

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

2024 COMPETITIVE STRATEGY LEADER

*IN THE GLOBAL
PKI-AS-A-SERVICE
INDUSTRY*

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

2024
BEST
PRACTICES
AWARD



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Best Practices Criteria for World-class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each recognition category before determining the final recognition recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. eMudhra excels in many of the criteria in the PKI-as-a-Service space.

RECOGNITION CRITERIA	
<i>Strategy Innovation</i>	<i>Customer Impact</i>
Strategy Effectiveness	Price/Performance Value
Strategy Execution	Customer Purchase Experience
Competitive Differentiation	Customer Ownership Experience
Executive Team Alignment	Customer Service Experience
Stakeholder Integration	Brand Equity

The Transformation of the PKI-as-a-Service Industry

The evolution of PKI-as-a-Service (PKIaaS) has been shaped by the increasing demand for secure, scalable, and cost-effective solutions to manage cryptographic assets. Traditionally, PKI was implemented on-premise, requiring organizations to manage their own hardware and software, bringing operational complexities and costs. Cloud-based PKIaaS emerged as a more efficient alternative, offering the flexibility and scalability to address the growing volumes of digital certificates without the associated need for digital trust expertise and expensive physical infrastructure.

By outsourcing the management of digital certificates, certificate authorities (CAs), and encryption keys to a third-party provider, organizations can dedicate resources to their core business. PKIaaS providers offer enhanced scalability, allowing organizations to easily adjust their security requirements as they grow. This is especially critical as businesses increasingly adopt hybrid and heterogeneous environments across cloud and on-premise infrastructure. PKIaaS also provides consistent and reliable access to the latest security standards and updates, protecting organizations from evolving threats.

PKIaaS plays a crucial role in meeting data residency and sovereignty requirements as global data protection regulations become stricter and industry standards evolve. Major cloud service providers such as AWS, GCP, and Azure are expanding their infrastructure worldwide to support compliance with data localization laws. PKIaaS solutions can be tailored to ensure data is stored and processed in specific regions, offering organizations greater control over data privacy and security. As digital transformation

continues, PKIaaS is becoming an essential part of the IT strategy for organizations aiming to balance security, compliance, and operational efficiency.

A Growth Strategy with Innovation at its Core

eMudhra, founded in 2008 as a CA issuing digital certificates to organizations and individuals, initially focused on PKI use cases such as digital signatures, tax filings, and bank transactions. In 2013-2014, the company underwent a significant transformation, shifting its approach to diversify its PKI offerings to expand into new markets. During this period, eMudhra made the strategic decision to develop its own intellectual property (IP) by replacing its existing PKI engine with a new, proprietary one that could handle large-scale operations to support its expansion, especially for issuance of single-use signatures and keys. The transition to handling large volumes of PKI transactions marked a significant business shift, setting the stage for eMudhra's rapid scaling. This move laid the foundation for eMudhra's future growth and the development of its other home-grown PKI solutions.

By 2016, eMudhra had expanded its portfolio further, with the creation of emSigner, a comprehensive solution that facilitates e-signature workflows for enterprises. Today, emSigner is used by around 800 enterprises, including many prominent global brands. Additionally, eMudhra launched its own enterprise PKI suite, emCA, which includes a Certificate Engine, Validation Authority, Time-stamping Authority, and a Registration Authority. This expansion saw eMudhra grow beyond its initial Indian roots, reaching over 20 countries by 2020 and 35 in 2024. With an increasing focus on cloud-based solutions and global expansion, eMudhra continued to expand its portfolio, supporting diverse use cases from ePassports to electric vehicles and smart meters. The company's clients range from government bodies, defense forces, to multi-national enterprises, with its largest deployment serving 550 million users.

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Sr. Industry Analyst

company's growth strategy to provide flexibility and customization for customers. With changing data localization and residency regulations, eMudhra sees PKIaaS as an evolution that serves both less-regulated industries and more sensitive sectors, including defense and financial services, where cloud services can be securely delivered if data sovereignty is ensured. eMudhra's PKIaaS strategy builds on the trust and flexibility of the company's on-premise offerings, with plans to create a unified interface that can cater to global data residency requirements and support hybrid implementations.

Expanding Capabilities and Increasing Customer Value

eMudhra differentiates itself by offering a full-stack solution, owning the IP end-to-end, including trust services, certificates, and Certificate Lifecycle Management (CLM). The company's capabilities in delivering PKI and PKIaaS offerings have significantly expanded over time to include customizable solutions like tailored private hierarchies, fully homomorphic encryption, hybrid certificates and PQC

compliance. In its latest offering, eMudhra integrated PKI into the verifiable credentials ecosystem to support various emerging use cases.

This holistic approach ensures seamless interoperability, providing customers with a comprehensive ecosystem. With a 900-strong workforce focusing solely on PKI and a dedicated R&D center, eMudhra boasts high innovation and product development capabilities; these have led to a substantial impact on the company's revenue growth and client expansion. These capabilities enable eMudhra to develop tailored solutions for region or industry-specific use cases faster and with lower costs. The company's continued investments in its human resources ensure sustainable growth and scalable innovation in the long term. The company's flexibility, unified product stack, and competitive pricing, backed by extensive global deployment experience, allow it to provide significant value to its clients while remaining responsive to their unique needs.

eMudhra has experienced substantial market growth and geographical expansion in the recent years. The

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company's growth performance has been significantly above industry averages and most of its competitors. eMudhra's strategy for growing its market share in adjacent industries and new regions focuses on leveraging its strong presence and expertise in digital trust across diverse geographies.

In India, eMudhra has capitalized on the "Make in India" initiative, becoming the dominant PKI player across industries, particularly in government-led digital public infrastructure and financial services. In the Middle East, eMudhra targets large enterprises, focusing initially on CLM and expanding towards zero-

trust architectures. Outside of its core markets of India, Asia, and the Middle East, eMudhra typically delivers its offering through a wide array of trusted channel partners. In several markets in Africa, eMudhra works with countries' top regulators to set up PKI frameworks as part of digital transformation projects on a national level and controlling entire operations downstream. The company's further large-scale deployments include projects for banks and telecom companies.

Conclusion

In organizations' digital transformation journeys, PKI and PKIaaS providers play a key role in providing robust security and reliability, while ensuring changing needs and requirements are met. By continuously enhancing its capabilities and expanding its market reach, eMudhra has steadily strengthened its competitive positioning in the PKIaaS market. With its strong overall performance, eMudhra earns Frost & Sullivan's 2024 Competitive Strategy Leadership Recognition in the Global PKI-as-a-Service industry.

What You Need to Know about the Competitive Strategy Leadership Recognition

Frost & Sullivan's Competitive Strategy Leadership Recognition is its top honor and recognizes the market participant that exemplifies visionary innovation, market-leading performance, and unmatched customer care.

Best Practices Recognition Analysis

For the Competitive Strategy Leadership Recognition, Frost & Sullivan analysts independently evaluated the criteria listed below.

Strategy Innovation

Strategy Effectiveness: Effective strategy balances short-term performance needs with long-term aspirations and overall company vision

Strategy Execution: Company strategy utilizes best practices to support consistent and efficient processes

Competitive Differentiation: Solutions or products articulate and display unique competitive advantages

Executive Team Alignment: Executive team focuses on staying ahead of key competitors via a unified execution of its organization's mission, vision, and strategy

Stakeholder Integration: Company strategy reflects the needs or circumstances of all industry stakeholders, including competitors, customers, investors, and employees

Customer Impact

Price/Performance Value: Products or services offer the best ROI and superior value compared to similar market offerings

Customer Purchase Experience: Purchase experience with minimal friction and high transparency assures customers that they are buying the optimal solution to address both their needs and constraints

Customer Ownership Excellence: Products and solutions evolve continuously in sync with the customers' own growth journeys, engendering pride of ownership and enhanced customer experience

Customer Service Experience: Customer service is readily accessible and stress-free, and delivered with high quality, high availability, and fast response time

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty, which is regularly measured and confirmed through a high Net Promoter Score®

Best Practices Recognition Analytics Methodology

Inspire the World to Support True Leaders

This long-term process spans 12 months, beginning with the prioritization of the sector. It involves a rigorous approach that includes comprehensive scanning and analytics to identify key best practice trends. A dedicated team of analysts, advisors, coaches, and experts collaborates closely, ensuring thorough review and input. The goal is to maximize the company's long-term value by leveraging unique perspectives to support each Best Practice Recognition and identify meaningful transformation and impact.

VALUE IMPACT			
STEP		WHAT	WHY
1	Opportunity Universe	Identify Sectors with the Greatest Impact on the Global Economy	Value to Economic Development
2	Transformational Model	Analyze Strategic Imperatives That Drive Transformation	Understand and Create a Winning Strategy
3	Ecosystem	Map Critical Value Chains	Comprehensive Community that Shapes the Sector
4	Growth Generator	Data Foundation That Provides Decision Support System	Spark Opportunities and Accelerate Decision-making
5	Growth Opportunities	Identify Opportunities Generated by Companies	Drive the Transformation of the Industry
6	Frost Radar	Benchmark Companies on Future Growth Potential	Identify Most Powerful Companies to Action
7	Best Practices	Identify Companies Achieving Best Practices in All Critical Perspectives	Inspire the World
8	Companies to Action	Tell Your Story to the World (BICEP*)	Ecosystem Community Supporting Future Success

*Board of Directors, Investors, Customers, Employees, Partners

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at <http://www.frost.com>.

The Growth Pipeline Generator™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.

[Learn more.](#)

Key Impacts:

- **Growth Pipeline:** Continuous Flow of Growth Opportunities
- **Growth Strategies:** Proven Best Practices
- **Innovation Culture:** Optimized Customer Experience
- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- Megatrend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)

