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Retail Robots: The Next Frontier

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How semi- to fully autonomous robots will continue to change retail.



Robots have been around for many years.¹ In fact, General Motors introduced industrial robots into production lines as far back as 1961.² These early robots were focused on simple repetitive manufacturing tasks. More recently, advancements in technology have led to autonomous mobile manipulation platforms, including those with the ability to pick and sort, such as the more than 100,000 robots deployed by Amazon in its warehouses.³

Yet, robotic introduction into retail stores has seriously lagged behind that of manufacturing and other industries. This point can be exemplified by a review of the WR Service Robots 2017 report,⁴ which notes that the number of professional services robots sold globally in 2016 rose by 24 percent in applications from agriculture to window cleaning. Retail is not even listed as an application. The good news is that innovations in cognitive computing, which enables robots to function autonomously within complex environments, are now leading to the introduction of various robots into the front of the store.

In this article, we highlight various front-of-the-house robots currently being deployed. We also discuss what we believe is the most consequential application for retailers in the near term. Finally, we outline one emerging application that retail executives should be tracking, because it will soon be coming to a store near you.

CURRENT DEPLOYMENTS

Retail robots currently being introduced generally have functionality including providing shopper assistance and assistance in merchandising. Shopper assistance services can include greeting and guiding customers to a product's location, providing information, and/or the distribution of flyers, coupons, or food samples.⁵ Merchandising operations include robots

auditing items on store shelves to determine needs for restocking, misplaced items, etc.

Examples include:

- SoftBank Robotics' Pepper: a customer-facing robot focused on engagement, providing product and promotional information, the collection of customer information, and attracting customers to a store. Pepper has been piloted at various U.S. retailers, and the company claims over 10,000 are in place globally, including at Pizza Hut in Singapore.
- Fellow Robots' Navii: another customer-facing robot, Navii guides customers to products in the store and provides related product and store information. In addition, it scans inventory to determine products that may be out of stock, finds price discrepancies, and discovers misplaced items.
- Bossa Nova Robotics: a shelf-auditing robot that scans shelves to check stock, identifies missing and misplaced items, as well as incorrect prices and mislabeling. According to Walmart, which is currently testing in more than 50 stores, the robots scan shelves more accurately and three times faster than store associates.⁶
- Simbe Robotics' Tally: like Bossa Nova, Tally uses image-recognition technology to audit shelves to determine out-of-stock, low stock, misplaced items, and pricing errors. Grocer Schnuck Markets ran a six-week pilot with Tally over the summer.

THE NUMBER-ONE ROBOTIC APPLICATION

The use of autonomous navigating robots that track inventory via RFID is, in our view, the most important robotic application for retailers to consider. This allows for the continuous measurement of inventory accuracy and item location for omni-channel fulfillment, as robots navigate a store multiple times a day.

The benefits of RFID technology have been well-documented. For example, in a 15-month study at Macy's, monthly cycle counts taken by hand scanners resulted in gross unit variance being maintained in a 2 to 4.5 percent rate, versus a 20 to 30 percent annual distortion due to only once-a-year physical counts. Omni-channel fulfillment is another major benefit associated with RFID, by making single merchandise units visible systemwide due to the ability to locate RFID-enabled merchandise.⁷

Yet, the benefits of RFID are still muted, to some extent, in that staff must manually scan merchandise. Due to the associated labor costs, this may occur only monthly. Fixed reader systems, which are capable of more frequent tracking, on the other hand, are expensive to install. In contrast, a robot that wanders a store can take multiple cycle counts during a day, greatly enhancing the value of RFID. Interestingly, in a test of handheld reader versus robot-read accuracy, the robot handily outperformed the handheld scanner (perhaps due to human error, i.e., forgetting to scan an area). The researchers found, for example, in the menswear department of a store that the robot achieved a read accuracy of 99.8 percent versus the handheld read accuracy of 77.9 percent.⁸

The elimination of labor costs associated with scanning inventory, the robots' ability to take multiple cycle counts daily, and increased accuracy all should encourage savvy retailers to stay on top of this trend. While, of course, RFID-based inventory robots come at a cost, they are less complicated than those that perform shelf audits, because complex object recognition video systems are not required. Firms operating in this space include MetraLabs' TORY, Keonn Technologies' AdvanRobot, Fetch Robotics' Robi, and Pal Robotics' StockBot. According to MetraLabs, TORY is the first permanently installed RFID robot worldwide at ADLER Modemärkte in Germany.

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THE TOP EMERGING APPLICATION

The robots discussed above operate semi-autonomously. For instance, they can guide a customer to a shelf, but the customer must then retrieve the product. The next wave of robots in retail are fully autonomous, where the robot can manipulate merchandise, such as retrieving the product for a customer or stocking store shelves. While stocking a store shelf, for example as in a grocery store, may seem simple for us humans, such fetch-and-place tasks are complex, requiring extensive extended perception and reasoning capabilities. Nevertheless, advancements in technology are making this possible.

Due to the complicated environment of a store and the complexity associated with matching human dexterity, robots are arriving late to the retail industry. Notwithstanding, advances in cognitive abilities are improving their ability to effectively function in retail environments. The result: Robots will soon be arriving at a store near you.

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¹ The International Organization for Standardization defines a robot to be an "actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks."

² Economic Report of the President, together with the Annual Report of the Council of Economic Advisers, 2016, p. 231.

³ See: "As Amazon Pushes Forward with Robots, Workers Find New Roles," New York Times, 10 September 2017.

⁴ Published by the International Federation of Robotics.

⁵ A variant on this, that is still a way off, is robot agents that shop with you and make product suggestions based on your purchase behavior.

⁶ Available at: <https://blog.walmart.com/innovation/20171026/thats-smartsee-the-tech->

helping-us-serve-you-better.

⁷ See: “Quantifiable Benefits and Analytical Application of RFID Data,” PRI Working Paper, January 2017.

⁸ “Development of an RFID Inventory Robot,” Robot Operating System, 2017, p. 387.