

AN MCM MARKET REPORT

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Ecommerce Fulfillment Robots Gain in Adoption, Capabilities, Results

Although we're nowhere near the stage of so-called "lights out" automated ecommerce fulfillment centers, more retailers are looking to robots as a way to increase productivity and drive efficiency and cost reduction including dependence on human labor.

While many question rosy projections like that of ABI Research, calling for 4 million warehouse robots in 50,000 locations by 2025, no one doubts that robotics for ecommerce fulfillment is trending up. The entry point for ecommerce companies is in the hundreds of thousands of dollars instead of multiple millions, and can be scaled up as needed.

The main types of systems are older generation automated guided vehicles (AGVs), faster and smarter autonomous mobile robots (AMRs), including goods-to-person and co-bots that work alongside fulfillment center associates, and stationary grasping/picking arms. Hybrid systems combining both capabilities are being tested, and partnerships have been struck, such as the recent one between AMR maker Locus Robotics and picking arm provider RightHand Robotics. In addition to picking and transporting goods around an FC, some robotics systems are used at the dock for unloading trucks, while others can build pallets of product for shipment.

"I've been covering supply chain technology for over 20 years, and I've never seen growth like this," said Steve Banker, vice president of supply chain management for market research firm ARC Advisory Group, which reports on the sector. "The industry is at the bottom of hockey stick growth. Some of the faster-growing suppliers have told me their growth for the next year or two is only limited by how many units they



can manufacture, and they are working to expand capacity."

ARC further breaks down AMRs into two categories: Fleet management, systems bringing larger payloads from point A to point B, such as from receiving to put away; and pick optimization, integrating the movement of bots and workers in a process flow designed to increase picking throughput.

Banker said AMRs are seeing strong double-digit growth, with retail and ecommerce and 3PLs representing the lion's share of the buying, and most of the 3PLs are doing work for merchant companies.

A 2018 study from Allied Market Research called for a CAGR of nearly 12% for the global warehouse robotics market between 2016 and 2023, for a market valuation of \$5.2 billion.

Robert Escobar, founder and principal of omnichannel supply chain and logistics consultancy Camino Real Group, said he's seen most robotics adoption in 3PLs, particularly larger ones with a focus on technology.

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"If they're able to lock in a large customer from 5-10 years, they'll add more robots because they can get the ROI," said Escobar, who in the past had senior operations roles at Gwinnie Bee and Rocksbox. "If it's a little guy they're not pushing a lot of technology but they'll throw labor at it and a bit of automation, because they don't think they'll recover their investment in technology."

Chris Elliott, a consulting manager with Blue Horseshoe, said he's seeing more robotics implementations move to the midmarket, and investment returns are faster.

"There are so many players out there, but the ones that were the first movers, like [6 River Systems](#), Locus Robotics and Fetch, those systems are getting to the point where they can be delivered quickly, and they're able to set up and start picking product within a week or two. Those are the ones where companies are seeing ROI in 18-24 months."

Fergal Glynn, vice president of marketing at fulfillment automation provider [6 River Systems](#), said the ideal customer profile for co-bots is a midmarket company being underserved by traditional material handling hardware and software.

"In 2017 and 2018 it was kind of pilot purgatory, but now robotic systems are becoming easier to purchase and deploy for large and small companies," said Glynn, whose company was listed in the leader category of IDC's recent MarketScape report for AMRs in order fulfillment, along with Locus Robotics. "A smaller company can buy eight robots to support 10 pickers, and for some that might be all they need, but (robotics) allows them to support the business as it grows."

Market Consolidation Coming

Bryan Jensen, chairman and executive vice president at supply chain consultant St. Onge, a company that works with major warehouse automation providers, said there is huge potential for robotics but he hasn't seen a spike yet, and consolidation is in order.

"Part of the challenge is, there are probably two dozen companies running after the picking bot space," Jensen said. "Imagine how long it would have taken to reach the moon if there were 20 companies trying for it. I'm not advocating for a monopoly, but



we'll see when there are a few major players past proof of concept and beta to large-scale adoption. No retailer in their right mind is going to go after a new robot application that isn't proven - it puts their business at risk."

Elliott agreed there will be a shakeout. "A lot of startups under NDAs and still losing money," he said. "They don't necessarily have the capacity to get funding to build out manufacturing, sales and delivery. They need to prove themselves out with case studies. Some of them will get there, but it will take some time." He pointed to the October 2018 bankruptcy of Rethink Robotics, whose assets were acquired by the HAHN Group.

Escobar said he's working on a project with a major European 3PL looking to gain entre into the U.S. market through an acquisition, and robotic capability is high on its priority list.

"They're looking for someone that understands technology, and is experimenting with robots and machine learning and artificial intelligence in order to leapfrog over the competition," he said. "If it's an old-school 3PL, it's not in their DNA. I think consolidation (in robotics) will start to pick up traction, as well as acquisitions from some of the larger hardware providers."

Applications of Robotic Systems

Elliott said while most retail and ecommerce companies implementing AGVs are integrating them with traditional MHE systems like conveyors, some are starting to experiment with replacing conveyors with AMRs that handle most of the conveyance.

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“With many of the current bot providers, instead of a conveyor in an aisle or near an aisle, the robot comes with a tote or bin, the worker picks into the tote, and the robot goes to the next pick location and the worker meets the next robot,” he said. “It removes the need for a lot of conveyors. It’s



also flexible, because you’re not doing as much sizing for conveyors with certain sized aisles and electric support. You can handle more order types, not just single unit orders from a shelf.”

Banker said AMRs are overwhelmingly used to increase the efficiency and throughput of order fulfillment, either by picking or doing goods to person, taking miles of associate travel out of the equation and cutting costs. In some cases, the bots pick cartons and bring them to an associate. In others, the worker and the bot move together.

In one co-bot scenario, an associate walks down an aisle, and the robot is standing in front of a slot indicating where to pick from. He puts the item in the carton on the bot, which goes off and stands by a different slot with different items for the same order. The associate then goes down another aisle, where a different robot is waiting at a slot and he picks an item for a different order.

“There are a variety of processes, but what it comes down to is, these solutions drive ROI because they can fulfill better and faster than just using people,” Banker said. “One supplier is even doing cycle counting with an attached RFID app on the bot.”

Robotics arms, which have been around for years in various manufacturing applications, are quickly being reengineered for ecommerce fulfillment. Companies like RightHand Robotics, Kindred Systems, IAM Robotics, ABB and others are advancing the state of the art in terms of what’s possible. While most

remain fixed to handle tasks like picking and sorting items, IAM has an articulating arm mounted on an AMR that can glide through aisles and pick items up to seven feet off the ground.

While some vendors are touting advancements in robotic arms,

Elliott said it will take more development before they’re capable of handling a wider variety of shapes and sizes. “We’re about 75% to 80% of the way there, but it will take a few more years to get to that last 20%-25%,” Elliott said. “The sweet spot now for ecommerce is medium-sized goods. But anything from a pack of cards up to small book, arms are going to need additional development. I think we’ll be surprised at what arms can do in five years or less, with all the R&D in private and academic settings, making them more usable and functional.”

Robots and Fulfillment Center Labor

While there are some concerns about robots replacing humans and taking their jobs, with U.S. unemployment at about 4% ecommerce companies are struggling to find enough workers and more are seeing robotics as a way to close the gap.

Elliott said he’s seeing companies that aren’t looking for robots and automation to replace people but just to fill positions that are unfillable.

“It comes down to, either you can’t find enough people to fill your positions, or you need a flexible labor force for seasonality, and robots can help you meet your labor requirement,” he said. “When we do analysis for our customers, the requirement for a work area might be 2.5 full-time equivalents, and you want the bot to be that .5, so you don’t have to hire a third person.”

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"A lot of companies are having a hard time with staffing, and turnover is high," Escobar said. "Everyone is being super creative in keeping their teams together. I talked to a guy who has three different temp agencies this year, and he's already getting nervous about the holidays, with bodies being so scarce. Workers having so many choices, they often leave and get another job. That's why they're motivated to put in more automation."

Glynn said a fulfillment system built on co-bots not only allows companies to keep their current workers, it also opens up opportunities to hire workers who were excluded in the past. For instance, a picker's job might require them to walk 10 or more miles a day in a more manual process, but with robots in place that's reduced to about three miles a day, making it less physically taxing.

"It also opens you up to consider others you hadn't in the past," he said. "If someone is not able to read or write English, they couldn't handle paper picking. But with a robot-directed system, they're shown a picture of the item, the color and the number. It opens up a whole new pool of available workers."

Brian Barry, president of operations and fulfillment consultancy F. Curtis Barry & Co., said the economics of implementing robotics in terms of labor costs and availability are shifting rapidly, meaning more ecommerce companies should give it serious consideration.

"There are typically two major costs to warehouse robotics you need to consider: Implementation and the monthly system lease," Barry said. "We've seen from early adopters that once the fully-loaded hourly labor cost reaches \$15 to \$16, robotics can be cost justified. They work longer without needing breaks and can run from 12 to 14 hours on a charge. As labor availability becomes tighter and wages push up, more companies will find a profitable application."

Results from Robotic Implementations

Banker said different robotic suppliers bring different value propositions for their systems.

"In some cases, companies are really swapping humans for robots, and they can't get enough of them," he said. "How robots drive ROI is less about accuracy and more about eliminating travel time. In a traditional ecommerce FC, many items are picked to cart. Those workers walk from 10 to 15 miles a day. Now the AMR brings the items to the worker and does the walking. That took up a lot of time."

Glynn said 6 River Systems clients are seeing average productivity improvements of 2-3x, depending on their

starting point.

"Another benefit is, safety issues are reduced," he said. "If you're an associate, you could be pushing around heavy carts, holding up to 24 totes and weighing 600 lbs. or more. That puts enormous pressure on the body. Our client Office Depot is highlighting the ergonomic benefits they're seeing now that their associates don't have to push around heavy carts."

Mario Harik, CIO of major 3PL XPO Logistics, said the overall benefits of implementing robotics in its ecommerce operations have been increased efficiency, accuracy and throughput, as well as a safer environment for its associates. XPO uses 6 River Systems co-bots and GreyOrange robots for goods to person, and Universal and ABB robotic arms in its facilities. The company leverages its innovation lab to "teach" the systems and develops its own warehouse software to control them.

"We're seeing fulfillment times brought down to 20-40 minutes that with manual processes used to take several hours," Harik said. "We've also had walk time reduced by more than 80% for pickers. Co-bots have given us a 2x gain in productivity and goods-to-person robots have seen a 4-5x improvement in picking process efficiency. That's why, with a company our size and a lot of Fortune 100 customers, we're investing heavily in technology to get these benefits."

