ZEBRA

Warehouse Vision Study

The Great Warehouse Convergence

Where Technology, Efficiency and Innovation Align

Discover how strategic innovations are transforming warehouses into powerhouses of efficiency and adaptability amid constant change.

Meeting Modern Demands: Today's Warehouse Pulse

Warehouses play a critical role in modern commerce, evolving rapidly to meet the demands of today's customer-driven world. By embracing technology and refining workflows, organizations are addressing internal inefficiencies, improving order accuracy, accelerating fulfillment and enhancing returns management. At the same time, they are navigating complex supply chain challenges such as inventory forecasting and reverse logistics to build resilient and responsive operations.

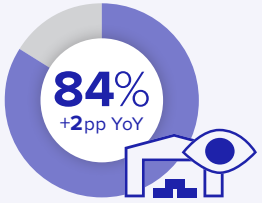
Addressing Operational Challenges

Decision-makers identify key challenges

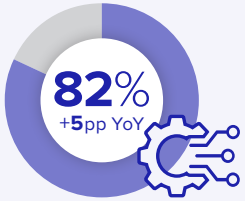
1. Order accuracy
1. Outbound processes
1. IT/technology utilization
2. Order fulfillment processing time
3. Returns management
4. Put wall
4. Inventory management
4. Throughput
5. Inbound processes
6. Quality of warehouse management system data

Navigating the Automation Journey

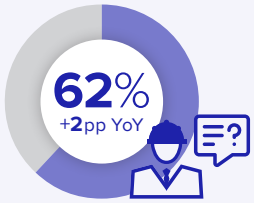
Decision-makers weigh confidence against uncertain starting points



agree if operational visibility is improved, more decisions can be automated for better staff and asset utilization



have a high degree of comfort in integrating new technology and automation solutions into their operations and technology infrastructure today



don't know where to start automating in the warehouse

Focusing on Core Investment Priorities

Decision-makers highlight investment priorities

- Investing in AI technology to improve performance, workflows and maintenance — 65%
- Investing in robotics — 64%
- Investing in increased visibility across the supply chain — 62%
- Automating workflows — 61%
- Investing in software and automating analytics and decision-making — 61%
- Prioritizing labor optimization — 59%
- Investing in inventory and asset visibility within the warehouse — 59%

Customer-Centric Transformation
Technology-Driven Advances

Meeting evolving customer expectations requires warehouse operators to adopt advanced technologies that drive efficiency and competitiveness. Eighty-four percent of decision-makers recognize new technology as essential to success in the on-demand economy. Yet, 80% acknowledge that the pace of modernization poses a significant challenge, highlighting the difficulties of adapting to evolving demands.

Over the next five years, warehouse decision-makers plan significant investments in technology, with 82% highlighting the role of automation and advanced tools in boosting worker productivity. Key priorities focus on innovations such as task management, predictive analytics and machine learning to streamline operations, reduce inefficiencies and improve worker and customer experiences.

Artificial Intelligence (AI) and Generative AI (Gen AI) are expected to drive revolutionary changes in the warehousing industry. While AI excels at optimizing processes and providing predictive insights, Gen AI drives innovation further by enabling dynamic problem-solving. Reflecting their growing importance, 63% of decision-makers plan to implement AI and 68% intend to adopt Gen AI by 2029.

Technology is also reshaping the warehouse as a workplace. Nearly 80% of decision-makers agree that innovation makes warehouse jobs more appealing, attracting workers and supporting long-term workforce stability. By enhancing hiring practices, streamlining training programs and improving daily operations, modern warehouses are becoming environments as engaging as they are efficient.

Evolving Perspectives: The Value of Technology in Modern Warehousing

Decision-makers agree:

84% ↑ +4pp YoY
Implementing new technology is essential to stay competitive in the on-demand economy

82% ↑ +2pp YoY
Increased use of technology and automation boosts frontline worker productivity

80% ↓ -2pp YoY
Warehouse requires modernization, but implementation of new devices and technologies remains slow

79% | No change YoY
Technology advances make the warehouse environment more attractive to workers

73% ↓ -3pp YoY
Investment in automation outweighs the risk of not implementing

67% ↓ -5pp YoY
Frequent downtime occurs due to difficulty of using devices/ applications

Scaling Up: Software Technology Investments

Percentage of decision-makers planning to implement in 1 to 5 years

68%	Generative Artificial Intelligence (Gen AI)
65%	Predictive Analytics
63%	Artificial Intelligence (AI)
63%	Augmented Reality (AR)
57%	Machine Learning
57%	Task Management

Connected Operations
Building an Adaptive Warehouse

Warehouses are evolving into interconnected systems where technologies improve visibility, accuracy and workflow efficiency. By 2029, 63% of warehouse decision-makers plan to implement passive RFID on handheld devices, underscoring its critical role in tracking and managing inventory with precision. Implementing RFID is crucial in modernizing processes and meeting growing demands for speed and responsivenesse.

Real-time data capture technologies such as fixed industrial scanning and machine vision also play a crucial role in advancing warehouse operations. Within the next five years, 65% of decision-makers plan to deploy machine vision and 57% intend to invest in fixed industrial scanning. These tools enable precise tracking, reduce errors and create a seamless flow of information across workflows. When paired with track-and-trace systems and location-based asset management, they provide enhanced visibility and operational oversight across the entire supply chain. Strengthening reverse logistics is another key priority, with 65% of decision-makers focusing on automated returns processing to reduce inefficiencies.

Empowering the workforce with advanced tools is also a major focus. Decision-makers are embracing AI applications on handheld devices to improve safety, streamline inventory management, enhance quality control and optimize picking accuracy. Recognized by 79% of decision-makers for safety, AI applications are helping warehouses control costs and adapt to shifting demands.

Charting the Path to Optimization

Decision-makers 1 to 5 year implementation plans for warehouse optimization and automation

- **69%** Third-party logistics (3PL) to manage returns
- **65%** Automated returns processing
- **64%** Implement an omnichannel logistics strategy that supports faster deliverables, unpredictable demand and decreases costs
- **63%** Location or asset visibility solutions
- **59%** Track and trace solutions

AI for Action: Precision and Productivity

Decision-makers see a high/moderate impact of AI device applications on handheld devices

- **Safety:** Detect potential hazards, issue alerts for prevention — **79%**
- **Quality Control:** Detect issues or anomalies — **78%**
- **Inventory Management:** Forecast needs, streamline stock levels, maximize space usage — **77%**
- **Picking:** Optimize routes, minimize errors and speed order retrieval — **77%**

Advancing Warehouse Visibility

RFID is at the center of decision-makers 1 to 5 year implementation plans

- **63%** Passive RFID on handheld reader devices and/or sleds
- **61%** Fixed RFID readers for passive locationing
- **59%** Passive RFID tags and sensors

Sustainability Leadership
Driving Emissions and Efficiency Goals

Sustainability is emerging as a key driver of business success, prompting warehouses to balance environmental priorities with operational efficiency. Decision-makers increasingly recognize the value of reducing emissions and waste, with 78% identifying it as a top priority. This focus reflects growing awareness of the benefits of sustainable practices, such as improved customer satisfaction, cost savings and opportunities to differentiate in a competitive market.

To achieve these goals, many warehouse organizations are focusing on strategies that minimize waste, improve energy efficiency and refine storage practices. Over the next five years, 60% of decision-makers plan to increase investments in sustainable technologies, which can help lower carbon footprints and reduce operational costs. Such initiatives improve efficiency and readiness to address both environmental and operational challenges.

Sustainability efforts increasingly align with corporate goals, addressing customer expectations, supplier requirements and government regulations. Prioritizing environmentally conscious practices helps strengthen customer loyalty, meet stakeholder demands and support scalable operations for long-term growth.

Five-Year Sustainability Commitments: Key Initiatives and Goals

Decision-makers plan to implement in 1 to 5 years

60% Improving supply chain practices

60% Increasing investments in sustainable technologies

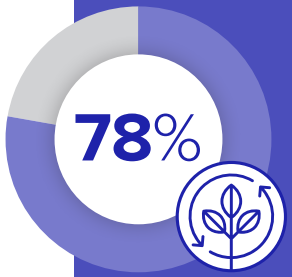
58% Setting targets to reduce carbon footprint

Top Influencers Driving Sustainability Efforts

According to decision-makers

1. Competitive advantage: reputation, customer satisfaction and loyalty
   - Scalability: long-term viability/adapt to changes quickly
2. Supplier requirements: adhere to standards/ contractual agreements
   - Corporate social responsibility: customer, employee
   - Environmental: reduced energy consumption/usage
3. Stakeholder expectations: investors, customers, employees
4. Governmental regulations/tax credits

Commitment to a Cleaner Future



of decision-makers agree that reducing emissions and/or waste is a top priority

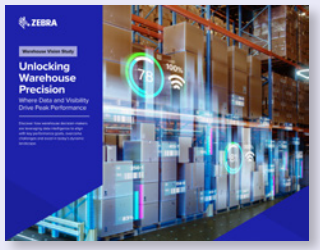
Innovation's Impact
Powering the Future of Warehousing

Modern warehouses are at the forefront of innovation, leveraging advanced automation, real-time data and sustainable practices to set new standards for efficiency and adaptability. Once seen as mere links in the supply chain, they have become the backbone of global commerce, driving resilience and progress. As technology reshapes the industry, adaptive and high-performing warehouses empower businesses to thrive in an unpredictable world.

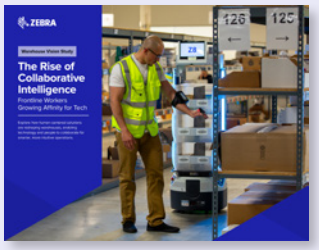
About the Study

Zebra Technologies commissioned a global research study to explore the trends and technologies shaping warehouse and distribution center operations. Conducted online by Azure Knowledge Corporation, the study gathered insights from over 1,700 associates and decision-makers across manufacturing, retail, transportation, logistics and wholesale distribution.

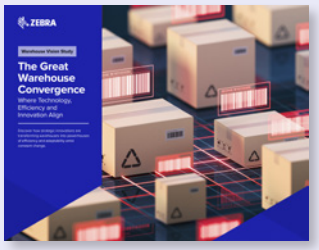
The series focuses on three key themes:



Unlocking Warehouse Precision
Where Data and Visibility Drive Peak Performance



The Rise of Collaborative Intelligence
Frontline Workers Growing Affinity for Tech



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To view the entire Warehouse Vision Study series, visit **zebra.com/warehousingvisionstudy**

To learn how Zebra can help your warehouse performance reach new heights, visit **zebra.com/warehouse**

About Zebra Technologies

Zebra (NASDAQ: ZBRA) empowers organizations to thrive in the on-demand economy by making every front-line worker and asset at the edge visible, connected and fully optimized. With an ecosystem of more than 10,000 partners across more than 100 countries, Zebra serves customers of all sizes, including 94% of the Fortune 100, with an award-winning portfolio of hardware, software, services and solutions that digitize and automate workflows.

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