



# Industry survey report: warehouse optimization strategies

Efficiency trends for automation & workforce





## About this report

We conducted an industry survey involving over 200 supply chain professionals. The data gathered covers all major markets and industries, including:

- 3PL
- Apparel
- Automotive
- CPG
- eCommerceFood & Beverage
- Pharmaceutical
- Retail
- Transportation
- Wholesale... and more

Those participating in the survey cover executive, managerial, specialist, and other roles within their respective supply chain organizations.

Small, midsize, and large enterprises are represented in the survey data.  
Note: Be mindful that as we dig deeper into industry-specific insights, sample sizes vary.

Thank you for reading! If the data and insights in this report help with your research and operations, contact us for even deeper perspectives and assistance with your supply chain challenges.

## Contents

I. Introduction	4
II. Automation adoption	6
III. Automation optimizations – challenges	10
IV. Optimization trends – software optimizations	16
V. Workforce industry trends	20
VI. Workforce optimizations: software, voice and mobility	22
VII. Better decisions, better optimizations	26
Conclusion	28



# I. Introduction

Change. It's the only constant in the supply chain industry. Market conditions, customer expectations, technology, and processes are all in flux. On the other side of change, we find opportunity. Opportunity to drive cost reduction, improve efficiency, or add attractive new services your customers want and need.

Sometimes simply tweaking buttons and knobs lead to small yet impactful improvements. Other times, operations undergo a sea change. In this report, we will take a closer look at the optimization strategies businesses take (or don't take) to improve performance.

In our recent warehouse automation survey, **the average satisfaction score for automation technology was a 3.1 out of 5**. Further, 55% of supply chain practitioners have no plans to augment their automation systems – even though the satisfaction scores leave room for improvement. (We'll cover these points in more detail later.)

These statistics prove that there are a lot of opportunities to leap ahead of the competition by investing in people, processes, and supply chain systems. So, in this report, we ask a simple question: **How?**

In this report, we'll focus on two areas:

- **Automation Optimizations**
- **Workforce Optimizations**

We focus on automation and workforce optimizations because they represent the chief modes for physically moving inventory. They're intrinsically tied to one another. For example, we found that 68% of businesses look to automation to offset labor-related issues. We're not suggesting automation is replacing manual labor. But, the automation-human dynamic will shape the future of warehouse operations.

In addition to the data and insights we're sharing for automation and workforce optimizations, we'll cover other key technologies such as **warehouse simulation** that offer the tools to conquer supply chain changes and complexity today and tomorrow.

68% of businesses look to automation to offset labor-related issues

**Did you know?**



**The automation-human dynamic will shape the future of warehouse operations.**



# II. Automation adoption

## Technology adoption

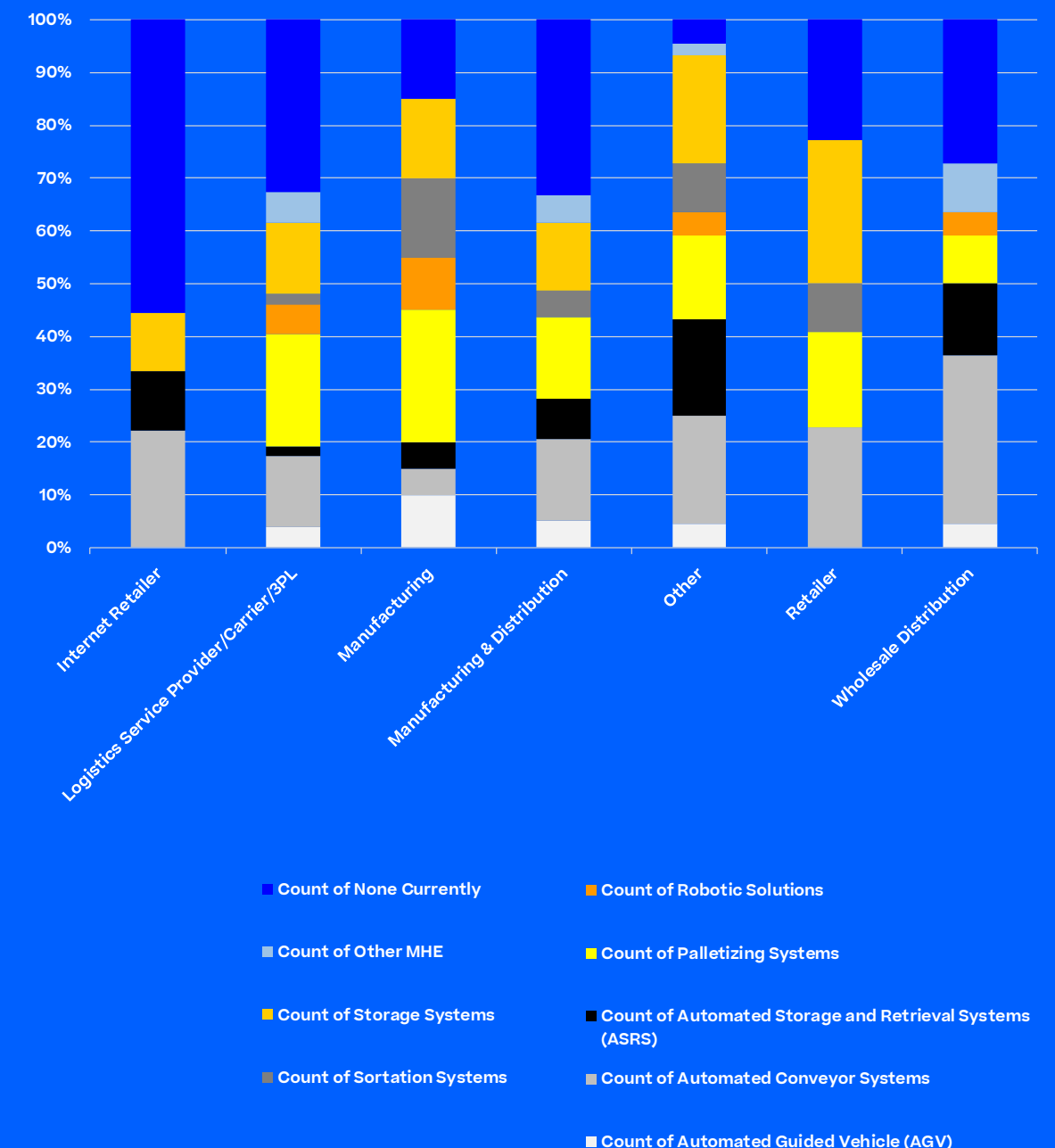
Automation in this context covers material handling equipment (MHE) such as conveyors, automated guided vehicles (AGVs), and more.

Before looking at how businesses plan to optimize their automation stacks, we broke down automation adoption based on industry sectors (see chart). This offers a foundation and context for the optimization findings later in the report.

## Takeaways

- According to the chart, Internet Retailers show the most room for growth for adding automation. The combination of lower adoption percentages with the growth of eCommerce points to a fast-coming need for warehouse resources.
- It's no surprise that more "traditional" MHE such as palletizing systems and conveyors are more widely adopted than newer technologies. However, we're currently watching robotics move from bleeding edge to the mainstream, and we expect adoption trends to favor "flexible" MHE that isn't bolted down as businesses open new projects.
- With businesses listing software and integration as a key challenge, make sure your hardware partnerships line up with supporting systems. Reducing the number of brands in your supply chain tech stack could reduce complexity.
- Have a plan. Even if your systems are currently flawless, nothing gold can stay. This isn't a knock against your partners or solutions. It's just a reflection of the fast-paced, rapidly changing industry. With smart systems providing valuable data and a proactive approach, you can get ahead of future challenges and prolong your success.
- Build fail safes into your operations whenever possible. Be it adaptable processes, workarounds, or systems like a WCS built to circumvent issues, expect the unexpected to keep inventory moving.

# Your industry's automation and MHE adoption



## Why AGVs and robotics

With **47% of businesses planning to acquire automation technology in the next five years**, expect a swing toward robotics. To be fair, fixed MHE isn't going anywhere. It's well suited for many warehouse applications. However, let's take a closer look at how robotics bring unique versatility for warehouse applications and even procurement.

There's certainly value in having the right tool for the right job. But, when making major technology acquisition decisions, flexible technology adds value that extends the return on investment. For example, an AGV or robot may be used to move large items, but they can also perform replenishment and picking. The ability to re-allocate these resources is critical for businesses that need to pivot quickly.

Compared to the procurement complexity that typically comes with large capital investments, the purchasing options available for robotics is attractive for many businesses. For example, we're seeing businesses showing interest in robotics as a service (RaaS). RaaS is an operational expense, thus transitioning the expense of automation from CAPEX to OPEX.



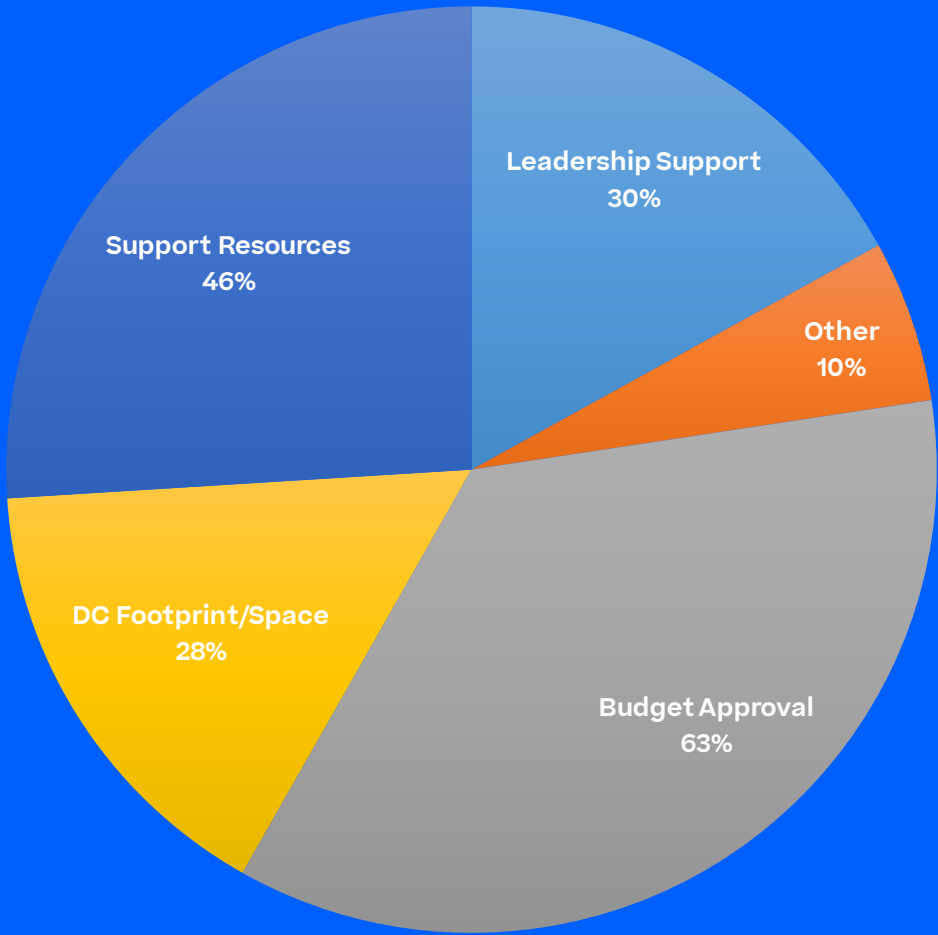
With RaaS, a robotics vendor offers scalable unit deployment. Once the robotic system is deployed, you can scale up and down temporarily to meet peak demands. This is possible because once the system is deployed, bringing new robots into the operation is quite simple. Because the software they align to is already in place, new robots already know everything about the operation once they hit the floor.

The survey finds that budget approval sits at the top of the list of challenges businesses face when starting new projects. Folding automation into OPEX on the budget sheet directly solves a pervasive challenge holding many supply chains back from adding critical resources.

### Takeaways

- Do you have one big challenge, or do you need solutions with versatility that fill several needs? Consider all your challenges (and opportunities)...not just the immediate need.
- If large capital expenses hold you back, consider partners with service-based solutions. RaaS and other service-based models make it easy to quickly ramp up projects and scales to your needs.

# Barriers for implementing or expanding automation



# III. Automation optimizations – challenges

## Takeaways

- Do not discount software when investing in MHE hardware. Be sure the systems that manage your tech are just as solid as the steel moving inventory.
- Technology solves big challenges, but adding new systems on top of existing systems may increase complexity and bring about new issues that come with managing disparate solutions.
- Build internal and external support as early as possible. This may include allocating headcount, aligning with IT, on-site maintenance services with your partners, or choosing infrastructure (such as cloud) that builds managed services into your solutions.

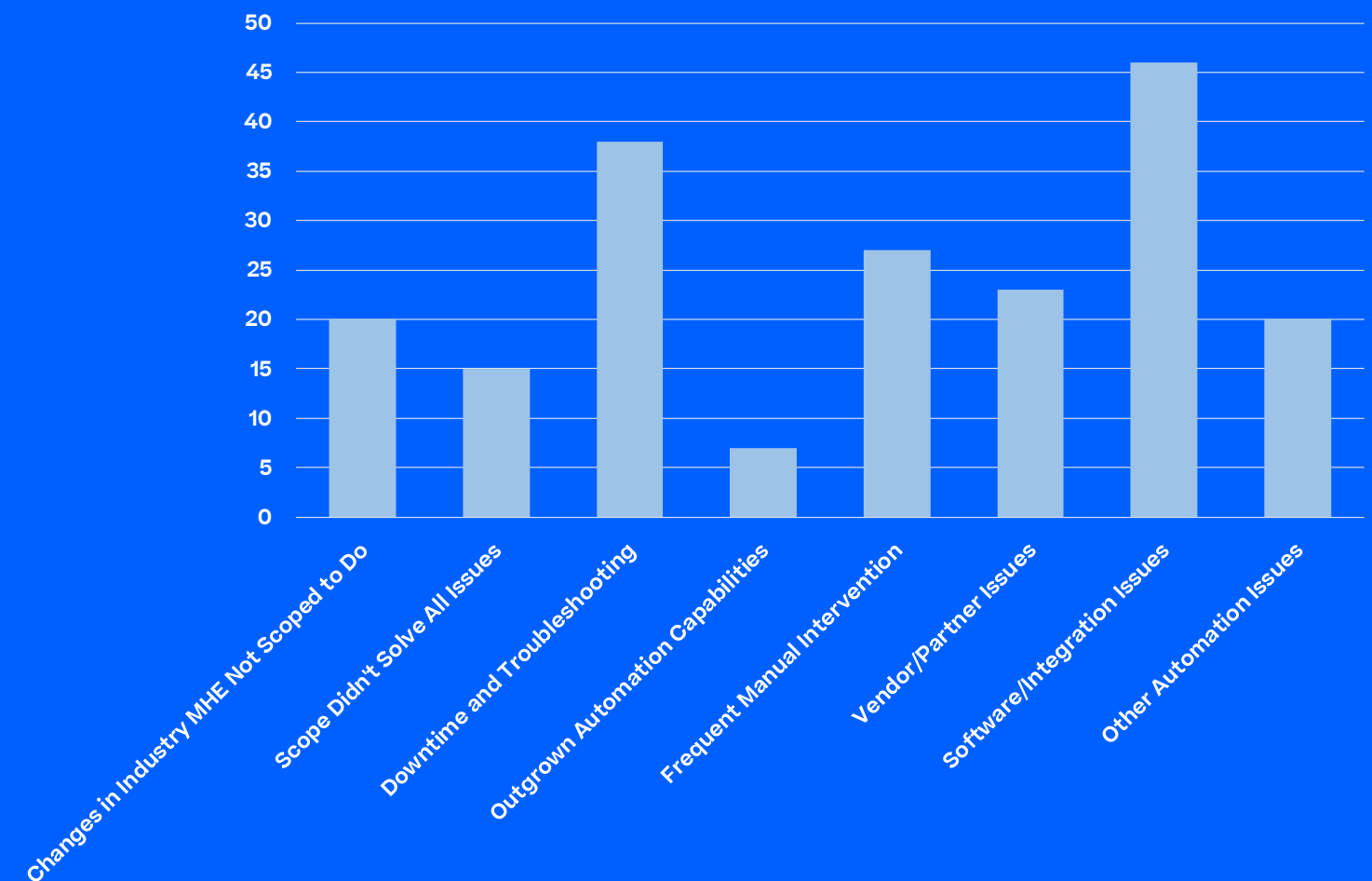
With an understanding of existing and emerging technology adoption, we can move on to how and why businesses plan to optimize these systems. First, we'll examine the why – challenges with technologies already being utilized. These issues point to the optimization projects. Second, we'll look at the trends and technologies businesses adopt to improve their automation systems.

### Technology challenges

We discovered people's top challenges with automation come down to:

- Downtime and Troubleshooting
- Software and Integration Issues

# Automation issues and challenges





### Optimization trends

How do businesses plan to augment their automation investments? Let's take a look:

#### Upgrading tech stack

There are technology solutions for virtually every challenge listed above. But, upgrading with new tech isn't just about solving problems. Over 50% of people believe automation is a strategic advantage for their business. To double-down on their competitive advantage, these businesses plan to expand existing solutions or integrate entirely new systems (e.g. adding robotics to work off of a conveyor system) to expand the range of their capabilities and profitability.

#### Third-party WCS

Many MHE providers offer a warehouse control system (WCS) to control automation systems made by the same manufacturer. While this helps with system management, it can also put technology into silos with disparate systems. The chart on the prior page shows that **46% of supply chain professionals list software and integration as a challenge**. A "device agnostic" WCS allows you to integrate with and control all automation within the warehouse, regardless of manufacturer. This reduces complexity and allows you to treat all automation systems as a cohesive unit (as it should be).

Over 50% of people believe automation is a strategic advantage for their business.

**Did you know?**

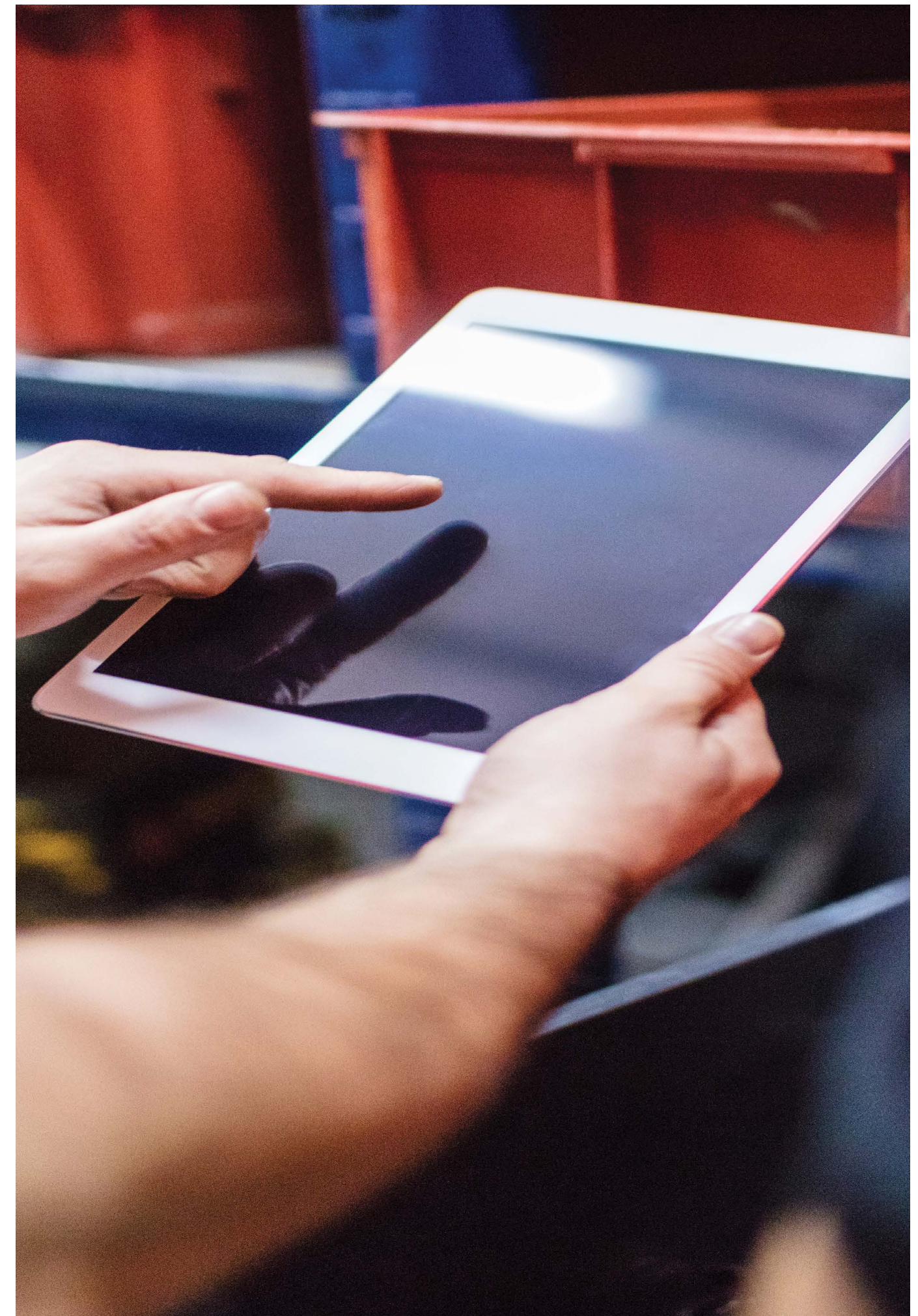
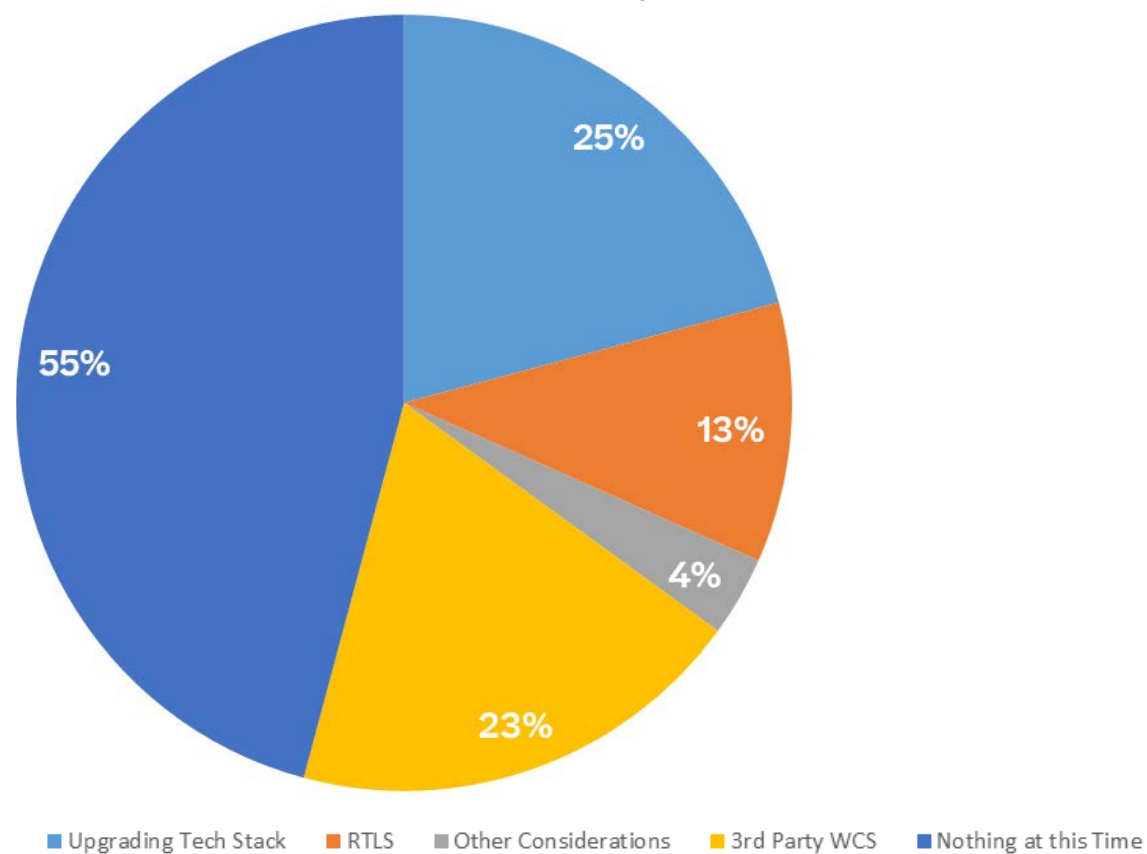
#### RTLS

Nearly half of the businesses reported order accuracy as a key automation ROI metric. Real-time location systems (RTLS) offer pinpoint accuracy for inventory whereabouts, decreasing the chance of lost and misplaced inventory. It's also a great tool to track material flow to help with warehouse planning.

#### No optimization plans

The simplest explanation for this approach is that there is no immediate need. While the satisfaction scores we reference earlier don't jump off the charts, many businesses are happy with their automation investments. If it isn't broke, why fix it, right? However, in an industry where things change fast, this could be risky. Building a plan could save the business from scrambling as conditions change.

**Top Automation Optimization Strategies**



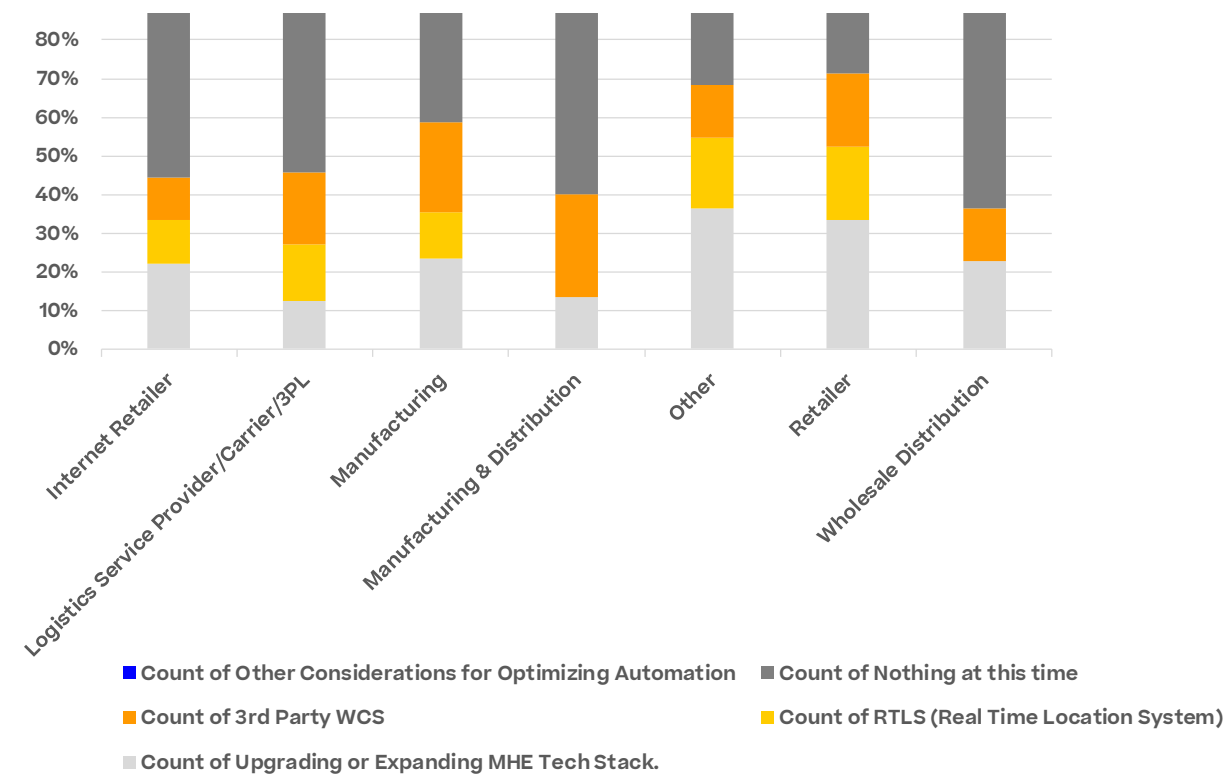


Time to value and ROI are other possible reasons why businesses aren't optimizing their automation. Once the system is deployed, it needs to start yielding returns. While this is an understandable feeling, 1 in 5 says that market changes create issues that their automation stack isn't scoped to handle. Another 15% say that their project scope didn't solve all their problems.

Even with big price tags, automation, like all technology, needs a solid strategy that welcomes improvement to be effective over the long term. This could be why the satisfaction scores we noted earlier are middling – there's no continuous improvement to maximize systems and keep up with the market.

Here we see how different business sectors approach optimizations. We see Manufacturing and Distribution businesses with the lowest likelihood to re-invest in automation to get more out of their systems, while Retailers seem to have the greatest propensity to launch an optimization project.

Your Industry's Automation Optimization Choices





# IV. Optimization trends – software

We all know the value of technology – a spreadsheet will only get you so far. But, the proliferation of solutions available to you increases complexity and can create confusion. Let's take a step back and bring clarity to all of the relevant software supporting automation:

**WMS:** With 89% of respondents listing a warehouse management system as a part of their tech stack, the WMS controls the business logic and inventory management within the warehouse. As the brain of the operations, process control and data management are two of the top responsibilities of the WMS.

**WCS:** A warehouse control system will act as air traffic control for automation systems. A first-party system from an MHE manufacturer typically only controls hardware from the same manufacturer. (We cover WCS more later on.)

**WES:** While we don't cover warehouse execution systems in this report, it is worth mentioning that a WES is a hybrid that combines the capabilities of a WMS and WCS. Functionality varies by vendor,

but a WES typically won't include the full functionality of a standalone WMS or WCS. Typically, it's a lite version of both.

**Robotics control:** This is a relatively new system, but we're seeing these more and more as robotics become more deeply ingrained in the industry. A robotics control system will function similarly to a WCS, but pertains to the robotic units on the floor.

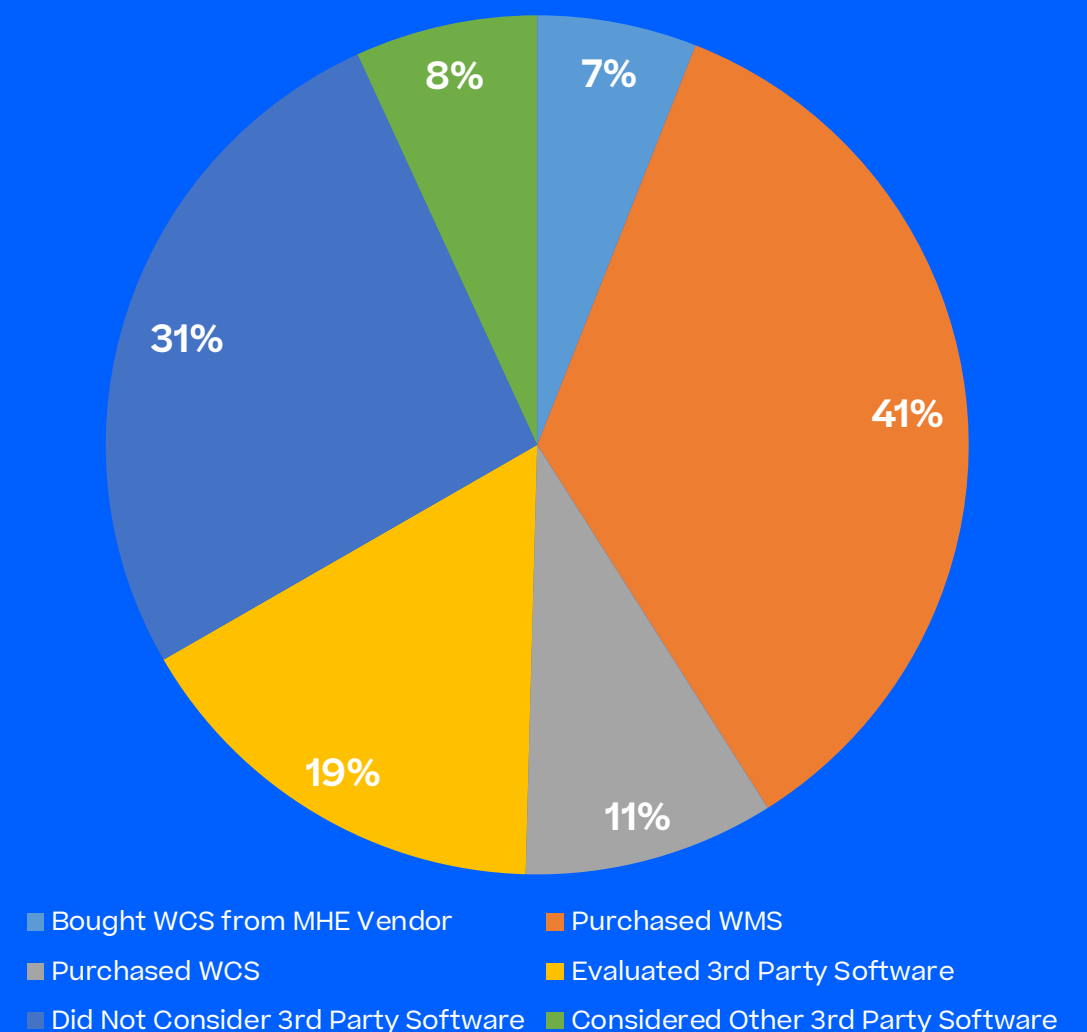
## The hardware-software disconnect

With so many listing software as a top automation challenge, let's take a closer look at some of these systems. As you can see, businesses utilize WMSs most frequently. However, it's important to note that while the WMS plays a large part in the overall health and operations within the four walls, it does not typically include automation and control capabilities. On the other hand, only **7% of businesses invested in a WCS from their MHE partner, and another 11% invested in a third-party WCS.**

Less than 20% of respondents say their business invested in a WCS to support their automation

Did you know?

# Supporting automation with software





Looking at a few factors side-by-side, we can identify a potential gap many businesses suffer from. First, we see a lackluster satisfaction score (a 3.1 out of 5), so we know that the averages point to only slightly positive satisfaction. Next, we look at software and integration being the top issue reported. Last, we see low adoption rates for WCS, even though it is a system dedicated to optimizing automation. The missing link for many businesses could be the WCS.

**The value of a WCS**

Pairing MHE with adequate software and supporting systems is critical. Technology has reached a level of sophistication that requires robust management systems. As a dedicated system for automation optimization, the WCS brings unique capabilities to the table that help you get more value out of MHE and improves operational health overall.

**Improving material flow** – MHE does a great job most of the time, but machines break down. It’s just a reality we all face with all of the technologies we rely on. But, with a WCS, bottlenecks, and malfunctions don’t necessarily bring operations to a grinding halt. If a WCS has complete visibility and control of all automation on the floor, you can build processes into the systems that re-route materials to circumvent unexpected issues.

**Reducing downtime** – A WCS can offer insights into MHE health and possibly identify hardware issues and maintenance needs ahead of malfunctions. This proactive approach to maintenance mitigates unexpected downtime.

**Collecting valuable data** – Every action from your MHE and PLCs is captured in your WCS. This data helps measure the strengths and weaknesses of automation operations, and also feeds back into the WMS to help build smarter processes.

**Takeaways**

- A little extra investment in the right supporting systems can have a major impact on the performance of your automation systems. It’s not just about the hardware—think about the people, processes, and systems together.
- Avoid a fairweather automation strategy. Unexpected challenges will come. By building agility into your automation operations, you can be prepare and keep materials flowing while troubleshooting issues.





# V. Workforce industry trends

Automation and robotics will continue to be a counterweight to the labor issues impacting warehouses and supply chains across the world. **In fact, 68% say that new automation projects are a direct result of labor issues.** However, technology will not fully replace manual workers, nor does it intend to. Technology creates a demand for system technicians and operators, and there is and will continue to be strong demand for old fashioned elbow grease on the warehouse floor for some time.

Even though workers continue to leave the warehouse, the need for labor isn't going anywhere. Why? A big reason is that technology can't truly replace workers. Not entirely. Automation and robotics do well for repetitive actions, and robotics are getting better at more complex applications thanks to artificial intelligence (AI). However, many businesses need people for problem solving and prioritization skills. Further,

the human hand is still a superior "tool" for many warehouse jobs, especially if inventory is not a uniform shape.

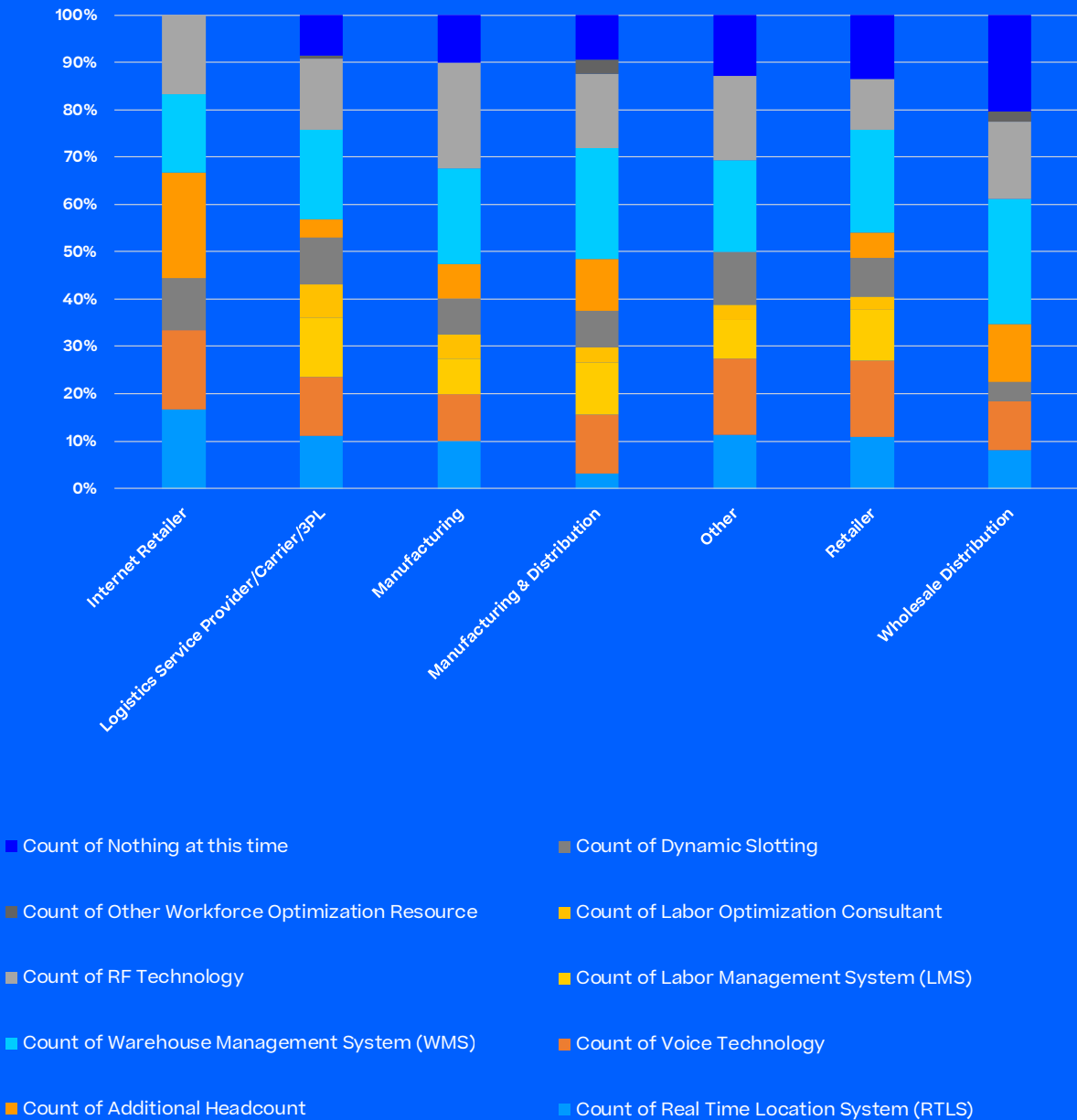
In some regions, manual work is still cost-effective and a readily available resource. But, for most the shortage of workers creates a need to improve the productivity of smaller warehouse teams. In response to this, we asked your peers how they plan to improve worker productivity.

Looking at the survey results from a high level, we see a fairly even preference towards RF, voice, and WMS solutions to improve worker output. Most businesses have low priorities for adding headcount—a clear reaction to market conditions, but also a positive reflection on technology. Businesses seem willing to work with the headcount available and leverage technology to innovate and fill the labor gaps.

## Takeaways

- Technology is meant to augment the workforce and extend their capabilities, not eliminate the need for workers.
- Businesses look equally to systems for process support and hardware such as voice and RF solutions to improve productivity.

# Workforce optimization considerations by industry





# VI. Workforce optimizations: software, voice and mobility

## Takeaways

- Bringing in a dedicated workforce system such as a LMS into your operations could be a way to find additional opportunities and even differentiate yourself with increased efficiency and demonstrable successes in your workforce.
- Based on the survey data, an average of two solutions are considered and evaluated to optimize the workforce. So while the WMS is the most-often evaluated tool, it is hardly the only resource considered to improve worker productivity.

Over 60% of businesses lean on the WMS to help improve worker productivity.

We can look at workforce optimization through two lenses:

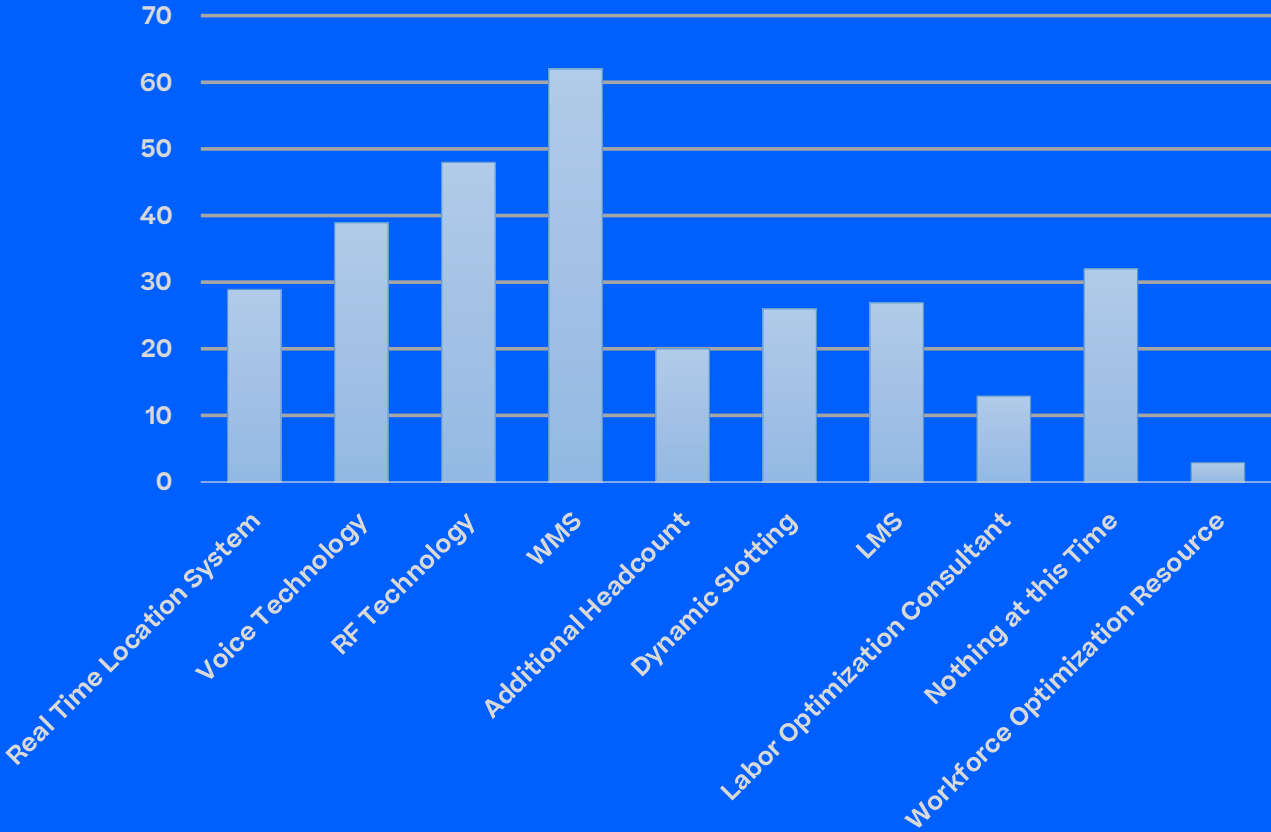
- Software-based optimizations
- Voice and mobility optimizations

### Optimizing labor – software

Based on the data, we see that over 60% of businesses lean on the WMS to help improve worker productivity. This can be accomplished by improving processes and reducing wasteful actions (i.e., reducing process variations). The WMS can also help with warehouse design and inventory placement, which ultimately creates optimal conditions for the workforce. By strategically placing pallets and SKUs in smarter locations, you can reduce travel distances and improve inventory accuracy. Just by moving high volume SKUs and commonly packaged items in smarter locations, you can greatly improve productivity and reduce errors.

It's surprising to see high WMS numbers for workforce optimization, but lower interest in a labor management system (LMS). The LMS plugs into the WMS, combining for a deeper view of productivity and planning. As a dedicated tool for managing the human components of warehouse operations, the LMS tracks true worker activity; measures worker KPIs, and helps deduce training opportunities.

# Workforce optimization considerations





### Optimizing labor – voice and mobility

Besides the WMS, the most popular strategies are to implement user devices such as voice and RF technologies that directly impact how workers do their jobs. RF technology reduces manual data logging and offers a mobile inventory database, while voice technology offers a hands-free approach to improve productivity for picking and other jobs.

If tools helped a caveman create fire, the same principle goes for improving warehouse efficiency. Voice and RF scanners replace clipboards, giving workers mobile inventory databases that speed up processes and improve inventory accuracy. While most businesses look to these devices for picking, these devices are well-suited for many applications, including put-away, receiving, loading, cycle counting, returns, inspection, and more.

These technologies bring efficiencies directly to workers, and innovations continue to improve the user experience to deepen worker productivity. Hardware is a great example. Battery life is longer and devices are lighter. Also, the emergence of Android-based systems offer user familiarity that helps with training, productivity, and even and recruitment.

What might be the most exciting are the voice integrations with robotics. Warehouses that deploy autonomous mobile robots (AMRs) to assist workers with picking can use voice to give robots orders. This hands-free approach allows workers to stay on task with packing, sortation, and other jobs while the robotics zip around the warehouse via voice commands. It's a great example of technologies working together to create a holistic warehouse system.

Tying hardware technology back to the supporting systems we mention earlier, logging interactions through voice and RF scanners provide valuable information that improves traceability of inventory and workers. This is a fantastic, never-ending cycle where the systems support the hardware (and the user), and the hardware provides a feedback loop to the systems. This helps you understand the flow of materials in the warehouse, uncover training opportunities, and continually improve operations.

### Takeaways

- Though businesses are looking into RF more than voice, both are highly valuable and have been viable solutions for decades. These solutions should be evaluated equally for your workforce.
- You can look beyond picking with user devices to find efficiencies for other jobs. This extends the value of your tech and opens new opportunities to innovate in your operations.
- The future is in a more connected, integrated warehouse. Look for partners and technologies that weave systems and solutions together. This positions you to truly optimize your warehouse.

## Voice technology offers a hands-free approach to improve productivity for picking and other jobs.





# VII. Better decisions, better optimizations

Automation, robotics, labor augmentations and optimizations – these are all highly important when solving challenges. But, how do you choose the right solutions and applications?

According to a separate survey we hosted for warehouse design:

- Less than 4% of professionals have all the data needed to design and outfit a warehouse
- 17% don't use objective data; they create data points based on (subjective) experience

Even with all of the sophisticated tools to solve operational challenges, over 80% of people are using spreadsheets for designs and testing. If we're applying robotics, AI, and other advanced tools at virtually every point in the supply chain, why is warehouse planning in the Stone Age?

Warehouse design should factor in the physical space, operational strategy, and the resources

## Takeaways

- Warehouse simulation helps identify the strengths and weaknesses of existing resources, as well as test technologies or processes you're considering in a safe space.
- Any tools you can leverage that create objective, data-driven models can be an asset when building business requirements and proving ROI over a period of time to executives and decision-makers.

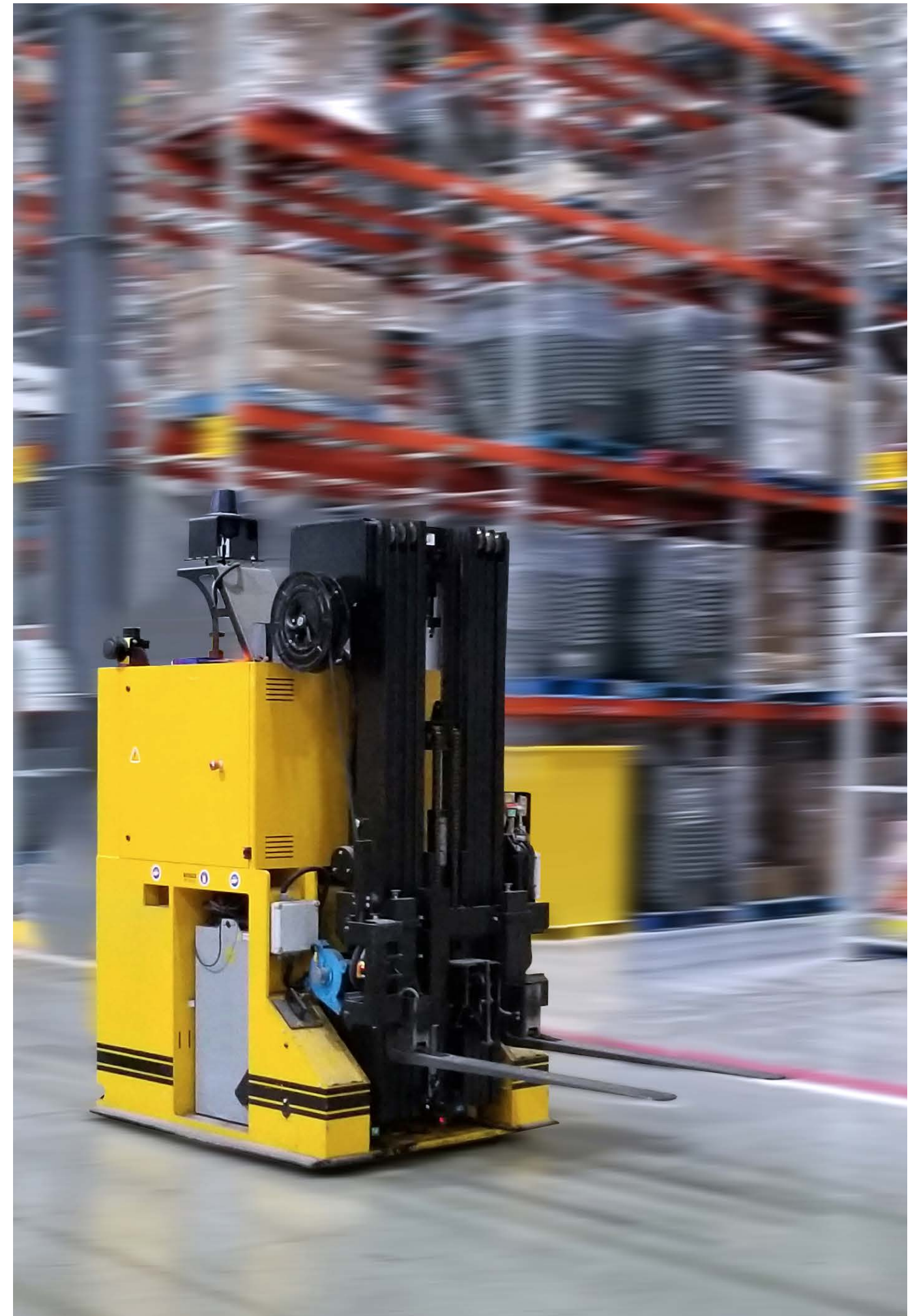
utilized to move inventory. Even an industry veteran has to do some guesswork to anticipate throughput on a spreadsheet. With the right systems, it's far easier and effective to anticipate issues, find the right strategies, and make smart investments.

### Warehouse simulation

There's no shortage of solutions to choose from. It's important to create a safe space and sandbox to not just consider, but test various solutions before signing partner agreements that can last decades. Warehouse simulation technology builds a "digital twin" of your warehouse, giving you the freedom to test virtually any fulfillment strategy under any conditions. This includes:

- Assessing warehouse layout changes and their effect on productivity
- Identifying throughput capacities and bottlenecks
- Analyzing the impact of different pick-face profiles and methods
- Pinpoint resource requirements and shift patterns
- Quantify costs and service levels by simulating daily receipts and dispatch profiles

Beyond a safety net for tech evaluations that reduces risk, warehouse simulation allows you to analyze existing data from your operations. It can uncover bottlenecks and process breakdowns that open opportunities for improvement. Or, you can model and forecast — a great tool to predict seasonal demand. For 3PLs, this can be used to assess a new client's needs based on existing resources.



# Conclusion

The top challenges reported by survey respondents were labor issues and improving throughput. Those challenges won't be going away any time soon. Thankfully, we are in a great position to overcome these challenges (and other) with the help of various technologies. Automation and robotics are ready to offset labor shortages. The sophistication of these solutions, combined with actionable data, driven by the WMS and AI, can create stronger ties between systems to push operations to greater levels of success.

- Based on the average satisfaction score, there is room for improvement with warehouse automation utilization. By more tightly weaving the hardware with supporting systems, you
- Workforce optimizations are a combination of software and user-friendly devices that combine to improve the processes, operational visibility, and execution of warehouse workers. The greatest opportunities come from tying these systems together – using the WMS and LMS in tandem while combining voice or RF systems with robotics and other supporting tools on the warehouse floor.
- Even with heavy investments, it's critical to look at any new system as a strategic investment that needs continuous improvement to remain viable over the long term. There is no “buy-to-win” scenario in supply chain. The industry moves too fast. By keeping your tools sharp, you're future-proofing operations for whatever challenges come next.

