

ForwardX Robotics Recognized for

2021

Technology Innovation Leadership

Asia-Pacific AI-powered

Autonomous Mobile Robots Industry

Excellence in Best Practices

ForwardX Robotics

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. ForwardX Robotics excels in many of the criteria in the AI-powered autonomous mobile robots 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

Market Overview

Autonomous robotics technology has been undergoing significant technological growth in recent years. This novel technology is crucial in transforming many key industries like automotive, aerospace, warehouse, and logistics. With the advent of Industry 4.0 and smart factories, industries across the spectrum adopt advanced robotic automation solutions for varied applications according to industry requirements. Autonomous Mobile Robots (AMRs) are pre-programmed to handle and transport materials across the warehouse autonomously. True AMRs rely on maps and utilize sensors for localization and navigation, such as cameras, lasers, light detection and ranging (LiDAR) technology, sonar, and optical. Automatic or semi-autonomous mobile robotic vehicles need supporting infrastructures, such as tracks, magnetic strips, or laser targets for navigation. The AMR solutions, integrated with an array of advanced sensors, can efficiently interpret and map the warehouse environment. The robots can also determine an efficient navigation path to perform material handling tasks optimally. Currently, autonomous robotic solutions are witnessing significant wide-scale adoption. Over the course of just five years (2020-2025), Frost & Sullivan expects the technology development and wide-scale adoption of these novel solutions to foresee a substantial increase across all regions.¹

¹ Opportunities of Autonomous Delivery Robots in Warehouse Management (Frost & Sullivan, March 2020)

Combining Automation and Intelligence for Innovation

Founded in 2016, Beijing-headquartered ForwardX Robotics is a technology-driven company bringing artificial intelligence (AI) capabilities to robotics. The company develops both the brain and the body for automating manual physical tasks, with a particular focus on smart warehousing and smart factory automation. ForwardX Robotics aims to transform its customers' business operations and simplify their journeys by deploying its state-of-the-art automation technology. The company visualizes a world with robots operating as a workforce supplement and aims to create and commercialize products that reshape business-to-business activities from first-mile to last-mile logistics.

In developed countries like Japan, robotics revolution challenges include labor shortage and expense. Catalyzed by the COVID-19 pandemic, the labor shortage transformed the demand for automation into a necessity. ForwardX Robotics assists the industry to cope with the sudden surge in new pressures with its unique AMRs that address industry challenges around labor shortage and expense. Its primary focus is providing automation across different sectors within the logistics and manufacturing industries and supporting them with affordable hardware and software. ForwardX Robotics develops cost-effective solutions that are attractive to small and large-scale operations across Asia-Pacific, North America, South America, and Europe, focusing on replacing high-cost labor with automation. It focuses on adopting more reasonably priced technologies and hardware and resorts to effective software integration.

The company extends sensing and navigation technology to robots and AI, allowing robots to understand the environment more efficiently. Moreover, ForwardX Robotics AMRs integrate with multiple sensors, such as, three-dimensional cameras, LiDAR technology, wheel encoders, and multiple two-dimensional cameras for image processing. The high-end sensors and cameras help robots gauge and navigate optimally around the facilities through simultaneous localization and mapping technology. Frost & Sullivan commends ForwardX Robotics for its commitment to ensuring AMRs' intelligence.

"The company's AMRs efficiently determine an optimized navigational path and perform tasks with high reliability and consistency. ForwardX Robotics proved the foresight of its bet on AMRs by digitally transforming the customer journey using its capabilities and high-end technology. The company's distinctive software systems and comprehensive platform orchestrate the AMRs like the brain operating the body."

- Ruman Ahmed, Best Practices Research Analyst

The company's dedication towards innovation and technological advancements reflects on its automation platform, ForwardX Matrix. The platform automates monotonous physical tasks by merging AMR robot fleets with intelligent fleet infrastructure across warehouses, distribution centers, and manufacturing facilities. Frost & Sullivan notes that ForwardX Matrix is uniquely positioned to serve multiple environments. ForwardX Robotics provides tools that are necessary to build solutions for a multitude of industries ranging from logistics for e-commerce, retail, and wholesale commerce to manufacturing for automotive, electronics, and pharmaceutical production. The company

distinguishes itself by creating a platform that forms the base of various solutions and orchestrates numerous factory tasks. Therefore, ForwardX Matrix gives the company liberty to expand and reach a broader target audience in the supply chain.

Furthermore, the company's ForwardX Cortex technology makes it robust and impactful in the industry. ForwardX Cortex performs as ForwardX Matrix's powerhouse, delivering cutting-edge intelligence and strengthening ForwardX Robotics solutions. It empowers robots to compete with human beings in terms of judgment and awareness of surrounding environments, using intelligence to communicate and collaborate. The technology offers robots the ability to autonomously learn and adapt to the environment, workers, and operations. Frost & Sullivan notes that ForwardX Cortex enhances the robots' performances by capturing information, analyzing the surroundings, and devising the ideal strategy.

Best-in-class Solutions under One Umbrella

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**- Doraiswamy Bharath Sunderraj,
Industry Analyst Tech Vision**

As organizations embrace new technologies and procedures, AI and automation optimize robotic operations and drive profitability. ForwardX Robotics offers comprehensive AMR solutions such as ForwardX Flex and Max, and on the software front, it provides f(x) Fleet Manager. The company caters to customers' hardware and software requirements. The software platform, f(x) Fleet Manager, provides a 360-degree view of environments, facilitating control and supervision. It authorizes customers to manage tasks through a single pane of glass and captures

meaningful insights for improving performance. The manager unifies all operations, from enterprise resource planning and warehouse management systems to manufacturing execution systems, for effective synergy with connected devices. ForwardX Robotics impresses Frost & Sullivan with its software system operating as a brain orchestrating the body and the AMRs forming the solution's body and limbs.

The AI-powered AMR industry faces the hurdle of payload limitations as most AMR solutions cannot handle heavy-duty payloads of materials. ForwardX Robotics addresses the challenge with its unique portfolio of solutions capable of handling labor-intensive long-haul tasks. The Flex AMRs support picking operations in logistics facilities and enable order fulfillment activities. The company uses its software to perform tedious tasks such as moving, lifting, or packing across various amenities. The Flex series has a feasible display touchpad and comes embedded with LiDAR and odometers that enhance proficiency by selecting suitable movement paths and avoiding obstacles. A feature that stands out is compatibility; the Flex series is compatible with mobile devices, tablets, and wearables. Moreover, the series also has unique attributes like radio-frequency identification scanning and automated wireless charging, limiting human intervention.

ForwardX Robotics makes advancements in its AMRs to accommodate higher payloads for pallet movements with its ForwardX Max. With the Max series, the company dramatically eliminates the need

for personnel to walk long distances, pick up heavy loads that range between 300 kilograms (kg) to 1,200 kg, and further reduces on-site accidents. The Max series is compatible with forklifts, pallet trucks, conveyors, and the Internet of Things devices to enhance material handling. The ForwardX Max range's built-in lift functionality autonomously picks up and drops off heavy loads at desired destinations. Besides, the company launched the Apex range exclusively within the Chinese market to replace forklifts and pallet trucks, making loading and unloading easier and faster. The range has the flexibility to lift loads up to two meters high and weights of 1,000-1,500 kg.

As new technologies emerge daily, ForwardX Robotics actively focuses on product development. The company plans twelve to eighteen months ahead to make advancements. ForwardX Robotics believes the key to success is thinking big and being agile. It experienced success in the Chinese market with a quick-moving product development stage, time to market, and testing phase. With its commitment to innovate and create, ForwardX Robotics is rolling out a new product that caters to the automotive manufacturing industry and electric vehicles. The company is working on supplemental technologies that complement AMRs, further enhancing the overall functionality.

ForwardX Robotics stands out among its competitors with strong pillars built through the deep expertise of talented and eminent individuals. The company has a well-accomplished team of distinguished experts to decipher AMRs' true potential. The company's culture derives from these individuals' expertise, reflecting in its top-notch technology and solutions. The unrivaled and extensive domain knowledge to meet specific customer needs sets the company apart from other industry participants. ForwardX Robotics' existence stems from its core goal of changing the material handling world by skillfully leveraging technology.

Growth Opportunities

In the Asia-Pacific (APAC) region, countries like China have a strong position in technology development and warehouse automation solutions adoption. The issue that customers face is around having twenty to thirty different products from various providers for warehouses. ForwardX Robotics behaves as a one-stop shop provider that caters to warehouse requirements with its customizable AMRs. Since markets like China are more inclined towards pricing, the company's ability to meet the customer needs while catering to price sensitivity and ensuring applicability provides a distinctive edge for ForwardX Robotics. It delivers higher levels of quality, technology, and safety at affordable cost structures.

The company focuses on addressing customer pain points by paying attention to details around performance, efficiency, and flexibility, ensuring accelerated workloads, increased productivity, and simplified administration. ForwardX Robotics impresses Frost & Sullivan with its continuous efforts to intensify the quality of services, systems, and solutions. The company has an unwavering attitude that ensures its quality and performance remain uncompromised with competitive pricing. As a result, ForwardX Robotics has received the International Organization for Standardization 9001 certification for aligning its portfolio with industry standards. The company unlocks new capabilities and seizes opportunities with agility, caliber, and execution.

ForwardX Robotics has successfully deployed over 1,000 robots in the field and experienced a 50% year-on-year growth for the last two years, with the bulk of its revenue coming from the APAC region and a

fast-growing percentage of its revenue coming from new overseas markets, such as the U.S. and Japan. It heavily invests in AI for its AMRs to help customers unravel the new wave of automation with its solutions. The company recently closed Series B funding of around \$63 million, raising nearly \$74 million in venture capital. The funding will help elevate the company's growth to meet the evolving customer demands and ever-changing industry requirements.²

Delivering Superior Customer Experiences

ForwardX Robotics strengthens the customer journey by enhancing the overall experience with its diverse portfolio offerings and reach. The company has a presence across APAC with an extensive customer base across warehousing and manufacturing for retail, e-commerce, healthcare and pharmaceuticals, grocery, electronics, and automotive spaces. The company employs a customer-focused approach to proactively develop differentiated offerings to address the unique demands of its customer base.

Case Studies Showcasing Relentless Pursuit to Meet Customer Requirements

- A leading supply chain company in China with insignificant automation levels used the conventional method of manual picking and sorting. The company experienced problems around inefficiency accelerated by human error. The facility required digital transformation to cut down expensive labor costs. ForwardX Robotics, using its Flex AMRs, increased efficiency and accuracy, significantly reducing long-distance walking. The company deployed these solutions with no additional expense for infrastructure.
- A notable Chinese electronics company required automation for material handling and reducing exhaustive tasks utilizing the workforce. ForwardX Robotics deployed its Max series to handle materials autonomously. The company maximized its AMR capabilities with the availability of fifth-generation technology. The AMRs and wireless technology are engineered together for running high-volume material operations and allow flexible path changes in just a few clicks.

With its innovative solutions and advanced technology, ForwardX Robotics works persistently to achieve a high degree of customer satisfaction. The company implements unique business models by making rapid developments in AMRs. Frost & Sullivan observes that the company's AMRs efficiently determine an optimized navigational path and perform tasks with high reliability and consistency. As these robot fleets can work round the clock, process output remains uninterrupted, leading to exceptional productivity and high-quality standards.

ForwardX Robotics invests in outbound and inbound marketing by innovating its strategies and creating a growth engine. In the past year, the company has acquired and retained customers threefold. The extensive sales network strengthens its outbound relationship by dynamically piquing customer interest in its products. For regions without a local footprint, the company relies on partnerships to attract customers. As most of the current customers are multinational corporations, ForwardX Robotics uses its networking strategy to traverse geographies and reach out to customers in diverse geographic locations.

² <https://www.forwardx.com/forwardx-robotics-closes-series-b-with-a-total-of-63m-in-funding/>

Conclusion

Industries across the spectrum are increasingly adopting advanced autonomous robotic solutions for varied applications. Yet, challenges such as payload limitations, implementation, and maintenance costs hinder the autonomous mobile robots (AMRs) industry.³

ForwardX Robotics is a leading AMR provider offering robot fleets at a lower cost than traditional capital expenditure and can proactively handle heavy-duty payloads. The company's AMRs efficiently determine an optimized navigational path and perform tasks with high reliability and consistency. ForwardX Robotics proved the foresight of its bet on AMRs by digitally transforming the customer journey using its capabilities and high-end technology. The company's distinctive software systems and comprehensive platform orchestrate the AMRs like the brain operating the body. The company has a well-accomplished team of distinguished experts to decipher the true potential of AMRs. The team develops a range of comprehensive solutions that enhances process workflows, significantly reducing labor-intensive tasks. With its advanced autonomous hardware and software solutions, the overall accidents related to material handling equipment have decreased along with the need for personnel to walk long distances.

For its robust platform, unique solutions, and extensive expertise, ForwardX Robotics earns Frost & Sullivan's 2021 Asia-Pacific Technology Innovation Leadership Award in the AI-powered autonomous mobile robots industry.

³ *Opportunities of Autonomous Delivery Robots in Warehouse Management* (Frost & Sullivan, March 2020).

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

