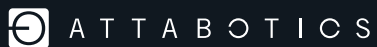
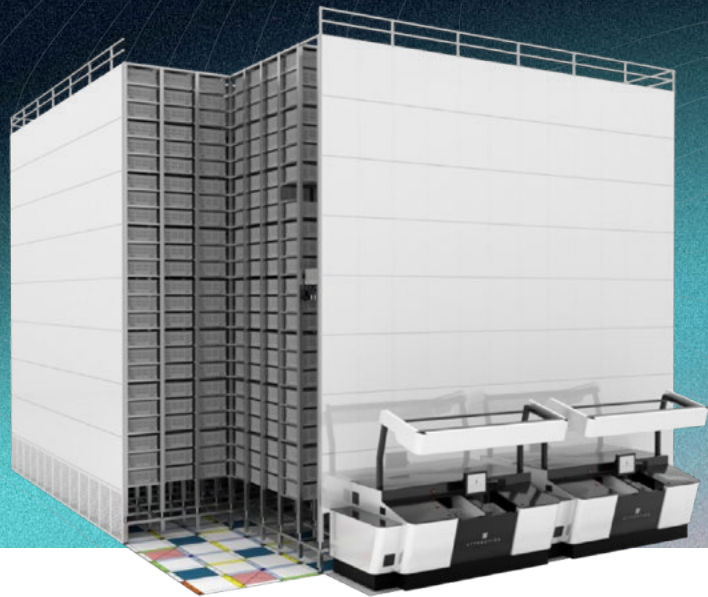


2023 TRENDS REPORT

# Automated Storage and Retrieval Systems



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# INTRODUCTION

In 2020, the pandemic caused massive disruptions in how companies order, store and distribute products. But what about the following years? Would emerging trends continue into 2021 and 2022, or would the retail, electronic commerce (eCommerce), and grocery environments shift back to pre-pandemic habits? Was this the “new normal” or just a blip on the radar?

Trends kicked off by the pandemic are here to stay. The good news is that innovative solutions can help companies survive and even thrive amidst the changes. Getting products to customers more quickly with expectations of same- or next-day delivery, handling labor shortages, and accommodating the increasing public and private focus on sustainability are transforming the automated and storage retrieval systems (AS/RS) industry. Companies can maintain a competitive advantage by investing in AS/RS solutions that have evolved to include smarter spaces and systems. Let’s dive into these two emerging trends, what AS/RS may see in the future, and how to navigate all the changes.

## Helpful Abbreviations

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<b>AS/RS</b>	Automated storage and retrieval systems.
<b>eCommerce</b>	Electronic commerce. Refers to companies who sell their products online and don’t have physical retail locations.
<b>eGrocery</b>	Grocery sales generated from online orders.
<b>SLA</b>	Service level agreement. A promise made by a company to its customers.
<b>MFC</b>	Micro-fulfillment center. Small warehouse built within or near an existing retail location or high-density population.
<b>SKU</b>	Stock-keeping unit. The number assigned to a product.
<b>WCS</b>	Warehouse control system. Software that controls warehouse throughput.
<b>GTP</b>	Goods-to-person picking method. Automated systems deliver products via robot to pickers.

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## TREND #1

# SMARTER SPACES

Growing eCommerce sales, increasingly demanding service level agreements (SLAs) between companies and customers, and the prioritization of sustainability have pressured the AS/RS industry to create smarter spaces.<sup>i,ii</sup> This new breed of warehouses has a reduced carbon footprint, provides easy internal access to products, and positions products closer to customers (Figure 1).



Figure 1 - Trend drivers for new warehouse configurations

## Trend Drivers: Customer Shopping Habits and Demands

The pandemic permanently altered customers' shopping habits. US eCommerce sales grew by an astonishing 31.8% in 2020. Even though customers returned to stores in 2021, their online shopping continued to grow, but not at the previous year's rate (Figure 2). eCommerce sales grew by 14.2% between 2020 and 2021 (Figure 3).<sup>iii</sup> Although 14.2% may not initially sound like a lot compared to the growth between 2019 and 2020, it shows something even more important—customers continue to shop online even with stores reopening.

### eCommerce Growth: 2020 and 2021

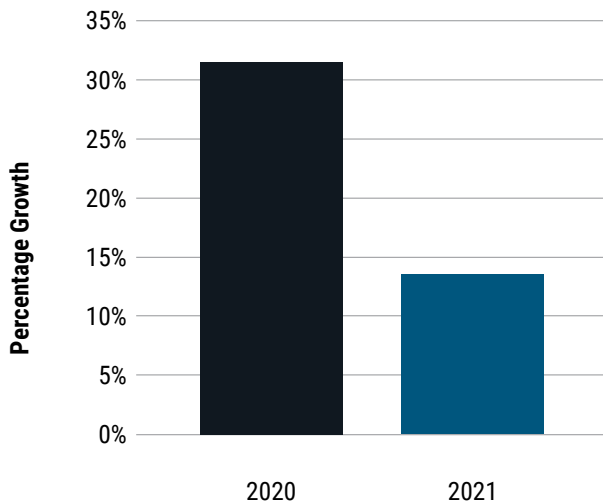


Figure 2 - eCommerce percent growth holding steady.  
Source: Digital Commerce 360, US Department of Commerce Retail Data; February 2022.

### eCommerce Sales

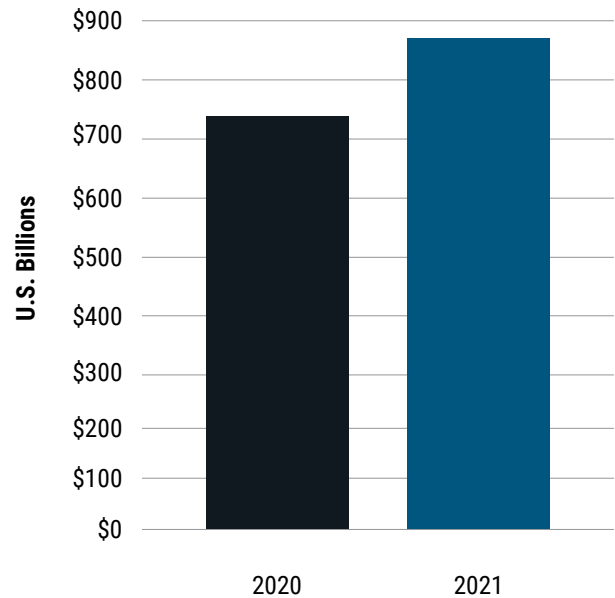


Figure 3 - eCommerce sales growth between 2020 and 2021.  
Source: Digital Commerce 360, US Department of Commerce retail data; February 2022.

SLAs, the promises companies make to customers, have also changed dramatically over the past two years. Demanding SLAs heavily impact electronic orders for the grocery industry (eGrocery). A 2022 report by Statista shows that eGrocery delivery and pickup in the US grew from 1.2 billion dollars in August 2019 to a peak of \$7.2 billion in June 2020. Pickup/delivery trends mirror eCommerce trends—instead of dropping back to pre-pandemic levels, delivery/pickup continues to thrive, with \$6.4 billion in sales reported in October 2021.<sup>iv</sup>

This paved the way for smarter, not larger, spaces to store and access products. These spaces had to accommodate increased automation to make up for labor shortages, flex to fill online orders, and operate quickly enough to meet promises for same- or next-day deliveries.

## Micro-fulfillment Helps Companies Meet Customer Demand

An emerging solution to the problem of how to meet the demands of more customers shopping online and expecting rapid delivery is building micro-fulfillment centers (MFCs). MFCs are small, often automated warehouses built in existing retail locations or near high-density or urban areas.<sup>vi</sup> Because they are closer to customers, MFCs can help solve the expensive problem of getting products from warehouses to customers' doorsteps, also known as last-mile delivery.<sup>vii</sup> MFCs, once built, allow companies to get products to customers quickly and efficiently without exponentially increasing their delivery fleet size.



eGrocery has been the quickest industry to adopt MFCs, but other sectors are catching up.<sup>viii</sup> Although they require an upfront investment in installation, the need to meet SLAs and keep last-mile delivery costs down provides return-on-investment. Also, some logistics companies design MFC systems to go directly into existing retail locations without hefty slab remediation, providing a huge cost saving.

MFCs are essential for retail and grocery businesses with a heavy online presence. As online shopping continues to rise, companies need solutions besides in-store picking that can meet SLAs for online shoppers without alienating in-store shoppers.<sup>ix</sup> Automation and smart technology (such as automated inventory analysis) built into MFCs streamline operations—cutting costs from \$10-15 per order to \$3-6 per order.<sup>v</sup>

## Environmentally-friendly Solutions Matter to Customers

In addition to streamlined operations, MFCs offer a more environmentally-friendly, sustainable solution to traditional types of order fulfillment. And sustainability is an increasingly attractive feature for customers and companies.

A recent survey by the IBM Institute for Business Value (IBV) found that 51% of consumers say sustainability is more important today than a year ago. Also, 49% said they'd pay more for sustainable products. Company decision-makers reflect these results: 53% of executive respondents from another IBM IBV and Oxford Economics survey saw environmental stewardship as a top priority in the next three years.<sup>xi</sup> Sustainability is becoming a priority for companies and their customers (Figure 4).



# 51%

of consumers place more importance on sustainability than in 2021

# 49%

of consumers would pay more for sustainable products

# 53%

of business leaders see sustainability as a top priority in next 3 years

Figure 4 - Sustainability is becoming a priority for customers and companies.  
Source: IBM Institute for Business Value 2022 Surveys.

MFCs have a smaller carbon footprint and require less upkeep than traditional warehouse solutions. Traditional warehouse systems range from 50,000+ square feet, whereas MFCs are 10,000 square feet or less.<sup>vii</sup> Innovative storage solutions, such as the one offered by Attabotics, reduce the space needed to store goods by 85%. Also, by decreasing on fleet sizes and transportation distance, they cut down on non-sustainable delivery practices.

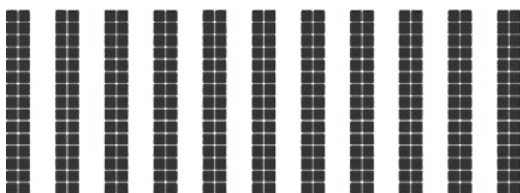
## Innovative Storage Solutions Meet SLAs

In addition to considering new spaces for storing products, companies should also consider new ways to store goods to adapt to labor shortages and changing customer demands. Online shoppers often include a variety of products in their orders that they expect to arrive together and on time. The many stock-keeping units (SKUs) companies must keep on hand to meet consumer demand still need to be accessible.

Unit-load AS/RS solutions no longer dominate today's warehousing environment.<sup>viii</sup> Instead, storage solutions require space efficiency and accessibility.

High-density stacking helps companies maximize space. However, stacking and unstacking bins to meet the depth of SKUs customers' orders require can compromise efficiency. Vertical storage solutions with 3-dimensional access offer an innovative answer to this problem (Figure 7). More points of access mean more products are within reach, resulting in faster throughput.

### LEGACY AISLES AND ROWS



### ATTABOTICS PROPRIETARY 3D STRUCTURE

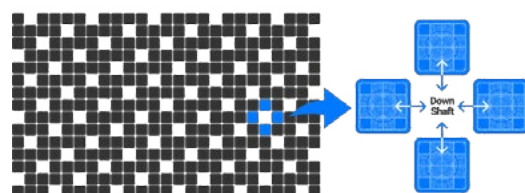


Figure 7 - 3D storage solutions achieve density without sacrificing accessibility

## TREND #2

# SMARTER SYSTEMS

Transformations are underway in where and how AS/RS store products. The “who” of AS/RS is also changing—who picks products and how AS/RS manage picking. These smarter systems help companies adapt to labor shortages while maintaining maximum throughput.

### Trend Drivers: Labor Shortages, SLAs

The pandemic caused a massive upheaval in how warehouses operated, from staff safety to labor shortages.<sup>xii</sup> Also, the need to quickly fulfill rising numbers of online orders to satisfy SLAs is driving how warehouse software manages sequencing and picking. The emerging AS/RS solutions have increased throughput and use automation to rely less on human labor.

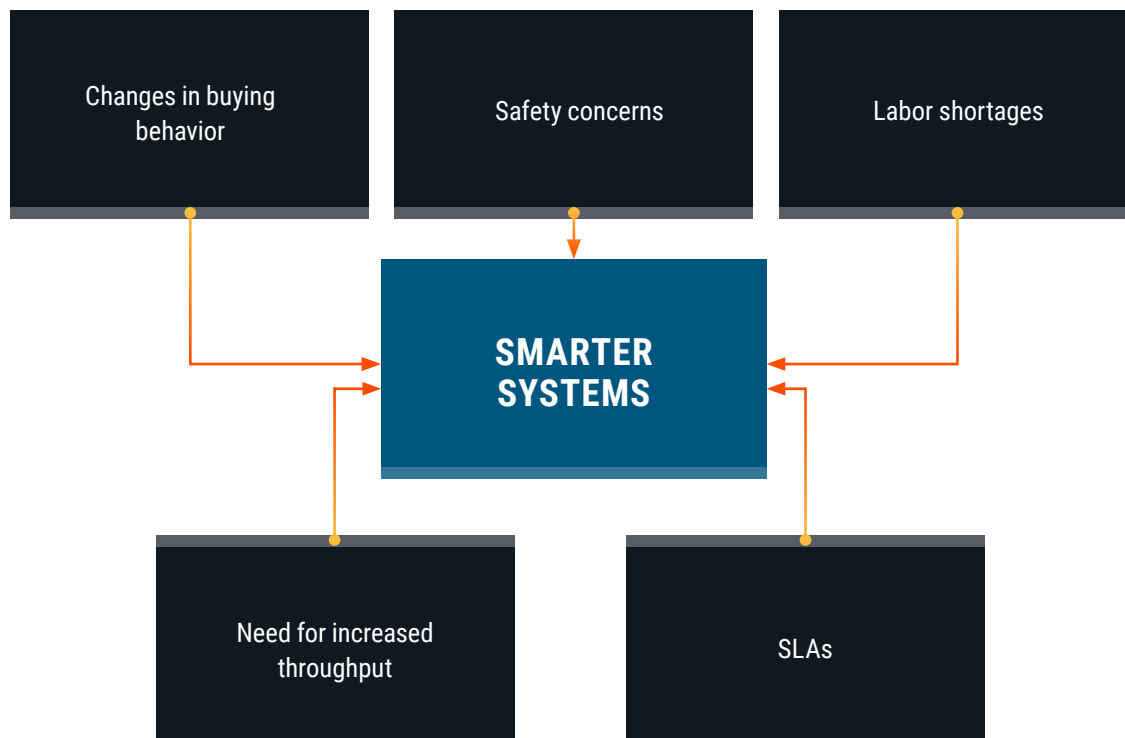


Figure 8 - Trend drivers towards AS/RS smarter systems



The pandemic caused staff to question the safety of their physical proximity to other workers in the warehouse layout. Recent polls by Microsoft and Adobe found that 37% of workers felt pressured by management during the pandemic to continue to work despite concerns over unsafe working conditions.<sup>xiii</sup> Today's AS/RS solutions provide the flexibility to modify workspace configurations to keep staff safe.

Labor shortages require warehouses to function with fewer people. According to the US Bureau of Labor and Statistics, job openings for transportation, warehousing, and utilities were 7.7% for August 2021 and 6.7% for August 2022.<sup>xiv</sup> Unemployment rates have dropped since the pandemic, but the open positions in warehouses across the US remain relatively empty, calling for alternative solutions.<sup>xv</sup>

## Automation is (Part of) the Answer

Today we're seeing an increased reliance on automation and robotic picking to solve labor shortages and achieve the throughput needed to satisfy SLAs. Robots are the next step in the evolution of warehouse logistics (Figure 9).<sup>ii</sup>



Figure 9 - Robots are the next step in the evolution of AS/RS logistics.

Unlike traditional warehouse models, AS/RS solutions relying on robotics and automation often use a goods-to-person (GTP) methodology. Instead of people walking through warehouse aisles to retrieve orders, robots pick products and bring them to workers to sort.<sup>xvi,xviii</sup> This optimizes warehouse space and provides safer working conditions for staff, as they only need to be by workstations.<sup>viii</sup> GTP methods also reduce staffing requirements; some AS/RS solutions can reduce labor by 75%.<sup>xvii</sup>

Automation enables efficient picking. Robots can present over 300 bins per hour to each operator without needing bulky conveyor systems or shuttles.<sup>xvii</sup> They can also work in the high-density storage situations used in MFCs. Some modern robotic solutions also have no single point of failure. In other words, malfunctioning robots can easily be substituted without blocking throughput.

## Adaptive Software Provides Control and Flexibility

Warehouses need easy access to vast SKUs to meet more frequent and less predictable orders.<sup>i</sup> Layering smart software over traditional warehouse control systems (WCS) allows for flexibility, improves efficiency, and increases throughput.<sup>ii</sup> WCS integrated with smart systems, such as Attabotics' Weave Platform, improve AS/RS performance (Figure 10).

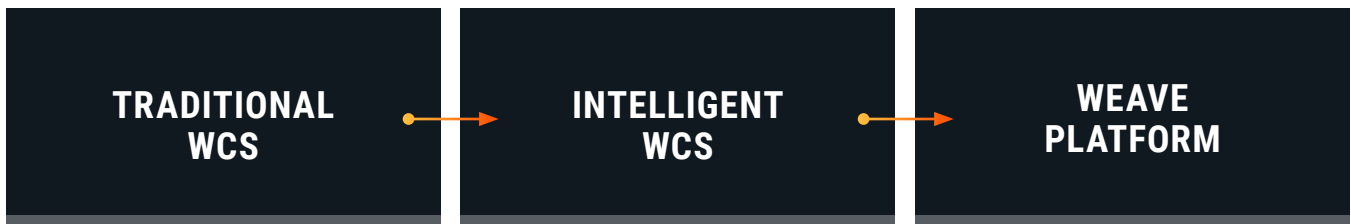


Figure 10 - Software system progression

Traditional WCS work with legacy warehouse management systems to manage, sequence and coordinate warehouse logistics.<sup>ii</sup> These rugged systems can last for decades but can't make dynamic decisions, leading to frequent bottlenecks. In comparison, the additional inputs built into intelligent WCS allow them to move loads between tracks. This more agile system improves throughput but can't differentiate between load units.

A truly smart software solution continues to build on these advancements. Solutions such as Attabotics' Weave platform offer even more control over warehouse logistics, improving efficiency and throughput. The Weave platform can hold back aged orders to accommodate high-priority orders and group orders of similar composition to maximize pickers' performance and reduce the number of robots needed (and associated maintenance costs).

Prioritizing orders, also known as automatic sequencing, improves retrieval times, provides intelligent use of space, and can handle rush orders. Sequencing can increase units picked per hour by 50%.<sup>xvii</sup> Smart software offers the flexibility needed to be successful in today's retail, grocery and eCommerce environment.<sup>xvii,xii</sup>

# FUTURE SNEAK PEEK

Today's leading AS/RS solutions can process orders quickly through automation, software, and smart design. But what will AS/RS look like in future years?

Robotics play a huge part in today's AS/RS trends, and experts predict their role will grow. One expert recommends renaming AS/RS "automated inventory engines" to reflect the increased focus on robotics.<sup>viii</sup> Some of today's innovative robotic solutions don't need external belts and conveyors, but tomorrow's robots may not even be limited to a grid.<sup>i</sup>

In the future, experts predict the role of machine learning and artificial intelligence in streamlining AS/RS operations will increase. They also foresee increased connectivity, such as linking wearables and driverless trucks to warehouse software through the Internet of Things (IoT).<sup>ix, xii</sup> Retail, grocery, and eCommerce companies can look to increased control and predictive capabilities of AS/RS and even more advanced robotic and automation solutions.

## PARTNERSHIPS SIMPLIFY DECISION-MAKING

Maintaining a competitive advantage amidst big changes is challenging. It can feel even more overwhelming when faced with so many options for how to proceed. Ultimately, each company needs an AS/RS solution tailored to fit future staffing needs, productivity expectations, and business risks.<sup>ii, iii</sup> For example, grocers have different storage requirements than an eCommerce clothing company. One will need an integrated cooling system; another will require a smaller-scale solution that fits their budget and product range.

Logistics companies like Attabotics can help businesses make decisions about their AS/RS systems that maximize return-on-investment. Each solution engineered by Attabotics is tailored specifically for a client's current and future needs. The future of warehousing is exciting—how can we help you adapt?

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