



White Paper Series

The 5 Catalysts for Automation Transformation in Manufacturing and Distribution

Topic 2: Shift to E-Commerce





Upstream and Unseen: The Hidden Impacts of E-Commerce on Logistics and How Automation Can Help

Material handling has undergone significant stress over the last few years, but the current crisis predates the pandemic. Most operations are still heavily-reliant on labor-intensive technology from the last century. With warehousing footprint expanding exponentially, now is the time to explore modern, flexible material handling automation to help respond to industry headwinds. This five-part white paper series explores each major catalyst for change in manufacturing and distribution, details their operations challenges, and covers how automation can help you overcome those headwinds and turn your response into a competitive advantage.

The growth of e-commerce was already outpacing many supply chain capabilities going into COVID-19. Then, the pandemic was like adding rocket fuel to the fire, accelerating trends, and condensing 10-year projections into a span of 18 months. However, many of the impacts of the recent stunning growth in e-commerce are less well-known and largely unseen, including by most industry observers.

What is known is that the “Amazon Effect” has created a major shock in the e-commerce world, with dramatic impact on supply chains, intensifying the urgency to keep pace with Direct-to-Consumer (DTC) demand. Retailers of all sizes are adopting new omnichannel strategies, investing in Micro-Fulfillment Centers (MFCs), scrambling to keep up with surging demand and consumer expectations, overseeing more and more e-commerce orders through buy-online-pickup-in-store (BOPUS), and shipping directly to consumers.

This general state-of-affairs is just the tip of the iceberg. Let’s look below the surface at the lesser seen layers of these challenges.

Upstream From the Fulfillment Center and Direct-To-Consumer (DTC)

Less evident than the Amazon Fulfillment Centers dominating the news is that upstream from picking these orders for DTC and BOPUS, Distribution Centers (DCs) and Wholesale warehouses must replenish their downstream warehouses and stores with truckloads of higher-mix orders.

Not so long ago, DCs shipped lots of homogenous pallets to stores every few days. Now, increasingly “rainbow pallets” containing a mixture of cases are needed. And those rainbow pallets need to be replenishment-friendly – arranged in a way that makes it easier for warehouse pickers and retail employees to restock shelves and fulfill orders. MFCs and “dark” stores can only store 1-2 days’ worth of inventory, so replenishment needs to occur more frequently and with more tailored shipments.

In addition, 25-33% of e-commerce orders are also now drop-shipped directly from the wholesaler or manufacturer to the consumer. And that consumer is not always who you think it is.

Percentage of e-commerce orders
drop-shipped directly to consumers



25-33%

B2B Outpaces DTC

Most of the public, including many supply chain professionals, focus on the DTC impacts of e-commerce. But businesses buy in bulk—even if those orders involve a higher mix than they used to—including larger, bulkier SKUs. The result is that the tonnage of B2B is more than **five times larger** than B2C.



Oversize Packages are Growing

Adding to the picture is the trend toward more oversized items. Online orders for fitness equipment and furniture have recently skyrocketed. But furniture, fitness equipment, and kayaks often don't fit well through existing fulfillment and delivery hubs and require special storage and handling.

Warehouses are Getting Larger, Taller and More Dense

To keep up with increasing demand and the growing number and sizes of SKUs, warehouses are getting larger and holding more inventory. Average warehouse size for companies with multiple logistics facilities increased by **18% from 2020 to 2021, to 535,550 square feet**. One often hears warehouse managers expressing their concern that if they don't stock slow-moving items, their customers might switch suppliers to a warehouse that does – but this takes up valuable space. More giant facilities are inevitable, which means travel times are becoming longer within warehouses. Traveling within the building sometimes accounts for up to 33% of a facility's overall labor costs. And that affects how long it takes to get things done at a time when next-day shipping is the new expectation.

Not only are warehouses getting more expansive in terms of square feet, but they're also getting taller. The average clear height of warehouses in 1990 was 24 to 26 feet. As real estate prices have risen, increasing storage capacity by going vertical makes sense, with clear heights today averaging 36 to 40 feet. And to keep costs down without reducing inventory, aisles are also becoming narrower to satisfy the demand for more dense storage.



Consider the Whole Iceberg

Add up the factors just mentioned, and it becomes clear that picking individual items from cases or totes – fulfilling orders for consumers – is the tip of the iceberg. It only scratches the surface of what’s needed.

To effectively support DTC fulfillment, MFC replenishment, and the much larger B2B e-commerce market, distribution centers and bulk warehouses need to store a broader range of SKUs, process higher-mix orders, and ship these in less time out of larger facilities. All of this means more material handling further up the supply chain, which can cause unforeseen consequences to downstream fulfillment operations when not correctly accounted for.

The upstream distribution and material handling to support e-commerce fulfillment is the 90% of the iceberg lurking beneath the surface. And the key to a robust e-commerce strategy - and to avoid becoming the next Titanic - is to invest in your upstream supply chain using proven automation solutions that provide a flexible, scalable path towards downstream fulfillment success.

The Solution: Flexible Material Handling Automation



This paradigm shift has resulted in an explosion of new equipment designed to rapidly perform pallet and case picking in tighter spaces and with heavier, bulkier payloads. Class II and Class III industrial vehicles reincarnated as modern **Autonomous Mobile Robots (AMRs)** solve many of the problems outlined above.

Driving a forklift or pushing a pallet jack is a low-value activity. Yet without automation, associates might spend 50% of their time traveling within the facility. By automating that travel, DCs and warehouses not only reduce the dependence on the upstream, unseen impacts of e-Commerce and how to solve them AMRs Autonomous Mobile Robots human labor, but they also improve the efficiency of operations – making it possible to “do more with less.”

These proven solutions differ from traditional industrial automation in their flexibility, scalability, lack of fixed infrastructure, and ability to adapt to operational changes on the fly. They can also operate collaboratively with complementary automation systems for even greater impact, such as robotic arms that can autonomously construct rainbow pallets.



Here are some of the key benefits of modern mobile material handling automation:

1. Reduces Reliance on Labor While Improving Throughput and Accuracy

- Manages mundane and repetitive tasks, allowing humans to focus on higher-level jobs.
- One person can oversee the work of several AMRs at the same time.
- The maintenance and operating costs of an AMR are typically less than a human salary and benefits.
- AMRs allow more work to be done at any given time by increasing the number of tasks executed at once.
- AMRs communicate with each other and the facility's WMS system to maintain the highest efficiencies in workflows and job execution.
- Vecna Robotics case studies show self-driving forklifts and tugs improve throughput and productivity by 30-50% compared with manual processes.

2. Quick to Implement with Rapid ROI.

Traditional automation has a fixed output and generally takes one to two years from the start of planning to a complete installation. In contrast, modern, flexible automation can be installed without massive infrastructure changes in a matter of weeks or even days. In addition, your automation can be easily reconfigured - it can adapt and grow with you by simply deploying more or fewer robotic vehicles. And the automation can be easily relocated to new facilities.

Emerging **Robotics as a Service (RaaS)** models remove the burden of securing significant capital for the investment and enable easy scaling up and down as a facility's needs shift. This subscription model allows facilities to see the efficacy gains and ROI more immediately, rather than waiting to pay down the investment over several years. By removing the requirement for companies to secure upfront capital for automation, the pay-as-you-go RaaS model allows more facilities to remain competitive with fast, efficient operations.

3. Adaptable to Changing Conditions

Modern, flexible automation is software-driven, so it can quickly adapt as:

- Order profiles shift
- Slotting and routing layouts change
- Workflows are reconfigured

As an example of this adaptability, an AMR picking system can simply be run in reverse for put-away and can also interweave replenishment. Or, in near real-time, AMRs can be deployed to other pre-configured workflows when there is a spike in demand or a shortage of workers in one area of your facility.

4. Increases Storage Density

Automation can safely operate in tighter spaces. Forklifts driven by people who are evaluated or paid according to a pieces-per-hour scale are incentivized to move at a very high pace and may cut corners. As a result, loads can fall and break, vehicles can tip, and entire shelving units can collapse. AMRs will never do this because they focus on executing their tasks. They identify the most efficient workflows and navigate with highly effective safety systems. By working 24/7, DCs and warehouses can move more products through a building. For example, a facility could have an overnight shift prepare inventory for the next day's picking, which opens slots and improves put-away. An overnight skeleton crew can take care of necessary but low-value activities like disposing of excess packing material.

Also, practically speaking, AMRs are starting to be purpose-built for autonomy meaning there is little to no need to have space for a driver. This means that the machines can have a smaller footprint and turning radius allowing them to squeeze into tighter spaces.

5. Improves Visibility and Drives Continuous Improvement

Automated systems can track orders and inventory, often down to the individual pallet/case/SKU/each level. Modern automation is continuously informed by machine learning and data insights. The result is constantly improving performance and ongoing new feature releases. Traditional capital equipment does not have this capability. Advanced analytics and vast amounts of data can be used for both warehouse optimization and supply chain insights.

Conclusion

Often overlooked by many industry observers, the biggest impact of e-commerce is in the B2B world, which is five times bigger than B2C. The workflows and workspaces defined by B2B require material handling vehicles that are larger, can handle heavier payloads, and can reach higher than most Autonomous Mobile Robots.

Modern, flexible AMR technology offers significant benefits to help organizations struggling to keep up that the mix shift that direct-to-consumer has imposed on upstream operations. The technology is now mature, cloud-enabled, leverages commoditized parts and has a variety of deployment models that helps complex operations optimize throughput and get back on track.



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