FROST & SULLIVAN

2024

TECHNOLOGY INNOVATION LEADER

IN THE NORTH AMERICAN ELECTRONIC WARFARE AND SPECTRUM MANAGEMENT INDUSTRY

KEYSIGHT

FROST & SULLIVAN

2024 BEST PRACTICES AWARD

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. Keysight Technologies excels in many of the criteria in the electronic warfare and spectrum management space.

AWARD CRITERIA

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

North America Electronic Warfare and Spectrum Management Market

The North American electronic warfare (EW) and spectrum management markets offer significant growth opportunities, driven by technological advancements and the escalating need for advanced systems. This market is notably fragmented, featuring intense competition among global and local players, all striving to offer cutting-edge technology and products. Substantial investments in research and development (R&D) accelerate sophisticated EW solutions' creation, while strategic collaborations with defense forces are customizing these technologies to address specific military requirements. The growing trend shows that international companies are increasing their market share over regional competitors by leveraging their broader geographical presence and greater investment in emerging technologies.

The United States (US) Department of Defense's EW budget for 2019 to 2025 is projected to grow at a compound annual growth rate of 3.0%.[1] During this period, radio frequency countermeasures will likely remain the largest segment, with procurement expenditures projected to surpass R&D, testing, and evaluation by 2025. This growth reflects investments across various departments and agencies in diverse technologies and services, including radar warning receivers, processing-exploitation-and-dissemination tools, and the rapidly expanding counter-unmanned aerial systems sector.

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[1] Frost & Sullivan: US DoD Electronic Warfare, 2020–2025 (February 2021)

Key market drivers include the rising demand for advanced systems fueled by ongoing border disputes and evolving warfare tactics. Technological innovations, particularly in the development of multilayered defensive systems and the integration of electronics into military hardware, are pivotal in this regard. Cognitive EW, integrated artificial intelligence, and neural networks, are transforming the market by improving threat detection and tracking capabilities, thereby accelerating innovation.

> *"By repurposing advancements from diverse industries (such as automotive and telecommunications), Keysight stays ahead of market demands, providing adjustable and sophisticated solutions that address current and future EW needs."*
>
> *- Norazah Bachok*
> *Best Practices Research Analyst*

However, the market faces challenges such as the complex integration of electromagnetic systems and the need to balance legacy systems with new technologies. Replicating a realistically contested electromagnetic environment remains difficult, complicating effective platform/system maneuvering in the real world. The need to integrate longstanding models with modern test equipment to address emerging threats creates a tension between maintaining traditional legacy systems and adopting new technologies.

Keysight Technologies: Leading Electronic Design and Test Solutions with a Global Reach

Founded in 2014 and headquartered in Santa Rosa, California, Keysight Technologies is a leading provider of electronic design and test solutions. Officially spun off from Agilent in 2014, the company builds on over 80 years of expertise in electronic design, test, and measurement. Originally a part of Hewlett-Packard and later Agilent, Keysight carries forward a rich legacy of innovation and industry leadership. The company offers a broad spectrum of software, tools, and services integral to electronic systems' design, development, and validation. Keysight's solutions encompass every stage of the product lifecycle, from simulation and manufacturing to installation, deployment, and optimization. In addition, the company provides extensive customer support, including start-up assistance, application support, asset management, instrument calibration, and consulting.

Keysight caters to a wide array of industries, including aerospace and defense, automotive, healthcare, energy, semiconductors, communications, and education. As a Standard & Poor's 500 Index company, Keysight maintains a global presence across the Americas, Europe, and Asia Pacific, holding over 2,000 patents and employing approximately 15,000 people. The company supports nearly 32,000 customers globally, reflecting its success and strong commitment to innovation.

Advancing EW and Spectrum Management Solutions

Keysight delivers state-of-the-art solutions tailored for the EW and spectrum management markets. The company's portfolio features advanced EW threat simulators and analyzer compromised of commercial off the shelf components including Radio Frequency (RF) vector signal generators, RF analyzers and open architecture software. These cutting-edge products enable comprehensive simulation, testing, and analysis of EW scenarios, significantly enhancing threat detection and response capabilities. Leveraging its expertise and advanced technology, Keysight aids defense organizations in navigating electromagnetic spectrum's complexities and enhancing their operational readiness.

A cornerstone of Keysight's strategy is its robust R&D investments, with approximately 15% of its revenue allocated to this critical area. This commitment fosters continuous innovation, allowing the company to adapt its commercial technologies for specialized defense applications. By repurposing advancements from diverse industries (such as automotive and telecommunications), Keysight stays ahead of market demands, providing adjustable and sophisticated solutions that address current and future EW needs.

Keysight's approach emphasizes scalable, open-architecture solutions that integrate legacy scenarios with new advanced systems. This strategy enables customers to modernize their test and evaluation competencies while preserving existing investments' value. By leveraging extensive R&D capabilities, the company develops innovative technologies to counter advanced and evolving threats, which is crucial in the rapidly evolving EW mission area.

The company is also expanding its presence in the EW sector through several strategic initiatives:

Technological Integration: Keysight explores the intersection of EW and space technology, exemplified by initiatives like its work with various space organizations, to address contemporary threats effectively.

Exploring Adjacent Markets: The company extends its influence into related markets (e.g., fifth-generation [5G] networks and data link technologies), building on its leadership in 5G to enhance EW solutions and tackle new interconnected systems challenges.

Enhancing Core Capabilities: Keysight optimizes its EW products by improving size, weight, power, and open software architectures, ensuring that its solutions remain effective in increasingly complex environments.

Through these strategies, Keysight not only fortifies its position in EW but also adapts to a swiftly changing technological landscape, reinforcing its industry leadership.

From Frost & Sullivan's overview, despite choosing not to sell to certain countries often viewed as adversaries of the West, Keysight's EW and spectrum management team still excels. The company achieves key performance metrics while funding innovative products by reinvesting 16% of revenues back into the company. Additionally, its contribution through volunteer work with the Association of Old Crows, a leading trade organization for EW, underscores Keysight's dedication to advancing the industry and fostering collaboration.

Driving Innovation and Partnership

Keysight's partnership-driven approach plays a crucial role in its success. Over the past two years, the company has marked significant achievements, including a major contract award for EW threat simulation and analysis tools. Keysight secured an $18-million contract to supply the US Air Force with two cutting-edge EW threat simulators. These state-of-the-art simulators generate and analyze various EW scenarios, enhancing warfighters' operational planning and effectiveness by evaluating complex multi-emitters, electronic disruptors, and dynamic flight paths.

In addition to the simulators, Keysight provides comprehensive support services, including field engineer assistance, critical and non-critical spare parts, software patch management, and storage solutions. The simulators feature the company's advanced M9484C Vector Signal Generator, which supports connections up to 54 gigahertz and offers capabilities such as signal descriptor word streaming and virtual channel options. They also incorporate Keysight's real-time radio frequency modeling platform, Simulation View Software, enabling dynamic scenario control and detailed visualization. Designed for adaptability, the simulators can be upgraded with additional software and hardware components. By using commercial-off-the-shelf technology, the company aims to reduce test costs, accelerate project timelines, and ensure high availability. Furthermore, its KeysightCare program offers technical support, warranty services, and upgrades to maintain operational effectiveness and minimize downtime.

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>
> *-Wayne L. Shaw III*
> *Director, Aerospace & Defense*

Additionally, the company's focus on partnership and feedback is evident in the development of its signal generator line. Early discussions with various defense customers led to continuous product refinements based on user input, exemplifying Keysight's broader strategy of creating tailored solutions that foster long-term customer relationships and technological evolution.

According to Frost & Sullivan, Keysight's EW threat simulation solution significantly enhances operational readiness by simulating and analyzing complex EW signals. The platform also offers scalability and upgrade options, further boosting its effectiveness.

Customer-Centric Approach

Keysight adopts a comprehensive and customer-focused strategy tailored to the EW market, reflecting its commitment to addressing the unique needs of large defense contractors and emerging startups. For smaller companies and startups, the company offers flexible solutions like rentals and demonstration boxes, facilitating their early-stage development and expandability. Keysight offers tailored testing operations and custom solutions to major defense primes. This approach highlights its flexibility and commitment to meeting a wide range of customer needs.

Keysight's strategy focuses on integrating customer feedback into its operations. By using engineers as sales representatives, the company gains a deep understanding of customer needs, delivering high-quality solutions and ensuring satisfaction. Formal feedback channels support ongoing product and service improvements.

Keysight's customer engagement strategies include:

- **Dedicated Local Sales Teams**: Engineers act as local account managers, providing tailored solutions and promptly addressing customer expectations.

- **Proactive Requirement Gathering**: Engaging with customers early to identify obligations and provide guidance on technical and long-term considerations.

- **Transparent Recommendations**: Proposing honest feedback on proposed solutions and suggesting alternatives if necessary.

- **Comprehensive Support**: Providing extensive support throughout the sales cycle, including startup assistance, on-site training, and lifecycle support.

- **Flexible Upgrades and Trade-ins**: Programs for upgrading or trading in equipment to keep technology current and efficient.

- **Customer Feedback Mechanisms**: Collecting feedback through surveys, advisory boards, and informal interactions to drive continuous improvement.

- **Open Architecture and Rapid Innovation**: Designing solutions with open architecture for integration and adaptation, supported by agile development for quick responses to customer needs and technological changes.

By maintaining strong relationships and open communication, Keysight ensures its products and services remain aligned with current and future demands.

Enhancing Brand Recognition and Market Reach

Keysight is dedicated to enhancing its brand recognition and showcasing its extensive capabilities. Although the company boasts impressive advancements and a broad range of offerings, there remains room to raise awareness among potential customers. Capitalizing on these opportunities, Keysight actively invests in various brand recognition initiatives (including regular press releases, active participation in professional organizations, and targeted marketing campaigns).

The company allocates dedicated marketing resources within its EW group to focus on elevating its profile and expanding market reach. These efforts aim to highlight Keysight's innovative solutions and reinforce its market position, ensuring that potential customers fully appreciate the breadth of its offerings.

Keysight is strategically positioned for notable growth, driven by its commitment to innovation and responsiveness to market dynamics. The company's development strategy, supported by a robust pipeline and thorough annual strategic planning, emphasizes scalable and reusable solutions. This approach is particularly effective in the EW sector, where Keysight's progress surpasses the market average.

Conclusion

Keysight Technologies (Keysight) stands out as a leader in technology innovation, driven by its commitment to advancing solutions in the electronic warfare (EW) and spectrum management markets. The company offers sophisticated tools and technologies (such as EW threat simulators and real-time radio frequency modeling and analysis platforms), which are critical for enhancing threat detection and operational readiness. Keysight's strategic focus on research and development and investing 16% of its revenue back into the business unit enable it to stay ahead of market demands and continually adapt its technologies for specialized defense applications. This commitment has led to notable surge, particularly in the EW sector, where the company's performance surpasses the market average.

Keysight's proactive approach to market expansion is evident in its integration of advanced technologies and exploration of adjacent markets. By leveraging its core strengths and addressing evolving industry needs, the company is well-positioned for future improvement. Keysight's dedication to innovation is supported further by a robust pipeline and strategic planning, ensuring scalable and reusable solutions.

With its strong overall performance, Keysight Technologies earns Frost & Sullivan's 2024 North American Technology Innovation Leadership Award in the EW and spectrum management industry.

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

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 Engine™

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:

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