Market Guide for Smart Robots in Retail

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Initiatives: Retail Digital Transformation and Innovation

> Retailers are scaling up smart robots to support flexibility and labor optimization in physical stores for unified commerce execution. CIOs can use this research to understand the direction of the smart robot market and guide the business on these technology investments.

Additional Perspectives

- Summary Translation: Market Guide for Smart Robots in Retail
  (19 July 2021)

Overview

Key Findings

- The critical need to optimize costs, due to labor shortages and minimum wage increases, is driving continued retailer interest and investment in smart robots throughout 2021.

- Frontline associate engagement and retention are top priorities for retailers, making a smart robot's ability to efficiently perform repetitive operational tasks a fundamental requirement in digital workplace environments.

- Smart robots enable real-time data capture and analysis essential for unified commerce execution. However, the data must also be connected to store and back-office systems to realize full potential.

Recommendations

CIOs focused on retail digital transformation and innovation should:

- Bring forward technology investment in smart robot technology for cost optimization, as well as to augment or release human resources for revenue-generating activities.

- Create a smart robot implementation value and feasibility scorecard, including human-machine hybrids to identify and prioritize the suggested use cases.

- Collaborate with store operations leadership to ensure that smart robots communicate and integrate with existing store and back-office applications.

Strategic Planning Assumptions

- By 2024, Tier 1 retailers in North America and Europe will have reduced inventory carrying costs by 30% to fund ongoing digital transformation.

- By 2024, augmented in-store associates in at least 10 Tier 1 retailers will execute inventory audits to support automated precision merchandising at the edge.

- By 2025, at least two of the top 10 global retailers will establish robot resource organizations to manage nonhuman workers.

Market Definition

This document was republished on 29 June 2021. The document you are viewing is the corrected version. For more information, see the Corrections page on gartner.com.

Gartner defines smart robots as electromechanical form factors that work autonomously in the physical world. Smart robots learn in short-term intervals from human-supervised training and demonstrations, or by their supervised experiences on the job. They sense environmental conditions and recognize and solve problems. Some can interact with humans using voice language, while some have specialized mobile functions used in warehouses and for delivery. Due to advanced sensory and intelligence capabilities, some smart robots may work alongside humans.

Market Description

In retail, smart robots currently perform a handful of discrete, repetitive tasks. Within stores and warehouses, including fulfillment, microfulfillment and dark stores, smart robots offer one or more of the following functionalities (see Table 1).

Table 1: Smart Robot Task Functionality

(Enlarged table in Appendix)

In-Store Robot Functionality	Warehouse/Fulfillment Robot Functionality
Promotion compliance	Replenishment
Price checks	Picking
Inventory audit	Materials and handling
Low and/or no stock detection	Goods transport
Directive action	Analytics
Notifications	Workflow optimization
Analytics	Directive action
Cleaning	Wayfinding
Picking	Delivery
Greeting	UV sanitization
Wayfinding	
Q&A	
UV sanitization	
In-store mapping	

Source: Gartner (June 2021)

Market Direction

At the time of this research, most of the vendors in the smart robots market focus on one or a small number of use cases, such as one type of smart robot is usually not "multiskilled" and is usually set up to focus on a particular task. For example, smart robots that perform full inventory or price audits typically do not also clean.

However, since COVID-19, there have been instances of dual-purpose robots beginning to show up in the market. For example, vendors of shelf-scanning robots have added UV sanitization lights to disinfect shelves during the audit process. In another example, Sam's Club is piloting a data-scanning accessory, integrated into existing robotic floor scrubbers, in order to conduct both auditing and cleaning work simultaneously.

Front-end, customer-facing smart robots may include conversational and facial recognition capabilities for greeting, wayfinding and limited multilingual Q&A. Examples include SoftBank's Pepper in German supermarket EDEKA, which is also helping to regulate check-out throughput. Examples of robots performing a combination of operational as well as customer-facing functionalities are those having the capability to provide delivery of packages (fulfillment operation) to homes or businesses (direct to the customer), such as Starship's delivery robot.

Smart robots can be added incrementally and deliver significant value, without large-scale deployment or disruption. A single robot can deliver a significant return on investment; therefore, investments can be incremental over several years. For example, a smart robot is also a more cost-effective option, at least for the time being, for inventory audit when compared to other Internet of Things (IoT) solutions, such as smart shelves that often require significant hardware investment upfront. As the cost of robotic systems diminishes, following investment and development, the barrier to adoption will also diminish.

Over the next year or so, we expect pilots and implementations of smart robots in physical stores and warehouse environments to persist. As a result, they will continue to garner significant attention and interest from both retailers and consumers alike.

Market Analysis

Retail Use Cases by Segment and/or Category

Table 2 lists examples of retailers of both consumables and nonconsumables using smart robots.

Table 2: Smart Robot Use Cases

(Enlarged table in Appendix)

Year	Segment/Category	Geography	Retailer	Use Case/Task	Vendor Name
2019	Apparel	U.S.	Gap	Picking	Kindred
2019	Apparel/Sporting Goods	U.S.	Decathlon	In-store inventory tracking and monitoring	Simbe
2020	Grocery	U.S.	Save Mart	Autonomous delivery	Starship
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2021	Grocery	U.S.	Kroger	Microfulfillment, picking, packing	Ocado Group
2021	Grocery	U.S.	Woodman's Markets	In-store inventory tracking and monitoring, price checks	Badger Technologies
2021	Grocery	U.S.	H Mart	In-store inventory tracking and monitoring	AutoStore
2021	Fashion/Apparel	UAE	Landmark Group	Picking, packing fulfillment	Dematic
2021	Grocery	UAE	Carrefour	In-store Inventory tracking and monitoring, price check, planogram compliance	Simbe

Note: All use cases in the table are sourced below.

Source: Gartner (June 2021)

Smart Robot Use Cases (Detail):

1. The Gap uses artificial intelligence (AI) picking technology from Kindred in distribution centers. The robotic system leverages vision, grasping and manipulation algorithms to pick and sort merchandise, as well as continuously learn. Its system analyzes millions of data points and determines the optimal pick strategy for each task in real time (Gap Inc. Speeds Up Warehouse Operations With Robotics, AI).

2. In fall of 2019, Decathlon's San Francisco store launched Tally, an autonomous shelf-scanning robot from Simbe. Tally is used to manage inventory and track product flow (Simbe Robotics Brings 'Tally' to Streamline Decathlon's Store Experience).

3. Save Mart launched on-demand, autonomous grocery delivery service to customers of the Modesto, California, flagship store. The robots from Starship can carry up to 20 pounds of groceries each (about three shopping bags) and can travel up to four miles round trip. This method of delivery allows for a safe, low-cost and touchless option, providing the ability to order items via the Starship app platform for on-demand delivery to the home (Save Mart Launches Robotic On-Demand Grocery Delivery).

4. Broad Branch Market has introduced four neighborhood-roving robots from Starship. These robots can bring groceries, prepared food and other supplies to residents in the Washington, D.C. metropolitan area. The six-wheeled vehicles, which are about the size of large Igloo coolers, are packed at the store and then travel down sidewalks to their destination, where purchases can be retrieved (Delivery Robots Come to D.C.'s Broad Branch Market).

5. CVS Pharmacy is testing the delivery of prescriptions using self-driving vehicles as part of a pilot program in Houston. The healthcare company partnered with Nuro, which has been developing autonomous driving technology for the initiative. Deliveries will be free to customers for orders through CVS.com or the CVS Pharmacy app, and are expected to be fulfilled in three hours or less, according to Nuro. Customers will have to verify their identity to unlock the vehicle (CVS Pharmacy, Nuro Partner on Driverless Vehicle Prescription Delivery).

6. Amazon is nearing completion on its first robotic and largest fulfillment center in Australia. The 200,000 square-meter facility in western Sydney will be able to store up to 11 million items. The use of AI means the ability to store 50% more items per square meter, resulting in a greater product selection and potentially faster shipping times for customers (Amazon's Mammoth Sydney Robotics Warehouse Nears Completion).

7. Schnucks has found that, amid COVID-19 pandemic-induced demand surges and labor shortages, Simbe's Tally robot shelf audit capability has proven critical. By providing real-time data to retailers, enabling store associates to keep sought-after items on shelves and support customers, Tally played a key role in maintaining on-shelf availability (OSA) and adding efficiency to in-store teams (The Future of Grocery).

8. German supermarket chain EDEKA has introduced a robot named Pepper to its Ahrensburg branch. Pepper is there to provide advice to customers on the protection and prevention of the coronavirus and helps to regulate the check-out process. Developed by SoftBank Robotics and ENTRANCE Robotics, Pepper is there to help customers understand behavioral recommendations and implement preventive measures, through intuitive and unproblematic conversations. The robot uses clear, unambiguous language, as the company has designed it specifically for human communication (A Robot Deployed to Combat Spread of Coronavirus in Supermarkets).

9. Walmart plans to add automated microfulfillment centers (MFCs) to dozens of store locations, according to a company blog post. It will test a variety of configurations across multiple tech providers, including Alert Innovation, Dematic and Fabric. Some local fulfillment centers will be located within existing store spaces, while others will be added on to buildings (Walmart Will Add Automated Microfulfillment to Dozens of Stores).

10. Online grocery retailer FreshDirect partnered with Fabric to build out a 10,000 square-foot, automated, robotic grocery e-commerce facility in the Washington, D.C. metropolitan area. It can process 500 to 1,000 orders per day and each order takes just minutes to fulfill, enabling FreshDirect to have a two-hour delivery window for customers (FreshDirect Expanding Service in D.C. Area).

11. Kroger and Ocado Group announced the continued expansion of their existing partnership, with plans to construct new high-tech customer fulfillment centers (CFCs) across the U.S. Kroger has partnered with Ocado to help accelerate its ability to provide customers with anything, anytime, anywhere. The first CFC location, incorporating state-of-the-art automation and AI, is now operational in Monroe, Ohio, as of April 2021 (Kroger Debuts First Ocado Automated Fulfillment Center).

12. Woodman's Markets uses autonomous robots equipped with Badger Retail InSight to address out-of-stocks, price integrity and planogram compliance issues. Shelf scans are now completed in hours, with 95% accuracy in detecting out of stocks (Badger Technologies Case Study).

13. H Mart, an Asian-American specialty grocer, has partnered with AutoStore, a Norwegian robotics technology company, to introduce a fully automated MFC to support H Mart's online grocery operations in Carlstadt, New Jersey. AutoStore robotics and warehouse management system (WMS) technologies combine to provide retailers with a complete MFC solution, increasing fulfillment efficiency for a broad range of grocery packaged goods, along with fresh and frozen items (H Mart Partners With AutoStore to Deploy Automated Microfulfillment Centers).

14. In January 2021, Landmark Group and Dematic completed a new automated distribution center that is capable of allowing 15,000 totes per hour to be transported to the picking stations. The system can also accommodate up to 2 million garments and can achieve high throughput rates of up to 250,000 items per day. The overall solution has more than 200 workstations with specific applications, including value-added services, such as customizing goods for specific retailers by adding tags, branding or promotional offers (Dematic Automates Landmark Group's Premier Distribution Center).

15. A year after introducing Simbe's autonomous inventory robot Tally to its Dubai's Mall of Emirates store, Majid Al Futtaim, owner and operator of Carrefour in the UAE, announced it is launching the technology in an additional 11 stores to ensure items are on shelves, inform better restocking and replenishment systems, and support its growing online grocery business (Majid Al Futtaim Retail Expands Tally Robot Deployment to a Dozen Carrefour Stores in the UAE).

To prioritize smart robot use cases:

■ Create a multidisciplinary team, including store operations and store associates, to assess key processes in order to evaluate the most suitable use cases for smart robots.

- Create a smart robot pilot and accompanying implementation value scorecards to assess and prioritize the suggested use cases. Parameters for the scorecard should include:

  - The feasibility of use for varying types of smart robots depending upon retail segment, customer strategy, store size and footprint.

  - The extent to which tasks in the major operational and customer-facing processes are repetitive, based on rules and volume-driven, as well as the extent to which they will need human judgment or intervention.

  - The benefits of automation of the process, or portions of the process, with smart robots in terms of efficiency gains and better throughput.

  - The costs to deliver a well-balanced, human-smart-robot, labor portfolio for the identified use cases.

  - The operational impact on the human workforce currently deployed on those tasks.

Representative Vendors

The vendors listed in this Market Guide do not imply an exhaustive list. This section is intended to provide more understanding of the market and its offerings.

Market Introduction

This Market Guide provides an overview of representative vendors in the market (see Table 3). All vendors listed here, at a minimum, provide at least one or more of the functionalities outlined in Table 1. At the time of this research, smart robot vendors offer varying levels of AI capability within discrete functionality areas.

Table 3: Representative Vendors in Smart Robots in Retail

(Enlarged table in Appendix)

Vendor	Product, Service or Solution Name
6 River Systems	Chuck: pick, pack and replenishment
Addverb	Zippy: SKU-level sortation; Dynamo: materials movement; Cruiser: vertical space utilization "first in, first out" (FIFO) and/or "last in, first out" (LIFO); Decimator: indoor disinfection; Quadron: picking and order fulfillment
Aethon	TUG: indoor materials transport
Alert Innovation	Alphabot: automated storage and retrieval system (ASRS) and automated each-picking system (AEPS) for microfulfillment
Amazon Robotics	Kiva: fulfillment; Scout: autonomous delivery
AutoStore	Microfulfillment
Badger Technologies	Inspect: hazard detection; Insight: out of stocks, price check, planogram compliance; Inform: combines inspect and insight solutions
BALYO	Sherpa-B: order prep and picking assist
Bossa Nova	Bossa Nova 2020: out of stocks, planogram and price compliance, promo execution
Boston Dynamics	Stretch: warehouse case handling; Pick: warehouse depalletizing
Brain Corp	Auto-C: autonomous cleaning; Autonomous Delivery Tug: indoor materials transport; Autonomous Shelf Scanning; BrainOS Platform
Dematic	Microfulfillment, returns, sorting (pouch)
Fabric (formerly CommonSense Robotics)	Microfulfillment
Fellow	Autonomous navigation and mapping
Fetch Robotics	HMI Shelf, Cart Connect 100 and Roller Top: materials transport; TagSurveyor: inventory data collection; Fetch Cloud Robotics Platform: for AMRs
GreyOrange	GreyMatter Fulfillment Operating System (FOS), Ranger GTP and Ranger IL: goods and/or materials transport; Ranger Move Smart: convey and sort packages and inventory; Ranger Pick: picking assistant
JD Logistics	Smart delivery station, autonomous delivery robots
Kindred	SORT: picking, sorting; AutoGrasp: vision, grasp, manipulation
Locus Robotics	LocusBot: picking, returns, materials transport
Mobile Industrial Robots (MiR)	MiR 100-1000: materials transport
Ocado Group	Ocado Smart Platform: picking, packing, microfulfillment
OTTO	OTTO Material Handling Platform, OTTO Self-Driving Vehicles and OTTO Fleet Manager: materials transport
Robomart	Mobile Mini Mart: autonomous delivery
Seegrid	Seegrid AGV: picking, packing and returns put-away
Simbe	Tally: pricing and promotion execution, planogram compliance, inventory tracking, out-of-stock management
SoftBank Robotics	Pepper: customer interactions and/or greetings, emotion detection, natural language processing
Solteq	Solteq Retail Robot: shelf audit, planogram compliance, indoor modeling, data accuracy checks
Starship	Self-Driving Delivery Robot: autonomous delivery
Takeoff	Takeoff eGrocery solution: microfulfillment
Tompkins Robotics	tSort: materials transport and sorting
Vecna Robotics	Automated Materials Handling Solution: materials handling and transport; Hybrid Fulfillment Solution: picking
Waypoint Robotics	Vector and MAV3K: materials transport
Zebra	SmartSight: pricing and promotion execution, planogram compliance, inventory tracking, out-of-stock management

Source: Gartner (June 2021)

Market Recommendations

- Reprioritize your capital expenditure to bring forward technology investment in smart robot technology for cost optimization, as well as to augment or release human resources for revenue-generating activities.

- Prioritize productivity and labor needs for the business to shortlist the vendor offerings. This research provides a number of use cases as well as potential suitable vendors.

- Create a multidisciplinary team that includes store associates to assess key processes, identifying the most suitable use cases for smart robots.

- Create a smart robot implementation value scorecard to assess and prioritize the suggested use cases.

Note 1:
Representative Vendor Selection

The thirty-three vendors listed in this guide were selected to represent the two types of smart robot solutions currently applicable to the retail market — in-store robotics, and warehouse and/or fulfillment robotics. Each vendor listed in the guide provides at least one of the task functionalities listed in Table 1.

Document Revision History

Market Guide for Smart Robots in Retail - 4 May 2020

Recommended by the Author

Some documents may not be available as part of your current Gartner subscription.

Top Trends in the Retail Frontline Digital Workplace for the 2020s

Infographic: Artificial Intelligence Use-Case Prism for Retail

Use Digital Business Key Performance Indicators to Gain Control of Retail Transformation

5 Best Practices to Attract and Retain Excellent Retail Store Associates

Market Guide for Retail Store Inventory Management Applications

Emerging Technologies: Smart Robots Will Augment Human Workers, Not Replace Them

Take a Human-Centric Approach to Empower the Workforce With AI

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