

FROST & SULLIVAN

KINTSUGI

2022
TECHNOLOGY
INNOVATION
LEADER

*NORTH AMERICAN VOCAL BIOMARKERS
FOR MENTAL HEALTH INDUSTRY*

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each Award category before determining the final Award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Kintsugi excels in many of the criteria in the vocal biomarkers for mental health space.

AWARD CRITERIA	
<i>Technology Leverage</i>	<i>Business Impact</i>
Commitment to Innovation	Financial Performance
Commitment to Creativity	Customer Acquisition
Stage Gate Efficiency	Operational Efficiency
Commercialization Success	Growth Potential
Application Diversity	Human Capital

Pioneering Voice Biomarkers for Mental Health

Founded in 2019 and headquartered in Berkeley, California, Kintsugi provides personalized mental health support and care through its application programming interface (API)-first platform. It derives actionable workflows from virtual call data. With growing funds for biomarkers for mental health, the voice technology industry sees an upsurge in start-ups.

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**- Azza Fazar,
Best Practices Research Analyst**

Voice-enabled technologies promote next-generation artificial intelligence (AI) and machine learning (ML) techniques to identify vocal biomarkers for diagnosing clinical conditions such as depression and anxiety. For example, sad people tend to have a flatter tone of voice, a universal human reaction to depression regardless of language or culture.¹

Recognizing the challenge in accessing quality mental health services through traditional healthcare providers, Kintsugi’s founders, Software Engineer Grace Chang and ML Scientist Rima Seilova-Olson, built the company alongside world-class subject-matter experts to help mental health practitioners detect depression and anxiety easily.

¹ <https://bmcp psychiatry.biomedcentral.com/articles/10.1186/s12888-019-2300-7>

Frost & Sullivan analysts believe that Kintsugi clearly stands out in the industry, as the company has built an ML model containing more samples than any clinician will see over a lifetime in practice.

Measuring Mental Health through Voice Recognition Patterns

Kintsugi developed the Kintsugi mobile application (app) and Kintsugi Voice Biomarker API, also known as KiVA™ (Kintsugi Voice), over the last three years.

The current state of mental health diagnosis includes self-reported questionnaires to screen for depression and anxiety and assess or monitor condition severity per the Diagnostic and Statistical Manual of Mental Disorders, widely known as DSM IV guidelines. Clinically validated, the Patient Health

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Questionnaire 9-item depression (PHQ-9) and 7-item Generalized Anxiety Disorder (GAD-7) scales assign scores to various questions.² The total sum indicates whether the condition is present and its severity, e.g., mild, moderate, moderately severe, and severe anxiety or depression. Based on these scores, healthcare providers can recommend further evaluation or treatment by a psychiatrist or psychologist. An unnecessarily long process, Frost & Sullivan notes that it has no place in existing clinical workflows - especially virtual care.

Kintsugi refined its holistic approach for better access to mental health diagnostic solutions, continuously building its technology to bridge existing industry gaps.

Kintsugi Mobile Application

Before building a model to detect depression and anxiety indicators through voice, the company's founders needed a vast pool of voice data, introducing the Kintsugi voice journaling mobile app. The app trained the ML model on what a depressed or anxious voice sounds like by using thousands of voice samples. Additionally, the company decided not to use natural language processing, which aligned with its goal to understand how people were speaking - rather than what they were saying. This decision simplified its underlying technology and enabled Kintsugi to focus on building a scoring system based on voice pattern detection. This recognition method also allowed the technology to be language-agnostic.

Kintsugi Voice

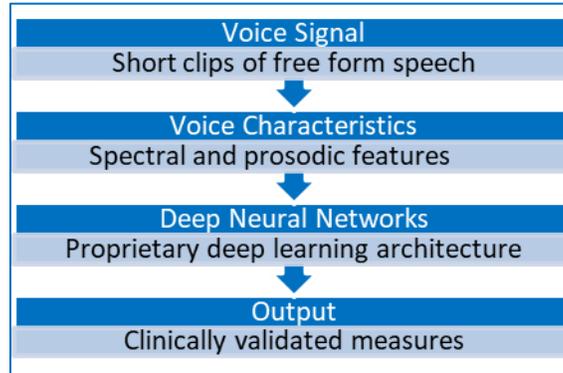
Kintsugi Voice is a cloud-based API platform that identifies, triages, and cares for mental health patients through novel voice biomarkers in speech. The platform rapidly detects clinical depression and anxiety by examining a short raw audio voice sample in as fast as 20 seconds, an industry-first capability. Kintsugi Voice scores the audio against the PHQ-9 and GAD-7 clinical scales.

The API-first platform connects with the clinical notes section of the patients' electronic health records, achieving clinical efficiencies and enhancing its utility. Kintsugi Voice is a versatile clinical decision support tool, integrating with call centers, tele-health solutions, care management platforms, and remote patient monitoring apps to help more people access the proper care at the right time.

² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4927366/>

Technology integration also enables care managers and nurses to understand if the patient is undergoing a behavioral health issue within a short duration during their outbound calls to patients.

How Kintsugi Voice Works



Kintsugi interview with Frost & Sullivan

Frost & Sullivan identifies Kintsugi’s cloud-based API-first platform, Kintsugi Voice, as a groundbreaking, innovative technology. Its strong intellectual property portfolio and patent-pending technology uphold its pioneering technology, adding value relative to its growth potential, thus securing a competitive advantage.

Strategic Practices Promoting Successful Operations

Kintsugi constantly works on validating and improving its technology. The company has examined over 16,000 audio files of clinical call center data, demographic information, past PHQ-9 screening scores, and patient diagnosis data. It analyzed relative screening rates across the selected demographics and ran the audio files through Kintsugi Voice to verify depressed patients within the selected group. Across all demographic groups, the platform identified an increase of over 30% in incremental depressed patients in addition to diagnosed patients. These results demonstrate the value its technology offers to healthcare organizations.³

Kintsugi also formed clinical partnerships with healthcare organizations and academia to study its technology’s effectiveness in various settings. For example, its collaboration with the University of Arkansas Medical Sciences explores Kintsugi Voice’s engagement effectiveness in patients with and without COVID-19. In its partnership with Main Line Health, the company investigates its technologies’ applicability among obstetrics/gynecology and post-surgery patients. In addition, as mental health conditions become more and more prevalent among American children and young adults, Kintsugi works with Children’s Hospital of Colorado and Joe DiMaggio Children’s Hospital to study Kintsugi Voice’s efficacy in assessing adolescents with cystic fibrosis and children admitted for depression and anxiety.

³ <https://techcrunch.com/2022/05/31/depressed-this-algorithm-can-tell-from-the-tone-of-your-voice/>

The Power of Foresight: Sustained Leadership

Backed by the National Science Foundation, Kintsugi strives to offer support and guidance to its customers, achieving accessible mental healthcare across all healthcare organizations. Although the market is quite rich in competitors, Frost & Sullivan's own research confirms that the company's technology is currently the first and only one to work in a production environment of only 20 seconds of audio and process the results in real-time.

The company trains the ML models powering Kintsugi Voice by utilizing the world's largest annotated voice dataset. Moreover, with contributions from individuals across 250 international cities, the platform is language agnostic and applicable anywhere in the world.⁴ The technology is now pending a De Novo approval by the United States Food and Drug Administration.

In 2022, Kintsugi raised \$20 million in a Series A funding round to accelerate its technologies' development. It anticipates reaching even more mental healthcare practitioners within the next year.⁵ Frost & Sullivan analysts conclude that the company's impressive growth momentum and trajectory are an exciting testament to its technology innovation leadership, earning its clients' trust and loyalty and enabling it to capture market share.

Conclusion

Technology is a critical success factor for the vocal biomarkers and mental health industry. Yet with many options available, market stakeholders need to leverage the most appropriate and best technology-based solutions to optimize their market impact.

With its Voice Biomarker application programming interface (API), also known as KiVA™ (Kintsugi Voice), Kintsugi delivers rapid access to mental health interventions through advanced voice assessment. Its technology enables mental health practitioners to score patients against depression and anxiety with faster diagnosis accurately. More importantly, this technology expedites Kintsugi's aim of making mental healthcare more accessible worldwide, nicely filling a gap in the industry.

Based on its commitment to innovation and creativity, Kintsugi Voice stands out from competitors' solutions as the only vocal biomarker technology for mental health that works with voice samples as short as 20 seconds while achieving clinical validation. The company launched studies with various organizations, forming clinical partnerships with the University of Arkansas Medical Sciences, Main Line Health, Children's Hospital of Colorado, and Joe DiMaggio Children's Hospital. Through these collaborations, Kintsugi tests its technology's performance in different settings with patients under various circumstances, thus further substantiating its effectiveness. Moreover, the company raised a total of \$20 million in a Series A funding round, equipping Kintsugi with resources to accelerate its technology's development. With its strong overall performance, Kintsugi earns the 2022 North American Technology Innovation Leadership Award in the vocal biomarkers for mental health industry.

⁴ <https://www.ucsfhealthhub.com/Award-finalists/geYeaxgg>

⁵ <https://www.fiercehealthcare.com/tech/ai-mental-health-startup-kintsugi-secures-8m-from-investors-works-to-close-mental-health-gaps>

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Leadership Award recognizes the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Award Analysis

For the Technology Innovation Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization Success: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

