FROST & SULLIVAN

# BEST PRACTICES AWARDS


GENOMENON®

## 2020 GLOBAL CLINICAL GENOMICS INTERPRETATION COMPANY OF THE YEAR AWARD

# Contents

# Background and Company Performance

## *Industry Challenges*

The one-size-fits-all approach to treatment is often ineffective, resulting in substantial healthcare-related expenditures with no associated improvements in health. With a rapidly aging population and rising chronic disease prevalence, the healthcare industry needs to tackle the massive global health crisis.

Personalized medicine strives to save billions of dollars through a more cost-efficient use of healthcare. This approach applies personal genetic and phenotypic variability, lifestyle, and environmental information to derive meaningful insights into disease etiology and deliver high-value care at reduced overall healthcare costs.

Next-generation sequencing (NGS) plays a prominent role in personalized medicine's evolutionary journey. Continuous innovations in high-throughput technologies over the past decade led to affordable and more accurate NGS platforms. As a result, the 3Vs of big data analytics—volume, velocity, and variety—in pharma and life sciences produce extensive genomic information daily, and the published information from genomics, drug discovery and development, and precision-based medicines yields both structured and unstructured data exponentially.

NGS informatics bridges the gap between data and clinical utility—the missing link amidst Big Data and actionable knowledge. Surging demand from customers in molecular diagnostics, biopharma, and academic institutions drive double-digit growth. The sheer amount of sequencing data generated through NGS technologies remains a significant roadblock to cost-effective clinical interpretation—i.e., disease-causing variant identification and annotation, data aggregation and statistical analysis, biological interpretation, and outcomes reporting. Efficiently navigating, aggregating, and synthesizing the data ocean to extract meaningful insights is imperative. Personalized medicine provides an unprecedented opportunity for vendors with robust, useful, and objective genomics tools and technologies advancing genomics research, evidence-based diagnostics, and targeted therapeutics.

As competition emerges and intensifies, strategic differentiation is critical going forward. NGS informatics tools providers must focus on cost-effective, solution-oriented approaches improving genomics data interpretation and reporting. Vendors offering clinically relevant, easy-to-use, customized tertiary analysis-based solutions will capture substantial share in this nascent, fast-growing, dynamic market.

## *Visionary Innovation & Performance and Customer Impact*

Founded in 2014 and based in Ann Arbor, Michigan, Genomenon is a global life science informatics company. It offers products and services to pharmaceutical companies and clinical diagnostic labs to streamline clinical genomics interpretation and connect scientific evidence to patient's genomic data for improved outcomes.

The company's flagship product Mastermind automatically simplifies variant interpretation for faster, more accurate diagnosis and clinical decision-making. With three platform

choices—Basic, for genomics research; Professional, suited best for clinical decision support; and Enterprise, tailored to advanced implementations—users can select an offering that best fits their current needs, application, sample volume, and price range. In just over two years, Genomenon has amassed over 5,000 users of Mastermind in 1,700 clinical laboratories across 101 countries.

**Genomenon's Mastermind: Pioneering Leadership**

Most translational researchers and clinical laboratories use publicly available literature, databases, and in-house expertise to identify and classify the genetic variants of interest, e.g., benign, pathogenic, or variations of unknown clinical significance. Finding the relevant disease-causing gene using a manual approach is the proverbial "needle in a haystack," requiring about 200 person-hours of interpretation for each whole-genome sequenced—a colossal effort and a daunting task.

Moreover, as most tools search titles and abstracts only, uncertainties about across-the-board process time and quality further hinder applications for evidence-based clinical practice. For instance, classification discordance and identified putative pathogenic variants often require later reassessment before taking any clinical action. A study reports reclassifying 69% of genetic variants indexed as disease-causing mutations to variants of unknown or lesser clinical significance after having spent 1 hour of curation time per genetic modification.[1]

Powered by its proprietary Genomic Language Processing™ algorithm and genomic literature database, Genomenon's flagship product Mastermind is a pioneering and leading automated disease-gene-variant association database. Unlike other commercially available tools, the first-in-class genomic database search engine enables searching full articles and supplemental datasets across the genomic literature allowing geneticists, molecular pathologists, and researchers to identify disease-causing variants from genomic-sequencing datasets quickly and accurately.

**Faster More Accurate Diagnosis**

Mastermind accelerates tertiary analysis (determining the clinical significance of biological data) by identifying every research article that includes any given variant in the context of any disease or phenotype and delivers the search results prioritized by clinical relevance. It leverages artificial intelligence (AI) and machine learning (ML) to find more than 5.7 million identified genomic variants in over 7 million full-text articles and over 600,000 supplemental data sets. The platform offers the world's most comprehensive gene and variant landscape, having indexed 100 times more content and identified 20 times more variants than HGMD, the incumbent database built by manual curation.

Mastermind cuts genetic testing turnaround time by accelerating the variant curation process three-fold, cutting the average 90-minute variant search and curation time using Google or Google Scholar to less than 30 minutes. This expedited variant search and

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4119063/

curation results in industry-leading turnaround times and superior diagnostic yields and throughput.

*"Dozens of emerging companies are building genetic reporting tools. However, clinicians still have to contend with the bottleneck of literature curation. Our unique position as the leading genomic search engine has enabled us to partner with these software reporting companies to integrate Mastermind data that links to our [Genomenon] products."*

*—Mike Klein, Chief Executive Officer, Genomenon*

Genomenon is aggressively expanding its compelling value proposition—accelerated time-to-treatment and increased diagnostic yields—to clinical labs around the world through partnerships, integrating the Mastermind search engine into existing clinical interpretation tools. In the past year, the company signed agreements with Fabric Genomics, GenomOncology, LifeMap Sciences, Diploid, Limbus, Shanghai Shanyi Biological Technology Co., and Google. It recently announced an additional two deals with SOPHiA Genetics and Congenica in October 2019. These partnerships are acting as a third revenue stream for Genomenon. As NGS labs use various companies with access to Mastermind for tertiary analysis, this channel is becoming increasingly important—building stickiness and expanding geographical footprint—and lucrative.

Genomenon uses a flexible software-as-a-service (SaaS) model, offering three plans to its expanding customer base: Mastermind Basic, Mastermind Professional, and Mastermind Enterprise. While the data content is the same, each version has unique features and capabilities specifically designed for each application. For instance**,**

*Mastermind Basic*—free service. This edition allows 50 articles and 20 searches per week, whether looking at 1, 6, or 100 variants, fulfilling most researchers' needs.

*Mastermind Professional*—licensing on a subscription basis. This edition allows unlimited searches with more specific analyses, e.g., by disease, gene, variant, and phenotype, along with ACMG and AMP guideline criteria, empowering high-volume clinical labs to do faster and more accurate diagnostics.

*Mastermind Enterprise*—enterprise licensing options. This version configures multi-parametric article prioritization and integrates application programming interfaces into customers' workflows, customizing the SaaS solution for faster and easier use.

With over 500,000 new genomic articles published each year, Genomenon keeps pace with scientific discoveries and developments by updating Mastermind on a weekly basis. Genomenon reports approximately 10% of users as paid subscribers and projects high growth rates as it continues to gain brand awareness in the marketplace, users recognize the value in additional paid Mastermind features, and NGS sample volumes increase to support a paid subscription.

Currently, Mastermind's features and capabilities center on searching genes, diseases, and variants, following the company's initial product positioning—supporting geneticists and molecular pathologists in their clinical genomic analyses for diagnostic purposes. The

company recently added phenotypic searches to its engine capability and will be adding drug and therapeutic searches in the near term, strengthening its emerging expansion into the pharmaceutical market to advance personalized medicine.

**Genome-informed Precision Medicine**

Biomarkers are emerging as dynamic discovery tools, enabling high-value drug candidate progress through the pharmaceutical development pipeline. For instance, genomic biomarkers can drive the discovery of novel drug candidates faster and support the drug-companion diagnostics (CDx) co-development for simultaneous United States Food and Drug Administration (FDA) submissions and accelerated approval.

Frost & Sullivan estimates the global CDx market to reach over $8 billion by 2023, increasing at a compound annual growth rate of 21% from 2017 to 2023.[2] Still, while the field is exploding with new biomarkers discovered daily, less than 1% of published biomarkers reach the market, often failing at the initial verification and validation stages.[3]

For genomic biomarkers, in particular, Genomenon is poised to unlock NGS' latent potential.

*"About 42% of FDA approved drugs last year were precision medicine drugs, with half of those tied to genomic biomarkers."*

*—Mike Klein*

In 2018, Genomenon partnered with a pharmaceutical company to develop a comprehensive dataset for obesity, with all the associated genes, variants, and underlying pathogenesis per the American College of Medical Genetics guidelines. The company delivered the information in less than 60 days using a data-as-a-service (DaaS) model.

Genomenon created a genomic biomarker knowledgebase of over 10,000 mutations in 120 genes related to obesity, expanding potential therapeutic targets exponentially—from 12 variants in 3 genes of focus by the pharmaceutical company's scientists. Mastermind's advanced AI and ML tools identified the set of pathogenic mutations associated with obesity with a speed and level of comprehensiveness impossible to produce with years of manual research.

Since its initial incursion into the pharmaceutical market, Genomenon continues to work with pharmaceutical, biotech, and diagnostic companies to advance their targeted therapeutics pipeline, particularly in rare and inherited disease. The company's evolving DaaS solution offers curated datasets, updated quarterly, to accelerate genomic translational medicine, drug discovery, drug development, and clinical trial target selection for drug sponsors. With 4 of the top 25 pharmaceutical companies as customers to date, Genomenon reports astounding growth on DaaS licensing over the last year, attributing 50% of its total revenues to the pharmaceutical market

Frost & Sullivan believes that Genomenon's content-rich genomic database platform and AI-driven processing can mitigate early-stage genomic translational research challenges—e.g.,

[2] *Companion Diagnostics: Biomarker Platforms Enabling Precision Medicine* (Frost & Sullivan, Nov 2018)
[3] https://www.mdpi.com/2218-1989/9/7/126/htm

biomarker utility, validation, and assay development strategies. Notably, precision oncology can propel the company's Mastermind genomics search engine front and center, as drug-biomarker co-development in oncology plays an increasingly important role in targeted therapeutics.

With rapidly increasing SaaS and DaaS product sales, Genomenon will continue to show strong growth in this high-growth market as the healthcare industry turns to personalized medicine.

## *Conclusion*

Over the last decade, precision medicine introduced a care paradigm shift from the 'one-size-fits-all' treatment approach toward personalized therapies. As next-generation sequencing (NGS) platforms generate petabytes of information levels, extracting meaningful genomic insights remains a significant roadblock for both clinical and drug discovery and development applications.

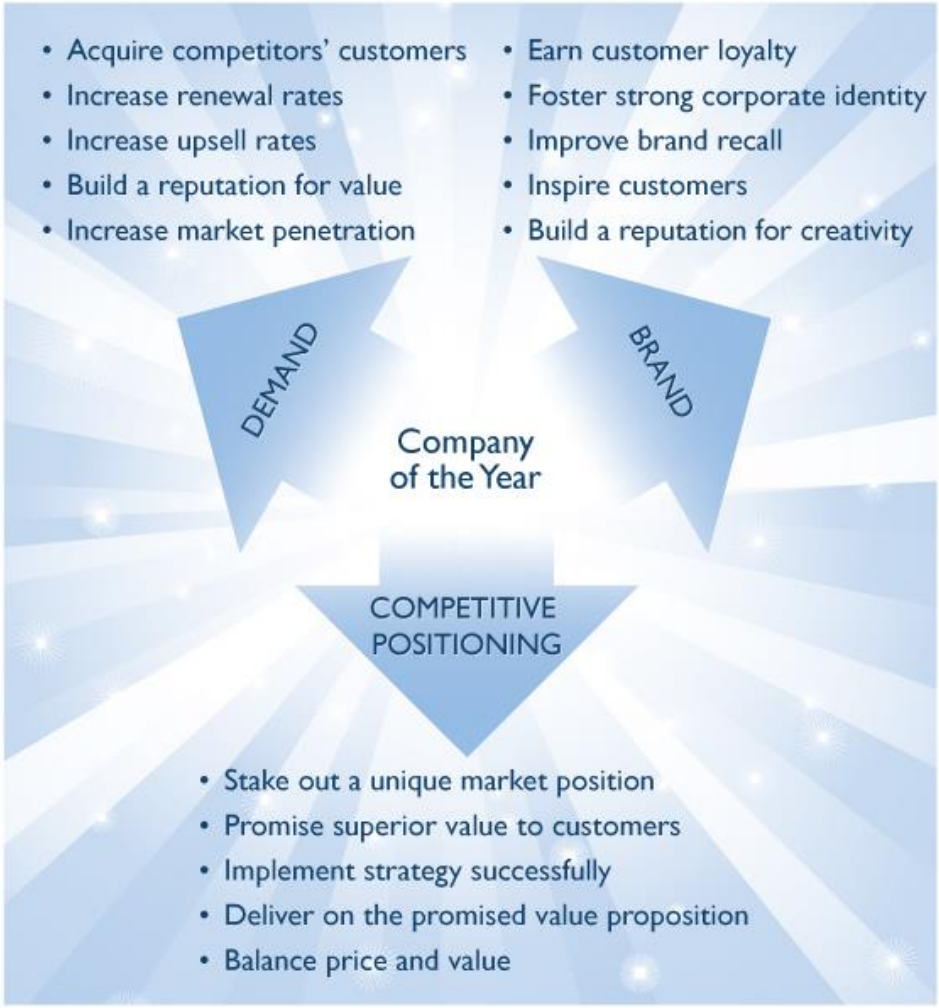
Frost & Sullivan previously recognized Genomenon for its technology foresight in improving both diagnostic accuracy and speed and now distinguishes the company's pioneering leadership and strategic role in advancing clinical genomics interpretation and personalized medicine. With the world's most comprehensive gene and variant landscape, the company's flagship product, the Mastermind genomics search engine, provides a glimpse of the road ahead.

The unique platform accelerates tertiary analysis for faster, more accurate diagnosis and clinical decision-making and genomics biomarker-driven research activities in translational medicine, drug discovery, drug development, and clinical trial target selection; thus, having an important role to play in the evolving value-based healthcare landscape.

For its commitment to transform NGS tertiary analysis through fast, efficient, and comprehensive genomics data interpretation, resulting in more accurate diagnoses and improved patient outcomes, Genomenon is recognized with Frost & Sullivan's 2020 Global Company of the Year Award in the clinical genomics interpretation market.

## Significance of Company of the Year

To receive the Company of the Year Award (i.e., to be recognized as a leader not only in your industry, but among non-industry peers) requires a company to demonstrate excellence in growth, innovation, and leadership. This excellence typically translates into superior performance in three key areas—demand generation, brand development, and competitive positioning—that serve as the foundation of a company's future success and prepare it to deliver on the 2 factors that define the Company of the Year Award: Visionary Innovation and Performance, and Customer Impact).




## Understanding Company of the Year

Driving demand, brand strength, and competitive differentiation all play critical roles in delivering unique value to customers. This three-fold focus, however, must ideally be complemented by an equally rigorous focus on Visionary Innovation and Performance to enhance Customer Impact.

## *Key Benchmarking Criteria*

For the Company of the Year Award, Frost & Sullivan analysts independently evaluated each factor according to the criteria identified below.

## *Visionary Innovation & Performance*

**Criterion 1: Addressing Unmet Needs**
Requirement: Implementing a robust process to continuously unearth customers' unmet or under-served needs, and creating the products or solutions to address them effectively

**Criterion 2: Visionary Scenarios through Mega Trends**
Requirement: Incorporating long-range, macro-level scenarios into the innovation strategy, thereby enabling "first-to-market" growth opportunity solutions

**Criterion 3: Implementation of Best Practices**
Requirement: Best-in-class strategy implementation characterized by processes, tools, or activities that generate a consistent and repeatable level of success.

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

**Criterion 5: Financial Performance**
Requirement: Strong overall business performance in terms of revenues, revenue growth, operating margin, and other key financial metrics

## *Customer Impact*

**Criterion 1: Price/Performance Value**
Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

**Criterion 2: Customer Purchase Experience**
Requirement: Customers feel they are buying the most optimal solution that addresses both their unique needs and their unique constraints.

**Criterion 3: Customer Ownership Experience**
Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

**Criterion 4: Customer Service Experience**
Requirement: Customer service is accessible, fast, stress-free, and of high quality.

**Criterion 5: Brand Equity**
Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

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

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

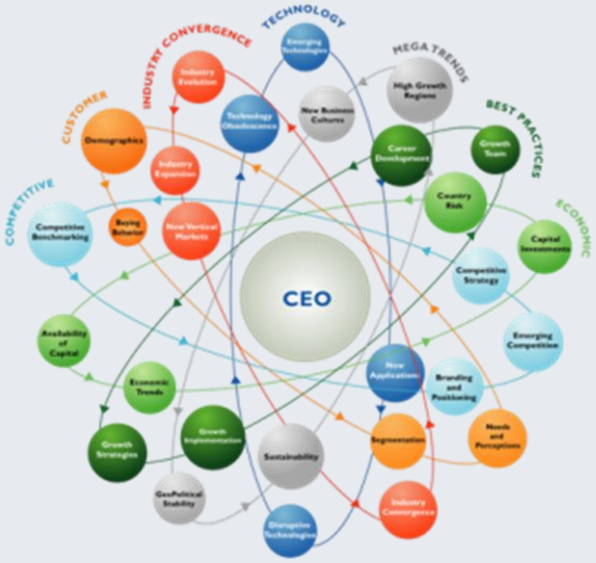
| STEP | | OBJECTIVE | KEY ACTIVITIES | OUTPUT |
|---|---|---|---|---|
| 1 | **Monitor, target, and screen** | Identify Award recipient candidates from around the globe | • Conduct in-depth industry research<br>• Identify emerging sectors<br>• Scan multiple geographies | Pipeline of candidates who potentially meet all best-practice criteria |
| 2 | **Perform 360-degree research** | Perform comprehensive, 360-degree research on all candidates in the pipeline | • Interview thought leaders and industry practitioners<br>• Assess candidates' fit with best-practice criteria<br>• 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 | • Confirm best-practice criteria<br>• Examine eligibility of all candidates<br>• Identify any information gaps | Detailed profiles of all ranked candidates |
| 4 | **Initiate research director review** | Conduct an unbiased evaluation of all candidate profiles | • Brainstorm ranking options<br>• Invite multiple perspectives on candidates' performance<br>• Update candidate profiles | Final prioritization of all eligible candidates and companion best-practice positioning paper |
| 5 | **Assemble panel of industry experts** | Present findings to an expert panel of industry thought leaders | • Share findings<br>• Strengthen cases for candidate eligibility<br>• Prioritize candidates | Refined list of prioritized Award candidates |
| 6 | **Conduct global industry review** | Build consensus on Award candidates' eligibility | • Hold global team meeting to review all candidates<br>• Pressure-test fit with criteria<br>• Confirm inclusion of all eligible candidates | Final list of eligible Award candidates, representing success stories worldwide |
| 7 | **Perform quality check** | Develop official Award consideration materials | • Perform final performance benchmarking activities<br>• Write nominations<br>• Perform quality review | High-quality, accurate, and creative presentation of nominees' successes |
| 8 | **Reconnect with panel of industry experts** | Finalize the selection of the best-practice Award recipient | • Review analysis with panel<br>• Build consensus<br>• Select winner | Decision on which company performs best against all best-practice criteria |
| 9 | **Communicate recognition** | Inform Award recipient of Award recognition | • Present Award to the CEO<br>• Inspire the organization for continued success<br>• 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 able to share Award news with stakeholders and customers | • Coordinate media outreach<br>• Design a marketing plan<br>• Assess Award's role in future strategic planning | Widespread awareness of recipient's Award status among investors, media personnel, and employees |

# The Intersection between 360-Degree Research and Best Practices Awards

## *Research Methodology*

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

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS




## About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation, and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit http://www.frost.com.