

# Industrial's autonomous future



Guest comment by **Steve Weikal** and **James Robert Scott**

*New technologies and systems are reinventing the supply chain and could soon become widespread, say MIT Center for Real Estate's researchers*

Industrial real estate is in the midst of a dynamic transformation, as demand has seen exponential growth in the wake of the e-commerce boom and new technologies and systems are adopted in this sought-after asset class. Increased demand and limited supply of large distribution centers, as well as smaller fulfillment centers located in urban and suburban areas, have resulted in significant investment in automation and other technologies to improve operational efficiency and productivity in these buildings.

The supply chain is also becoming increasingly interwoven within the everyday life of cities, with customer demand for ever-shorter delivery times, rising land and labor costs, and the increasing complexity of last-mile delivery. We look at some interesting concepts and companies that are changing how we think about warehouses and industrial real estate, logistics systems and the overall built environment.

## Warehouse vending machines

More than 4 million commercial robots will be installed in 50,000 warehouses

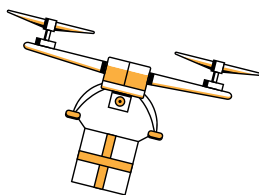
by 2025, up from about 4,000 robotic warehouses in 2018. In the future, automated storage and retrieval systems (ASRS) – computer-controlled systems that automatically place and retrieve items from storage locations – and independent robots will become increasingly integrated with each other. Dematic's ASRS, for example, manages inventory of full pallets alongside independent robots that pick products for customers. Firms like Ocado Technology and Berkshire Grey combine the use of AI, computer vision, machine

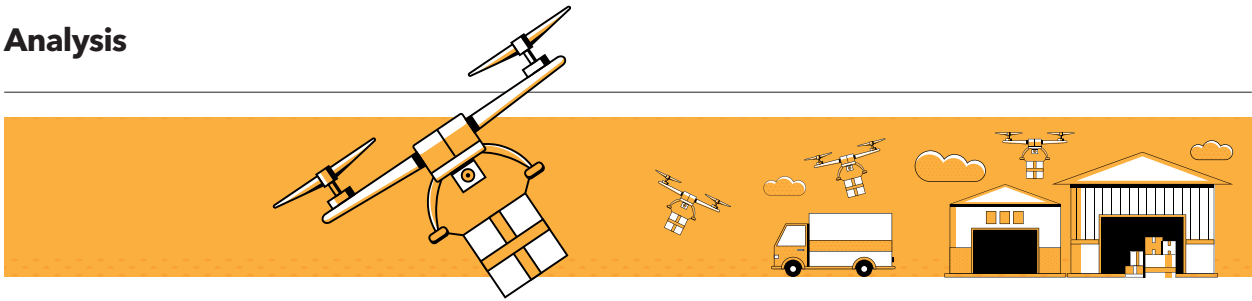
learning and advanced sensing to manage their pick, pack and sort systems.

In parallel with ASRS, robotic carts like those from Fetch, Otto, Canvas (recently acquired by Amazon) and 6 River Systems (acquired by Shopify) use lasers, embedded floor sensors and machine vision to navigate warehouses and also enable social distancing by allowing workers to reduce direct contact with one another in the time of covid-19. Boston Dynamics' Handle robots don't just shuttle goods, but use machine vision to identify and locate boxes, unload trucks, palletize and depalletize, high and low – all autonomously.

Even forklifts, which were invented in the early 20th century, are becoming more automated. Using lasers, image recognition and locational sensors, they can measure distances, map facilities, store data and navigate based on their position relative to the contours of the warehouse floor – walls, racks and other machinery. And soon, robotic forklifts will have the ability to recognize the state of the loading dock, such as the presence of a trailer and the dock's position, as well as the trailer's

*“Autonomous vehicles will optimize a warehouse's operational footprint”*





destination or origin, to connect goods with ASRS or specific inbound and outbound vehicles.

Do these increasingly intelligent robots and flexible ASRS systems mean that future warehouses will be autonomous ‘dark boxes,’ operating with minimal human intervention? A recent report from NAIOP, the commercial real estate development association, suggests that inflow of goods from the receiving dock may remain fairly normal, but when the pallets are automatically and autonomously unloaded, unbundled, sorted and racked, and items are then repackaged to go out as an order, warehouses could resemble a giant vending machine.

### Asset class convergence

The rapid growth of automated storage and retrieval technologies and systems enables real estate owners, operators and developers to re-think traditional real estate classes and their uses, as mounting demand for warehouse and fulfillment space and the shortage of usable space strain the distribution system. Although there were 1,200 new logistics properties under construction in the US in Q4 2020, demand can only be fully met by updating existing stock and innovating them for alternative uses.

According to research by Professor William Wheaton of the MIT Center for Real Estate, automation is perfectly suited to fit into existing structures – and at smaller space utilization rates than prior industries required. Attabotics, for example, makes automated fulfillment systems small enough to fit inside an average-size retail store, and are currently deployed in the US in spaces from 350 square feet up to 61,000 square feet. Fabric, a micro-fulfillment start-up, provides modular storage and retrieval

systems that promise to “deploy to any parameter.” One site in Tel Aviv is located underground in an underutilized parking garage with 11-foot ceilings.

In the relentless push to be closer to the customer, an emerging network of micro-distribution sites are repurposing a variety of unconventional spaces. As landlords deal with falling office occupancy rates, start-up Ohi operates last-touch micro-warehouses in class-B office buildings, with sizes ranging from a few hundred to a few thousand square feet in 80 cities across the US. And instead of displaying items for passing customers, some vacant storefronts are becoming storerooms and delivery depots. Another start-up, Bond, is expanding its network of micro-warehouses for last-mile delivery. Typically between 600 and 1,000 square feet, these spaces are most often at street level, with a storefront accessible by bikes, scooters and local delivery crews.

### Fully autonomous distribution

While much of the media’s attention is on driverless passenger cars, autonomous vehicle technology has applications throughout the logistics chain. Rolls-Royce and ABB Marine, for example, are experimenting with unmanned container ships, while the Association of American Railroads is running trials of driverless freight trains. Driverless technology is also being successfully applied to line hauling, with trials of trucks ‘platooning’ a string of autonomous semis, being conducted by manufacturers such as Daimler, Scania, DAF, Iveco, MAN and Volvo.

These efforts are mostly confined to the highway, but progress has been made allowing tractor trailers to safely navigate hub-to-hub and even dock-to-dock. Once these long-haul vehicles arrive at the warehouse, autonomous

technology in the docking yard will take over. Outrider, a start-up focused exclusively on autonomous yard operations for logistics hubs, has raised \$118 million to develop its system of autonomous electric yard trucks that efficiently and safely manage yard traffic, and the dock interface.

When goods leave the warehouse, the delivery fleet will also be autonomous. Waymo is designing a self-driving Ram delivery van with Stellantis (formerly Fiat Chrysler Automotive) and Walmart is partnering with Ford on autonomous cargo vans. Even the ‘last block’ will be serviced autonomously. Delivery robots like Amazon’s Scout, Uber’s Serve Robotics and Tel-eRetail’s Pulse One deliver packages to the doorstep, while Mercedes Benz has partnered with Starship Technologies to develop Robovan, an integrated delivery van (likely autonomous in the future) that acts as a mothership for a swarm of Starship delivery bots, each making doorstep delivery.

Whether long-haul tractor trailer, yard truck, delivery van or bot, autonomous vehicles will optimize a warehouse’s operational footprint by reducing space required for navigation and maneuvering on the site and allowing 24/7 activity.

### Conclusion

Even though some of the technologies and concepts discussed above may still be a while away from widespread adoption, the potential changes that new technologies can provide the industry are vast – from more efficient operating systems, to faster delivery times, to the repurposing of underutilized space across our cities. All will enable increased throughput and help address current supply chain issues being felt throughout the global economy. ■