Robotics**24/7**

LOGISTICS REACHES NEW LEVELS WITH ROBOTICS

The potential is great, but it's best to focus on specific needs first, say suppliers and users.

CONTENTS

Editor's Note

Welcome to *Robotics 24/7*'s Special Focus Issue on how logistics is leveling up with robotics! We're in the midst of a holiday shopping season after nearly two years of elevated e-commerce demand, persistent labor and supply chain problems, and widening adoption of automation.

If there was a one-size-fits-all solution to logistics challenges, it would already be in use. But robotics suppliers do now have proven systems for materials handling in numerous environments. According to ABI Research, warehouses are starting to bring in mobile robots in larger numbers.

Collaborative robot arms or cobots can work alongside human staffers and are also becoming more widespread. After years of development, we're also starting to see more robust picking and last-mile delivery systems.

As you consider scaling your robotics fleet or just getting started, remember that the software and management around robots, as well as your own processes, are also important. We look at how asset management, artificial intelligence, and financing options can help companies of various sizes.

In addition, this digital issue examines the difference between mico-fulfillment and hyperlocal fulfillment, two buzzworthy phrases in groceries and e-commerce, but not limited to those sectors.

Finally, I spoke with First Financial Equipment Leasing about how its financing options are different from robotics-as-a-service, or RaaS, models.

After years of business uncertainty, one thing is certain: Forward-thinking logistics providers and customers need to maximize their value from robots immediately!

Robotics 24/7 has a full slate of Special Focus Issues coming in 2022, so keep reading, and let us know what you think!

Eugene Demaitre, Editorial Director
Comments? E-mail me at
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Wireless Safety for Warehouse Robots

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Mobile Robot Adoption by Warehouses Will Surge to Half-Million Mark, Says ABI Research

BY EUGENE DEMAITRE
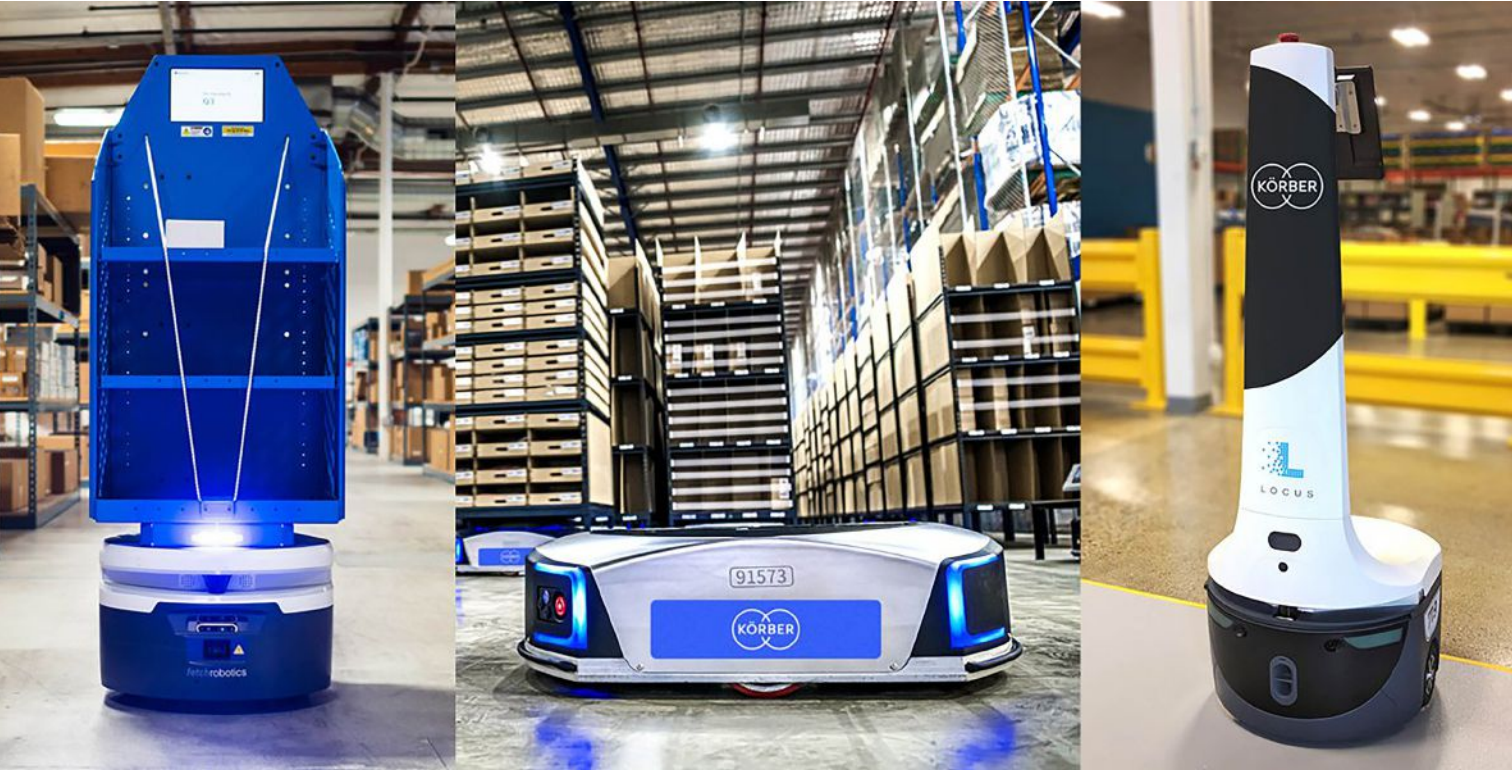
Körber works with multiple AMR and ASRS companies.

The sustained increase in order volume is increasing global automation demand, finds research firm.

The supply chain industry has surged its warehouse automation efforts, considering the e-commerce boom and labor scarcities. In addition to systems such as headphone-enabled voice-picking and exoskeletons that reduce human effort, mobile robots are proving to be the most prevalent productivity-enhancing solution in the warehousing sector. Worldwide mobile robot shipments to warehouses will have a compound annual growth rate (CAGR) of almost 40% from 2021 to 2030 and exceed 500,000 global shipments in 2030, according to ABI Research.

"Productivity technologies can achieve far greater return on investment if correctly combined with other technologies," stated Adhish Luitel, an industry analyst for supply chain management and logistics at ABI Research. "For example, by combining location-tracking data with a voice solution, warehouses using a warehouse execution system (WES) platform can optimize workflows by minimizing distance traveled based on where the worker is."

Automated storage also growing

In addition to mobile robotics, the growth of solutions such as automated storage and retrieval systems (ASRS) has also been explosive, said ABI. Led by companies such as Swisslog, Bastian Solutions, and Körber, the global ASRS industry is set to be valued at over $18 billion (U.S.) by 2030, with a year-over-year growth of 9% from 2021 to 2030, said the research firm.

ASRS includes a variety of computer-controlled systems for automatically placing and retrieving loads from defined storage locations, which is ideal for high volume of loads being moved into and out of storage, said ABI. This trend falls in line with the fact that the logistics sector has been experiencing high volume over the past year, it added.

Parcel shipping reached 95 billion in parcel volume globally in 2020. This volume is expected to double by 2026, with a 14% CAGR between 2020 and 2026.

"As the shift toward robotics occurs with busier warehouses, manual workflows can be automated or workflows that have traditionally been carried out by highly specialized and inflexible machines could soon be carried out by robots that can be moved and retrained as needed," Luitel said.

These findings are from ABI Research's "Smart Warehousing" market data report. This report is part of the company's Supply Chain Management and Logistics research service, which includes research, data, and ABI Insights. Market Data spreadsheets include data, market-share analysis, and highly segmented, service-specific forecasts of opportunities, said ABI. ∎
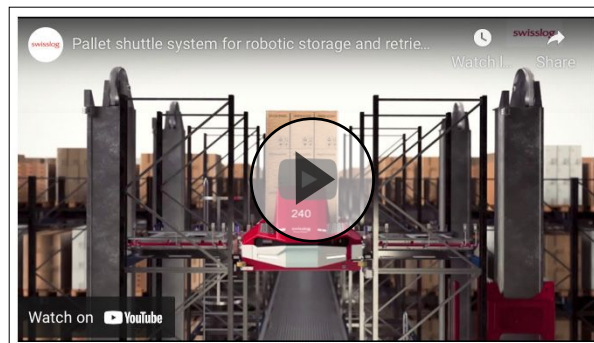
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Capitalizing on the Benefits of Automation Through Leasing.

HOW TO GET TO HYPERLOCAL FULFILLMENT, FAST

BY ROBERTO MICHEL

In e-grocery, automated micro-fulfillment centers are catching on, but for general retailers and e-commerce sellers, other approaches are part of the picture.

M icro-fulfillment is on everyone's lips these days, or so it seems. Major supermarket chains including Kroger, Walmart, and H-E-B have started micro-fulfillment center projects, tapping automation companies that offer robotic, high-density storage and picking systems, which can be placed inside a store or a so-called "dark store" that fulfills online orders for a compact geographic area.

But for all the attention on the micro-fulfillment center (MFC) trend to date, it's mainly taking hold in grocery. It does, however, overlap with the concept of hyperlocal fulfillment, which almost every retailer or e-commerce brand is trying to achieve in some form. The "hyper-local" concept overlaps with other fulfillment network approaches when the aim is enabling next-day or two-day deliveries, including providers of technology-driven warehousing services, also known as "on-demand" warehousing.

Micro-fulfillment and on-demand warehousing aren't the same thing, but they do both address the need to meet consumer expectations for rapid online order fulfillment. Whether micro-fulfillment will gain much traction outside of grocery remains to be seen.

In e-grocery, there are some unique order and service-level requirements. Online shoppers typically want same-day home or curbside delivery for groceries, and you may have 40 items in a customer order, which is higher than in most other retail segments. By contrast, consumers may be fine with one- or two-day delivery for many other types of goods, though expectations tend to be rising.

On-demand fulfillment network providers do offer technology, especially software tools that help determine where to hold inventory and in what quantities. If the goal is to get online retail orders to customer concentrations quickly, without worrying about building out fulfillment infrastructure, these providers are a part of the picture.

Micro-fulfillment vs. hyper-local fulfillment

In the grocery sector, the term "micro-fulfillment" generally refers to automated MFCs, typically in the back of a store or attached to it. The "dark store" functions as an automated MFC to serve a ring of nearby consumers and non-automated stores. MFCs typically use robotic, high-density storage and picking systems, as well as some major warehouse automation providers.

The MFC market has high growth potential, according to Logistics IQ. It predicted that the market will reach $10 billion by 2026 at a compound annual growth rate (CAGR) of 60% between 2020 and 2026.

Grocery is going to be the main contributor for this market, but general merchandise and other industries may pursue the model, said Logistics IQ. The analyst firm reported that that MFC automation typically ranges between 5,000 to 25,000 sq. ft. of space.

To date, several major grocery retailers have deployed a handful of automated MFCs, though some have aggressive plans for more, including Walmart, which announced in January that it would be deploying dozens of what it called "market fulfillment centers," tapping various technology partners, including Alert Innovation, Dematic, and Fabric.

Tel Aviv, Israel-based Fabric also runs an automated MFC for Super-pharm, and it recently announced a second MFC project with the drugstore chain and health and beauty retailer.

"Hyper-local" is a somewhat broader term centering on the need to position inventory very close to customer concentrations for rapid fulfillment. If the aim of a merchant is to quickly establish fulfillment reach and enable one- or two-day deliveries, that brings in other trends like providers of on-demand warehousing services.

Think of the service-level needed as a key demarcation point. Hyper-local fulfillment with a same-day service goal is essentially the same as the micro-fulfillment concept.

More than 3PLs

Companies offering warehousing on-demand or cloud logistics networks vary in focus, but they are more than a loose combination of third-party logistics (3PL) facilities, since they typically offer cloud-based software that helps manage inventory levels and positioning, as well as other aspects of order-fulfillment activity for merchants.

While traditional 3PLs are a proven way to expand fulfillment reach, with a technology-driven logistics network, there is no need to make arrangements with multiple 3PLs to achieve the needed reach, said Sean Henry, co-founder and CEO of Stord Inc. The cloud-based, distributed logistics network provider works with warehouse partners to offer more than 400 facilities to e-commerce brands or to retailers looking to position goods close to customer concentrations.

"If you look at traditional 3PLs, they are constrained to the buildings they own or operate and their tech stack," Henry said. "The constraint there for the retailers or brands is that if you need dozens of warehouses across the country, close to your end consumers."

"In this case, you're trying to piece together how to work with multiple 3PLs and how to distribute your volume across them, given different pricing or different minimum commitments you have with them," he said. "And you're also trying to figure out the tech stack issues at the same time, integrating your e-commerce channels and inventory data across 10 or 20 warehouses run by different partners."

With Atlanta-based Stord's network, one point of integration exists for the retailer or e-commerce seller, plus supply chain software that can be used to rebalance inventory within the nodes being used, added Henry. The software also provides distributed order management and order-allocation logic to decide which of the nodes in its network, or combination of nodes, is best to fill incoming orders. In addition, Stord has carriers in its

network to facilitate delivery.

"We overlay our network with software that acts like an operating system for our customers and their distribution," Henry said. "This operating system is a distributed inventory and order orchestration system for deciding how to optimally place specific SKUs [stock-keeping units] across the nodes in their network, and how to optimally route the orders against the inventory."

"We're showing [the merchants] their real-time inventory levels across all the nodes that they have with Stord, but also giving them active advice about how to rebalance that inventory, achieve optimal service levels for their customers, and reduce their transportation costs based on where that inventory is being ordered from most," he said.

Building your own warehousing on demand

Providers of on-demand warehousing have differing models. While Stord partners with smaller and regional 3PLs for sites, others are building out their own warehouses. For example, ShipBob Inc. describes itself as a tech-driven 3PL and as a cloud-based logistics platform designed for small and midsized businesses to provide rapid fulfillment capabilities. The Chicago-based company has a network of 16 fulfillment centers and is adding about one per month.
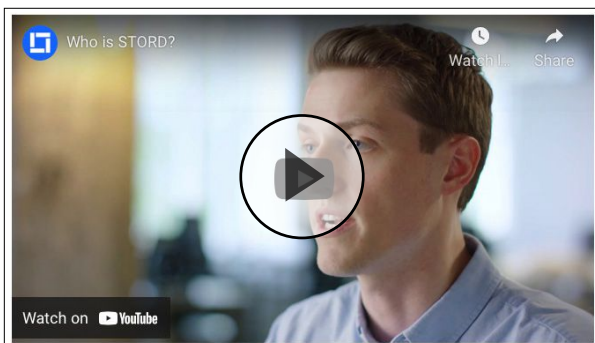
According to Divey Gulati, co-founder of Ship-Bob, the sites use the company's custom-developed warehouse management system (WMS), and software that the retailers or digital brands can use to gain insight on inventory trends and fulfillment performance.

"Essentially, we provide them with a source of truth for their orders and their inventory, based on our software capabilities," said Gulati.

Many of ShipBob's customers are e-commerce brands that don't have stores and have contractors who make their products. Such brands typically use e-commerce software from vendors like Shopify or Big

Commerce, but they don't want to get into the business of building out their own distribution network or managing multiple 3PLs. They do want analytics and insight into inventory strategy and how that matches up with their demand patterns, said Gulati.

"They can monitor order-fulfillment trends and how much inventory they have left, and also benefit from analytics," he said. "With our analytics, they can see where their customers are, and then the software recommends the best fulfillment center locations for them to use in our network to optimize for both transit time and cost."

Within ShipBob's network, its distribution centers (DCs) are not heavily automated, though software technology and wireless handhelds are used to direct picking, packing, and shipping activities.

"We are super heavy on the use of software and analytics," says Gulati. "We wanted to focus on software capabilities first, because we're expanding so fast."

Ware2Go, a provider of on-demand fulfillment and warehousing, also layers software functionality into its services to benefit the merchants and online brands who use it, as well as to help the warehouse partners who carry out the fulfillment. This software platform is called FulfillmentVu, and it combines warehouse management, order management, and transportation management functions.

The Atlanta-based UPS company also offers a free app called NetworkVu, which analyzes a merchant's sales and transit data using machine learning to recommend ideal warehouse placements to maximize delivery speeds within ground networks.

For merchants looking to reliably fulfill next-day orders and to be able to fine-tune inventories, such software-driven insights will help with customer satisfaction and their bottom line, explained Patrick Cadic, chief revenue officer at Ware2Go.

"We help [merchants] with insights into their fulfillment processes, and that can improve their unit level economics, but the larger benefit is how the platform ensures a consistent level of customer experience, and consistent outcomes, for their customers," he said. "That is where the real value comes in."

Mall-based hubs

A different sort of platform for retail fulfillment has emerged that leverages unused space in shopping malls for a variety of fulfillment services. Fillogic bills itself as a logistics-as-a-service platform for retail.

The New York-based company places "micro-hubs" within mall properties to perform a variety of services, mainly using technology such as WMS to direct efficient and accurate pick and pack, but foregoing high-density MFC automation.
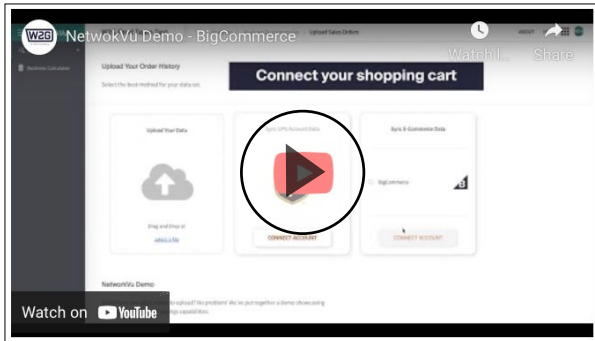
"We take under-utilized space at shopping malls—not every shopping mall, but with the right shopping mall partners—and convert them into tech-enabled micro-distribution hubs," said Bill Thayer, co-founder and co-CEO of Fillogic. "We provide a variety of value-added, differentiated services at these locations. E-commerce pick and pack is a big part of what we do right now, but it also includes receiving optimization, forward staging of inventory, outbound shipment optimization, and reverse logistics."

For general retail, which lacks the high units-per-transaction (TPU) found in grocery, having some software capabilities at the hubs to direct work and ensure accuracy makes the most sense, said Thayer, rather than trying to shrink down high-density warehouse automation.

Fillogic has developed its own WMS for its hubs, and it has proprietary software for routing and shipping management, he explained. These software tools, plus the location of the hubs, are key to the effectiveness of the Fillogic platform, said Thayer. He did not rule out adding some mobile robots in the future.

"We live in the last mile because we are operating from these shopping malls," said Thayer. "We are providing retailers with multiple services from the best physical locations, close to the target consumer concentrations everybody wants to reach."

Most retail stores weren't designed to act as mini-DCs for e-commerce fulfillment, he said, so it's a better idea to create small, technology-enabled fulfillment hubs that can aggregate fulfillment operations and capacity for multiple retailers within the mall.

As of April 2021, Fillogic already had eight micro-hubs operating at mall locations in Connecticut, New York, New Jersey, and Pennsylvania, with plans to have 30 across the country by the end of this year.

The value comes not just from the physical locations of the hubs, but also from the software. "We call ourselves an operations-enabled technology company," said Thayer. "The power comes from the connectivity in the software, from the network of hubs we offer, and also from the operations and services we provide."

"Our perspective is that retail is not dead—it's just in transformation," he said. "That transformation is going to be in flux for a couple of years, but if you have a good technology platform for logistics and sound operations, you're going to be much more successful in adapting to how that transformation plays out."

Automation's play

The demand side characteristics that make MFC automation attractive in grocery are not found in most other types of retail, noted Colman Roche, vice president of e-commerce and retail industries at Swisslog, which provides MFC automation for customers such as H-E-B Grocery Co. For one thing, most consumers need groceries once or twice a week in comparison with apparel or home electronics, which are bought less frequently.

The other big differences is that in grocery, the typical number of units per customer order ranges between 28 to 38 items, and many consumers want same-day curbside or home delivery for groceries, Roche said.

Most non-grocery retail outlets don't have the order characteristics found at big supermarkets, making MFC automation within retail shops a tougher proposition to justify, said Roche.

"The sheer quantities in terms of number of lines per typical order, is vastly higher in grocery than with your typical online order," he said. "There are just some striking differences between grocery and non-grocery that influence why grocers are moving first with micro-fulfillment."

Some goods-to-person mobile robots are well-

suited to facilities with low ceilings and odd-sized, larger products like coats or other bigger apparel items, said Roche. For example, Swisslog's CarryPick system uses mobile robots that transport mobile storage units to a picking station. The compartments in these racks are configurable, which would allow them to handle oddly shaped or bigger items, as well as smaller, more uniform items.

Some business-model innovation may lead general retail to use some MFCs and automation, such smaller metro-area fulfillment centers, to accelerate rapid fulfillment of online retail orders to homes or nearby stores.

Small fulfillment centers in shopping malls could create the volume of picking activity that makes MFC automation attractive. In Thailand, Swisslog has deployed a small—500-bin— AutoStore system for TRUE, a mobile network provider, inside of a branding shop in Bangkok. The shop is in a high-end shopping mall, and the system stores and picks goods for customers buying mobile phones or accessories.

Swisslog has deployed AutoStore solutions that are smaller than those found in larger DCs. However, they still might hold 12,000 SKUs, or as many as 30,000 SKUs, with some MFCs filling 3,000 customer orders a week. Others are capable of more filling more than 30,000 customer orders per week.

Whether general retailers will jump into MFCs and automation remains to be seen, but it needs to be justified by dramatically faster, more efficient picking than could be done manually. Other potential benefits include freeing up store aisle space for in-store shoppers, rather than disrupting the store experience with a bunch of workers trying to fill online orders from shelves.

"I think the whole retail industry is watching what is happening in grocery with micro-fulfillment and trying to learn as much as possible from that," said Roche.

Steve Simonson, a vice president at Tompkins Solutions, agreed that MFC automation makes sense for some stores or locations because of order complexity, volumes, and service-level requirements in grocery orders. For general retail, MFC automation can be a stretch, since shoppers sometimes only buy a couple of items, he said.

"If the volumes aren't there, the automation may not make sense," Simonson said, adding that if there was a more hub-and-spoke model or a large retail store with enough volume, MFC automation
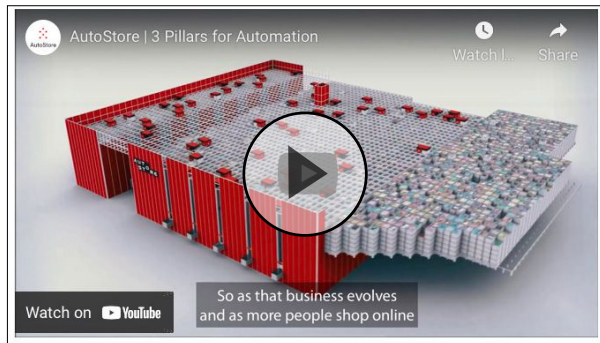
might bring payback.

Tompkins Robotics, a sibling company to Tompkins, offers the t-Sort sortation robot for MFCs. However, even if a small retail store doesn't have the volume for such automation, a retailer could outfit a regional DC with t-Sort to sort each-level items for store replenishment or to support direct-to-consumer order fulfillment, said Simonson.

In regional DCs, mobile robotic sortation has enough "many to one" sorting volumes to bring rapid payback and efficiently replenish stores at the item level for goods like health and beauty products, hardware items, or many other goods that are labor-intensive to sort manually.

Even if a retailer finds its stores don't call for MFC automation, the same type of robotics could help with the ultimate aim of faster fulfillment at regional DCs, many of which struggle in finding enough labor, said Simonson.

"The warehouse industry is starved for employees," he said. "The average wage rate is going up, and it is just very difficult to fill those open positions, so companies are addressing this need by using automation. That is the bigger trend we are seeing a lot of in retail distribution." ∎
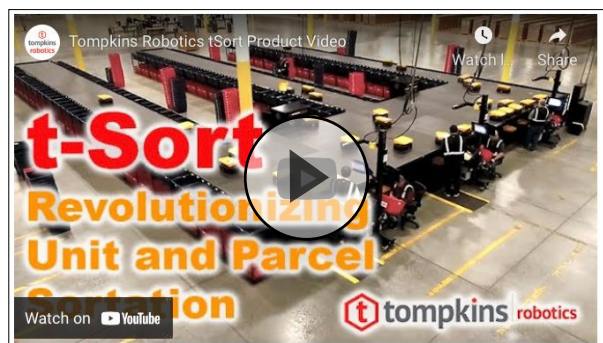
ABOUT THE AUTHOR
Roberto Michel is a senior editor at Modern Materials Handling, a sibling site to Robotics 24/7.

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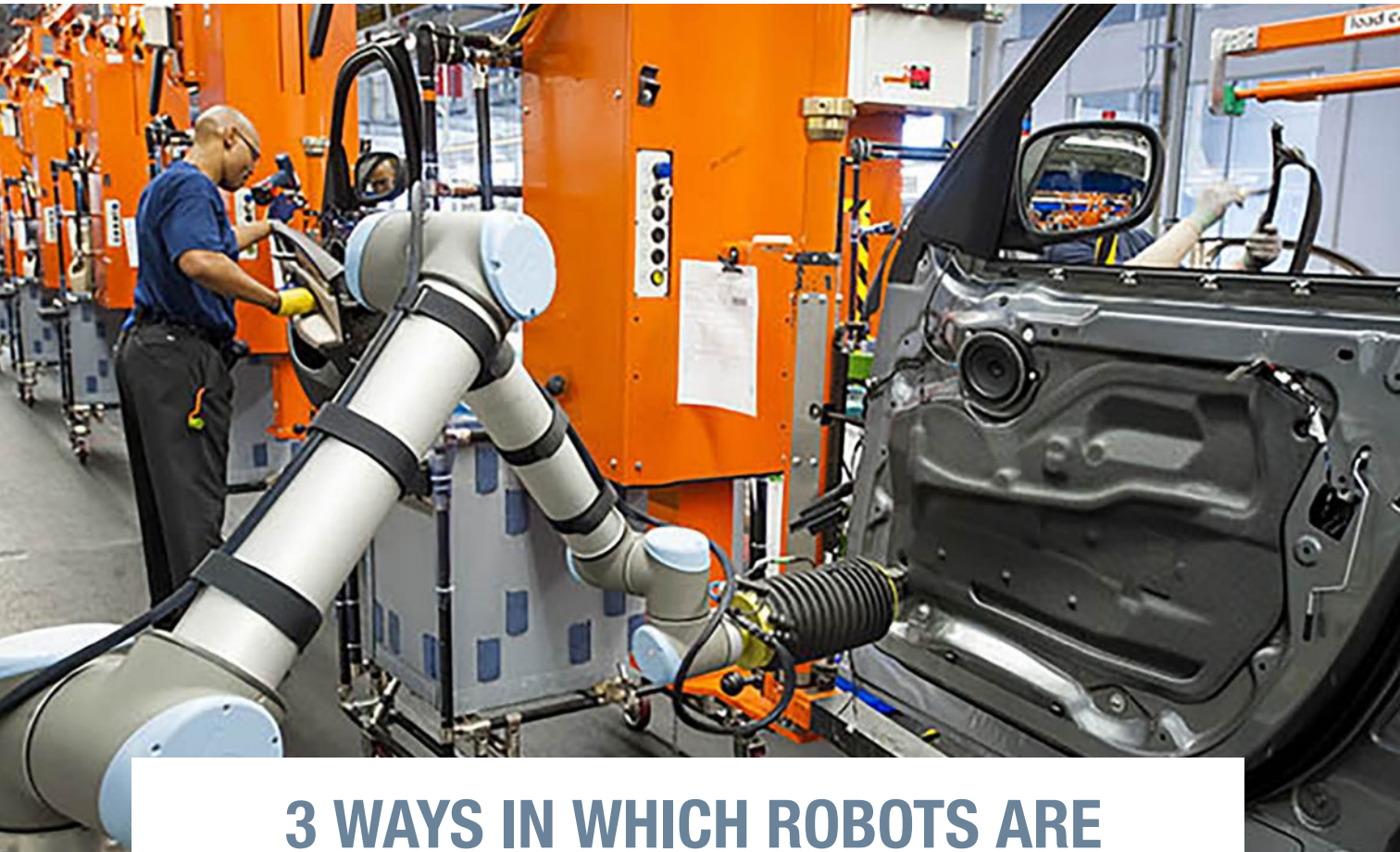
3 WAYS IN WHICH ROBOTS ARE HELPING THE SUPPLY CHAIN INDUSTRY

BY DAVID MILLER

From automotive manufacturing to electronics and logistics, collaborative robots can help improve efficiency, safety, and retention.

Collaborative robots, or cobots, were not made to replace workers in supply chains. These machines were created to improve their working experience. Cobots help their human counterparts by assisting them in tasks that can be repetitive or even dangerous.

In fact, collaborative robots offer advantages during the pandemic, given the strict social distancing protocols. With the help of cobots and other types of robots, companies like DCL Logistics have been able to increase their productivity by 300% without sacrificing employee safety. That said, here are a few ways cobots can assist their human counterparts:

Improving workflow efficiency

Collaborative robots are designed to sense humans and to safely slow or stop in their presence. They can also focus on more meticulous and repetitive tasks. This allows human workers to focus on more complex processes.

In supply chains, cobots are often designated to pick up items from shelves or handle delicate materials. The printed circuit board
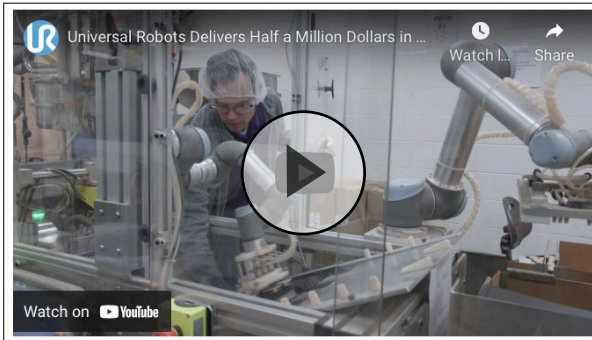
(PCB) supply chain involves the testing and inspection of small and fragile components. Cobots can help assemble and inspect such electronics components.

Cobots also help in improving workflow efficiency by taking over the packaging process. For another example, Coty Cosmetics uses Universal Robots cobots in their cosmetics supply chain to pick and place powder pans from one station to another.

Once these powder pans pass the quality check, the cobots take over the repetitive task of packaging. Since then, the brand has saved about half a million dollars annually. In addition, they can now assign their employees to more complex but less monotonous tasks.

Organizing archives

Besides helping in handling and packing products, robots can also assist employees in managing paper files and archives. Archive management is a vital process in every business, but it can be very time-intensive.

In fact, a lot of workers experience difficulties in organizing and sifting through piles of documents. Businesses can also lose a lot of time and money to poor record management.

Robots are an asset in this supply chain process since they can scan documents in a few seconds. Then, they can organize these documents and file them in the designated areas. This has proven to be very effective in the case of the FBI, which has deployed an automated storage and retrieval system (ASRS) to handle millions of sensitive documents in their facility.

Increasing worker safety

Cobots also help employees by improving safety in the workplace. Some cobots are already being deployed in high-risk environments, such as hospitals and security facilities. However, a lot of them are also used in supply chains to perform hazardous tasks, such as lifting heavy loads. This reduces the physical risks that may cause injuries to workers.

For instance, the BMW plant in Spartanburg, S.C., uses cobots to assist employees in moving and carrying car parts. This minimizes the risk of injury and employee strain from handling heavy materials. With the assistance of cobots, the automotive plant managed to boost worker safety and eliminated the need for employees to do physically exhausting tasks.

Collaborative robots are innovations that can improve working environments and assist supply chain workers. With these robotic partners, employees can forego repetitive, arduous, and even dangerous tasks to improve productivity and reduce risks.

Thus, supply chain companies, as well as businesses across all sectors, should strive to incorporate robotics wherever it can help. This improves the state of worker safety and can even boost employee satisfaction. ∎

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FREE EVALUATION

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Robots Deliver in the Last Mile, Giving Retailers and Patrons More Options

BY JIM ROMEO

From college campuses and urban neighborhoods to hospitals and hotels, delivery robots are starting to solve the last-mile problem.

Last-mile logistics can be a costly but important component of the extended supply chain. Goods must move from restaurants, fulfillment centers, retail stores, and other points of origin before traveling to customers or users. They most go through a complex series of transitions to successfully reach their final destinations. These items are not just parcels—they could be perishables such as groceries or food for dinner that evening.

Typically, last-mile delivery requires a fleet of vehicles as well as workers who must drive the vehicles and get out to bring orders right to the end users, wherever they may be. In a campus environment such as a hotel, a worker must make a separate trip from the kitchen, gift shop, or another location and go directly to the room of the party who had requested goods.

This entire dynamic is now changing, as the technologies for delivery robots mature. Such systems are making trips easier and more popular as they become further developed. The COVID-19 pandemic and parallel revolution in e-commerce have also driven interest in last-mile delivery robots.

Cleveron offers customizable vehicle

Cleveron is one of the world's leading robotics delivery companies. The Viljandi, Estonia-based company designed its Cleveron 701 robots specifically for retailers and logistics firms seeking to boost their last-mile ef-

ficiencies. The mobile robots can enable businesses to scale and meet expanding demand for same-day deliveries that are ordinarily performed by vehicles and employees.

The Cleveron 701 can be driven in low-traffic areas like suburbs and deliver orders to nearby customers within 15 to 30 minutes.

The goods come from a retailer or a fulfillment center. The delivery vehicle is supervised remotely, and its ability to efficiently deliver packages within an hour makes it very competitive with conventional methods.

In addition to saving time and consumer trips to the store, the Cleveron 701 also requires less labor. This reduces the cost because one teleoperator can supervise up to 10 robots at the same time.

Cleveron said its system is adaptable for different needs. For example, a temperature-controlled section can be added for grocery deliveries. The Cleveron 701 can also be used for parcel deliveries or even as a high-tech coffee robot or an ice cream truck.

Refraction AI

Delivery robots are increasingly being used for last-mile logistics across the U.S. The downtown neighborhoods of Austin, Texas, known as South Congress and Travis Heights are using robots produced by Refraction AI
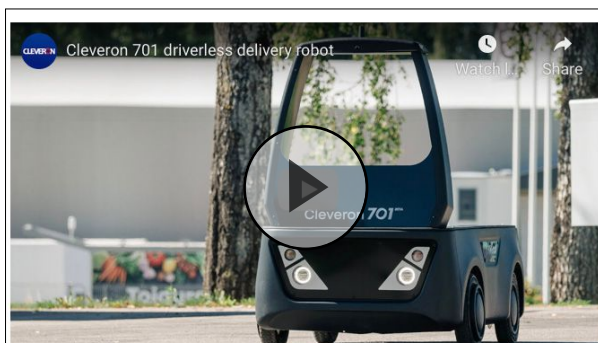
Inc. The Ann Arbor, Mich.-based company raised $4.2 million in April.

The REV-1 can deliver food orders from participating restaurants directly to the curbside of customers, said Refraction AI. After placing an order, the customer receives a text message with a unique code from the provider to be able to open the robot once it arrives.

In addition, texts also keep customers up to date on the whereabouts of the robot as the delivery progresses. When it does finally arrive at the destination, the customer is notified to meet the robot at the curb. The customer can input the code received as a text message and grab the order.

The REV-1 is no larger than a person on a bicycle, operating primarily on the side of the road or in a bike lane. It can travel in traffic lanes and sidewalks on a case-by-case basis. The robot has three wheels and is only about 4.5 ft. high and about the same distance long, but a mere 30 in. wide.

It weighs a total of 150 lb. and achieves speeds of up to 15 mph—fast enough to accomplish deliveries and stay on schedule with the minimum of stopping distance of any device on the road. The REV-1 has an internal capacity of 16 cubic feet or about six grocery bags worth of space. It's a voluminous vehicle that can serve a valuable utilitarian function.

Robotic room service

The concept of robotic deliveries is also being applied at the Bayside Hotel,

a small boutique hotel in Santa Monica, Calif. The hotel has partnered with Los Angeles-based Coco, which raised $36 million in Series A funding last month, to provide deliveries on call during the day.

Guests can order a wide variety of things from a menu, as well as other kiosks and stores within the hotel. They might order food and beverages or sundries and personal care products. They even have a selection of items available for the pets of guests staying at the hotel.

Guests can place orders via a COCO app on their mobile devices. The robot operates from 9:00 a.m. to 10:00 p.m., seven days a week, and the hotel guests pay a $1.95 delivery fee.

These deliveries are an additional service the hotel is providing, but it is indicative of the potential of robots to perform similar services in any facility, adding a new level of convenience for patrons.

Not long ago, robotic delivery services seemed
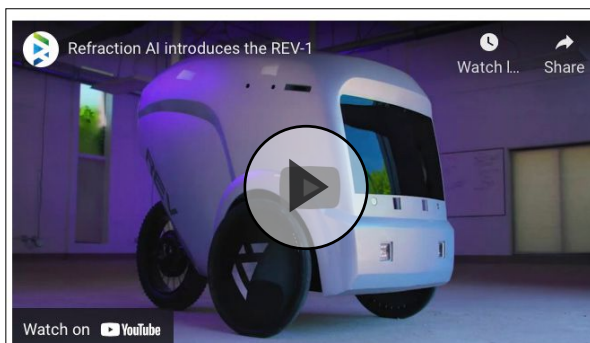
too complex to perform. As computer vision, autonomous or semi-autonomous navigation, and fleet management software develop, robots are providing new mobility services and changing transportation on roads or within facilities.

Now that robots have come of age and are starting to coexist with pedestrians, cyclists, and vehicles, it looks like last-mile logistics may have been solved with delivery robots. ∎

ABOUT THE AUTHOR
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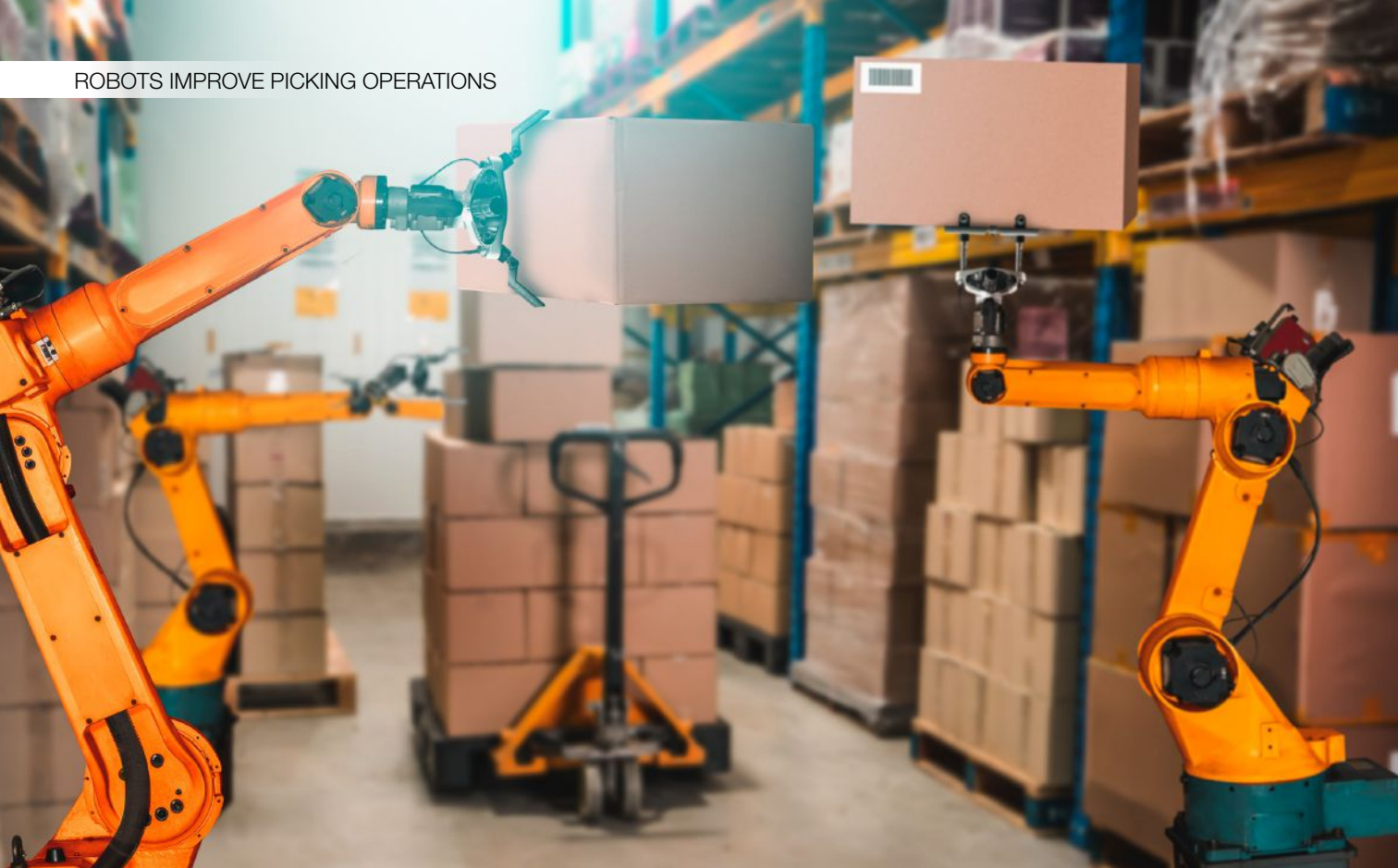
How Can Robots Improve Picking Operations in Warehouses?

BY EMILY NEWTON

Robots have gone from a "nice to have" to essential during the e-commerce boom, but it's important to understand how they can help businesses.

W arehouses today have become centers of technological innovation. Technologies like Internet of Things networks and automation have become standard, as facilities strive for higher productivity and resiliency. Robotic picking systems have garnered particular attention recently, and for good reason.

Warehouse robots as a whole are becoming increasingly common, with 50,000 facilities using them by 2025, predicts ABI Research. Pick-and-place robots have seen more interest than most, but the reasons why may not be immediately clear. Here's how robots can improve picking operations in warehouses.

Improved efficiency

The most immediately recognizable benefit of robots in picking is that they can improve productivity. Repetitive tasks are ideal for automation because machines can typically perform them faster than people, who may find the job tedious. After hours of doing a monotonous task, human workers can start to grow tired and slow down, but not robots.

Pick-and-place robots further improve efficiency by helping their human counterparts. Implementing robots can ease the workload on staffers, freeing them to focus on other, value-adding tasks. These machines work alongside people instead of replacing them, enabling them to work more efficiently due to less stress. This leads to higher overall productivity.

Modeling software can also help you discover the best uses for your pick-and-place robots. For example, Maplesoft was able to help a company solve a motor failure problem in its pick-and-place robots, improving its manufacturing process and saving the cost of frequent replacements.

"The company was able to essentially apply a software update to what was previously expected to be costly, on-site hardware replacements for larger motors," Maplesoft recalled in a case study. "Going forward, they are using their MapleSim models for other robots, minimizing the high costs of over-engineered components and unexpected on-site repairs."

Higher accuracy

In addition to working faster than humans, robotic picking systems are typically more accurate. These machines improve accuracy by reducing human interactions, which can lead to errors.

Technologies like pick-to-light and pick-to-HUD systems can reduce errors by 67% compared to traditional, entirely manual processes. Picking robots operate exclusively off these resources and lack the capacity to lose focus on them. As such, they can offer far higher accuracy, leading to smoother, more efficient operations.

People can easily grow tired or bored with repetitive work, losing their focus and making mistakes, but robots don't have this problem.

"We're going to become caretakers for the robots," predicted futurist Gray Scott. "That's what the next generation of work is going to be."

More employers will start looking for robotics programmers to make sure their in-house robots perform the proper tasks and receive regular maintenance.

Scalability and flexibility

Warehouse robotics can improve picking operations by making them more easily scalable. Robots give warehouses the ability to artificially expand their workforce during peak seasons. For example, when online orders pick up around the holidays, facilities could add more robots into their operations, helping workers handle the increased workload.

"Forward-thinking 3PLs [third-party logistics providers] and retailers are making moves now to digitize their operations and prepare for possibly their best peak season yet," said Currin McCarty, enterprise sales executive for the 3PL segment at Locus Robotics.

Industry professionals are expecting consumer demand to be higher than last year.

Traditionally, warehouses have adapted to seasonal demand by hiring temporary workers, but that's becoming increasingly challenging. Job openings in the sector are nearing a 20-year high, as many facilities struggle to find enough employees to keep up with demand. Automation lets them do so without seasonal workers, as well as avoid costs and lost time from onboarding.

If you're interested in setting up robotics solutions, "3PLs and retailers looking to go-live before peak should have agreements signed by early September," recommended McCarty.

Warehouse robots are increasingly crucial

In today's increasingly competitive landscape, warehouses must do everything they can to optimize their operations. In the face of growing labor shortages and rising demand, automation is the solution in many areas. Pick-and-place robots, in particular, are becoming less of an advantage and more of a necessity.

Picking is ideal for automation, thanks to its repetitive nature and historical inefficiency. Robots can help warehouses move past long-standing obstacles and meet the needs of the growing e-commerce sector. Before long, robotic picking systems will be an industry standard. ∎

ABOUT THE AUTHOR
Emily Newton is a tech writer who enjoys writing about the latest innovations changing our world. Read more of her articles online at Revolutionized Magazine.

THINK OF ROBOTS AS A **SUPPLY CHAIN ASSET**

BY JIM ROMEO

DHL has expanded its use of mobile robots from Locus Robotics.

As warehouses and other operations increasingly turn to robots, they should be considered an asset rather than some hostile technology.

The end-to-end supply chain is a critical part of today's globally competitive enterprise. Shipments get sorted, packaged, and loaded for delivery, ultimately making their way to customers. Within these processes, there are many moving parts, and robots can improve the efficiency of many of these functions.

Whether they work alongside people or relieve them to do other value-added tasks, tireless robots have matured in the past few years to be an intrinsic part of many logistics operations, from the dock to the destination.

What can robots do in modern supply chains?

With advances in perception, manipulation, and mobility, groups of robots can increasingly do the heavy lifting in warehouses, fulfillment centers, and distribution centers. Here are some noteworthy examples of how robots can provide returns on investment:

• **Picking and packing:** Robots can now pick items from shelves, package them, and take them to the parking lot. FANUC, which claims to be the world's largest maker of industrial robots, has already produced machines that can pick and package virtually any product. Footwear company Crocs credited 6 River Systems' Chuck mobile ro-

bots for helping it meet increased demand during the pandemic while also increasing output. Crocs' managers said the use of Chucks led to fewer errors and greater efficiency.

• **Lift heavy loads:** The warehouse race is on, and warehouse managers are looking for ways to automate their processes. One way they're doing this is by using robots that can lift heavy items. FANUC has produced robots that can lift cars. Last December, Vecna Robotics unveiled its next-generation autonomous counterbalanced fork truck, which can lift heavy loads up to 12 feet.

• **Moving shelves**: Amazon.com acquired Kiva Systems in 2012 and uses robots to move shelves in its warehouses, eliminating the need for humans to do this tedious and error-prone job. Amazon warehouses are filled with small orange robots made by subsidiary Amazon Robotics, and one person monitors them.

• **Archive management:** Not only can robots

See DHL Robots at Work: LocusBots

manage bins, corrugated cartons, and pallet loads; they can also manage paper files and archives. They can sort, scan, and organize documents in ways that would be difficult for humans to do. For example, the FBI uses a squad of wheeled robots to file away millions of paper records from its 256,000-sq.-ft. facility near Washington, D.C.

• **Integrating technologies:** As more warehouse and logistics environments incorporate robots for all these tasks, there will start to be environments using systems from multiple vendors. Those technologies need to be able to communicate with one another and enterprise systems for interoperability and efficiency. Organizations are addressing the issue, and a software ecosystem is growing to meet this need.

Global shipping company DHL, for instance, has collaborated with Microsoft and AI-driven fulfillment provider Blue Yonder to integrate warehouse robots. DHL's initial implementation of the system was in a Madrid warehouse, where the company said it saved integration time by 60%.

What's driving the rapid of adoption of automation?

Companies have cited different reasons for implementing robotics and automation in their warehouses. The following are the most common ones:

• **Economics:** Robotics can reduce labor costs, work around the clock, and add precision to certain tasks. The robotics-as-a-service (RaaS) model enables companies to pay for hardware, software, and services as an operational expense rather than an upfront purchase.

• **Increase productivity:** Robots may take up less space than human workers or human-driven vehicles, which is crucial when warehouses are running at capacity. In goods-to-person applications, well-managed workflows can combine human flexibility with robotic precision for greater throughput. Some warehouse managers have reported a significant boost in productivity.

• **Safety:** Warehouse workers often face repetitive stress, extreme temperatures, and even high-voltage environments. Forklifts are involved in numerous accidents. Robots and automation are ideal for tasks such as material handling.

What's ahead for robots in warehouses?

In the past year, partly because of accelerated e-commerce demand during the COVID-19 pandemic, robotics has rapidly moved from trials to deployment in warehouses. This trend will likely continue. Manufacturers such as Nimble Robotics are investing heavily in this market, and industry analysts predict that autonomous mobile robots (AMRs) alone will be worth $6.8 billion in 2025.

Increasingly sophisticated machine learning algorithms enable robots to rapidly identify objects. Thanks to lidar and infrared sensors, they can perceive items in superhuman ways rather than rely on sight or touch alone.

Speaking of touch, robot suppliers have studied and applied human-machine interaction lessons, with touchscreens rather than buttons and systems such as Veo Robotics' that slow robots to safe speeds when they sense people are in proximity.

In addition, remote telepresence and teleoperation capabilities allow for human robotics experts to troubleshoot and resolve edge cases and reduce downtime.

The march of automation isn't inevitable or universally welcomed, however. Managers should watch for "automation anxiety," where workers fear that robots will endanger their jobs. However, contrary to some widely circulated reports, supply chain operations are so short-handed, and the need for both skilled labor and robots is still so great, that all parties to automation have a responsibility to better educate shareholders, employees, and other stakeholders about its potential.

As Markus Voss, a global manager at DHL, said about the future: "The aim is not to replace employees over time, but to assign the more attractive and interesting tasks to our human workforce." ■

Meet Amazon's robots

ABOUT THE AUTHOR
Jim Romeo is a freelance writer and contributor to Robotics 24/7 based in Chesapeake, Va.

Lucas Systems meant to demonstrate the use of AI with voice technology inside of a warehouse. **Source:** *Lucas Systems*

Warehouses Not Yet Taking Full Advantage of AI, Finds Lucas Systems Study

ROBOTICS 24/7 STAFF

Although warehouse executives are optimistic about AI and automation, they say they need to learn more, says Lucas Systems.

Artificial intelligence is a warehouse game-changer, but organizations are struggling to use it optimally, according to Lucas Systems Inc., which released insights from a market study today.

"These findings are consistent with what we're hearing from our customers," said Ken Ramoutar, chief marketing officer at Lucas Systems. "There's a belief that AI is a heavy lift—that it's difficult to use and risky or expensive. This thinking prevents widespread adoption in the warehouse and the ability to tap AI's true potential."

The study was conducted by market research firm Vanson Bourne and examined AI's use, perception, and value. Survey respondents included executives, directors, and warehouse managers from 350 U.S. and U.K. organizations. They said they're using AI mostly for inventory management and described challenges with using AI more broadly.

Lucas Systems, which commissioned the study, has 23 years of experience implementing AI-powered software into more than 400 warehouses worldwide. The company, which has offices in Wexford, Penn.,

and Bracknell, U.K., said it can help distribution centers (DCs) increase worker productivity, operational agility, and customer satisfaction with voice and AI optimization technologies.

Operators are Targeting These Hot Spots for Implementing AI Solutions

- **Productivity of warehouse workers**
- **Reduce errors from warehouse workers**
- **Decision making for managers and supervisors**
- **Material handling equipment management**
- **Maintenance and repair operations**
- **Manage robots and other machines**

LUCAS

Source: Lucas commissioned market study with Vanson Bourne
Question: Why is your organization utilizing, or planning to utilize AI based software within its warehouses/distribution centers?

Warehouse execs optimistic but need more info

According to the study, executives are optimistic about AI, saying they expect an average return on investment (ROI) of more than 60% within five years.

Despite this optimism, 99% of organizations said they face challenges to using AI more effectively, said Lucas Systems. Top reasons included perceptions of high costs compared to benefits, concerns about risks and control of operational decisions, the cost and time for training, and a lack of understanding for implementation.

Nearly 90% of respondents, regardless of industry, said they more expertise and information when it comes to AI deployment and use. "Managing robots and other machines" was cited as a top reason why respondents are using or planning to use AI-based software in their warehouses or distribution centers.

Ease of use is key, says Lucas

The key to transformation in the warehouse is in providing AI that doesn't require users or IT staffers to be experts in AI, said Lucas Systems. The company noted customer interest in its AI-embedded technologies such as voice, dynamic slotting, and in-warehouse travel-optimization systems.

"These technologies have strong adoption today because operators realize their high value," said Ramoutar. "They trust the software, and they appreciate how easy they are to use."

AI-based systems can have a profound effect on management effectiveness, safety and ergonomics, and picking accuracy, said Lucas execitves. They can also help with labor costs, employee satisfaction, and throughput, they added. The company recommended its series of "Five Fast-Start AI Opportunities."

"DCs are target-rich environments for using AI to optimize performance," Ramoutar said. "When applied in the right places, AI is a distribution center game-changer. AI can drive significant operational and customer experience gains."

Top 5 Areas for AI Performance Gains

- ① Dynamic Slotting
- ② Workflow Orchestration
- ③ Workforce Planning
- ④ Performance Management
- ⑤ In-Warehouse Travel Optimization

LUCAS

Source: *Lucas Systems*

"But software providers must continue to make AI easy to implement and use," he said. "This is what we expect in our personal lives from smart phones, digital assistants, and apps." ∎
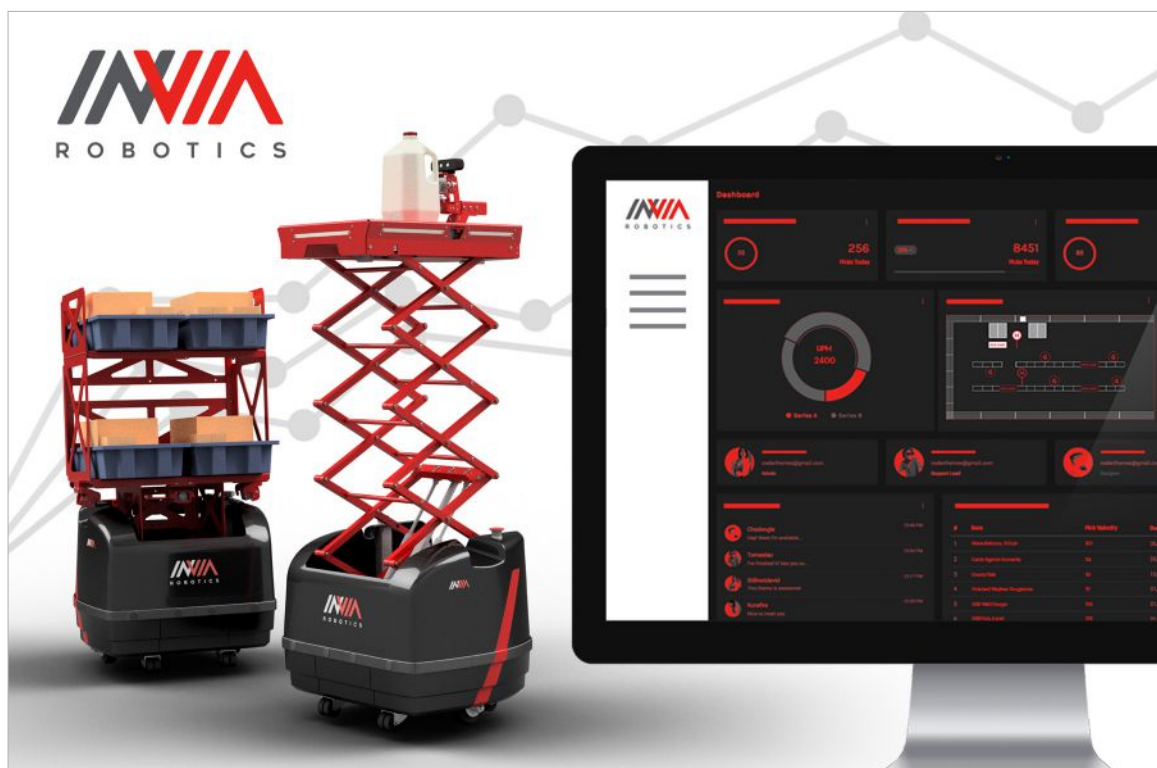
inVia offers mobile robots and warehouse optimization software.

inVia Robotics Raises $30M in Series C Funding From Microsoft, Qualcomm, Hitachi

BY EUGENE DEMAITRE

Mobile robot and warehouse optimization software provider plans to use the funding to expand its global presence.

i nVia Robotics Inc. recently announced that it has secured $30 million in Series C funding from M12, Microsoft Corp.'s venture fund, as well as Qualcomm Ventures LLC, Hitachi Ventures, and existing investors. The Westlake, Calif.-based company provides artificial intelligence and autonomous mobile robots as a service to improve warehouse throughput and workforce efficiency.

"We are proud and honored to have earned the confidence from these industry-leading investors who are equally as committed to the progression of automation within the supply chain as we are," said Lior Elazary, co-founder and CEO of inVia. "We have intentionally aligned ourselves in the best interest of our customers and their businesses, finding ways to not only optimize productivity, but also further inVia Robotics' global reach."

inVia revenue grows sixfold

The COVID-19 pandemic has increased adoption of optimization technologies for order fulfillment. In the U.S. alone, e-commerce experienced 44% year-over-year growth, requiring online retailers and logistics providers to keep up with record shopping demand. Last year, inVia Robotics reported that its revenue grew by 600%.

Goods-to-person advantages

inVia CEO Lior Elazary recently participated in a free Robotics 24/7 Hot Seat webinar on "Advances in Goods-to-Person Automation."

The company said its platform programmatically digitizes every logistics workflow, using AI to continually optimize machines and people. The inVia Logic software orchestrates the most efficient movement of goods across a warehouse using proprietary algorithms to efficiently assign and balance tasks, said inVia.

inVia claimed that its Picker goods-to-person autonomous mobile robots (AMRs) offer the highest throughput per person in the industry. The complete system can be integrated into existing operations or new facilities and deliver flexibility and scalability for unprecedented returns on investment (ROI), the company said. These include a 4X to 5X increase in productivity and accuracy rates of 99.9% at a fraction of a cost of traditional automation.

inVia offers its automation services to e-commerce and third-party logistics (3PL) businesses through a robotics-as-a-service (RaaS) model. Subscriptions allow companies of any size to quickly deploy and scale AMR fleets as needed without disrupting existing operations, according to the company. This eliminates the costs of leasing and maintaining equipment, it said.

Investors share expertise

inVia Robotics' Series C brings the company's total investment to $59 million from investors including Point 72, Upfront, and Embark. The company said it will use its latest funding to extend its product's reach and operational support in North America.

The funding will also drive market expansion into the Asia-Pacific region and Europe, the Middle East, and Africa. In addition, inVia said it will use the capital to align strategic supply chain partners to open new channels and deliver end-to-end logistics solutions.

inVia plans to use the Qualcomm Robotics RB5, described as "the world's first" 5G and AI-enabled robotics platform to accelerate development of power-efficient, high-computing robots and drones.

"Global e-commerce adoption is experiencing exponential growth, resulting in the need for robust warehouse optimization solutions," said Quinn Li, senior vice president of Qualcomm Technologies Inc. and global head of Qualcomm Ventures. "inVia's AI-powered warehouse automation solutions help improve warehouse throughput and workflow efficiency. We look forward to supporting inVia in accelerating warehouse digitization with AI and 5G through our investment."

"inVia's integrated solution—with software and AI at the core—enables warehouse managers to take advantage of operational and cost efficiencies that have historically only been available to large enterprises," added James Wu, principal at M12. "Now, inVia's prebuilt integrations with warehouse management systems are making scalable customization accessible to companies of all sizes."
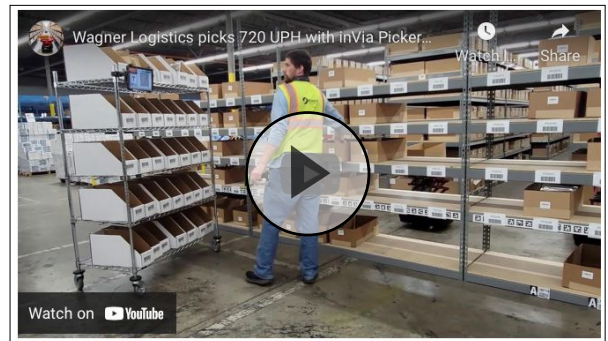
New investor Hitachi Ventures, the corporate venture capital arm of Hitachi Ltd., will bring extensive experience in industrial automation across other verticals as inVia scales, said the company.

"The Hitachi brand is synonymous with leading-edge technology that connects and amplifies the advances in AI-powered software and automation hardware," inVia said. "They share inVia's vision of optimizing operations in every warehouse by maximizing efficiencies across all processes through digitization." ∎

First Financial Equipment Leasing Offers to Reduce Risk in Adopting Automation

Leasing robots and automation can reduce financial risk for both robotics suppliers and users, says FFEL.

By Eugene Demaitre

In addition to the cloud and simulation, robotics and AI are essential to improving flexibility and reshoring of production, say two tech CEOs.

From warehouses to hospitals, as businesses prepare to add automation, the question inevitably arises—"How are we going to pay for this?" As with the technology itself, there is a growing range of options, from robotics as a service to financing. First Financial Equipment Leasing is a privately held lender specializing in the acquisition and lifecycle management of healthcare, information technology, and automation and materials handling equipment and services.

The Orange, Calif.-based company said it takes a "solutions-first approach" to understanding customer challenges and sourcing the necessary equipment. For more than 20 years, First Financial has helped businesses implement the latest technologies and discover their leasing options.

Robotics 24/7 spoke with David Sanborne, senior vice president of sales at First Financial, about what companies adopting robots need to know.

How did First Financial get into robotics?
SANBORNE: When I became head of sales nine years

ago, we were mostly leasing forklifts to midsize to large companies. Assets to be financed make up a big part of the business for us, including equipment financing and leases for a single piece of equipment up to warehouse robotics for a Whirlpool, Keurig Dr Pepper, or Thermo Fischer.

We talked to customers about other equipment, including AGVs [automated guided vehicles], ASRS [automated storage and retrieval systems], and sortation systems. We then started to go to ProMat and MODEX, and we've built up a tremendous amount of knowledge about warehouse automation.

We've heard from both vendors and customers that one barrier is upfront costs. We've built leasing structures to make payments and realize return on investment [ROI] over time. That way, customers can get instant savings from efficiencies. We're one of the rare companies that does this, and we're looked upon very favorably by both robotics suppliers and end users.

How is leasing different from robotics as a service (RaaS)?

SANBORNE: The financial benefits are different from that model. The downside to the vendors is that they don't get $5 million in revenue recognition; they have to collect that money over time. If we lease, the vendors get the money in advance, which is better for them.

A lot of those robotics-as-a-service deals aren't fixed-term but month to month or semiannual. That may be more flexible for the end user, but it's less revenue guaranteed for the vendor.

For end users, we can finance RaaS for baseline usage. It's a more complex model, but payments come to First Financial, and we do the same thing for software as a service.

With leasing, how important are service-level agreements (SLAs)?

SANBORNE: If we finance RaaS, it still has to have a fixed term. There's a baseline number of picks or sorts, and they have to true up every month or quarter. It's harder to budget for.

We've worked with a few vendors that have a hard time figuring out how RaaS helps their business rather than a true lease.

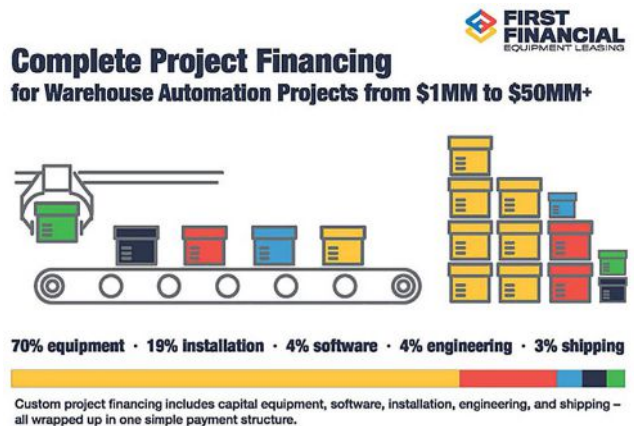### What sorts of equipment can you finance?

SANBORNE: ASRS, picking and sortation, and AMRs [autonomous mobile robots]—we talk to all of them because we can write true leases like a car lease. A lot of finance companies can't leave risk or residual value, even on something as simple as racking or conveyance.

For deep-channel storage robots, AMRs, and AGVs, we bring a financing structure. An "Aha!" moment for the vendors is when they understand how to wrap our solution. It gives them a big competitive advantage.

What aspects of deployment does First Financial cover?

SANBORNE: FFEL pays all "soft costs," such as shipping software, engineering, and installation. We wrap that into the solution, and the customer pays over three to seven years. This can save thousands.

We work with all the major manufacturers, including Attabotics, AutoStore, and SSI Schaefer.

Complete Project Financing
for Warehouse Automation Projects from $1MM to $50MM+

70% equipment · 19% installation · 4% software · 4% engineering · 3% shipping

Custom project financing includes capital equipment, software, installation, engineering, and shipping – all wrapped up in one simple payment structure.

Source: *First Financial Equipment Leasing*

How much do you need to educate the market about reducing risk?

SANBORNE: There is risk for companies involved with new technologies. Our direct model is less scary.

We work with a lot of robot manufacturers, distributors, and systems integrators. A lot of them are really successful at selling our offerings.

Banks don't understand how to write these leases. For example, the chief financial officer of a Fortune 500 company got nine months into a deployment and wanted to give it to a bank, but the bank didn't have a clue about how to write a lease.

That's going to be a common issue—lots of companies buy technology but can't use their own capital, and banks can't deal with soft costs like delivery, integration, and software, which can be 25% to 40%.

Who are your typical customers?

SANBORNE: We try to identify decision makers at end-user customers. It's often the chief financial officer or someone in the treasury department who's trying to budget for automation. It can be people in procurement, supply chain, and direct spend, all the way to warehouse managers.

First Financial generally serves bigger customers—$100 million in revenue and over—but we can deal with smaller customers with $5 million in revenue.

With the COVID-19 pandemic accelerating e-commerce demand, what automation trends have you seen?

SANBORNE: A lot of companies are automating existing manual processes, from individual machines to re-engineered distribution centers [DCs]. We've helped some customers go from fully manual, wide aisles with fork trucks to much more automated systems and dense DCs.

The integrator can show the cost of moving a case, as well as the monthly and annual totals. If you put in automation, it can bring the cost down. If you lease the equipment, the day you start operating it, money starts falling to the bottom line.

We've seen explosive interest in AGVs and AMRs. Retailers and logistics providers are having trouble finding employees, and costs have gone up. We've also seen a tremendous amount of interest in sortation of small parcels.

Do you expect this heightened demand for robotics to continue?

SANBORNE: If anything, it won't slow down; it will speed up. In Phoenix, DCs are building up for Los Angeles. New half-a-million or 1 million-sq.-ft. DCs are being built all over the U.S.

A number of industries had to prepare for e-commerce. Some were better set up for it, but the ones that couldn't fulfill orders electronically took a hit. We've heard a lot about the grocery business automating.

Is First Financial growing as the market grows?

SANBORNE: We're ahead of the curve, and we are hiring a lot of people. We're in the right place, and we're getting the word out how we can help companies.

There is a lot of education of both vendors and end users. If you're thinking of doing something in the warehouse automation space, you might want to finance. This protects you against obsolescence, and it's a formula so you don't put your own cash out front and wait for ROI.

Once people see inefficiencies and labor savings from robotics, the question is "How do I acquire this technology?" When you start seeing others using new technologies, financing can help give midsize and large companies an edge. ■

First Financial Equipment Leasing

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