FROST & SULLIVAN

BEST PRACTICES AWARDS

INFINITY™
OPTICS SOLUTIONS

2020 GLOBAL BIOMETRICS NEW PRODUCT INNOVATION AWARD

Contents

Background and Company Performance

Industry Challenges

Cybercrime and data security breaches are common today, and it is increasingly challenging for organizations and governments worldwide to protect their data as existing systems are quickly moving to cloud- and Internet of Things (IoT)-based business models. In the recent past, the world has witnessed multiple data breaches that have resulted in organizations losing millions in repair and restitution costs. Cyber theft causes irreparable damage to organizations and government agencies because hackers can sell, encrypt, or lock the compromised information.

Biometric technology makes identity and authentication processes secure and less prone to security breaches because the end-users' biometric data are required to allow access. Yet most biometric recognition systems need to generate a template of end-users' biometric data that gets stored electronically, used with secondary encryption for matching and authenticating at a later period. The problem, however, is that this stored template can be hacked, resulting in misuse of end-users' biometric data (i.e., their identity).

Globally, organizations such as financial services and government agencies are increasingly demanding key management systems for blockchain, data security, and digital wallet solutions that can identify end users by verifying their biometric information, but the major need here is to do so without storing the biometric data electronically in a template. In addition, the adoption of biometrics technology is picking up momentum in applications such as mobile devices, IoT devices, and connected cars. The high growth of smart phones, wearables, tablets, and IoT-connected mobile devices has resulted in business applications increasingly moving to mobile platforms. Biometrics work as a highly secure technology for protecting users from a potential security breach. Similarly, automobile OEMs are increasingly adopting biometric technology for increased security in connected cars. Among mobile devices and connected cars, it is extremely important that end users are able to enjoy the security benefits of biometric technology without storing the biometrics data in templates and on the devices themselves.

In such a scenario, a solution that can combine both biometric technology and cryptography, another security system, will address the data storage issue still restraining the biometrics industry today. This type of advanced solution will not only ensure the identity and authentication of users attempting to access information to help reduce cyber hacks, but the key management system of cryptography will ensure that the users' biometric data is not stored and hence cannot be stolen or misused.

New Product Attributes and Customer Impact

Infinity Optics Solutions Pte Ltd (Infinity), founded in 2014 and headquartered in Singapore, is a biometrics solution provider that has developed an industry-leading platform that combines biometric hash and biometric cryptography technology. The company is owned by Global Bionic Optics® Ltd (GBO Ltd)., an Australian company that owns a diversified portfolio of security and surveillance technologies, such as optical designs and image processing solutions. Infinity commercially launched its biometric hash technology in November 2019.

Innovative, Cutting-edge Design Makes Biometric Hash Technology Extremely Reliable and High Quality

Biometric companies have long been working towards bridging the gap between biometric and cryptography technology. Frost & Sullivan is impressed with Infinity's delivery of QuantumCrypt™, a biometric cryptography platform that addresses this industry need. The QuantumCrypt platform allows iris, fingerprint, and 2D/3D facial images to generate biometric codes, also known as True Biometric Hash technology. These codes act as key management solutions, such as blockchain-based identity. Infinity's technology for biometric cryptography enables easy verification of users at any given point during a particular transaction, thereby making it more secure because the registration can be easily revoked if the data is found to be compromised. The solution also ensures that the user identification process does not rely on stored biometric information, so is not prone to being compromised. Frost & Sullivan is also impressed that QuantumCrypt™ is highly secure for use within Cloud-based biometric solutions and authentication processes. As such, financial services, government, cryptocurrency, and fintech are the sectors that find QuantumCrypt™ extremely beneficial.

Infinity has already made significant progress in its iris biometric solution by developing depth-of-field (DOF) iris authentication technology. The company's single lens technology can capture DOF images at a distance between 150mm and 600mm in a single shot using a single element lens. This performance overcomes the challenge that iris biometric authentication poses, which is adjusting the eyes within a narrow focus zone in order to allow accurate and fast identification. Infinity's technology combines custom optics and image processing capability to offer better performance, making extended DOF (EDOF) solutions highly convenient for IoT-based iris recognition systems. For instance, the EDOF technology is applicable in devices such as smartphones and wearables, and can be used in applications such as payment, retail, cryptocurrency, and blockchain key management. Frost & Sullivan finds Infinity's EDOF technology sets the company apart from its competitors in terms of technology superiority and innovation.

Infinity has also developed other QuantumCrypt modules for fingerprint , 2D face, iris recognition and working on other modalities. By integrating its QuantumCrypt technology with fingerprint recognition technology, Infinity's solution will be used by fingerprint sensor and smart card manufacturers. The QuantumCrypt platform is designed such that most biometric systems are able to generate stable and repeatable biometric codes from the respective capture devices, meaning Infinity has managed to achieve the success rates and performance expected by the industry. Beyond its iris and fingerprint success, the company is now working towards developing 3D face recognition and plans to integrate its QuantumCrypt platform with both 2D and 3D face recognition systems.

Higher Performance Value Resulting in Greater Customer Satisfaction; Infinity Emerges as Innovator in the Biometric and Cryptography Space

India-based Biomatiques Identification Solutions Pvt. Ltd. partnered with Infinity to offer BDOF iris recognition technology in the Indian market. The company has established a high level of customer satisfaction as Infinity's solution helped it upgrade the quality of its imaging systems and offer an improved technology to end users. This partnership has

allowed Biomatiques to offer a dynamic and highly convenient user experience in iris recognition. Infinity's algorithm maps the random iris patterns and then generates a unique biometric template for identification. The specialized EDOF technology has been made available to Indian consumers by Biomatique at a very affordable price. The technology, due to its superior hardware performance, provides high-level user experience by capturing high-quality EDOF images.

Precise Biometrics, a fingerprint recognition technology provider, is currently working with Infinity to integrate the QuantumCrypt platform with its fingerprint recognition technology. The companies are conducting multiple pilots and offering a fingerprint solution with hash technology. Unlike today's biometric solutions that use end-users' biometric data to generate a template, the QuantumCrypt fingerprint-based solution offered by Precise Biometrics will ensure secure personal identification without storing users' biometric templates. This significantly reduces the risk of identity fraud and data breaches. By offering a hash technology fingerprint recognition solution, Precise Biometrics aims to become an industry pioneer offering a converged biometric and cryptography security solution.

Frost & Sullivan recognizes the catalyzing role Infinity has taken in leading the biometrics industry forward by transforming the way biometric authentication has traditionally been achieved. The EDOF technology by Infinity makes iris recognition solutions much more user friendly, thereby creating massive-scale opportunity for mobile device-based applications where mobile phone cameras can be used for iris recognition. As Infinity is developing QuantumCrypt solutions for 2D and 3D facial recognition, it will unlock the potential of facial recognition biometric solutions in mobile and IoT-based applications across numerous industries, smart homes, smart cities, and connected cars.

Conclusion

Infinity Optics has developed QuantumCrypt, a platform that bridges the gap between biometric and cryptography on a single platform. This cutting-edge technology has significantly enhanced the security level of current biometric authentication processes and solutions. Previously demonstrating product innovation in iris recognition technology by developing a single lens DOF capture system, Infinity Optics has introduced the cryptography and biometric hash technology to its iris recognition system; the QuantumCrypt platform can also be successfully implemented in fingerprint and 2D and 3D facial recognition systems.

Infinity's platform is one-of-kind, and unlike the rest of the biometric solutions available in the market that need to electronically store and add layers of encryption to end-users' biometric data in templates, it eliminates this step fully, thereby making the solution highly secure for IoT-based applications and cost effective.

For its strong overall performance, Infinity Optics has earned Frost & Sullivan's 2020 New Product Innovation Award.

Significance of New Product Innovation

Ultimately, growth in any organization depends on continually introducing new products to the market and successfully commercializing those products. For these dual goals to occur, a company must be best in class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

Understanding New Product Innovation

Innovation is about finding a productive outlet for creativity—for consistently translating ideas into high-quality products that have a profound impact on the customer.

Key Benchmarking Criteria

For the New Product Innovation Award, Frost & Sullivan analysts independently evaluated 2 key factors—New Product Attributes and Customer Impact—according to the criteria identified below.

New Product Attributes

Criterion 1: Match to Needs
Criterion 2: Reliability
Criterion 3: Quality
Criterion 4: Positioning
Criterion 5: Design

Customer Impact

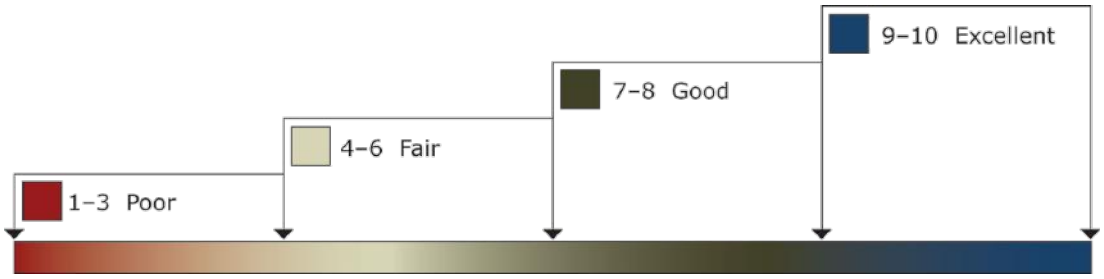
Criterion 1: Price/Performance Value
Criterion 2: Customer Purchase Experience
Criterion 3: Customer Ownership Experience
Criterion 4: Customer Service Experience
Criterion 5: Brand Equity

Best Practices Award Analysis for Infinity Optics

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 New Product Attributes and Customer Impact (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.

Measurement of 1–10 (1 = poor; 10 = excellent)			
New Product Innovation	New Product Attributes	Customer Impact	**Average Rating**
Infinity Optics	**9.8**	**9.8**	**9.8**
Competitor 1	8.5	8.5	8.5
Competitor 2	8.2	8.6	8.4

New Product Attributes

Criterion 1: Match to Needs

Requirement: Customer needs directly influence and inspire the product's design and positioning.

Criterion 2: Reliability

Requirement: The product consistently meets or exceeds customer expectations for consistent performance during its entire life cycle.

Criterion 3: Quality

Requirement: Product offers best-in-class quality, with a full complement of features and functionalities.

Criterion 4: Positioning

Requirement: The product serves a unique, unmet need that competitors cannot easily replicate.

Criterion 5: Design

Requirement: The product features an innovative design, enhancing both visual appeal and ease of use.

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 optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience

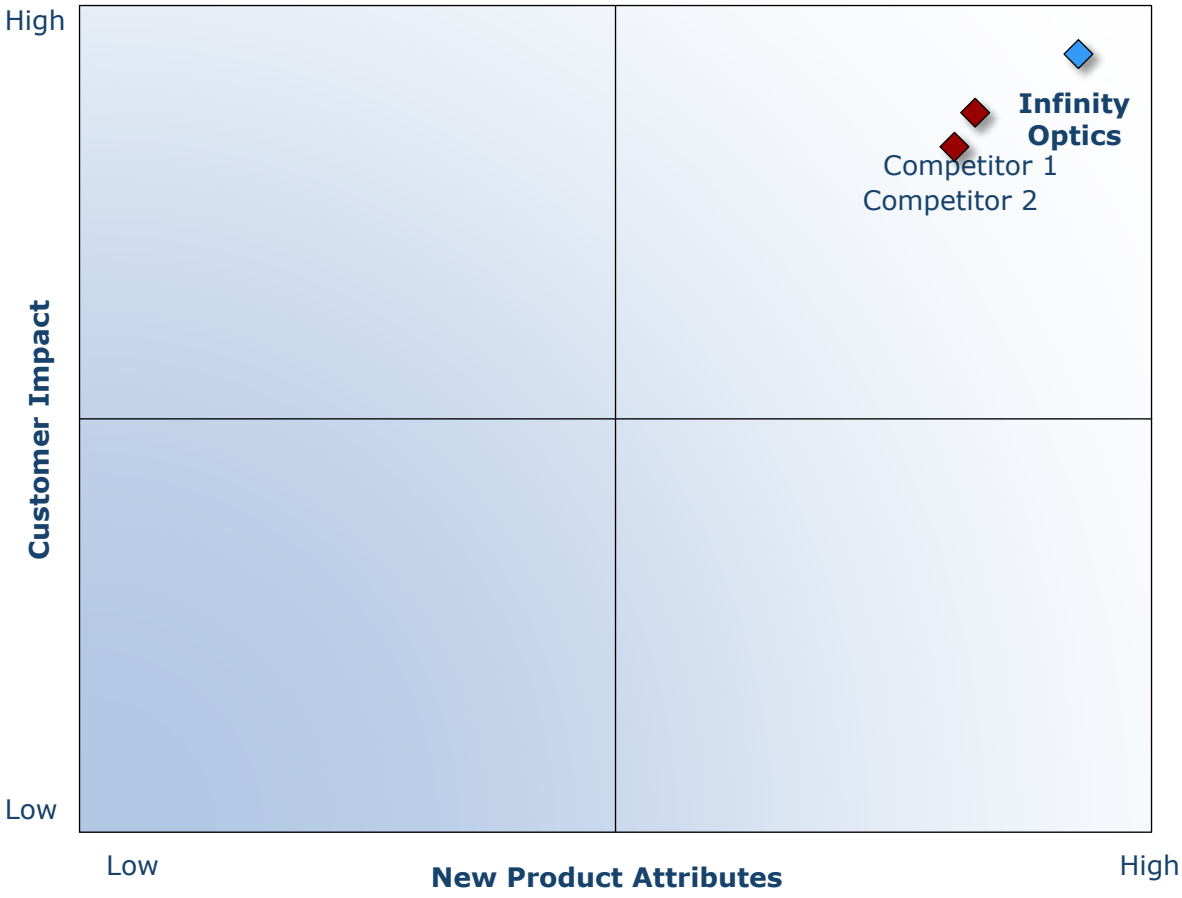
Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

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.

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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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

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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.