Could AI Transform Your Distribution Center?

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Overview

In today's fast-paced e-commerce environment, more than ever before, distribution center operations require agility and accuracy. Ever-increasing demand for faster delivery speeds and more robust product variety puts pressure on both companies and their employees.

Consumers expect products quicker than ever before, as same day or next-day shipping is now one of the biggest drivers of sales online. According to a CommerceHub November 2023 study, 78% of shoppers prioritize delivery in fewer than two days when making a purchase online.

Most distribution centers are not yet equipped to meet that level of demand. For those companies, keeping up will require significant improvements in their picking, packing and shipping processes.

Those improvements, however, can be stymied by the fact that distribution centers, like most businesses today, face serious labor challenges with hiring and retaining employees.

While the warehouse worker shortage has shown some signs of slowing down in the first half of the year, Instawork's 2024 State of Warehouse Labor report found that nearly 40% of surveyed operators still do not have enough employees to keep up with demand.

Fortunately, new and emerging technologies, including AI-powered solutions, can provide powerful options for optimizing distribution center and warehouse operations, even as companies face ongoing labor and demand challenges.

FreightWaves teamed up with Verizon to explore how AI solutions can be utilized in distribution centers – and what kind of network connectivity upgrades companies need to make in order for those solutions to work.

Leaders Understand Growing Importance of AI

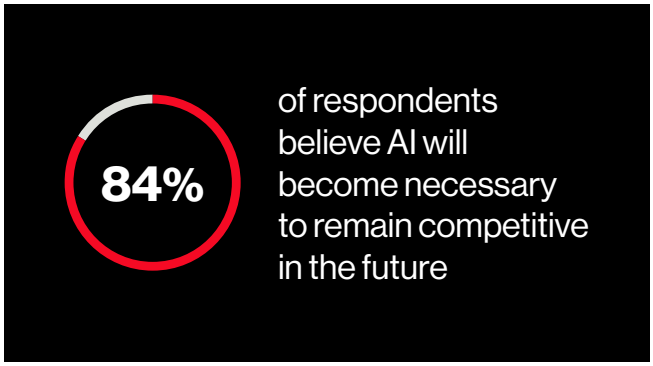
Distribution centers need to reconcile their operating procedures with the demands of their customers. In order to do that without losing business, companies will need to reimagine how they operate and work to eradicate productivity constraints.

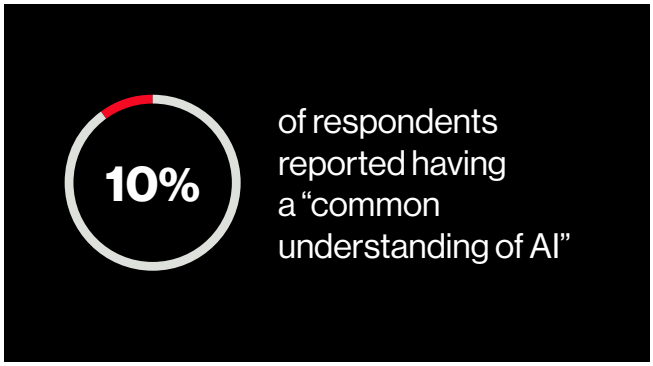
At the highest level, implementing AI-powered solutions can help distribution centers reduce costs and increase profitability while enhancing efficiency and driving up productivity. This is done by optimizing operation processes, minimizing human error, creating safer work environments and improving existing customer service.

A recent survey conducted by Incisiv found that most distribution and logistics organizations understand the growing importance of AI. In fact, 84% of respondents believe AI will become necessary to remain competitive in the future. This result illustrates a willingness to explore modern solutions. Despite their belief that AI will soon become a necessary part of their operations, only 10% of respondents reported having a "common understanding of AI" in the same survey. Only 5% said they understand the difference between traditional AI and generative AI.

These survey results highlight both an openness to technology and a poor understanding of its nuances. Industry leaders – and third-party partners – should be aware of those knowledge gaps, which present an opportunity to learn and grow alongside technological changes.

Education and implementation should be tailored to each company. Each distribution center faces slightly different challenges, and each distribution center will utilize AI in slightly different ways.





AI Use Cases for Distribution Centers

AI-powered solutions can help distribution centers meet demand while simultaneously reducing costs and improving employee safety. This wide range of benefits can be attributed to the fact that AI itself is naturally versatile.

It can be harnessed for tasks that range from inventory management and real-time visibility to labor optimization and safety improvement.

There are a myriad of possible AI use cases that distribution centers could deploy now or in the near-term future in order to optimize their operations.

Demand Forecasting and Inventory Optimization

Predictive analytics: AI algorithms analyze historical sales data, market trends and even weather patterns to forecast future demand with greater accuracy.

Automated replenishment: Based on demand predictions, AI can automate purchase orders and optimize inventory levels, minimizing stockouts and excess inventory.

Warehouse Automation and Robotics

Automated mobile robots (AMRs): AI-powered robots automate the movement of goods within the warehouse, improving speed and efficiency.

Robotic picking and sorting: Robots equipped with computer vision and machine learning can identify, pick and sort items with greater accuracy and speed than humans.

Connected, manned fork trucks: AI-based directions for forklift operators can help improve efficiency of tasks and directions.

Smart Warehouse Management

Real-time visibility and tracking: AI provides end-to-end visibility of inventory location and movement within the warehouse, allowing for real-time tracking and improved efficiency.

Predictive maintenance: AI algorithms analyze sensor data from equipment to predict potential breakdowns, enabling proactive maintenance and minimizing downtime.

Labor Management and Optimization

Next task directions: Generative AI can proactively communicate next task instructions to employees on their mobile devices.

Task allocation and optimization: AI can analyze worker performance data and optimize task allocation, ensuring the right people are assigned to the most suitable tasks and tasks are completed in the most efficient order.

Workforce planning and forecasting: AI helps predict future labor needs based on anticipated demand fluctuations to optimize staffing levels.

Enhanced Security and Safety

Surveillance and anomaly detection: AI-powered cameras can monitor the facility for suspicious activity, identifying and alerting security personnel to potential threats.

Safety monitoring and accident prevention: AI can analyze worker movements and identify potential safety hazards, helping to prevent accidents and injuries.

Improved Shipping and Logistics

Route optimization: AI algorithms can optimize delivery routes in real-time, considering traffic conditions and other factors to minimize delivery times and fuel costs.

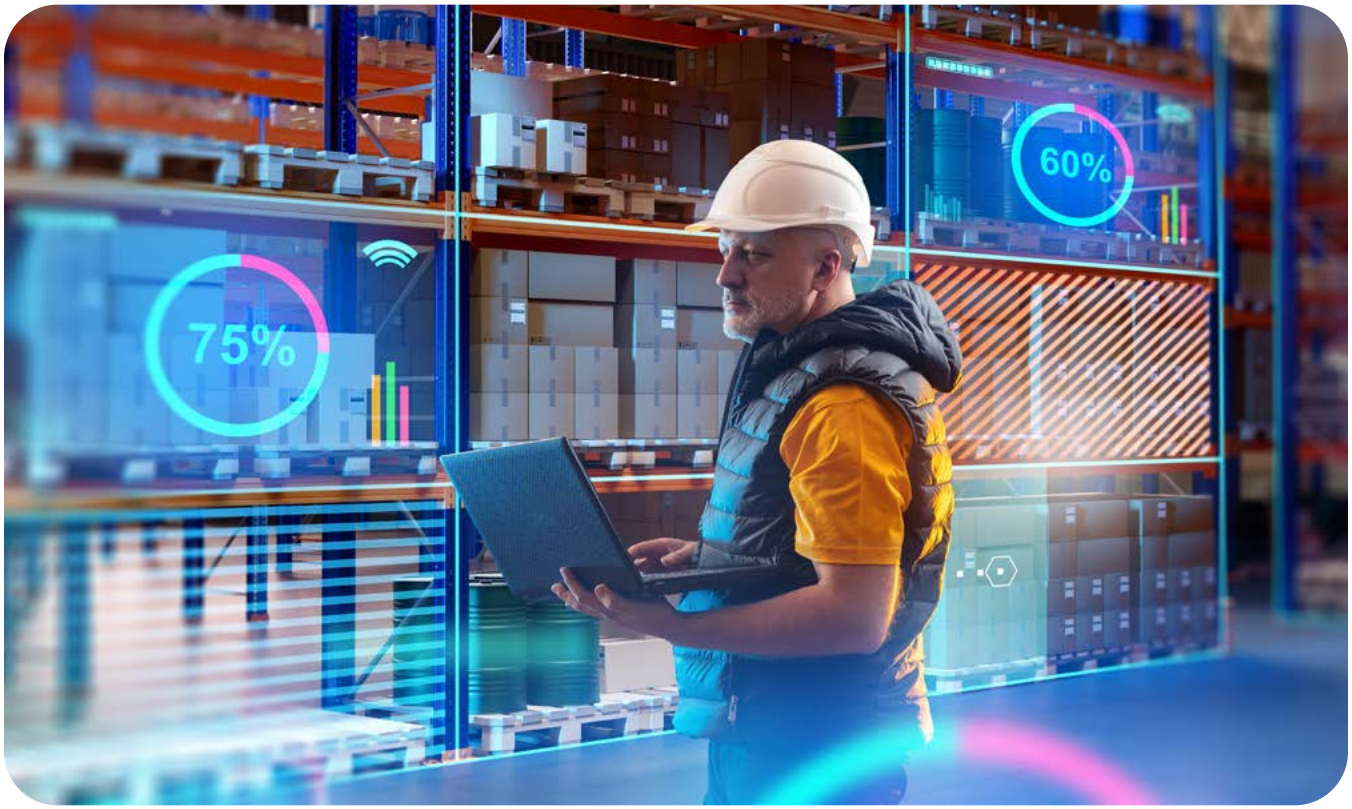
Carrier selection and management: AI can analyze historical carrier performance data and select the most efficient and cost-effective carrier for each shipment.

Companies Plan for High-Tech Future

Distribution center decision makers are planning for significant technological advancement in the near-term future. As demonstrated by Incisiv's survey results, these people understand the importance of modern technology in today's competitive market. Many of them are ready to act.

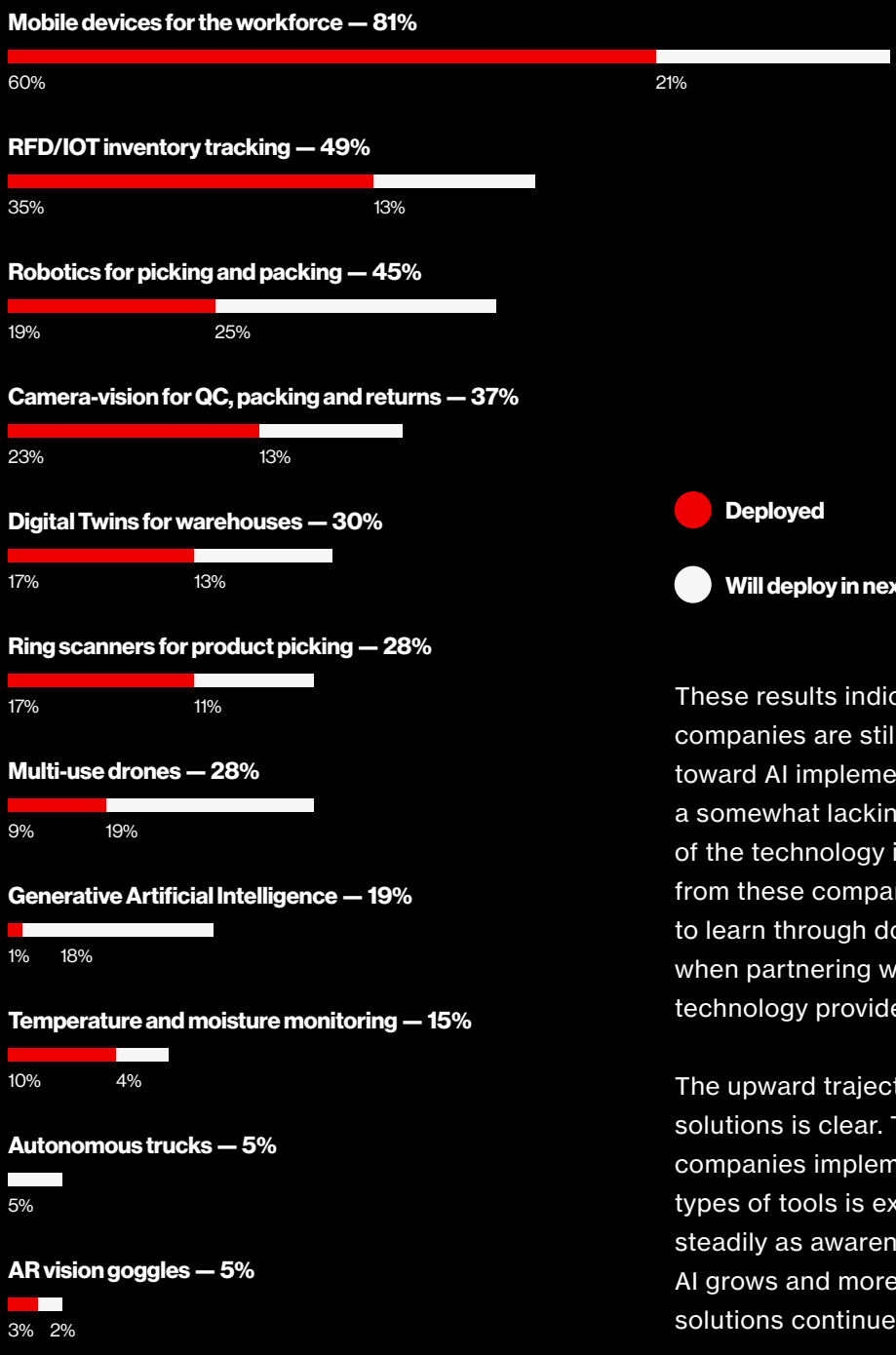
Incisiv asked survey respondents about their current and planned technological developments. Overall, the survey showed that a significant number of companies are either already using or planning to use AI-powered solutions like IOT inventory tracking (49%), robotics for picking and packing (45%) and camera-vision for various tasks (37%).

Survey results also revealed that the majority of companies are either already utilizing mobile devices in their workforce (60%) or planning to in the next 24 months (21%).



Current and Planned Technology Deployment

% Respondents



These results indicate that companies are still taking steps toward AI implementation despite a somewhat lacking understanding of the technology itself. Leaders from these companies will be able to learn through doing, particularly when partnering with hands-on technology providers.

The upward trajectory of AI solutions is clear. The number of companies implementing these types of tools is expected to grow steadily as awareness around AI grows and more accessible solutions continue to hit the market.

Network Connectivity Is Imperative

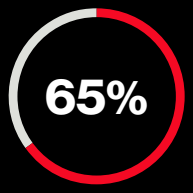
AI offers a wealth of benefits for distribution centers. Being able to fully realize those benefits, however, requires reliable network connectivity that works across the entire enterprise facility. This includes both indoor and outdoor spaces. Inconsistent and non-secured connectivity would hinder the ability for AI technology to deliver the expected results. This is especially the case for assets, products and resources that are in motion.

Facilities often must contend with large open areas and pervasive metal racks and shelves, making connectivity an even greater challenge. When Incisiv asked distribution companies how satisfied they were with their network connectivity, they found that the quality of connectivity tends to degrade significantly based on mode and location.

For example, 61% of respondents were dissatisfied with the reliability of their indoor network connectivity and 65% of companies indicated that their current network cannot support their needs over the next 24 months.

A critical problem is the presence of 'zombie zones,' areas with no or poor connectivity. In warehouses, inadequate connectivity can severely impact real-time operations like robotics, inventory management, order processing, and communication between automated systems and personnel. According to respondents, 17% of the area inside warehouses has no or poor connectivity and 37% of outdoor areas have no or poor connectivity.

These results show that most distribution centers struggle with maintaining consistently good connectivity across modes and areas of their facilities. This is problematic because inconsistent connectivity can hinder the ability for AI technology to deliver its expected results.



of companies indicated that their current network cannot support their needs over the next 24 months.

The AI use cases identified above rely on reliable, site-wide access to cloud-based platforms for successful execution. Warehouse and distribution companies that rely on Wi-Fi alone to cover their operations often learn the hard way that this type of connectivity doesn't easily keep pace with their growth or ambitions. And that's why private wireless networks are growing in popularity.

Wi-Fi has long been the conventional choice for wireless connectivity in distribution and logistics. While Wi-Fi is a great fit for home or office environments, it doesn't perform as well in vast outdoor/ indoor areas like a distribution center. Their large footprints and need for pervasive connectivity pose specific challenges for Wi-Fi, including: spotty wireless coverage, high total cost of ownership due to the large number of access points needed and unreliable service quality.

Increasingly, distribution companies are implementing private wireless networks to complement their existing Wi-Fi infrastructure and to take advantage of the unique, innovation-enabling attributes of private 4G LTE or private 5G.

A private wireless network is a customized solution, right-sized for each facility and its unique operational requirements and use cases. It provides consistent, predictable coverage and bandwidth for business-critical applications. Leveraging either public or licensed spectrum, a private wireless network creates a highly reliable, highly secure connectivity environment to support a large number of connected devices, data volume and high-fidelity applications in a variety of operating environments.

These are attributes that excel in a distribution center environment while ensuring there are no "dead spots" for coverage, which a distributor cannot afford to have when real time communications, mobile devices and automated robotics must remain active at all times.

Conclusion

AI applications have the potential to radically transform distribution center operations. By addressing the challenges and considerations outlined in this white paper, distribution centers can leverage AI technology to achieve significant improvements in productivity, accuracy and customer satisfaction.

Working to solve challenges like inconsistent network connectivity is a necessary component of using AI to its fullest potential. Companies should begin exploring their options in this area as soon as possible.

As technology continues to evolve, AI will play an even greater role in optimizing distribution center operations and shaping the future of supply chain logistics. Companies that implement these solutions early will gain a competitive advantage both now and in the future. These companies will be able to help shape how the industry transforms.