THE IMPACT OF ROBOTS IN RETAIL INDUSTRY

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Introduction

Robotics is quickly becoming an integral part of the retail industry. The technology has already set its foot across several processes in the retail supply chain, ranging from back-office operations, sales and marketing, and front-end operations to customer interaction experiences. Robots are enabling retailers to remain efficient in meeting the growing demands of customers in today's digital age.

Research shows that the retail robotics market was valued at USD 4.78 billion in 2018 and is expected to grow by 31.89% from 2019 to 2026 and reach USD 41.67 billion by 2026. A recent survey also reveals that the pandemic has further pushed the use of robots in retail environments. 47% of the surveyed retailers plan to have an in-store robotic automation project over the next 18 months.

With robots becoming increasingly prevalent in the retail sector, this whitepaper explores the potential impact these intelligent machines are bringing in the industry by handling different operations more efficiently.

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Retail Robotics
Market Valued

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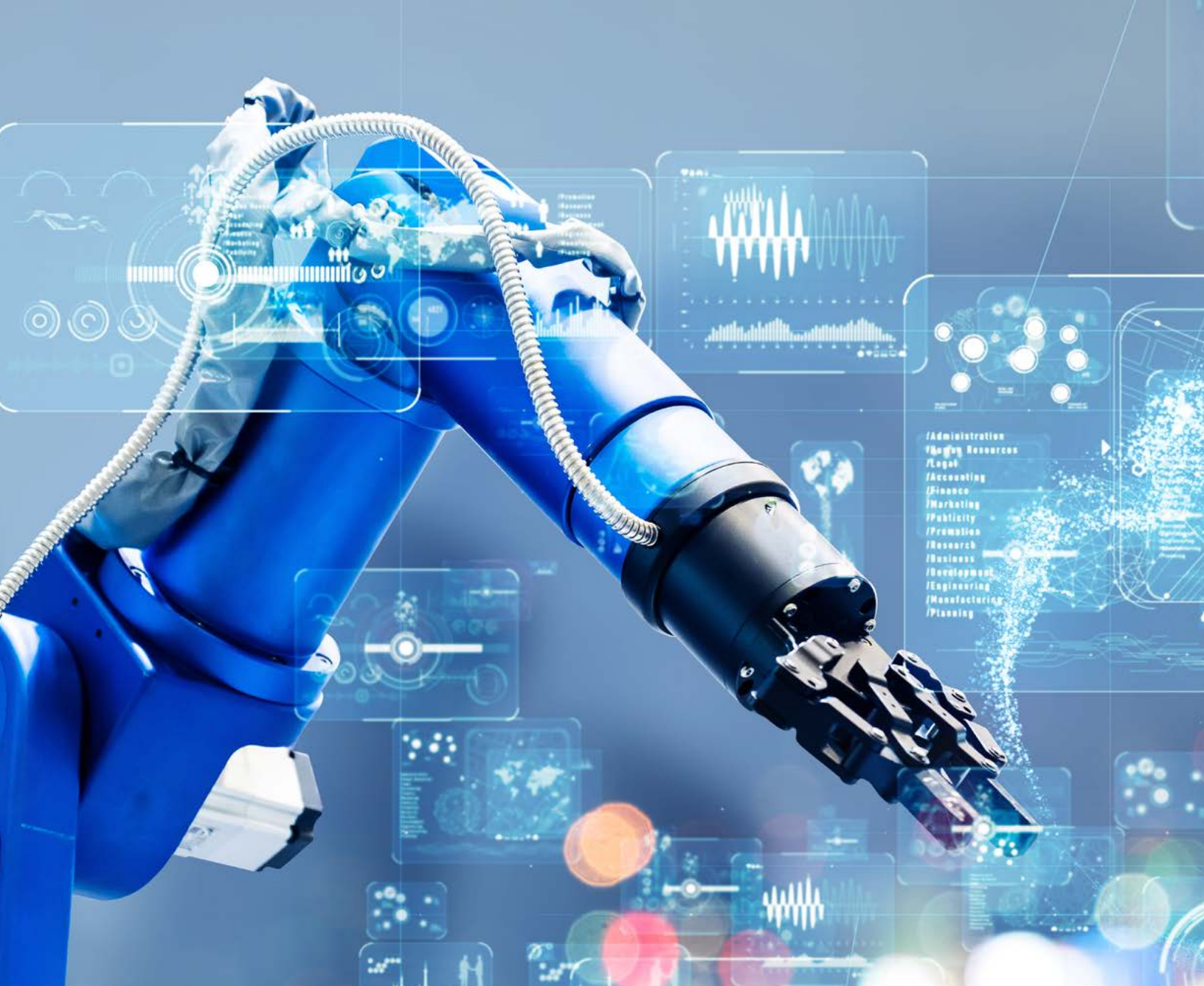
Robots Across the Retail Value Chain

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From logistics, supply chain, and store operations to merchandising and customer-facing experiences, here's how robots are enabling retailers to improve their efficiency and boost their bottom line.

Robots in Warehouses

Robots are playing a game-changing role in the areas of retail operations. For example, they're increasingly becoming a fundamental aspect of retail warehouses to fulfill offline and online product deliveries efficiently. Popularly known as Autonomous Mobile Robots (AMRs), these robots use sensor technology, computers, and maps to deliver inventory around the warehouse premises while avoiding obstacles in their environment.

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AMRs are useful for a range of warehouse functions such as sorting, inventory tracking, and even transporting goods. These day-to-day warehouse tasks are often monotonous in nature and may likely induce errors when handled manually. Robots can perform these operations with better accuracy and efficiency, enabling workers to take on other creative or collaborative roles.

Warehouses today also employ computer-controlled automated storage and retrieval systems, also known as AS/RS systems. These systems enable faster retrieval and placement of products using warehouse execution software. For example, in an AMR-based AS/RS, the AMR robot can travel vertically up the storage rack to place or retrieve the required inventory, navigate down the shelf, and traverse to the designated order picking station.

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In addition to these robots, warehouses can also benefit from collaborative robots, or cobots, which are semi-autonomous and designed to help human workers in performing diverse tasks. For example, some cobots can act as mobile storage bins following human pickers to collect all the picked orders. Others can assist humans in transporting loads with less effort. These robots employ sensors to detect obstacles and navigate accurately through the facility.

Major retailers are already employing many of these robots to enhance the efficiency of their warehouse operations. For example, in 2014, the online retail giant Amazon claimed that their operational cost at each warehouse slashed to 20% after bringing in the robotics technology. Similarly, Walmart recently announced that it would deploy a fleet of fully autonomous robots across 25 of its distribution centers over the next few years to improve efficiency and warehouse capacity.

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Robots for Delivery

As more consumers expect same-day delivery of their ordered products, retailers are finding the solution to this challenge in robots. Delivery is one of the most sensible applications for robots. Robots and related automation technology can optimize and expedite product delivery through automation.

Scout, the delivery robot from Amazon, can identify and navigate obstacles, including pedestrians, to deliver the package to the customer's doorstep.

In the present context, many grocery chains used delivery robots during the COVID-19 pandemic to adapt the delivery process to the necessary standard of safety, low-cost delivery, and contact-less delivery. These automatic delivery robots perceive their surroundings through sensors to carry delivery operations with relative ease. Some of these robots are guided by a remote operator, while others follow programmed or transmitted coordinates.

Although there has been a significant amount of research in automating the last mile using robots, there are a few challenges along the way. For instance, delivery robots need to make their way through sidewalks, roads, pedestrians, and possible obstructions to deliver the assigned package and return to the station safely. On the other hand, drone delivery mandates adherence to the restrictions imposed by aviation and defense bodies in different countries.

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However, new developments in robotics and sensor technology enable retail businesses to overcome these challenges and develop robust mobile robots that work in outdoor environments more efficiently. For instance, Amazon rolled out its robot delivery trial to several cities in the US last year and is planning to expand this autonomous delivery service to more cities across the country. Scout, the delivery robot from Amazon, can identify and navigate obstacles, including pedestrians, to deliver the package to the customer's doorstep. This autonomous service helped the e-commerce giant meet increasing customer demand during the pandemic.

Robots as Shopping Assistants

The shop assistant robots can identify and greet customers and improve the customer's shopping experience in several ways. For example, they can responsively guide or direct the customer towards a product or section they choose to look for. These shopping companions even carry grocery bags and follow these customers around while providing them data-driven product preferences. Some shopping assistant robots can also recognize the customer and even recommend products according to their age, demographics, and buying behavior. For example, it can effectively eliminate the unintentional sale of liquor to minors by smart identification. Alternately, this capability can help in offering personalized buying experiences to repeat customers.

Apart from scanners and a voice control system, the robots need sensors to do their job. For example, assistant robots use sensors to map the environment first and optimally navigate their way through the store to the correct aisle. Secondary applications of these assistant robots are in the automatic scanning of barcodes, identification of products, and also complementing inventory management through systematic logging.

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One of the exciting innovations happening in the customer-facing side of retail operations is the development of robot sensors capable of recognizing human expressions and associating them with specific individuals. This capability allows robots to track and analyze shoppers' emotions and engagement levels and uses this data as feedback to take corrective actions.

In addition to offering assistance to shoppers, robots are also tackling other in-store operations effectively. For instance, using sensors along with 2D and 3D depth cameras, robots can scan the shelves of a store and keep track of inventory levels. In addition, robotics technology can also help turn a retail store cashier-less by allowing automated check-out points at different spots within the store.

These shopping companions even carry grocery bags and follow these customers around while providing them data-driven product preferences.

In 2016, Lowes was the first to introduce one such in-store robot assistant called the LoweBot to help shoppers navigate the store effectively while also helping employees with real-time inventory monitoring. Several major retail brands are also experimenting with in-store marketing robots to increase the chances of stopping customers from walking by the shelf and interact with the advertised product. Tokinomo is one such solution enabling FMCG brands to create unique shopping experiences in supermarkets and increase sales.

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Role of Sensors in Robotics

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Robots get the capability to sense their surrounding environment through sensor technology. Sensors such as LiDAR, proximity, temperature, light, sound, and pressure enable these machines to become intelligent and efficiently perform the tasks they're programmed for.

Most mobile robots programmed for moving in a given environment utilize LiDAR (Light Detection and Ranging) sensor, offering them the navigation capability. These sensors help robots avoid obstacles in their path and enable them to operate autonomously and safely, with no human intervention. In addition to LiDAR, delivery robots also rely on GPS for navigation and 3D depth cameras to identify the position and orientation of the objects.

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Sophisticated sensor technologies are a core requirement to build robots that accurately and precisely handle retail operations tasks in any given environment.

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It is evident that for these robots to function effectively, these sensors must provide accurate information to the robot's controller, no matter the environmental conditions they're operating in. In addition, most environments also demand variable sensing range and resolution. Therefore, sophisticated sensor technologies are a core requirement to build robots that accurately and precisely handle retail operations tasks in any given environment

Build Your Next Retail Robot with Sensors from Hokuyo

From handling repetitive tasks efficiently and helping businesses understand their customers better through data to offering personalized customer experiences, robots significantly impact the retail industry. As customer demands continue to grow with digital consumers preferring better and personalized experiences, the retail sector will continue relying on robotics technology to automate and innovate across the entire value chain. The technology, in turn, will depend on sensors to ensure accuracy, reliability, and safety. The sensor system you choose for your specific autonomous application will determine the desired functionality of your robots.

Hokuyo's line of sensors for autonomous mobility applications infuses precision in the functioning of your mobile retail robots. Designed to operate in all weather conditions with low-power consumption, our sensors are ideal for different indoor and outdoor retail operations.

Integrate autonomy in retail operations with robots and enhance productivity and profitability.

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Contact us to learn how Hokuyo-USA sensors can help you build the next robot for your specific retail application.

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