems, fuel efficiency, and composite materials to increase safety and decrease the overall and operational costs. Aero OEMs and tier-1 enterprises are already working in this area and have started outsourcing these projects to reduce the project spend and overall risk.
- **Strong partnership ecosystem:** Aerospace engineering is now heavily influenced by digital and emerging technologies, so service providers need to leverage cross-domain knowledge and invest significantly in IP and product innovation to deliver differentiated value to customers. Due to the newness of the application of these technologies, service providers are entering into partnerships, joining industry consortia, and working with academia for different business cases.



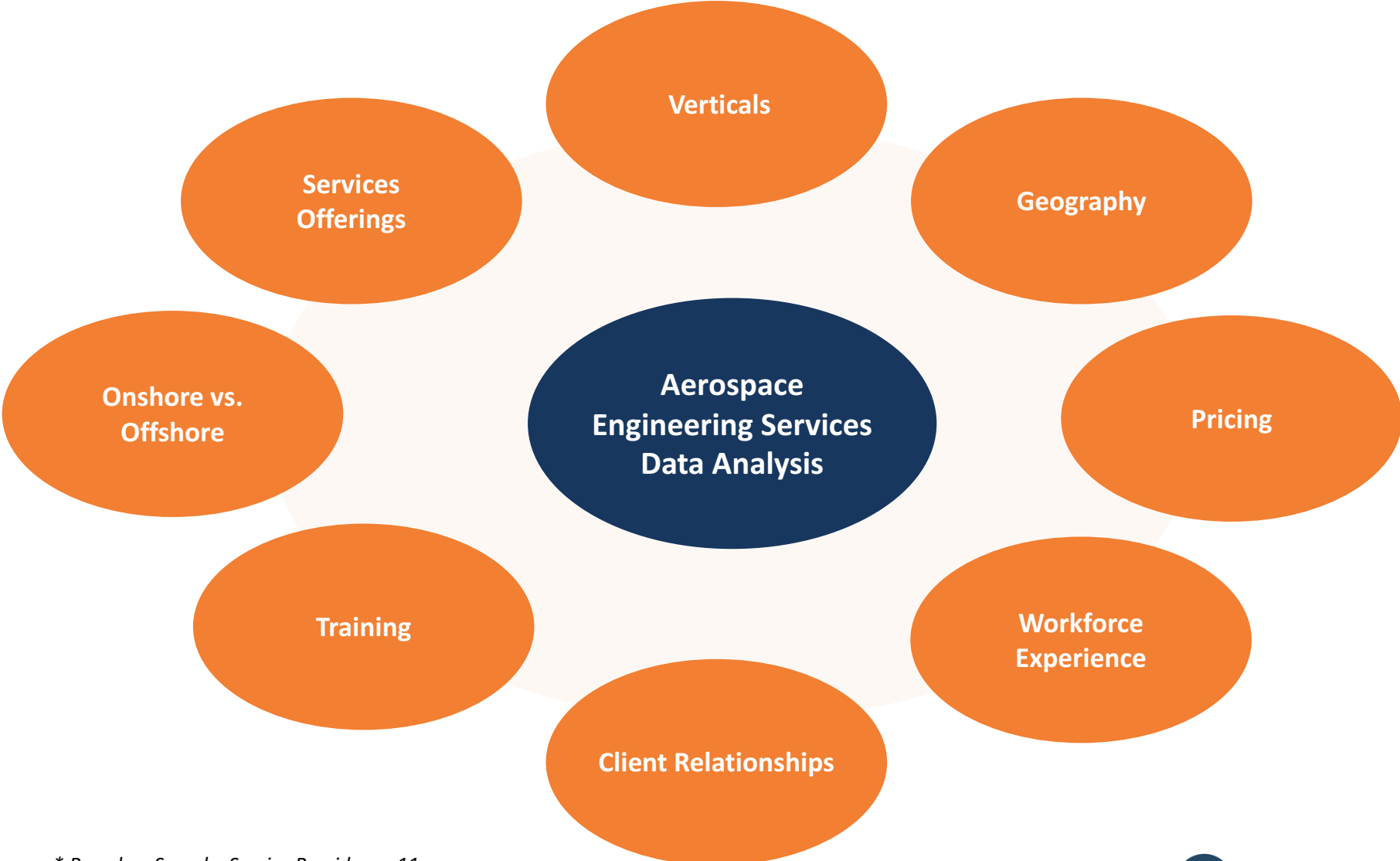
# Key Trends Driving the Aerospace Engineering Services Market (3)

- **Defense compliance management and certifications:** Defense engineering demands the fulfilment of local government regulations such as ITAR Certification for US defense requirements and CEMILAC certified for India defense requirements. So, service providers are developing an offset global strategy to meet the offset obligations in both civil and defense areas for their clients. For example, HCL has capability as per US defense requirements (ITAR Certification) through its Butler acquisition.
- **Strategic collaboration with clients:** Service providers are building strategic partnerships with aerospace OEMs and tier-1 enterprises by co-investing in next-generation technologies, new products, and services. This has paved the way for more “risk sharing models” with focus on outcome-based pricing models.
- **Growth in the APAC region:** The demand for aerospace engineering services is increasing outside North America and Europe, notably in the Asia-Pacific region due to increased application of aftermarket and MRO services. As China and India are future aerospace growth markets, some service providers have already started to prioritize an APAC strategy, and others have indicated a strategy to target the Asia-Pacific region in particular in the coming years.

# Market Data Analysis



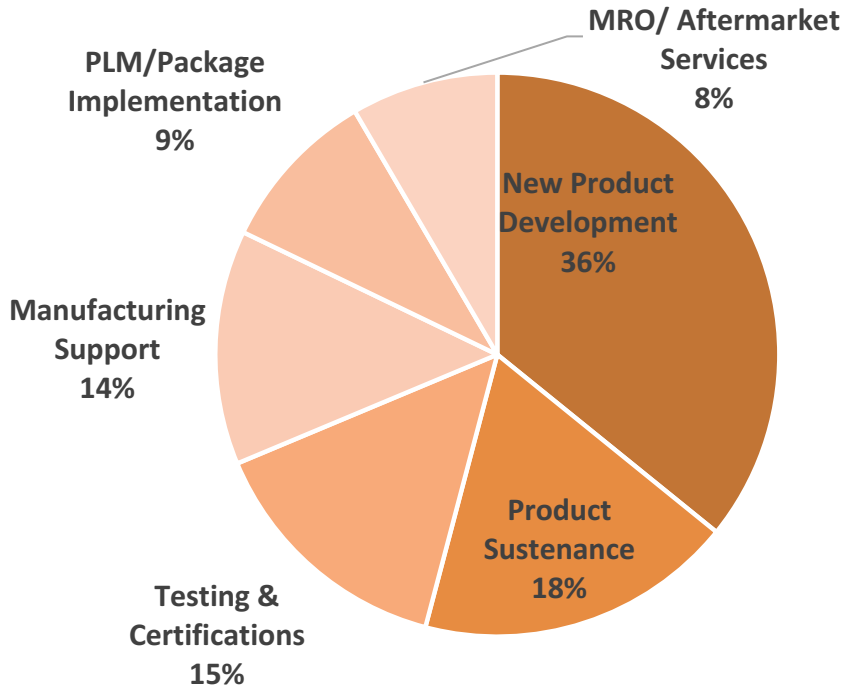
# Market Data Analysis\* of Aerospace Engineering Services Across Eight Dimensions



\* Based on Sample: Service Providers = 11

# Current Services Revenue Spread in Aerospace Engineering Services Across Value Chain

## AEROSPACE ENGINEERING SERVICES REVENUE BY TYPE OF SERVICE ACROSS VALUE CHAIN



- New Product Development
- Product Sustenance
- Testing & Certifications
- Manufacturing Support
- PLM/Package Implementation
- MRO/ Aftermarket Services

### AEROSPACE ENGINEERING SERVICES SEGMENTATION

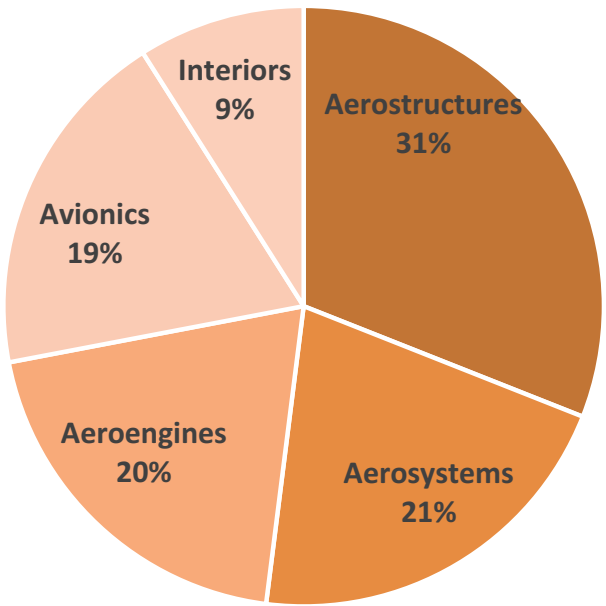
New product development and product sustenance services are the leading service, accounting for more than 50% of revenue, followed by testing and certifications services.

According to service providers, the share of the MRO/aftermarket services, manufacturing support, and testing is increasing in the aerospace engineering service mix.

Source: HfS Research, 2017; Sample: Service Providers = 11

# Current Services Revenue Spread in Aerospace Engineering Services Across Aero Segments

## AEROSPACE ENGINEERING SERVICES REVENUE BY TYPE OF SERVICE ACROSS AERO SEGMENTS



### AEROSPACE ENGINEERING SERVICES SEGMENTATION

Aerostructures and aerosystems are the leading aero segments for more than 50% of revenue, followed by aero engines.

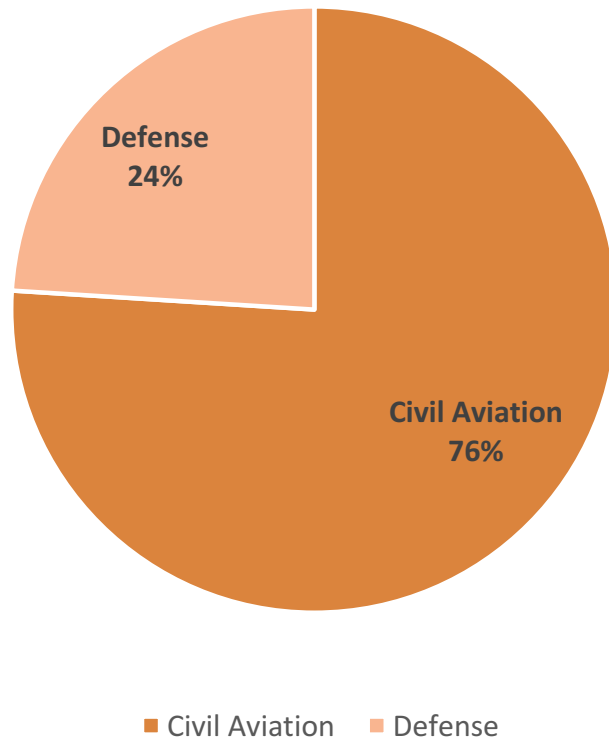
According to service providers, the share of avionics, interiors, and aero-engines is increasing in the aerospace engineering service mix.

- Aerostructures
- Aerosystems
- Aeroengines
- Avionics
- Interiors

Source: HfS Research, 2017; Sample: Service Providers = 11

# Current Vertical Segmentation in Aerospace Engineering Services

## AEROSPACE ENGINEERING SERVICES REVENUE BREAKDOWN BY VERTICAL



Source: HfS Research, 2017; Sample: Service Providers = 11

### AEROSPACE ENGINEERING SERVICES VERTICAL SEGMENTATION

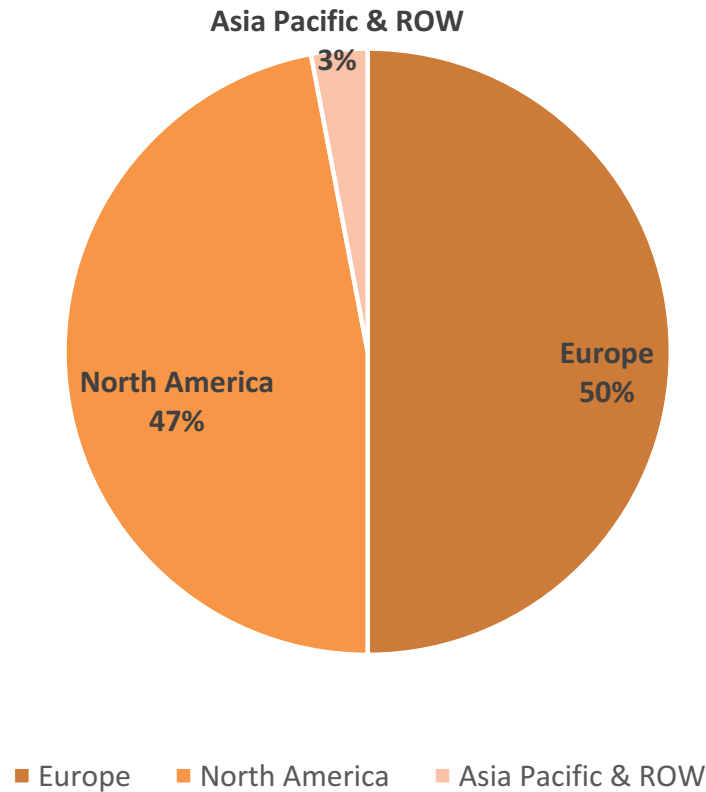
Aerospace engineering services are segmented into the following:

- Civil Aviation
- Defense

Most of the aerospace engineering services revenue comes from civil aviation. The defense market is dominated by large aerospace OEMs and the service providers are associated with some of the defense projects outsourced by these OEMs and government projects.

# Current Geographic Spread in Aerospace Engineering Services

## AEROSPACE ENGINEERING SERVICES REVENUE BREAKDOWN BY GEOGRAPHY



### AEROSPACE ENGINEERING SERVICES GEOGRAPHIC SEGMENTATION

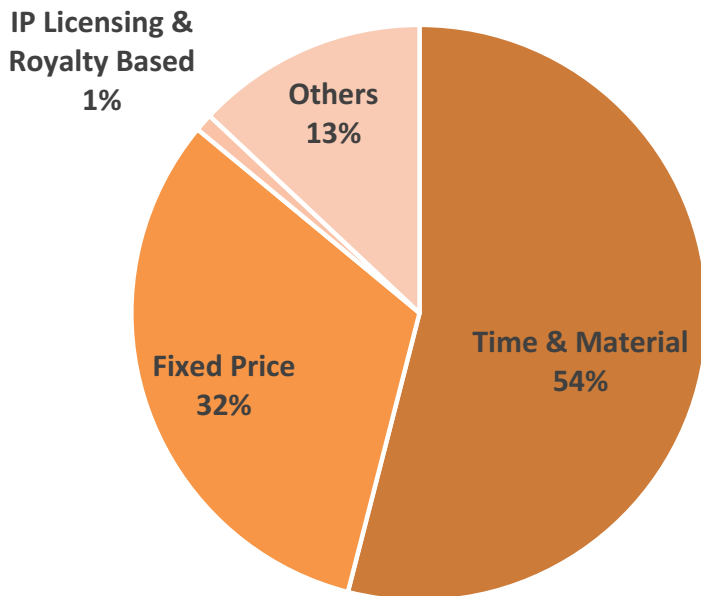
Europe is the largest market for aerospace engineering services, followed by North America.

According to service providers, Asia-Pacific has more growth potential now because of the MRO services, aircraft manufacturing by China (COMAC), and increase defense spending, among other reasons.

Source: HfS Research, 2017; Sample: Service Providers = 11

# Current Pricing Models Deployed in Aerospace Engineering Services

## AEROSPACE ENGINEERING SERVICES REVENUE BREAKDOWN BY PRICING MODELS



■ Time & Material ■ Fixed Price ■ IP Licensing & Royalty Based ■ Others

### PRICING FOR AEROSPACE ENGINEERING SERVICES

The pricing in aerospace engineering services is predominantly time and material (T&M) and fixed price.

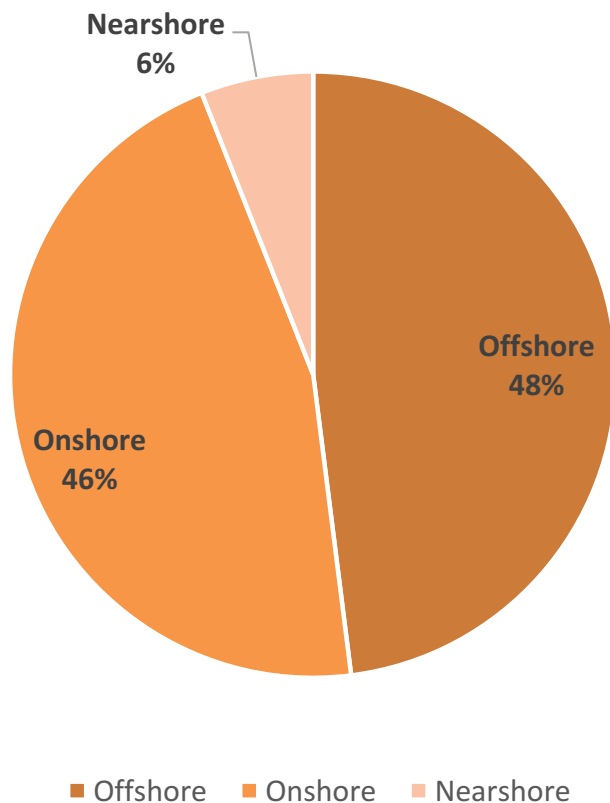
HfS' discussions with buyers and service providers indicated a growing demand for more risk share-based pricing models.

Source: HfS Research, 2017; Sample: Service Providers = 11



# Current Onshore/Nearshore/Offshore Split in Aerospace Engineering Services

## AEROSPACE ENGINEERING SERVICES PRICING BREAKDOWN BY DELIVERY LOCATION



### GEOGRAPHIC SPLIT IN AEROSPACE ENGINEERING SERVICES

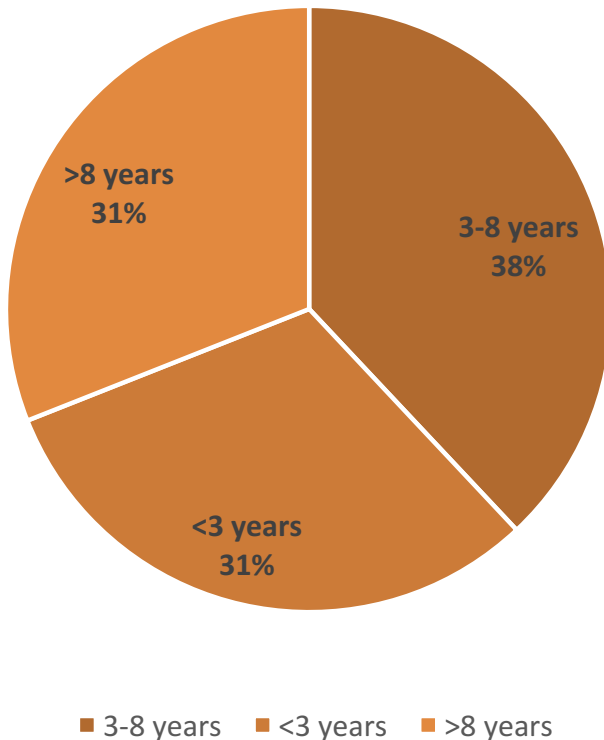
About 94% of the aerospace engineering services headcount is either offshore or onshore.

According to service providers, the onshore and nearshore headcounts are growing faster. Besides developed countries across the globe, India, China, and Eastern European countries are hot destinations for aerospace engineering services.

Source: HfS Research, 2017; Sample: Service Providers = 11

# Current Workforce Experience Split in Aerospace Engineering Services

## AEROSPACE ENGINEERING SERVICES WORKFORCE EXPERIENCE BREAKDOWN



### WORKFORCE EXPERIENCE SPLIT IN AEROSPACE ENGINEERING SERVICES

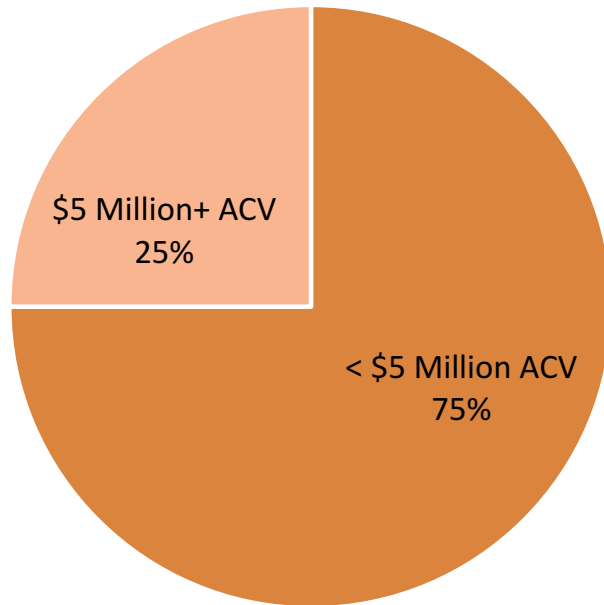
The workforce mix is balanced across different experienced professionals. Overall, high experienced professionals dominate the aerospace engineering services space.

As aerospace engineering services demand high-end design, development, testing, and domain knowledge, the workforce mix of professionals with 3-8 years and more than 8 years of experience will increase in the future.

Source: HfS Research, 2017; Sample: Service Providers = 11

# Client Relationships: Percentage of Clients with \$5M+ ACV

## AEROSPACE ENGINEERING SERVICES CLIENTS BREAKDOWN BY ACV



■ < \$5 Million ACV   ■ \$5 Million+ ACV

### CLIENTS WITH \$5 MILLION + ACV

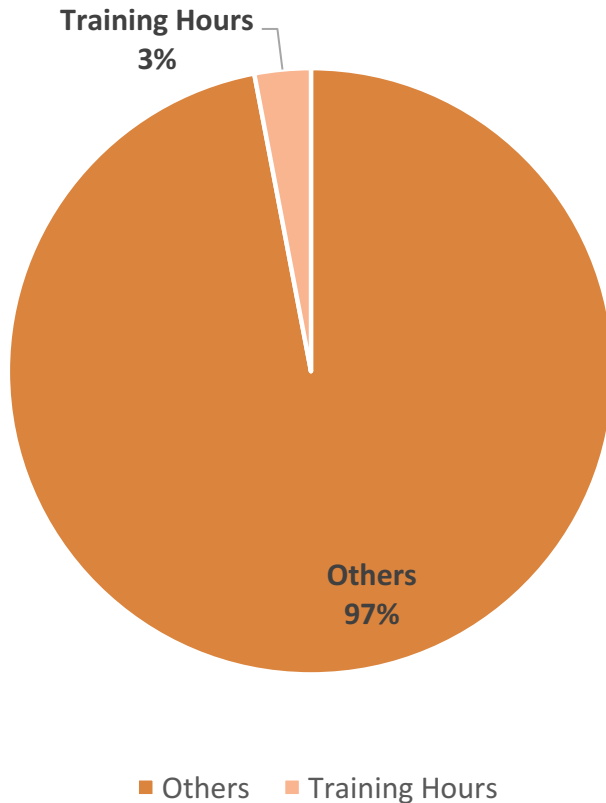
On an average, 25% of aerospace engineering service provider client accounts have more than \$5 million in ACV.

There is a large variation among service providers in their percentage of clients with \$5 million+ ACV. It varies between 0% and 80%.

Source: HfS Research, 2017; Sample: Service Providers = 11

# Investment in Training Hours/FTE

## WORKING HOURS/FTE BREAKDOWN



### TRAINING HOURS/FTE

Aerospace engineering service providers spend about 60 hours/FTE/year on aerospace engineering related training, on an average. Assuming an average of 2000 hours/year, this will be about 3% of work hours.

Source: HfS Research, 2017; Sample: Service Providers = 11

# Service Provider Grid

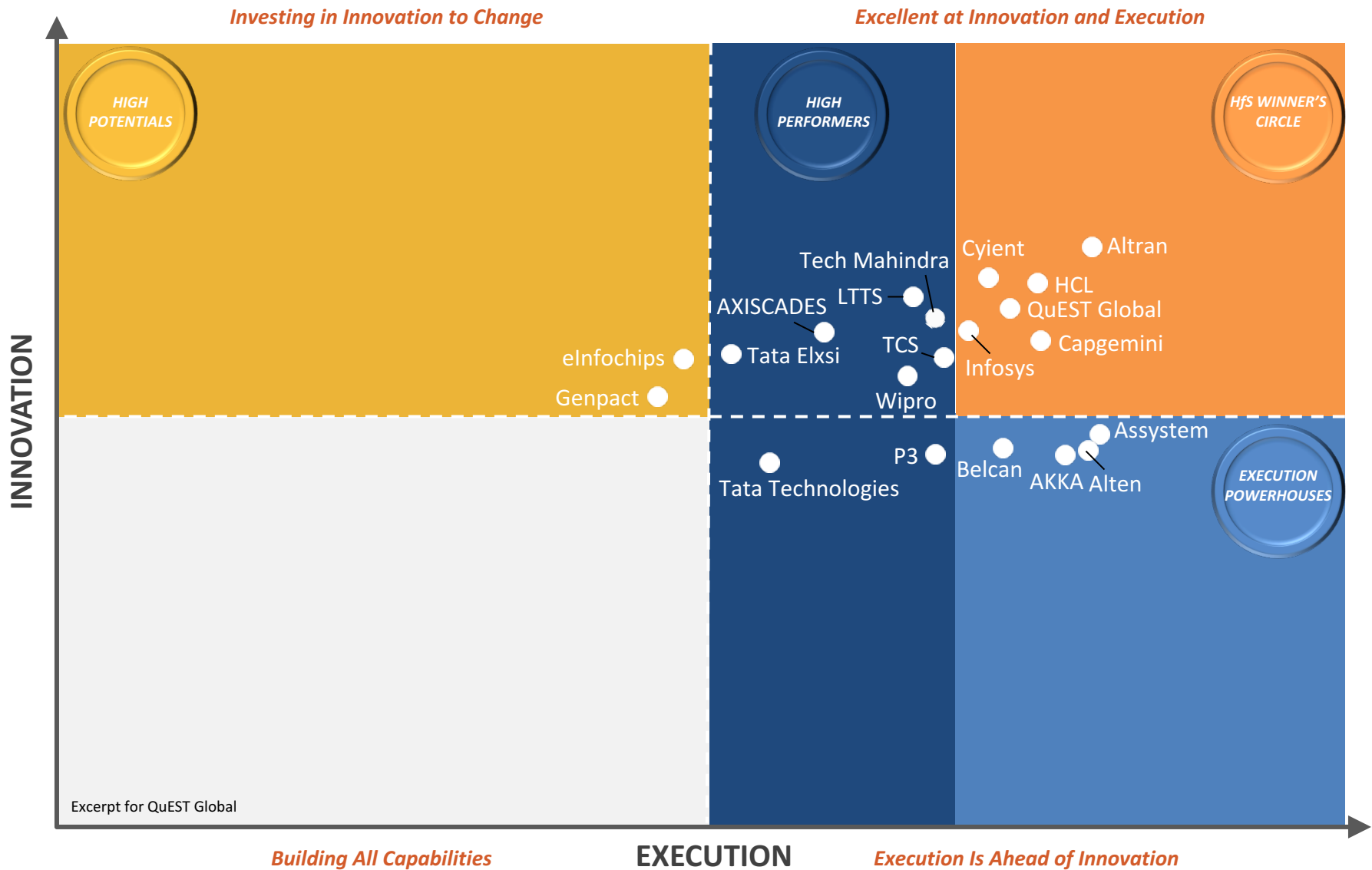


# Guide to the Blueprint Grid

To distinguish service providers that show competitive differentiation across innovation and execution, HfS awards these providers the “HfS Winner’s Circle” designation.

	EXECUTION	INNOVATION
<ul style="list-style-type: none"><li>● <b>HfS Winner’s Circle</b> show excellence recognized by clients in the 8 Ideals in execution and innovation</li></ul>	Collaborative relationships with clients, services executed with a combination of talent and technology as appropriate, and flexible arrangements.	Articulate vision and a “new way of thinking,” have recognizable investments in future capabilities and strong client feedback, and are driving new insights and models.
<ul style="list-style-type: none"><li>● <b>High Performers</b> demonstrate strong capabilities but lack an innovative vision or momentum in executing the vision</li></ul>	Execute some of the following areas with excellence: worthwhile relationships with clients, services executed with “green lights,” and flexibility when meeting clients’ needs.	Typically, describe a vision and plans to invest in future capabilities and partnerships for As-a-Service, and illustrate an ability to leverage digital technologies and/or develop new insights with clients.
<ul style="list-style-type: none"><li>● <b>High Potentials</b> demonstrate vision and strategy but have yet to gain momentum in executing them</li></ul>	Early results and proof points from examples in new service areas or innovative service models but lack scale, broad impact, and momentum in the capability under review.	Well-plotted strategy and thought leadership, showcased use of newer technologies and/or roadmap and talent development plans.
<ul style="list-style-type: none"><li>● <b>Execution Powerhouses</b> demonstrate solid, reliable execution but have yet to show significant innovation or vision</li></ul>	Evidence of operational excellence; however, still more of a directive engagement between a service provider and its clients.	Less evident vision and investment in future-oriented capability, such as skills development, “intelligent operations,” or digital technologies.

# HfS Blueprint Grid: Aerospace Engineering Services 2017



# Major Service Provider Dynamics: Highlights

## EXECUTION

- **Capgemini Has Strong Specific Capabilities and Expertise Across Value Chain and Segments:** Capgemini has a balanced solutions mix with good capabilities across all aero segments and the value chain.
- **Infosys Has a Highly Educated Workforce:** Infosys has one of the highest percentages of 8+ years experience in its workforce among the service providers evaluated for this Blueprint.
- **Wipro Has a Strong India Offset Strategy:** Wipro leverages its manufacturing entity, Wipro Infrastructure Engineering (part of Wipro Enterprises), to meet Indian defense offset guidelines.
- **Alten Leverages Its Airbus Relationship:** Alten is a major digital transformation partner of Airbus and involved in a number of engagements in the areas of virtual reality platform and 3D printing.
- **AKKA Thrives on Defense Expertise:** AKKA has strong expertise in defense engineering and has been involved in a number of fighter aircrafts, helicopters, and missile systems engagements.
- **TCS Invests in Developing Workforce Capability:** TCS has one of the highest rates of training hours per FTE among the service providers evaluated for this Blueprint.
- **Assystem Has a High Onshore Presence:** Assystem has a high onshore presence in both North America and Europe.



## INNOVATION

- **Cyient Leads in Patents and Innovation Credentials:** Cyient has strong innovation credentials in the aerospace engineering space. It has one of the highest number of patents among the service providers evaluated for this Blueprint.
- **Altran Leverages Acquisitions and Partnerships:** Altran has acquired ten companies in the past six years, and these acquisitions augment Altran's capabilities across the value chain, segments, and geographies. Altran also has partnerships with 30+ entities which have created a robust ecosystem.
- **HCL Offers Nonlinear Pricing Models:** HCL uses risk sharing to jump start clients' development activity on a long-term basis, building a perpetual business model.
- **QuEST has Strong Expertise in Aero Engine Segment:** QuEST has strong expertise in both aero engine products as well as services. It is working very closely with the top four aero engine manufacturers for a long period.
- **Tech Mahindra Leverages Digital Expertise:** Tech Mahindra is investing heavily in next-generation digital technologies, including factory of future lab, analytics, health monitoring, mobility, and automation.
- **LTTS Offers Lab-As-A-Service:** LTTS has a strong expertise in designing aerospace automatic test equipment (ATE) and testing certification capabilities. It offers "Lab-As-A-Service" for aerospace testing and certification activities.



# Service Provider Profile



	<b>Strong Capabilities/Mature Offering—Presence of Offerings in the Majority of Subcategories, &gt; \$ 25 Million Revenue</b>
	<b>Developing Capabilities, \$5–25 Million Revenue</b>
	<b>Yet to Develop or Minimal &lt; \$5 Million Revenue</b>

# QuEST Global

An aerospace engineering service provider in a high-growth trajectory with aeroengine and aerostructures capability, strong defense sector presence, and India offset strategy



## HfS Winner's Circle

Blueprint Leading Highlights
<ul style="list-style-type: none"> <li>Expertise in Aeroengine and Aerostructures</li> <li>Capability in Defense Sector</li> <li>Presence in India</li> <li>Account Management</li> <li>Delivery–High Onshore Presence</li> </ul>

Strengths
<ul style="list-style-type: none"> <li><b>Expertise in Aeroengine and Aerostructures Segments:</b> QuEST has strong expertise in different components of aeroengine including compressor, external and control, combustor, and turbine. It is working very closely with the top four aeroengine companies for a long period of time. In aerostructures, it has capability in nacelles, pylons, and wings among others.</li> <li><b>Strong Presence in Defense Sector:</b> QuEST has a high percentage of revenue mix from the defense sector. It works with the top five defense OEMs across different segments, including aeroengine and avionics.</li> <li><b>India Offset Strategy:</b> QuEST has established QuEST Global Defence, a subsidiary of QuEST Global, to address the need of major OEMs to have a key strategic partner based in India for major defense programs. It expects more than 80% of QuEST Global Defence Engineering Services business to come from offsets.</li> <li><b>Account Management:</b> QuEST has strong account management capabilities in this market. Its average FTE/client ratio is on the higher side relative to its competitors, which reflects positively on the depth and breadth of its engagements.</li> <li><b>Geographic Delivery Mix:</b> QuEST has a strong geographic spread with 20+ aerospace engineering delivery centers covering all major regions, including North America, Europe, and Asia-Pacific. In addition, it has one of the highest percentages of resources in onshore and nearshore locations.</li> <li><b>Fast Growth:</b> QuEST has achieved one of the fastest growth rates in the last few years on the revenue front among the service providers included in this Blueprint. This growth can be attributed to its acquisition of GKN AES.</li> </ul>

Challenges
<ul style="list-style-type: none"> <li><b>Increasing Share of PLM Segment:</b> QuEST's services revenue is dominated by mechanical engineering with little presence in PLM and MES implementation. It needs to focus on this segment as the significance of PLM is increasing due to connected systems.</li> <li><b>Digital:</b> QuEST is developing capabilities in digital technology areas such as IoT, AI, 3D printing, and composites in aerospace engineering. It has the opportunity to scale up faster in this space.</li> <li><b>Finding New Clients:</b> QuEST's revenue mix is North America- and Europe-centric, which it has the opportunity to diversify. QuEST needs to look into opportunities in other APAC countries and regions outside India. Also, its customer portfolio is tilted towards large clients (greater than \$10B revenue), so it can also target aerospace and defense tier-1 or tier-2 players that have yearly revenue below \$10B.</li> <li><b>Patents:</b> QuEST has filed very few patents (less than 10) which is much lower than the industry average. In discussions with QuEST, we realized that it is now focusing on developing IPs in the aerospace engineering space.</li> </ul>

### Industry

Aerospace
Defense

### Value Chain

NPD
Sustenance
Manufacturing Support
Testing & Certification
AMS/MRO
PLM/Package Implementation

### Solutions

Aerostructures
Aeroengine
Aerosystems
Avionics
Interiors

Relevant Acquisitions/Partnerships	Key Clients	Global Operations Centers	Proprietary Technologies/Platforms
<p><b>Acquisitions:</b></p> <ul style="list-style-type: none"> <li>GKN AES (2012)</li> </ul> <p><b>Partnerships:</b></p> <ul style="list-style-type: none"> <li>Siemens, GE, aPriori</li> </ul>	<p><b>Top 100 Aerospace &amp; Defense Companies as Clients:</b> 12</p> <p><b>Clients:</b> 10+ clients including:</p> <ul style="list-style-type: none"> <li>Airbus</li> <li>Honeywell</li> <li>Pratt &amp; Whitney</li> <li>Rolls-Royce</li> <li>UTC Aerospace</li> </ul>	<p><b>Aerospace engineering services Headcount (In-Scope):</b> 3,000 – 4,000 estimated by HfS</p> <p><b>Locations:</b> 20+ major aerospace engineering services delivery center locations including:</p> <ul style="list-style-type: none"> <li>North America: US</li> <li>Europe: Germany, Spain, UK</li> <li>APAC: India, Singapore</li> </ul>	<p><b>Total Patents (Filed + Granted):</b> &lt; 10</p> <p><b>Key IP Solution</b></p> <ul style="list-style-type: none"> <li><b>Eagle Platform:</b> Condition-based monitoring and visualization</li> <li><b>Embedded Software Product for Accelerated Testing:</b> Software tool to monitor and control system status</li> <li><b>CIVIM:</b> Framework for continuous integration, virtualization, and test automation</li> </ul>

# Market Wrap-Up and Recommendations

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# Service Provider Selection

**Why this service provider?** The top 10 reasons clients we spoke to selected their service provider are:

1. Broad portfolio of aerospace engineering service offerings across the value chain and segments
2. Depth of skills and experience, including aerospace engineering, process, and certification expertise
3. Client management and delivery capability
4. Historical relationship
5. Investment for in-house lab and infrastructure
6. Recommendation from references and similar experience in the industry
7. Pricing flexibility and competitiveness
8. In-house tools, templates, and accelerators
9. Solution approach demonstrated during RFP process
10. Geographical reach

# What Is Next in Aerospace Engineering (1)

We see the following as the major trends that will foster the future evolution of aerospace engineering over the next two to three years:

- **The engineering mix will change:** All the major civil aerospace programs are coming to end in FY17, so the next phase of aerospace engineering will cater to aeroengines (more fuel efficient, clean fuel), avionics, interiors (in-flight entertainment), manufacturing, and MRO segments among others. This is a shift from mechanical engineering to more software engineering, safety, and passenger experience areas. The big aerospace players have already started to embrace this digital disruption in their manufacturing landscape, extended supply chain, and other stakeholders.
- **Increasing digitization in aerospace engineering:** Digital technologies are going beyond the traditional aerospace engineering to manufacturing, maintenance, customer experience, and other areas due to influence of a number of digital tools such as AR/VR, analytics, AI, IoT, 3D printing, and industry 4.0 among others. The digitization is enabling better supply chain management, interactive product design and training, and improved maintenance for aviation players.
- **The geographic mix will change:** At present, the aerospace engineering services outsourcing client mix is dominated by the US and Europe. We believe that in the next few years, Asia-Pacific will be the major growth drivers. In civil aerospace, Chinese player COMAC is a new entrant for both short-medium and long range. Defense expansion programs in India, Saudi Arabia, and other APAC countries will create volume orders for defense manufacturers. In addition, low-cost APAC countries will be a hotbed for MRO hubs for civil aerospace companies.

# What Is Next in Aerospace Engineering (2)

- **Investment in electric aircraft:** The aviation industry is observing a huge momentum towards electric aircrafts to reduce environmental pollution and bring about ease of transportation. The electrification will force a rethink of the entire design of an air vehicle. Major aircraft manufacturers have started to explore this option. For example, Airbus, Rolls-Royce, and Siemens have collaborated to develop the technology needed to create electrically-powered aircrafts. Zunum aero, a Seattle-based startup, is planning to build small hybrid-electric aircrafts by the early 2020s and has received funding from Boeing, JetBlue, and the state of Washington.
- **Increase in mergers and acquisitions, major partnerships in aviation:** Aerospace and defense M&As and partnerships will increase and be targeted to get rapid access to niche and emerging technologies, entry to a particular product category, and geographic penetration among others. In 2017, we have observed two major M&As and partnerships in the aerospace sector: UTC acquired Rockwell Collin, and Airbus and Bombardier entered into a partnership agreement for C-Series aircrafts. In the coming years, we are expecting more acquisitions in the areas of aerostructures, components, and consolidation among tier-1 aerospace players.
- **Focus on MRO services:** As most of the aircraft development programs are entering into production, the next focus will be the maintenance of the fleet. With the advent of IoT, different aircraft data is captured over flight hours and it is analyzed for predictive maintenance, enabling better maintenance and improved design over time. Boeing has established a dedicated Global Services business that will focus on MRO services.

# What Is Next in Aerospace Engineering (3)

- **Focus on UAV, urban mobility development programs:** The aviation industry is observing a lot of traction in UAV programs from both defense and commercial (construction inspection including volumetric measurement, remote oil & gas field and pipeline monitoring, agricultural focus for crop monitoring) purposes. Major aircraft manufacturers are also focusing on urban mobility programs that can be an alternate mode of transportation for future cities. For example, Boeing acquired Aurora Flight Sciences, an aviation and aeronautics research company, which has partnered with Uber to develop a network of “flying taxis.” Airbus is also investing in short-range VTOL (vertical take-off and landing) urban air mobility demonstrator projects like Vahana and CityAirbus.
- **Pilotless Future:** Big aviation players are exploring to combine sensor, AI, and other technologies to develop autonomous flight technology. Boeing has invested in autonomous flights and Airbus is also looking to build autonomous technology that will allow a single pilot to operate commercial jetliners.
- **Global Offset Strategy:** Defense suppliers are rethinking their global offset strategy to fulfill local government regulations and compliances. They are increasingly entering into partnerships with local certified players for contribution in non-core areas. For example, Tata Advanced Systems and Lockheed Martin have signed an agreement to manufacture F-16 fighter jets in India. Saab has entered into a partnership with the Adani Group to grab a pie of India’s search for single-engine fighter jets.

# Recommendations: Enterprise Buyers (1)

- **Select service providers based on the skills you need:** Participants for this Blueprint were selected because they are the leading or emerging service providers in their field of expertise. Every aerospace engineering service provider covered is capable of meeting buyers' broad needs, although capabilities differ significantly across the value chain and different aero segments. Therefore, buyers are advised to match carefully the service providers' skills with their need and take analysis to an appropriate level before shortlisting a service provider for an RFP.
- **Leverage pricing models and contracts:** Many service providers prefer to opt for a work package pricing model assuming end-to-end delivery capability. With the advent of digital technologies, buyers are more interested in nonlinear pricing models, such as transaction-based or risk reward pricing, like some of their peers to get the maximum out of service providers. Fixed price and time and material (T&M) are already the most popular, and outcome-based models have started showing up more frequently in the service providers' pricing mix as well. We recommend buyers engage with service providers for outcome-based pricing models for both cost reduction and risk sharing perspectives. In this way, buyers can get the best out of their service providers.
- **Trust service providers with more strategic work:** Buyers need to think about long-term strategic engagements beyond cost and efficiency to engage with service providers. After discussions with buyers, we also confirmed that they are interested to outsource strategic, higher-value services, including design and testing projects. This is often easily expressed but not as easily adopted by various stakeholders within client organizations. More trust and close working relationships are needed to convert traditional relationships to strategic partnerships.



## Recommendations: Enterprise Buyers (2)

- **Prepare for radical change:** Aerospace engineering is going through a massive transformation with more development programs in niche and emerging areas. The focus is on flying urban transportation and electric aircrafts. These programs demand a new set of capabilities and we are observing a number of small companies coming up in this space. Choose service providers that can support you to understand and embrace these radical changes besides co-working with internal R&D teams, finding a new balance, and interplaying between internal and external capabilities.
- **Check the service provider's ability to support required locations:** Most service providers claim to have the ability to support clients across the globe. However, very few service providers have the true capability to have a balanced presence in North America, Europe, and the APAC regions. As local government regulations and compliances are big challenges for aerospace engineering, access to local resources is of paramount importance. Also, in many cases, some of the outsourcing engineering works demand close proximity to the client location for close collaboration.
- **Push the digital envelope:** Digital transformation is an important aspect to improve quality and efficiency in many existing standardized processes. The adoption of digital technologies is unevenly distributed in the industry, and most players have started to experiment. Make digital transformation a central anchor in aerospace engineering operations. Select service providers that can be long-term partners in this digital transformation journey to achieve overall business objectives in terms of cost savings, quality, and accuracy among others.

# Recommendations: Service Providers (1)

- **Long-term vision for aerospace engineering services:** Aerospace engineering services need a long-term strategy and planning for capability development. Some aerospace projects are stretched due to stringent regulations, development guidelines, and testing procedures. Service providers need long-term planning commitment followed by delivery alignment, research labs, investment funds, and other entities. As Digital and IoT are becoming mainstream, service providers need to leverage all their digital learnings in aerospace engineering.
- **Continue to invest in talent management and retention:** Access to good skills and retention remain big challenges for aerospace engineering services. Service providers need to focus on hiring and retaining talent. There is also less scope for formal education in niche areas of advanced aerospace engineering, so service providers need to address this challenge by investing more in internal training. Currently, they are establishing partnerships with leading aerospace educational institutions for talent recruitment and training.
- **Expanding presence in the APAC market:** Service providers need to focus on the APAC market for aerospace engineering services growth. At present, most aerospace businesses come from North America and Europe, but in the future, APAC will be a hub for aerospace engineering, particularly MRO services. Service providers have already started to improve their geographical mix.
- **Enhance partnership approach to address aerospace engineering white space:** Service providers have partnerships with diverse technology companies for different aero segments offerings. As digital technologies are becoming prominent in the aerospace industry, service providers need to leverage their partnerships to work more closely to develop joint industry solutions, collaborative pricing models, and PoCs specific to client needs.

## Recommendations: Service Providers (2)

- **Drive more collaborative engagements:** In our research, buyers described collaborative engagements as one of the most important selection criteria for service providers that work on outcome-based pricing model. To buyers, collaborative engagement means the service providers are willing to take risks and invest in the client's success. Service providers need to address new pricing models to clients, even if this deteriorates their revenue security in the short term. These new commercial models also promote service providers' flexibility and agility. In addition, we observed initiatives for joint IP developments in some areas of aerospace engineering.
- **Build scale and look at acquisitions:** Scale is becoming a very crucial differentiator in the aerospace engineering services business as it can enable service providers to make the required investments in new technologies, design, domain, and local certification across a broader base. Our recommendation for service providers is to build scale fast, inorganically, or risk falling behind competitors who also see the strategic opportunity in this market. Niche aerospace engineering service providers in each geography could be good acquisition targets to get market and client access.
- **Investment in industry knowledge:** Aerospace engineering services projects demand industry-specific business process knowledge and regulatory compliances awareness. Buyers expect threshold industry knowledge from service providers. Service providers need to increase their domain knowledge to improve their customer experience. A few service providers we spoke to are making investments in this area at this time by developing internal training modules on specific topics such as in-flight entertainment and UAVs.

# About the Authors



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## Overview

- More than 15 years' business experience in buy side, sourcing advisory, service delivery, and industry research in the global outsourcing industry across the US, Europe, and Asia
- Coverage areas in HfS are engineering services and Industry 4.0
- Engineering services coverage is across four horizontals (mechanical, embedded, software product, and PLM) and four verticals (automotive, aerospace, telecom and medical devices)
- Quoted in leading publications such as Harvard Business Review (HBR), Times of India, Economic Times, Business Standard, NDTV, Hindu
- Won 2016 analyst report of the year for HfS Engineering Services Top 20 research (world's first global ranking of engineering service providers)

## Previous Experience

- Business Planning Manager (Asia Pacific), Emerson Electric, Malaysia
- Manager, Outsourcing Advisory, Neo Group, India
- Software Engineer, Geometric PLM (Acquired by HCL), India
- Author of the book Who Is That Lady?

## Education

- MBA, Indian Institute Of Management (IIM), Bangalore, India
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## Overview

- 6 years of experience in research, advisory, and delivery in the global IT Services industry across the US, Europe, and Asia-Pacific.
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# Engineering Services Research Agenda 2018

Timeline	Horizon 1: Act now	Horizon 2: Watch out	Horizon 3: Investigate
Q1 2018	<ul style="list-style-type: none"> <li>Automotive Engineering (Blueprint)</li> <li>Q4 Quarterly engineering services trends (PoV)</li> <li>Buyer Voice on supplier innovation and execution capabilities in automotive (POV)</li> </ul>	<ul style="list-style-type: none"> <li>Accessibility Engineering (PoV)</li> <li>Aerospace Engineering Revenue Benchmarking (PoV)</li> <li>Aerospace Strategy &amp; Differentiators (PoV)</li> </ul>	<ul style="list-style-type: none"> <li>Autonomous Driving Engineering Problems (PoV)</li> <li>Digital Thread and PLM (PoV)</li> <li>Software 4.0 and Digital One Office (PoV)</li> <li>Accelerating Industry 4.0 (PoV)</li> </ul>
Q2 2018	<ul style="list-style-type: none"> <li>Q1 Quarterly engineering services trends (PoV)</li> <li>Software Product Engineering (Blueprint)</li> <li>Buyer Voice on supplier innovation and execution capabilities in software product engineering (POV)</li> <li>Engineering Services Market Size (PoV)</li> </ul>	<ul style="list-style-type: none"> <li>Automotive Engineering Revenue Benchmarking (PoV)</li> <li>Automotive Engineering Strategy &amp; Differentiators (PoV)</li> <li>HfS Engineering Services Top 20 (PoV)</li> <li>Engineering Captive Investments (PoV)</li> </ul>	<ul style="list-style-type: none"> <li>Autonomous Driving Solution Case Studies (PoV)</li> <li>Emerging Technology Trends in Aerospace (PoV)</li> <li>R&amp;D Patent Licensing Partnership (PoV)</li> </ul>
Q3 2018	<ul style="list-style-type: none"> <li>Q2 Quarterly engineering services trends (PoV)</li> <li>Telecom Engineering (Blueprint)</li> <li>Buyer Voice on supplier innovation and execution capabilities in telecom (POV)</li> </ul>	<ul style="list-style-type: none"> <li>Software Product Engineering Revenue Benchmarking (PoV)</li> <li>Software Product Engineering Strategy &amp; Differentiators (PoV)</li> <li>Engineering Services M&amp;A Investments</li> <li>Software Engineering IP Partnerships</li> </ul>	<ul style="list-style-type: none"> <li>Autonomous Driving Startup Landscape (PoV)</li> <li>EV Cars (PoV)</li> <li>Connected Cars (PoV)</li> <li>Collaborative Robots (Cobots) Trends (PoV)</li> </ul>
Q4 2018	<ul style="list-style-type: none"> <li>Medical Devices Engineering (Blueprint)</li> <li>Q3 Quarterly engineering services trends (PoV)</li> <li>Buyer Voice on supplier innovation and execution capabilities in medical devices (POV)</li> </ul>	<ul style="list-style-type: none"> <li>Telecom Engineering Revenue Benchmarking (PoV)</li> <li>Telecom Engineering Strategy &amp; Differentiators (PoV)</li> <li>OEE to Cognitive Plant Management (PoV)</li> </ul>	<ul style="list-style-type: none"> <li>Emerging Technology Trends in Telecom (PoV)</li> <li>10 Ideals of Managing R&amp;D Organization</li> <li>Connected Industrial Workers (PoV)</li> </ul>

# The HfS Mission: Revolutionizing the Industry

HfS' mission is to provide visionary insight into the major innovations impacting business operations: automation, artificial intelligence, blockchain, digital business models, and smart analytics. We focus on the future of operations across key industries. We influence the strategies of enterprise customers to develop operational backbones to stay competitive and partner with capable services providers, technology suppliers, and third-party advisors.

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- ThinkTank model to collaborate with enterprise customers and other industry stakeholders
- 3000 enterprise customer interviews annually across the Global 2000
- A highly experienced analyst team
- Unrivaled industry summits
- Comprehensive data products on the future of operations and IT services across industries
- A growing readership of more than one million annually.

The [As-a-Service Economy](#) and [OneOffice™](#) are revolutionizing the industry.