

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

FROST & SULLIVAN BEST PRACTICES AWARD

MICROBIOME DIAGNOSTIC - INDIA

Technology Innovation 2019



FROST & SULLIVAN

2019

BEST
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Background and Company Performance

Industry Challenges

Rapid research and technological advances across genomic, transcriptomic, proteomic, metabolomic and computational studies have helped demystify the links between host microbial interactions and their implications in human health and wellness.¹ Microbial dysbiosis has been frequently associated with gastrointestinal diseases such as inflammatory bowel disease (IBD), along with other metabolic and inflammatory diseases such as obesity, cardiovascular disorders and rheumatoid arthritis². While most microbiome research has been skewed toward understanding the role of commensal bacteria in human wellness, there is a lack of research with regards to exploring the role of other host microorganisms such as archaea, fungi, virus and nematodes in relation to health and disease. Therefore, there is a growing need to develop holistic technology platforms that can provide a link between different types of human microbiota and disease pathogenesis.

Furthermore, there is a dearth of platforms that can provide personalized dietary and nutritional recommendations using gut microbial data, especially across South Asian regions. Microbiome-based healthcare recommendations can enable a paradigm transition from sick care to healthcare practices through early identification of disease risks and customized dietary action plans. Although next generations sequencing (NGS) platforms have been available for a long time, there is a huge unmet need for leveraging these microbiome-based sequencing technologies and products for human health and wellness applications.

Technology Attributes and Future Business Value

Enabling Industry Transition from Sick Care to Healthcare

Leucine Rich Bio Pvt. Ltd (Leucine Rich Bio) is the first South Asian company to offer a comprehensive microbiome testing platform, BugSpeaks, to study the diversity of human gut microbiota. BugSpeaks provides a direct-to-consumer testing platform that can study the composition of bacteria, archaea, fungi, eukaryota and virus within the host gut environment. This data can be subsequently linked to human health and disease risks to help provide bespoke dietary recommendations, which includes determining the optimal intake of probiotics and prebiotics. The platform uses a stool sample to conduct microbial sequencing analysis. The company currently uses state-of the-art short read sequencing technology from Illumina and long read sequencing from Nanopore, which is reflective of the company's emphasis on generating high quality data. Furthermore, Leucine Rich Bio utilizes an advanced interpretation engine comprising a proprietary algorithm and

¹ Gilbert, J. A. et al. Microbiome-wide association studies link dynamic microbial consortia to disease. *Nature* 535, 94–103 (2016).

² Kumar, Manish, et al. Modelling approaches for studying the microbiome. *Nature Microbiology*, 4(8), 1253-1267 (2019).

innovative scoring matrix to provide customized probiotic, prebiotic and other nutritional recommendations. Remarkably, Leucine Rich Bio is the only South Asian company to provide direct to consumer microbial testing services that are combined with personalized dietary suggestions.

Frost & Sullivan believes that the platform has the potential to enable a groundbreaking industry transformation toward pro-active and preventive healthcare practices, instead of the traditional sick care methods. BugSpeaks' technology and service offerings can drive the focus toward maintenance of human health, while delivering actionable insights that can mitigate disease risks.

Visionary Innovation Enabling Unprecedented Application Diversity

BugSpeaks is available in two distinct product formats, one of which is the comprehensive BugSpeaks platform that is capable of analyzing all microorganisms within a span of 4 weeks for INR 14,000 (USD 197.36). The company also offers the 'BugSpeaks Lite' version that is capable of analyzing the gut bacteria at approximately half the price (7,000 INR or 98.68 USD) within the same turnaround time. These technology platforms can evaluate the extent of gut dysbiosis and can also examine susceptibility to 15 diseases, including atherosclerosis, chronic kidney diseases, clostridium difficile infection, colorectal neoplasms, diabetes, obesity, depression, constipation, Crohn's disease, bowel disorders, hypertension, rheumatoid arthritis and several others. Most importantly, this direct to consumer testing platform is capable of providing customized dietary recommendations and actionable insights across drug metabolism, nutrient intake, mood, weight management and other factors that enhance health, wellness and well-being.

BugSpeaks has been developed by the convergent efforts of leading medicinal, computational biology, life sciences, and nutritional experts to derive actionable and meaningful health insights using the vast sea of gut microbiome sequencing data. Important components of this groundbreaking invention include, a sampling kit for collecting the stool sample, MetaRich: a computational analysis suite; MicroByte: a meticulously hand-crafted database of gut microbiome disorders; a proprietary disease risk scoring method; NutriBite: a manually developed database that establishes the links between gut microbiota and nutrition; and lastly, the nutritional recommendations derived from evidence based analysis of the host microbiome. Remarkably, all the recommendations are completely backed by evidence-based analysis.

This comprehensive research platform can also be adapted for research and clinical evaluations for a wide range of diseases. Furthermore, it can be studied to assess the role of probiotic, prebiotic and other dietary supplements on disease and gut health.

Frost & Sullivan believes that this visionary innovation can empower individuals to take holistic control of diet and lifestyle habits for improved health and decrease susceptibility to several disorders.

Leveraging Microbial Insights for Human Health & Wellness

Leucine Rich Bio has the analytical infrastructure for analyzing 1000 gut microbiome samples every day. Scalability is not a setback for the company as the labs are being prepared to handle any amount of sample influx for analysis. Despite the Indian microbiome sequencing based direct-to-consumer market being very new, Leucine Rich Bio has already tapped in to approx. 5-10% of the total addressable market. While the key focus area for BugSpeaks continues to be gut microbiome, the company is also looking toward expanding into oral and skin microbiome application segments.

From a technological standpoint, the company also intends to transition completely toward the use of long read sequencing methods from Nanopore, which highlights the company's deep commitment to garnering comprehensive microbial insights. Although Leucine Rich Bio is primarily focused toward prognostic applications for enabling personal wellness, the company is also accelerating R&D for disease diagnostic products in the long term. The company is looking to develop diagnostics in house. However, Leucine Rich Bio will also collaborate with partner labs for two disease segments. The company is also expecting a patent grant for its unique direct-to-consumer microbiome based sequencing platform in the next 8 months.

For the next three years, Leucine Rich Bio expects a month-on-month growth of 20%, post which the growth is expected to double every month. From a wellness standpoint, Leucine Rich Bio expects approx. \$10-15 M in annual revenue coverage. Considering that BugSpeaks has already been deployed to complete approx. 1000 genomic projects, Frost & Sullivan believes that the company revenues are suitably positioned to increase in the future.

Frost & Sullivan commends Leucine Rich Bio for developing a visionary microbiome sequencing platform for the South Asian segment that has the potential to transform current human health and wellness landscape through personalized dietary recommendations and potential groundbreaking diagnostic applications.

Conclusion

Leucine Rich Bio's unique BugSpeaks platform has been able to analyze gut microbial sequencing data from bacteria, archaea, fungi, eukaryota and virus to provide actionable and personalized nutritional and dietary recommendations that have the potential to transform human health, wellness and well-being. Not only does BugSpeaks address the key industry gaps related to holistic microbiome analysis that go beyond gut bacteria studies, but also has the potential to be expanded across several disease diagnostic applications. As South Asia's first gut microbiome test that provides actionable and evidence-based microbiome insights, BugSpeaks is suitably poised to enable a paradigm shift from sick care to healthcare practices across the industry.

With its strong overall performance, Leucine Rich Bio has earned Frost & Sullivan's 2019 Technology Innovation Award.

Significance of Technology Innovation

Ultimately, growth in any organization depends on finding new ways to excite the market and maintaining a long-term commitment to innovation. At its core, technology innovation, or any other type of innovation, can only be sustained with leadership in 3 key areas: understanding demand, nurturing the brand, and differentiating from the competition.



Understanding Technology Innovation

Technology innovation begins with a spark of creativity that is systematically pursued, developed, and commercialized. That spark can result from a successful partnership, a productive in-house innovation group, or a bright-minded individual. Regardless of the source, the success of any new technology is ultimately determined by its innovativeness and its impact on the business as a whole.

Key Benchmarking Criteria

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

Technology Attributes

- Criterion 1: Industry Impact
- Criterion 2: Product Impact
- Criterion 3: Scalability
- Criterion 4: Visionary Innovation
- Criterion 5: Application Diversity

Future Business Value

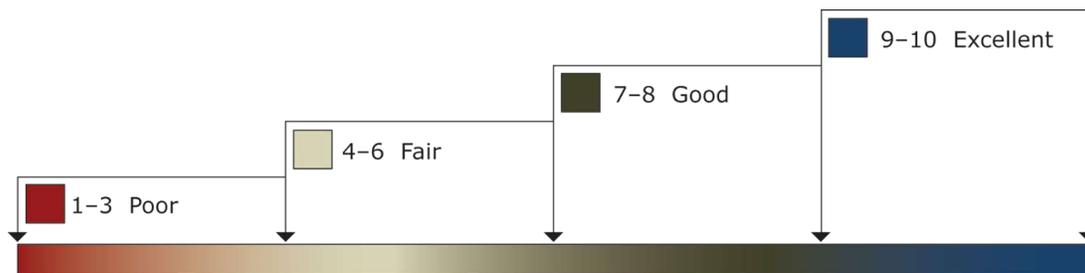
- Criterion 1: Financial Performance
- Criterion 2: Customer Acquisition
- Criterion 3: Technology Licensing
- Criterion 4: Brand Loyalty
- Criterion 5: Human Capital

Best Practices Award Analysis for Leucine Rich Bio

Decision Support Scorecard

To support its evaluation of best practices across multiple business performance categories, Frost & Sullivan employs a customized Decision Support Scorecard. This tool allows research and consulting teams to objectively analyze performance according to the key benchmarking criteria listed in the previous section, and to assign ratings on that basis. The tool follows a 10-point scale that allows for nuances in performance evaluation. Ratings guidelines are illustrated below.

RATINGS GUIDELINES



The Decision Support Scorecard considers Technology Attributes and Future Business Value (i.e., the overarching categories for all 10 benchmarking criteria; the definitions for each criterion are provided beneath the scorecard). The research team confirms the veracity of this weighted scorecard through sensitivity analysis, which confirms that small changes to the ratings for a specific criterion do not lead to a significant change in the overall relative rankings of the companies.

The results of this analysis are shown below. To remain unbiased and to protect the interests of all organizations reviewed, Frost & Sullivan has chosen to refer to the other key participants as Competitor 1 and Competitor 2.

<i>Measurement of 1-10 (1 = poor; 10 = excellent)</i>			
Technology Innovation	Technology Attributes	Future Business Value	Average Rating
Leucine Rich Bio	9	9	9

Technology Attributes

Criterion 1: Industry Impact

Requirement: Technology enables the pursuit of groundbreaking ideas, contributing to the betterment of the entire industry.

Criterion 2: Product Impact

Requirement: Specific technology helps enhance features and functionalities of the entire product line for the company.

Criterion 3: Scalability

Requirement: Technology is scalable, enabling new generations of products over time, with increasing levels of quality and functionality.

Criterion 4: Visionary Innovation

Requirement: Specific new technology represents true innovation based on a deep understanding of future needs and applications.

Criterion 5: Application Diversity

Requirement: New technology serves multiple products, multiple applications, and multiple user environments.

Future Business Value

Criterion 1: Financial Performance

Requirement: Potential is high for strong financial performance in terms of revenue, operating margins, and other relevant financial metrics.

Criterion 2: Customer Acquisition

Requirement: Specific technology enables acquisition of new customers, even as it enhances value to current customers.

Criterion 3: Technology Licensing

Requirement: New technology displays great potential to be licensed across many verticals and applications, thereby driving incremental revenue streams.

Criterion 4: Brand Loyalty

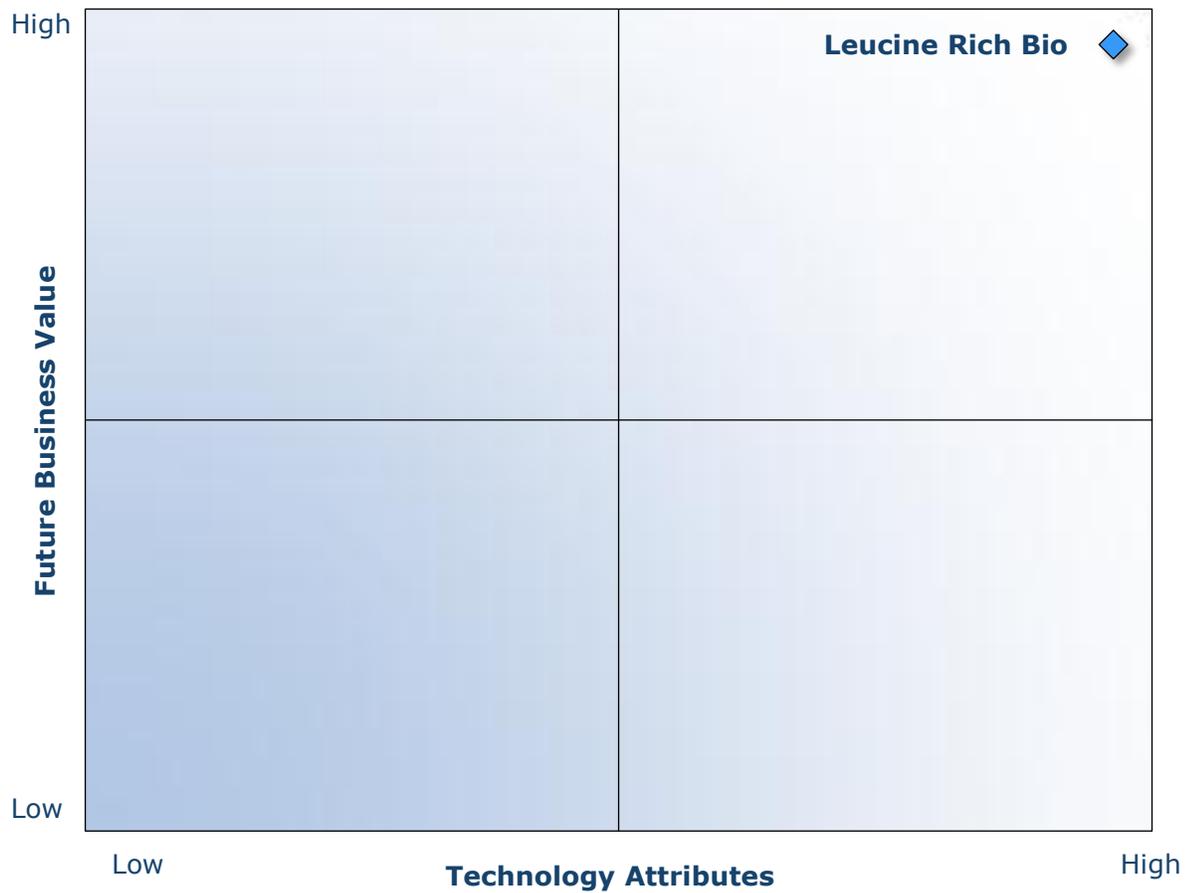
Requirement: New technology enhances the company’s brand, creating and/or nurturing brand loyalty.

Criterion 5: Human Capital

Requirement: Customer impact is enhanced through the leverage of specific technology, translating into positive impact on employee morale and retention.

Decision Support Matrix

Once all companies have been evaluated according to the Decision Support Scorecard, analysts then position the candidates on the matrix shown below, enabling them to visualize which companies are truly breakthrough and which ones are not yet operating at best-in-class levels.



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

Frost & Sullivan analysts follow a 10-step process to evaluate award candidates and assess their fit with select best practices criteria. The reputation and integrity of the awards are based on close adherence to this process.

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

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of the research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, resulting in errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry 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>.