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BEST PRACTICES

AWARDS

FROST & SULLIVAN

2020 BEST PRACTICES AWARD



**2020 GLOBAL SMART BUILDING
OPTIMIZATION & EXPERIENCE MANAGEMENT
CUSTOMER VALUE LEADERSHIP AWARD**

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Background and Company Performance

Industry Challenges

Smart building automation and energy management technologies and applications experience growing interest as the market demands value-driven solutions, including occupants' health, wellbeing, productivity, and comfort, and energy cost savings. Simultaneously, governmental support worldwide for artificial intelligence (AI) research and the increasing adoption of digital transformation projects in commercial and industrial end-user segments also fuel active incorporation of smart building technologies and applications. Currently, many governments in Europe, India, China, and other developing nations actively invest in AI to facilitate innovation. Such a situation creates a window of opportunity for development and further AI uses cases, such as predictive maintenance, building performance optimization, building process optimizations, asset optimization in the commercial and industrial buildings. Many governments have policies and guidelines for businesses and building owners to ensure compliance with energy and sustainability standards, paving the way towards a clean energy transition in the buildings sector. Subsequently, many building owners incorporate smart solutions to achieve carbon and energy cost savings and higher building-level sustainability targets. At the same time, a growing number of building owners rely on innovative AI-driven solutions in the building sector as they drive not only significant reduction in energy consumption, but also ensure occupant's health, wellbeing, productivity, and comfort.

Moreover, as buildings become data-rich environments, with growing penetration of the Internet of Things (IoT) connected devices, cloud technologies, and data analytics, building owners seek ways to use data points and provide actionable intelligence for overall facility optimization, tracking and monitoring occupant's health, and enforcing workforce re-entry policies and guidelines to mitigate COVID-19 spread in indoor environments. In this regard, such critical use cases lead to active AI-driven smart building solutions to empower a buildings' autonomous intelligence and improve building health performance further.

Frost and Sullivan forecasts that the AI capabilities in the homes and buildings industry will experience growth from \$719 million in 2020 to reach \$8.9 billion in 2030, at a global compound annual growth rate of 27.7%¹. At the same time, despite AI's inherent benefits, existing challenges restrain market growth and drive down AI adoption. Some of the challenges are: high expenditure, uncertain return on investment, cybersecurity risks, and the lack of infrastructure compatibility and resources.

Customer Impact and Business Impact of Larsen & Toubro

Excelling in the Smart Buildings Industry

Larsen & Toubro (L&T), an India-based engineering conglomerate, earned an excellent reputation by providing industry-leading smart building solutions to the world's largest companies in commercial, industrial, and critical end-user segments. By leveraging its high-performance and transformative smart building technologies, the company outpaces its competitors and maintains an excellent standing among its partners and clients across different industries worldwide.

¹ Frost and Sullivan's *Artificial Intelligence – Impact on Homes & Buildings Industry*, April 2020

Since 2016, L&T's publicly listed subsidiary L&T Technology Services (LTTS) which is a leading global pure-play engineering services company, partnered with several large global companies to advance smart building solutions. For instance, in August 2020, L&T expanded its collaboration with Microsoft to enhance its Intelligent Building Experience Management System (i-BEMS), leveraging advanced IoT analytics and AI/machine learning algorithms to create digital experiences and transform workplace optimization. L&T Technology Services launched its cutting-edge smart building solution, i-BEMS, to transform building premises into smart campuses through facilities' operating expense optimization, experience management, and AI/ML-based predictive fault detection and diagnostics services. Additionally, Microsoft Azure helps LTTS to enable i-BEMS to serve as a facility information broker, incorporating information from disparate building systems, making the building a single entity rather than a heterogeneous system focused on occupant's health, and wellbeing, productivity, and comfort, and overall building performance optimization.

Moreover, in less than a decade, L&T Technology Services has received 137 application patents for its ground breaking solutions, while also co-authoring 365 additional patents with its customers.

Frost & Sullivan recognizes that L&T Technology Services exceeds customers' needs and expectations as many clients value the top-performance and business impact of its solutions and services:

"As a leader in engineering solutions for smart and sustainable campuses, LTTS' Smart Building solutions enable modern workplaces by leveraging cutting-edge Microsoft Azure IoT, Edge & AI technology. Employee safety, energy-efficiency, and sustainability is the need of the hour, and LTTS delivers an integrated, advanced Azure-based Smart Building solution for global enterprises to deploy smart and sustainable campuses."

-Senior Director, Microsoft Corporation

"The Internet of Things is disrupting markets with the emergence of new and innovative business models. Redknee is excited to partner with L&T Technology Services to offer an end-to-end IoT solution to provide connectivity, monetization, and subscriber management solutions that support new and innovative monetization models as part of the IoT revolution."

-Redknee's CEO

"LTTS' expertise spans across a wide range of industries including those with mission-critical applications such as Transportation, Aerospace, and Defense. By working together with leaders such as LTTS, Wind River can help deliver powerful solutions to meet the diverse needs of our shared customers."

-Senior Business Development Manager, Wind River

"This strategic partnership with L&T Technology Services is built on mutual trust, shared visions & values with a win-win approach. L&T Technology Services has worked with us to enhance our global diversification by cross-utilization of key talent and broadening our portfolio of products, solutions, and services."

-CEO, Rockwell Automation

The Cornerstone of LTTS' Success: i-BEMS Platform

L&T Technology Services continuously strives to improve its portfolio by meeting ever-changing customer needs. Its i-BEMS platform helps clients acquire a holistic understanding and management of their building infrastructure, reach substantial facility cost savings, and enhance occupants' experience.

The i-BEMS platform offers the following key features and benefits to its users:

- **Versatility:** The i-BEMS platform is available in four expansive modules (Shield, Facility, Plus, and Max) that cater to customers' specific needs and budgets. i-BEMS Shield, the critical module to mitigate COVID-19 spread in indoor environments, includes several features such as temperature detection, face detection, occupancy management, air quality management, mask detection, social distancing, and contact tracing. The other i-BEMS modules include asset monitoring and optimization of mechanical, electrical, and plumbing systems, building security and monitoring systems, and other advanced applications such as smart cafeteria, smart toilets, digital signage, indoor navigation, and smart parking.
- **Flexibility:** The ability to support versatile mobility and third-party access and support of open-source protocols, such as Modbus/BACnet. i-BEMS' cloud-agnostic design enables users to host it on any cloud platform.
- **Smart Visitor and Lobby System: i-BEMS given enterprises** the ability to ensure swift and smart registration, access, and communication with visitors prior to and after their arrival to building facilities via its visitor management system. As a result, clients not only ensure easy movement of visitors in the building facilities but also secure safety and time efficiency due to expedited visitor processing.
- **Smart Workplace and Meeting Rooms:** Smart workplace enables occupants to identify suitable workplaces of their preference and ability to personalize their workplaces with heating, ventilation, and air conditioning (HVAC) and lighting controls. The smart meeting room empowers occupants to optimize the usage of meeting rooms by monitoring the data on room availability, bookings, occupancy count, lighting, air quality, and many other features. Thus, users utilize space more effectively and achieve substantial energy savings.
- **Smart Parking:** A parking management system that enables tracking and manages slot occupancy and vehicle count, ensuring smooth parking for visitors and employees.

- **Smart Electronic Security:** Around-the-clock digital management of all critical assets via closed-circuit television (CCTV) cameras and video analytics. Thus, customers receive tools to detect any untoward activities on the premises via face detection and recognition, preventing potential theft and financial losses.
- **Substantial Savings and enhancing Overall Experience:** The i-BEMS platform empowers customers to identify actions to minimize costs via monitoring, analyzing, and optimizing building systems while also improving bottom lines by lowering staff burdens and increasing productivity. Furthermore, the platform also enables customers to play a significant role in climate change by lowering carbon emissions from buildings. Specifically, facility managers and employees receive alert notifications on carbon dioxide and other particulates to reduce air-related sickness substantially.

Uniquely Positioned to Support Workforce Re-entry and to Mitigate COVID-19 Spread in Indoor Environments

Today, there is an incremental need to tackle the COVID-19 pandemic and minimize its adverse impact on people worldwide. Many companies in the private and public sectors seek to implement smart building solutions to optimize activities in addressing COVID-19 implications in the workplace. With many companies gradually bringing employees back to work, there is a need for policies and guidelines to ensure high air quality management, thermal screening, contact tracing and social distancing.

L&T is at the forefront of providing such holistic solutions that enable buildings to increase responsiveness and enhance operational efficiency while also minimizing excessive investment and efforts they might require to navigate the challenges posed by the current COVID-19 pandemic effectively.

The company's i-BEMS Shield solution, integrated with thermal and optical video cameras, provides a set of tools that help companies minimize the spread of COVID-19 in workplaces. As more employees return to their workplaces, employers must undertake comprehensive precautionary safety measures against the COVID-19 pandemic. L&T Technology Services is well-positioned to provide versatile smart building solutions that meet and exceed customer expectations across different end-user segments. The company's solutions offer several crucial benefits:

- **Temperature, Face and Mask Detection:** LTTS' temperature detection application comes with an unmanned dual-sensor thermographic and day/night camera to monitor and identify people with a high body temperature. It provides the possibility to monitor numerous people and ensures high accuracy with a maximum deviation of 0.3 degrees Celsius. Thus, it becomes possible to detect people in a crowd and determine if they have a fever or wear a mask. The face detection application involves a facial recognition system with deep learning algorithms that track 200 people simultaneously with a fever for a given length of time. The mask detection application detects people who are not wearing a mask; integration with the access control system denies entry to such people.

- **Social Distancing and Contact Tracing:** The company's social distancing application leverages CCTV cameras and video analytics to enforce six-foot social distancing and notifies authorities if anyone breaks the protocol. The contact tracing application mainly uses video analytics and Bluetooth low energy beacon for contact tracing and communicate to other people through mobile applications.
- **Air Quality and Occupancy Management:** LTTS offers an air quality management solution to monitor various malicious particles, like particulate matter 10, particular matter 2.5, and carbon dioxide for both outdoor and indoor environments. Simultaneously, the occupancy management solution involves IoT-enabled occupancy sensors and camera-based automated tracking of people by areas, zones, and floors within premises to enforce COVID-19 mitigation strategies. This application also enables clients to gain full visibility of real-time occupancy levels within its building facilities.

Best Practice Examples Confirm High-performance and Ultimate Reliability

Frost & Sullivan lauds L&T Technology Services for the high-quality performance and efficiency of its smart building solutions as demonstrated by the following use cases:

Best Practice Example 1: LTTS helped a fortune 50 company with a 620,000 square foot space located in Bangalore, India to optimize its building assets' usage and monitoring. Its i-BEMS' advanced building analytics enabled the client to reduce water and energy usage, improving the overall performance of building systems with the help of sensor information and AI/ML algorithms. The i-BEMS space optimization application also helped improve space usage by improving cubicle utilization rates via the employment of occupancy sensor data to aid employees in locating free cubicles.

Best Practice Example 2: L&T Technology Services aided the world's leading technology conglomerate in Israel to launch the state-of-the-art facility, "Smartest Office Campus in the World," which relies on interconnected intelligent systems based on cutting-edge digital technologies such as IoT, AI/ML, and predictive asset management. Specifically, the client applied LTTS' i-BEMS solution to enable a high level of personalized user and digital experience, air quality monitoring, occupant safety, and predictive diagnostics. The smart office campus offers multiple unique features for occupants and facility managers. It creates engaging user experiences and customized applications to guide occupants across every aspect of their work life, ranging from commuting for work to indoor navigation. The campus also provides smart meeting rooms and smart cafeterias with food menus and dining occupancy. Additionally, it provides digital signage screens with live updates on major activities in buildings, smart parking, and commuting experience with live traffic updates and car pool services, smart gym, hot-desking, smart lobby, and many other applications. As a result, the customer improved productivity by 50% by lowering the time to access facilities and achieved 30% savings in operational expenditures due to the improved efficiency of HVAC, lighting, and other building systems.

Conclusion

L&T Technology Services' Intelligent Building Experience Management System solution is a 360-degree smart building solution that covers all aspects of a building and its occupants, including health and wellbeing, digitalization, and sustainability, which according to Frost & Sullivan's research are three pillars of the smart buildings industry. In spite of economic and technical hurdles that impede many industry participants from increasing market share, LTTTS maintains its stellar reputation for industry-leading smart building solutions across diverse end-user segments worldwide.

The i-BEMS solution, a holistic smart building platform that provides customers with cutting-edge digital tools and applications to ensure comprehensive monitoring, diagnostics, analytics, and optimization of critical building assets is a testament to the company's strong research & development background and its willingness to adapt to changing business environments to meet and exceed customer expectations.

With its unrivaled expertise and know-how, innovation-driven solutions, and customer-centric approach, L&T Technology Services earns Frost & Sullivan's 2020 Global Customer Value Leadership award in the smart building optimization & experience management industry.

Significance of Customer Value Leadership

Ultimately, growth in any organization depends on customers purchasing from a company and then making the decision to return time and again. Satisfying customers is the cornerstone of any successful growth strategy. To achieve this, an organization must be best in class in 3 key areas: understanding demand, nurturing the brand, and differentiating from the competition.



Understanding Customer Value Leadership

Customer Value Leadership is defined and measured by 2 macro-level categories: Customer Impact and Business Impact. These two sides work together to make customers feel valued and confident in their products' quality and performance. This dual satisfaction translates into repeat purchases and a lifetime of customer value.

Key Benchmarking Criteria

For the Customer Value Leadership Award, Frost & Sullivan analysts independently evaluated Customer Impact and Business Impact according to the criteria identified below.

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.

Business Impact

Criterion 1: Financial Performance

Requirement: Overall financial performance is strong in terms of revenue, revenue growth, operating margin, and other key financial metrics.

Criterion 2: Customer Acquisition

Requirement: Customer-facing processes support the efficient and consistent acquisition of new customers, even as it enhances retention of current customers.

Criterion 3: Operational Efficiency

Requirement: Staff is able to perform assigned tasks productively, quickly, and to a high quality standard.

Criterion 4: Growth Potential

Requirements: Customer focus strengthens brand, reinforces customer loyalty, and enhances growth potential.

Criterion 5: Human Capital

Requirement: Company culture is characterized by a strong commitment to quality and customers, which in turn enhances employee morale and retention.

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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 award recognition	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.



About Frost & Sullivan

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>.