

# **DIGITALIZATION IN TRANSPORTATION, LOGISTICS, AND WAREHOUSING**

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# INTRODUCTION

**In the fast-paced world of Transportation, Logistics, and Warehousing (TLW), the ability to adapt and innovate is paramount for success.**

As the retail industry thrives on customer satisfaction and engagement, the TLW sector hinges on operational efficiency and customer-centric solutions. In this digital age, the convergence of technology and logistics has become a cornerstone for companies looking to gain a competitive edge and meet the evolving needs of their customers.

From the seamless movement of goods to real-time tracking and optimization of supply chains, digitalization has emerged as a game-changer in the TLW sector. Business owners and industry stakeholders alike recognize the pivotal role that technology plays in driving growth and profitability. Whether it is optimizing route planning, enhancing warehouse operations, or improving last-mile delivery, the adoption of next-generation technologies is reshaping the landscape of the TLW industry.

As we look to the future, it is clear that digitalization will continue redefining how businesses operate within the TLW sector. Companies must embrace a diverse ecosystem of digital solutions, leveraging technologies such as the Internet of Things (IoT), artificial intelligence (AI), machine learning, and data analytics to unlock new efficiencies and achieve automation. This whitepaper aims to provide valuable insights to stakeholders within the TLW sector, including transportation companies, logistics providers, warehouse operators, and technology solution providers dedicated to enhancing TLW operations worldwide. Through an exploration of the latest trends, innovations, and use cases, this whitepaper will shed light on the transformative power of digitalization in the TLW industry.

Honeywell Industrial Automation (Honeywell IA) stands at the forefront of this digital transformation as a trusted partner for TLW companies seeking to embrace digitalization. Through its innovative technologies, domain expertise, and commitment to customer success, Honeywell IA is shaping the future of the TLW sector by driving efficiency, agility, and competitiveness in an increasingly digital world. Honeywell IA offers a comprehensive suite of technologies and services designed to enhance operational efficiency, optimize processes, and improve overall productivity within the TLW industry, which includes advanced mobile computing devices, barcode scanners and printers, voice-enabled software, automation and control systems, data analytics and insights, and integrated solutions and services.

# EXECUTIVE SUMMARY

Digitalization is transforming the TLW industry, addressing critical challenges and capitalizing on emerging trends to drive efficiency, sustainability, and customer satisfaction. The sector faces a myriad of challenges, including the following:

## LABOR SHORTAGE:

The TLW industry faces a critical skill gap and labor shortage, impacting overall efficiency.

## RISE OF ECOMMERCE:

The rapid growth of eCommerce has impacted the TLW industry, placing a strain on existing infrastructure due to surging demand for online deliveries.

## CARBON EMISSIONS:

Due to the severe dependence of the TLW sector on vehicles that consume fossil fuels, carbon emissions are a key challenge.

## UNFORESEEN DISRUPTIONS:

Supply chain disruptions, ranging from unforeseen events to opaque operations, can hinder the smooth workflow of the TLW sector.

## SAFETY RISKS:

There are several safety risks associated with the workers in the TLW sector due to the nature of the job and where they operate, and any slack around worker safety will, in turn, impact the productivity of the TLW companies.

## OPTIMAL INVENTORY MANAGEMENT:

Meeting volatile customer demand and minimizing holding costs is required to ensure efficiency and customer satisfaction in the TLW sector.

## CUSTOMER SATISFACTION:

Punctual deliveries, robust supply chain visibility, and streamlined warehousing are prerequisites that customers expect.

**To navigate these challenges, TLW businesses are increasingly turning to digital solutions that can revolutionize operations, streamline processes, and enhance productivity, which include the following:**

## AUTOMATION AND ROBOTICS:

Increasing automation and robotics in warehouses and transportation will improve efficiency, safety, and accuracy.

## GREEN LOGISTICS AND SUSTAINABILITY:

Sustainability will be a key driver, with green packaging, fuel-efficient vehicles, and optimized routes reducing environmental impact.

## LAST-MILE DELIVERY SOLUTIONS:

Innovative solutions such as drones, micro-fulfillment centers, and contactless delivery will transform last-mile delivery.

## AI IN TLW:

AI will play a critical role in optimizing routes, predicting disruptions, managing inventory, and enhancing customer service.

Amid these transformations, the role of OEM and system integrators (SI) such as Honeywell IA cannot be understated. Honeywell IA brings expertise in technology integration, deploying automation and robotics solutions, and providing end-to-end support throughout the digitalization journey. Its contributions are vital in implementing advanced technologies seamlessly, optimizing operations, and ensuring compliance with regulations, ultimately enhancing the competitiveness and sustainability of TLW businesses in the digital age.

# STRATEGIC IMPERATIVES OF TRANSPORTATION, LOGISTICS, AND WAREHOUSING

# 1

The TLW industry considers the digital revolution a strategic priority that drives operational efficiencies, optimizes supply chains, and enhances customer experience. By harnessing the power of IoT, AI, and automation, TLW businesses gain real-time insights, streamline processes, and make data-driven decisions.

The adoption of warehouse automation is on a rapid rise, with a projection that by 2027, over

**26%**

of sites will be equipped with some form of automation, a significant increase from 14% in 2017 and 18% by the conclusion of 2021<sup>[1]</sup>. This digital transformation empowers them to navigate complex challenges like cost pressures, demand fluctuations, and sustainability concerns.

## NAVIGATING CROSSROADS: DEMAND SURGE, WORKFORCE GAPS, AND THE EVOLVING LOGISTICS LANDSCAPE

The TLW industry faces a persistent challenge of labor shortage, a pressing issue exacerbated by various factors. Demographic shifts, an aging workforce, and evolving job preferences contribute to a dwindling pool of skilled workers. Additionally, the industry contends with a lack of specialized skill sets required for managing advanced technologies such as data analytics, robotics, and AI-driven systems. With the **demand for labor increasing by 12% a year** since 2015, there is always a shortage of skilled labor in the market. In addition, the **labor shortage** exacerbated by the COVID-19 pandemic, resulted in post-COVID-19 wages in transport and logistics being four times higher than before the pandemic, compared to two to three times for the private sector<sup>[2]</sup>.

This shortage significantly impacts operations, leading to increased costs, delays, and potential service disruptions. Addressing this shortage necessitates innovative strategies, such as improved working conditions and integrating automation and digital solutions to augment human efforts, ensuring sustained productivity and operational resilience. According to Interact Analysis on Warehouse Automation (2023), automation of distribution centers is essential owing to labor shortages and consequent labor costs and the growing need to optimize the efficiency of these facilities.

The TLW industry, amid constant technological transformation, is also hamstrung by a **critical skill gap**. Based on a research study focusing on supply chain automation, the preference is for a division of 58% reliance on technology and 42% reliance on human resources to accomplish logistics tasks<sup>[3]</sup>. While the industry demands professionals to be adept at navigating complex supply chains and wielding cutting-edge tools, a lack of requisite skills in automation, system integration, data analysis, and specialized logistics management hinders progress. According to a survey, **more than 40% of logistics organizations** believe a lack of required skills or talent will prove a barrier to digital transformation<sup>[4]</sup>. Several

factors contribute to the efficiency gap, including driver shortages, under-equipped warehouse operators, and under-skilled technology resources. Organizations with a shortage of skilled workers cannot compete with those with the necessary workforce. Consequently, logistics companies may also have to pay higher wages to attract and retain skilled workers.

**The meteoric rise of eCommerce** has brought a wave of challenges to the TLW industry, as the surging demand for online deliveries strains existing infrastructure. According to the Fivedash organization publications, global eCommerce sales reached USD 4.9 trillion in 2021 and are projected to increase its market sizing to USD 6.4 trillion by 2024, which equates to ~22% of the total sales in 2022<sup>[5][6]</sup>. This exponential growth necessitates a robust and adaptable supply chain, encompassing a swift and reliable transportation network and optimized warehousing, distribution, and last-mile solutions.

## CONQUERING COMPLEXITY: TACKLING OPERATIONAL, SUPPLY CHAIN, ENVIRONMENTAL AND INVENTORY HURDLES

The operational complexity within the TLW industry arises from various factors, including globalized trade networks, diverse regulatory environments, shifting consumer preferences, and the necessity for effective coordination among multiple stakeholders throughout the supply chain. Managing inventory across multiple locations, optimizing routes for efficient transportation, ensuring timely deliveries, and maintaining stringent quality control further amplify this complexity. **A lack of optimization in delivery costs and a surge in online sales can lead to a 26% decrease in profits** over a period of three years<sup>[7]</sup>.

**Worker safety** is another important challenge faced by the TLW companies, as they primarily operate and use heavy machinery and large equipment, which requires proper security steps to avoid accidents. Any slack in the worker's safety directly impacts the productivity of the TLW companies, which is a highly labor-intensive industry.

Meanwhile, the intricate world of TLW faces a constant adversary in **unforeseen supply chain disruptions**. Supply chains are increasingly vulnerable to disruptions, from unpredictable events such as natural disasters and pandemics to a lack of real-time visibility and tracking for smooth workflow optimization. According to Interact Analysis on Warehouse Automation (2023), due to various supply chain disruptions during the pandemic, many durable and non-durable manufacturing companies shifted from just-in-time to just-in-case models, which brought its own inventory and storage problems. The current business landscape is rife with disruption, **with a staggering 76% of supply chain leaders reporting an increased frequency of supply chain disruptions compared to just three years ago**, as revealed by a recent Gartner survey. This pervasive

volatility underscores the urgent need for businesses to build adaptable and resilient operations as well as adopt automation to navigate this complex environment<sup>[8]</sup>. According to Interact Analysis on Warehouse Automation (2023), in 2023, food & beverage (F&B) manufacturers continued to invest in their supply chain automation during 2022. They constructed highly automated facilities aimed at shortening their supply chains.

The TLW sector also plays a significant role in **carbon emissions** due to the nature of operations, especially transportation vehicles that depend heavily on fossil fuels. Inefficient route planning, vehicle maintenance, and congestion can increase fuel consumption and increase carbon emissions. This is also applicable for last-mile delivery, where traffic congestion, inefficient delivery routes, and frequent stops are unique challenges that result in increased operational costs and higher carbon emissions.

**Optimal inventory management** remains a logistical balancing act in the TLW sector. Striking the balance between meeting volatile customer demand and minimizing holding costs requires intricate coordination across the entire supply chain. Inaccurate forecasts, logistical delays, and unexpected disruptions can tip the scales, leading to costly overstocks or frustrating stockouts, hindering efficiency and customer satisfaction. This necessitates real-time visibility, accurate tracking, and the agile adjustment of inventory levels—a challenge met head-on through advanced technologies and robust systems. According to a survey by Resilience360, **80% of companies in the US experienced supply chain disruptions in 2020, with 33% attributing the disruptions to inventory issues**. The average annual loss due to these disruptions is significant, with businesses losing around USD 1.75 million on average<sup>[9]</sup>. The true cost of supply chain disruptions can vary by industry, with

the average cost of a disruption being USD 610,000 in the manufacturing industry, USD 1.1 million in the retail industry, USD 1.5 million in the pharmaceutical industry, and USD 2.2 million in the oil & gas industry<sup>[10]</sup>.

## UNLOCKING CUSTOMER LOYALTY: OVERCOMING BOTTLENECKS AND EMBRACING INNOVATION IN TRANSPORTATION, LOGISTICS, AND WAREHOUSING

**Customer satisfaction** presents a significant challenge in the TLW industry due to the complex and interconnected nature of these sectors. Timely deliveries, reliable supply chain visibility, and efficient warehousing are prerequisites, while delays, tracking errors, and supply chain disruptions can negatively impact customer trust and brand reputation. The supply chain ecosystem is complex, involving multiple stakeholders, from manufacturers to retailers, which makes seamless communication and collaboration vital. Customers increasingly demand real-time updates, transparency, and personalized solutions, which challenges the industry to optimize processes for cost-effective excellence continuously. According to a survey by an internet-based mailing and shipping company, **almost half of shoppers (44%) are unlikely to buy from companies that provide poor delivery service**<sup>[11]</sup>. The ability to consistently deliver a premium service, dynamically adapting to evolving customer expectations, is the ultimate differentiator in this high-stakes arena. A survey by Dropoff in 2021 also revealed that almost half of the shoppers in the US paid more to get their orders delivered either on the same day or the next day<sup>[12]</sup>.

The TLW Industry navigates a complex storm in today's landscape—the eCommerce surge fuels labor shortages, demanding a workforce equipped for evolving skillsets. Supply chain disruptions, stimulated by natural disasters, pandemics, and global tensions, raise operational waves.

Managing inventory in real-time and ensuring worker safety are significant challenges TLW companies face, even with changes in the business. To overcome these multifaceted challenges, the industry must adopt innovative and automated solutions, invest in workforce development, and prioritize strategic planning. This will enable the industry to achieve sustainable growth and secure a competitive future. While adopting various automation solutions, such as robotic picking, mobile automation, and mobile AS/RS, will help TLW companies enhance their operations, integrating these varied hardware and software with their legacy infrastructure can create further issues.

Consequently, key SIs such as Honeywell IA play a pivotal role in the digitalization journey within the TLW sector by leveraging their specialized technology integration capabilities across a spectrum of hardware and software solutions. With a deep expertise in deploying automation and robotics solutions, Honeywell Intelligated (IGS) addresses labor shortages and optimizes warehouse operations, ensuring seamless transitions towards digitalization. In addition, Honeywell IA assists organizations in analyzing extensive data from diverse sources. This helps facilitate predictive analytics for demand forecasting, route optimization, and proactive maintenance strategies. Ultimately, this results in significant cost savings and operational efficiencies. Moreover, with its various worker safety products and productivity and data capture devices (such as autonomous mobile robots (AMRs), smart flexible depalletizer, mobile computers, printers, barcode scanners, etc.), they can help TLW companies improve worker productivity along with keeping the safety of the workers on top of the mind.

# TRENDS DRIVING DIGITAL TRANSFORMATION IN TRANSPORTATION, LOGISTICS, AND WAREHOUSING

# 2

Driven by advancements in technology and changing consumer preferences, the TLW industry is experiencing significant changes. Solutions for real-time visibility and tracking enhance transparency and efficiency throughout supply chains.

Warehouses are becoming increasingly automated with the help of robotics, artificial intelligence, and autonomous vehicles. Data analytics and predictive insights illuminate routes, optimize inventory, and forecast demand, empowering smarter decisions. From last-mile innovation and sustainability initiatives to integrating digital platforms for seamless supply chain management, these trends paint a vibrant picture of a future where logistics are smarter, faster, and more responsive than ever.

## AUTOMATION AND ROBOTICS: REVOLUTIONIZING THE TRANSPORTATION, LOGISTICS AND WAREHOUSING INDUSTRY

Robotics and automation have emerged as transformative trends, reshaping the landscape of the TLW sector. Integrating automated technologies and robotic systems transforms traditional operational methods, providing unmatched efficiency, accuracy, and scalability. In warehouses, robots such as AGVs, robotic arms, and drones streamline inventory management, picking, packing, and sorting processes, optimizing workflows and reducing human error. **Warehouse robotics is valued at USD 6.12 billion in 2023 and is expected to reach USD 10.5 billion in 2028, growing at a rate of 11.4%** <sup>[13]</sup>. Meanwhile, collaborative robots in logistics, valued at USD 134.4 million in 2023, are projected to reach USD 615.7 million in 2028, growing at a rate of 35.9% <sup>[14]</sup>. In transportation and logistics, automation facilitates

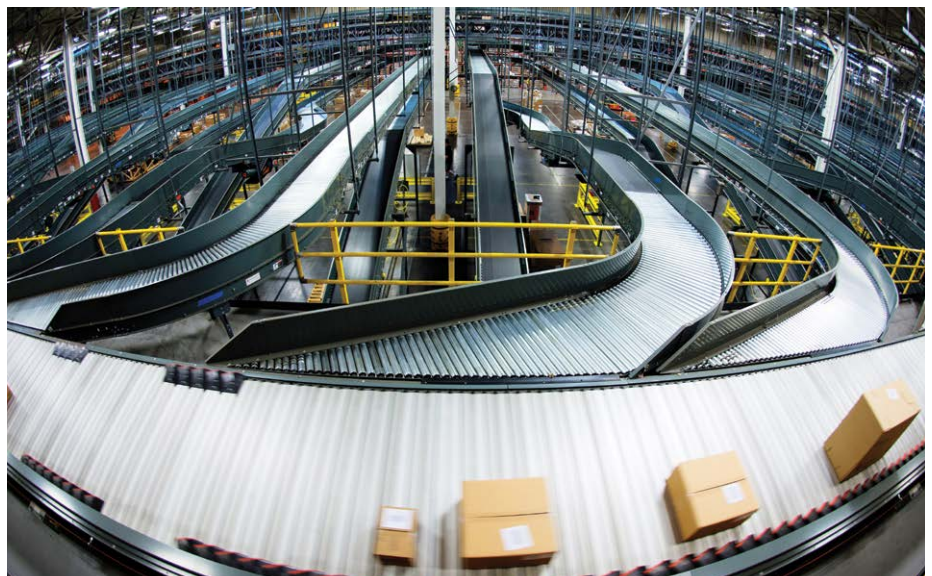
route optimization, vehicle platooning, and autonomous vehicles, enhancing last-mile delivery and transportation efficiency. According to the McKinsey Global Industrial Robotics Survey, automated systems will account for 25% of capital spending over the next five years <sup>[15]</sup>. Automation and robotics solutions are ideal for physically demanding and less desirable roles within the TLW sector, such as manual loading and unloading and repetitive picking and packing.

### Warehouse automation systems

integrate advanced technologies and robotic systems to automate various processes within warehouses. According to the Society of Manufacturing Engineers (SME), the global market for warehouse automation is growing significantly to reach USD 30 billion by 2026 <sup>[16]</sup>. According to research by ProGlove

(2023), currently, just over a third (36.1%) of respondents are in the process of deploying warehouse automation technology, and only 16.3% have successfully introduced warehouse automation within the last two years, indicating the initial phases of growing adoption. An additional 30% of respondents report being currently engaged in automation projects, suggesting a significant upward trend in automation implementation <sup>[17]</sup>.

Warehouse automation systems include several elements, such as robotics, sensors, barcode scanners, RFID systems, conveyor systems, and warehouse management software. In order to integrate these disparate technologies into a cohesive and efficient system, SIs such as Honeywell IA play a major role. Honeywell IA works closely with warehouse operators to understand specific needs and





customize the end automation solution accordingly to ensure maximum efficiency, productivity, and safety. Moreover, Honeywell IA also offers various services across productivity, safety, and warehouse automation, such as engineering services, field services, custom design and integration, connected services, and operational excellence to improve overall warehouse operations. Choosing the right SI is crucial for warehouse automation systems to ensure minimal overall costs and smooth integration of solutions across the environment.

**Augmented Reality (AR)** is also weaving a new path for enhanced order picking and packing, inventory management, and last-mile delivery. This groundbreaking technology blends virtual and real worlds, offering warehouse workers smart glasses, headsets, and mobile devices that overlay digital guidance onto their physical environment. A leading logistics company reported **increased productivity and accuracy by 15%** after implementing AR technology in business practices <sup>[18][19]</sup>. Honeywell IA provides the SwiftDecoder™ solution, which integrates AR elements into applications, such as barcode location coordinates.

**Wearable technology** in the TLW sector is empowering employees with devices such as wearable computers that allow them to track inventory levels, locate products, and manage inventory in real-time, reducing errors and improving efficiency. According to ProGlove's survey of 1,000 warehouse and logistics professionals from US and Europe (2023), **over half (56%) of warehouse and logistics leaders are currently utilizing industry wearables to improve efficiency** in the warehouse <sup>[20]</sup>. Honeywell IA's wearable barcode scanners (such as 8680i and 8690i Wearable Mini Mobile Computer) can quickly and safely scan barcodes, granting employees the use of both hands to complete processes such as picking, sorting, and packing, saving time while handling products and moving boxes more efficiently.



Meanwhile, TLW sector is also deploying **voice-enabled devices** for inventory checking, allowing warehouse workers to update stock levels and manage shelves by issuing voice commands, thereby saving time and reducing errors. TLW companies can now access advanced data collection, automated documentation, and analytics capabilities to optimize workforce productivity using Honeywell IA Voice solutions, which can also help achieve 99.99% order accuracy.

**Automatic Identification and Data Capture (AIDC)** solutions are also being greatly deployed by TLW companies to automatically collect and process data. Honeywell IA provides a variety of barcode scanning solutions, ranging from handheld scanners, fixed-mount scanners, etc., to rugged mobile computers with barcode scanning capabilities that can grant workers access to real-time information, execute tasks like inventory management and route optimization. In addition, Honeywell IA's vehicle-mounted computers, designed for use in forklifts, trucks, and other industrial vehicles, provide compute capability and barcode scanning capabilities to enable workers to carry out tasks such as order picking and asset tracking directly from the vehicle.

### **BEYOND EFFICIENCY: BUILDING A GREENER FUTURE FOR T&L**

Sustainability and green logistics have emerged as prominent trends in the TLW industry, reflecting a heightened focus on environmental responsibility and resource efficiency. With transportation being identified as the largest contributor of greenhouse gas emissions and accounting for more than 27% of total US greenhouse gas emissions <sup>[21]</sup>, companies are increasingly adopting eco-friendly practices and technologies to minimize carbon footprint, reduce emissions, and optimize energy consumption throughout the supply chain. Sustainable logistics practices can also help businesses reduce their greenhouse gas emissions by up to 50% <sup>[22]</sup>. Moreover, innovative packaging solutions and warehouse designs prioritize recyclability and waste reduction.

**Green packaging solutions** are flourishing, prioritizing reduced waste through eco-friendly materials and optimized designs. According to reports, the market for sustainable packaging was USD 225 billion in 2020, which accounted for 25% of the overall packaging market <sup>[23]</sup>. Meanwhile, reusable transport packaging solutions accounted for 35% of all transport

packaging used worldwide, mostly due to their ability to reduce costs and improve handling efficiency <sup>[24]</sup>. Advanced packaging machinery, such as automated packaging lines and robotic systems, can enhance efficiency and reduce material waste and can be incorporated by specialized SIs, such as Honeywell IGS, to optimize the packaging processes. Honeywell IA can also provide consultation services on sustainable packaging practices and assess current packaging methods to identify areas of improvement. It can also recommend eco-friendly alternatives and develop customized solutions tailored to the specific needs and challenges of TLW operations.

**Fuel efficiency** reigns supreme in the transportation sector, driven by both the green imperative and the bottom line. According to IEA, 24% of the global energy-related CO2 emissions cause climate change because of the transportation sector. Consequently, technology is taking center stage, streamlining logistics, optimizing routes, and slashing fuel consumption. Data analytics, IoT sensors, automation, and machine learning algorithms work together to optimize routes, with real-time performance dashboards providing insights and smart technologies reducing idle hours. Honeywell IA, as an SI, can leverage its expertise in integrating advanced technologies such as IoT, AI, and data analytics into the TLW to monitor, analyze, and optimize fuel usage throughout the supply chain. Honeywell Field Services technicians are adept at installing devices within clients' physical facilities, including on warehouse vehicles and material handlers. These installations encompass a range of equipment, such as fixed-mount computers, imagers, RFID readers, and dimensioning systems, ensuring seamless integration and optimal functionality.

## REVOLUTIONIZING THE FINAL STRETCH: EMERGING TRENDS IN LAST-MILE DELIVERY SOLUTIONS

**Last-mile delivery solutions** have emerged as a prominent trend, reshaping the TLW landscape. This focus on the final leg of the delivery process has gained significance due to heightened customer expectations for faster, more convenient deliveries. Companies increasingly employ innovative strategies such as route optimization algorithms, autonomous vehicles, drones, and micro-fulfillment centers to expedite and enhance last-mile deliveries. **The autonomous last-mile delivery market is valued at USD 996 million and is projected to reach USD 4.1 billion by 2030**, growing at a rate of 22.7% <sup>[25]</sup>. By leveraging technology and data-driven approaches, businesses aim to mitigate challenges related to traffic congestion, delivery accuracy, and cost-effectiveness, ultimately improving customer satisfaction and loyalty while driving efficiencies in the overall supply chain. Last-mile delivery services account for 41% of the entire supply chain costs worldwide <sup>[26]</sup>. Honeywell IA provides mobility devices (such as CT60 XP, CT45/CT45 XP, etc.) that can improve productivity for highly mobile workers in distribution and warehouse operations. Honeywell IA mobile computers enable devices to last up to two full shifts, backed by Honeywell's durable, stable, and secure Mobility Edge™ platform.

**Contactless delivery** has rocketed to the forefront of the TLW sector in the wake of changing consumer expectations and public health priorities. Driven by technology like mobile apps, QR codes, and advanced tracking systems, this transformative trend minimizes physical interactions, fostering increased safety and efficiency. A Salesforce survey indicates that due to safety concerns, nearly 40% of American consumers choose contactless delivery <sup>[27]</sup>. To reduce physical touch, last-mile delivery companies have embraced automated delivery processes through digital solutions such as Electronic Proof of Delivery software (e-POD) and digital payments.

By leveraging solutions such as mobile computing devices, smart sensors, and barcode scanning, leading companies facilitate a seamless transfer of goods without needing face-to-face contact. Honeywell IA has the expertise at integrating various technologies necessary for contactless delivery solutions, including hardware such as sensors, RFID, and barcode scanners and software solutions such as Honeywell IGS (suite of SCM solutions, including WMS and TMS), Momentum WES (Warehouse Execution Software), Momentum Machine Control (Conveyor and Sortation Control), and Momentum Labor (Labor Management System), etc., so that these technologies work seamlessly together to create an efficient and effective contactless delivery ecosystem.



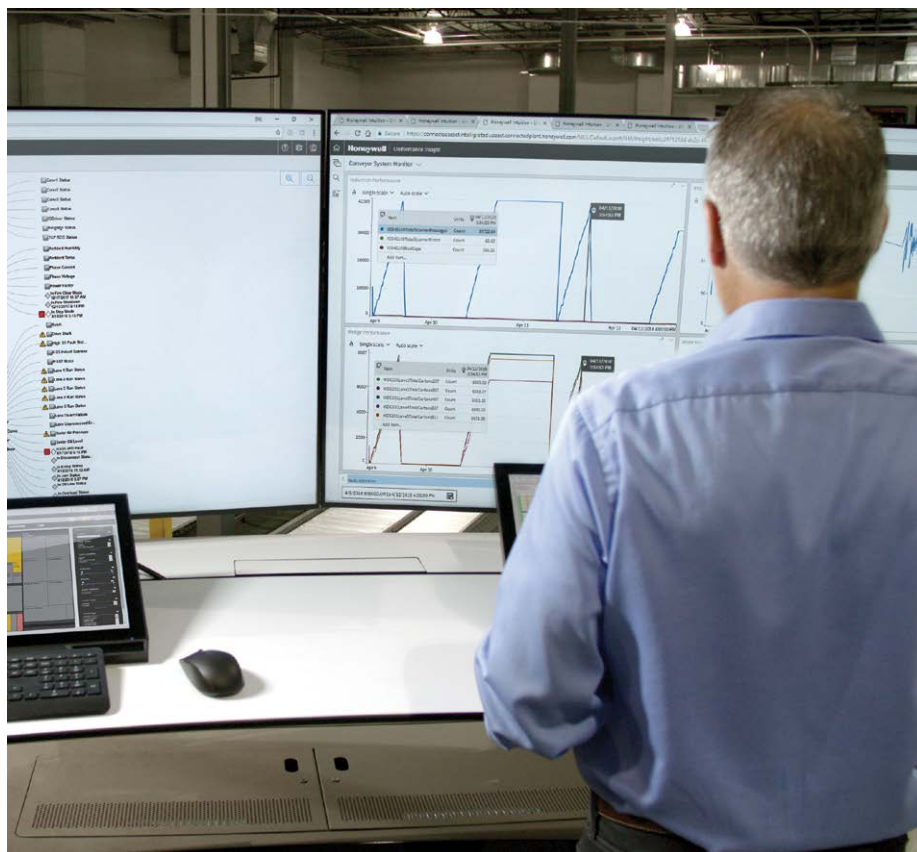
**Micro-fulfillment centers** are revolutionizing the last mile, offering a potent antidote to the rising demand for faster, smoother deliveries. These compact, tech-powered hubs, nestled near urban centers, empower retailers and logistics providers to turbocharge order fulfillment. Within the centers, robots, conveyors, and smart storage systems work parallelly, optimizing the picking and packing process and lowering overall delivery times. As efficiency and responsiveness reign supreme, MFCs stand poised to reshape logistics and rewrite the last-mile narrative. The grocery sector is expected to be the main contributor to the MFC market, with a share of ~70–80%, and it is projected to present a cumulative opportunity of USD 10 billion by 2026 <sup>[28]</sup>. MFCs often require a mix of technologies such as robotics, automation systems, WMS, sensors, and data analytics as well as need to scale and adapt accordingly as businesses grow or adapt to changing market demands. Honeywell IGS is an SI specializing in integrating these diverse technologies into a cohesive and customized solution tailored to each client's specific needs. It combines the best of existing and new automation technologies, such as robust automation equipment, robotics, and advanced execution software, to help TLW companies deploy micro-fulfillment strategies.

## **AI/ML DRIVES EFFICIENCY AND INNOVATION: TRANSFORMING TRANSPORTATION, LOGISTICS, AND WAREHOUSING**

AI/ML is emerging as a key trend across the TLW sector, offering a wide range of applications that can improve efficiency, reduce costs, and enhance decision-making processes. According to McKinsey, the successful implementation of AI-enabled supply-chain management has helped businesses improve logistics costs by 15%, inventory levels by 35%, and service levels by 65% <sup>[29]</sup>. In the TLW sector, AI/ML plays critical roles in route optimization and planning, predictive maintenance, supply chain visibility, demand forecasting, warehouse

automation, last-mile delivery optimization, and customer service and personalization. Moreover, combined with sophisticated warehouse execution system (WES) software, the AI/ML models can enable dynamic, real-time “decision intelligence” to achieve optimal execution strategies and business results in complex fulfillment environments. Honeywell IA has extensive expertise in various AI technologies, including machine learning, natural language processing, and predictive analytics. With Honeywell IGS' Momentum WES software suite, which is equipped with modular functionality and a Decision Intelligence machine-learning engine, TLW companies can accurately predict the workload and anticipate future states of warehouse automation. Honeywell IA also ensures these solutions integrate seamlessly with existing systems and processes. In addition, Honeywell Operational Intelligence provides advanced data collection, automated documentation, and analytics capabilities that allow DC managers to optimize workforce productivity while ensuring compliance with new safety protocols.

All these trends indicate a shift toward TLW companies needing to incorporate innovative solutions for automation and operational efficiency. Many companies are interested in transitioning to a more automated and digital environment. However, choosing the right solution and implementation partner is crucial. The fear of experiencing downtime during a complete, all-at-once implementation of the solution is a common concern. Even phased implementations pose risks and challenges, especially for organizations that must integrate old and new systems or maintain continual operations. This makes it necessary to find suitable partners to oversee the implementation process. Forward-thinking TLW companies understand the importance of concentrating on their core business operations while collaborating with seasoned integration and technology partners. While numerous technologies and solutions are available in the market, SIs like Honeywell IA play a vital role in optimizing operations within the TLW sector through seamless integration of technologies, enhancing efficiency, visibility, and automation across the supply chain.



# DIGITAL TRANSFORMATION AND ROLE OF THE INTEGRATOR

# 3

In the rapidly evolving landscape of the TLW sector, digitalization plays a pivotal role in reshaping operations and driving efficiency. This transformation involves navigating a complex landscape of hardware, software, and solutions tailored to meet the unique demands of the TLW sector.

With the industry experiencing an accelerated rate of change, it is evident that no single vendor can offer a comprehensive solution to address every aspect of modernization. Consequently, customers are advised to seek the best-of-breed solutions, combining the most effective technologies from vendors to suit their specific needs. In this dynamic environment, the role of the integrator emerges as critical, tasked with seamlessly integrating disparate systems and technologies to create cohesive and optimized solutions.

## DEMYSTIFYING THE WAREHOUSE AUTOMATION SPACE: SYSTEM INTEGRATORS UNLOCK DISPARATE TECHNOLOGICAL LANDSCAPE

The TLW sector is multifaceted and complex and encompasses a wide range of technologies that are critical for efficient operations. Warehouse automation solution (WAS) is a key example of the complex landscape in the TLW sector. Material handling equipment such as forklifts, conveyors, robots, and automated guided vehicles (AGV) have operating systems, communication protocols, and maintenance requirements. Warehouse management systems (WMS), the software driving the operation, often struggle to integrate seamlessly with the diverse hardware ecosystem. Data silos, operational bottlenecks, and increased costs are complexities that arise from improper integration due to incompatibility, lack of standardized protocols, and inconsistent data formats. Technologies are also constantly evolving, requiring continuous upgrades and integration, adding layers of complexity to manage the existing hardware and software ecosystem. According to recent research from ProGlove, a

quarter (25%) of respondents mentioned that struggles with integrating new WAS into their current warehouse environment were a key barrier to implementation. Meanwhile, for 18% of respondents, the complexity of implementing WAS across the entire business presents a formidable challenge. In addition, around 21% identified support and maintenance as significant hurdles that impede automation efforts <sup>[30]</sup>.

Warehouses are the backbone of a supply chain operation. However, warehouses do not have identical requirements and depend on each business's unique requirements, constraints, and objectives. WAS, hence, must be tailored to suit the specific needs of each enterprise. Some of the key points to be considered before the deployment of WAS are:

**Varied Processes:** Every business has its own set of workflows, processes, and inventory management practices, and the warehouse automation system must be designed to integrate seamlessly into the existing system without causing disruptions.

**Scalability and Flexibility:** Warehouse requirements evolve as businesses evolve. Warehouse automation systems must scale with the business's growth and have the flexibility to accommodate changes in demand patterns or market trends.

**Technology Integration:** Warehouse automation will involve several technologies, such as robotics, conveyors, RFID systems, and WMS, but the combination of technology will be dependent upon budgetary constraints, infrastructure limitations, and existing IT system compatibility.

## **OPTIMIZING WAREHOUSE OPERATIONS: DESIGNING TAILORED SYSTEMS, EFFICIENT GO-LIVE STRATEGIES, AND OUTCOME-BASED SOLUTIONS**

Automation can help organizations cope with increasing demand amid global supply chain challenges and the ongoing struggle to fill vacancies. However, despite the potential benefits, many leaders encounter difficulties while implementing these solutions.

Consequently, an ideal SI partner in the TLW sector embodies a combination of expertise, reliability, innovation, and long-term support. They should possess **deep industry knowledge and understanding of TLW** operations, including the nuances of supply chain dynamics and warehouse management as well as understand the unique requirements of the customer and design a robust system.

Secondly, the SI should be ready to set up an aggressive go live target, as each day a new facility is not operable due to new solution deployment and integration issues, the client is losing time and money. Moreover, if the implementation and integration does not go right in the first instance, the integrator should have the right technical expertise and team to support and resolve the issue.

Another important point to consider is that the integrator should excel in orchestrating various software platforms and data sources into a cohesive solution, enabling seamless communication and workflow optimization across the entire TLW ecosystem.

Lastly, they must offer comprehensive life-cycle service and support as well as training, recognizing that TLW projects typically have long depreciation cycles spanning 5 to 20 years.

## **HONEYWELL IA: EXEMPLIFYING THE KEY CHARACTERISTICS OF AN IDEAL SYSTEMS INTEGRATOR PARTNER**

### **COMPREHENSIVE WAREHOUSE AUTOMATION SOLUTIONS BY HONEYWELL IA: LEVERAGING ITS SINGLE-SOURCE OEM CAPABILITY**

An industry-leading SI such as Honeywell IA can consider all the various requirements that are part of a warehouse automation project and can integrate the ideal solution that can come from Honeywell's own in-house products. As an SI and an OEM, Honeywell IA allows some of the largest manufacturing and TLW clients to build end-to-end solutions that cover a wide spectrum of operational needs. With an ability to manufacture and integrate the solutions at massive scale, Honeywell IA has been able to create a unique differentiator in the TLW industry.

As a single-source parts supplier, Honeywell IA provides several important benefits to keep equipment running with the right parts at the right time. It offers access to the latest versions of parts, simplifies the ordering process, proactively extends system lifecycle, and more efficiently leverages

inventory. Furthermore, Honeywell IA as an OEM can yield easier budget management, better parts value and quicker root-cause analysis in the event of an equipment issue.

For example, Honeywell IGS was selected as the supplier and integration partner for an automated palletizing solution for a leading US enterprise. The client was looking to deploy a solution that can handle different types of products, packages, and pallet setups with its fullest potential. The Honeywell IGS team took the time to research and understand the unique business challenges and leverage their industry expertise from previous projects to provide a comprehensive, integrated end-of-line palletizing solution capable of handling 95 percent of the client's products with the flexibility to run different stacking patterns and complicated pallet configurations.

### **COLLABORATIVE INNOVATION AND ADVANCED TECHNOLOGY INTEGRATION**

Honeywell IA also collaborates closely with OEMs and other industry partners to co-develop and co-manufacture integrated cutting-edge solutions using the latest technologies, such as quantum computing, AI, automation, and robotics, in conjunction with established Honeywell solutions. By leveraging the expertise and resources of its partners, Honeywell IA can scale production capacity rapidly, accelerate time-to-market, and address the evolving needs of customers in a timely and cost-effective manner. Honeywell IA combines the latest advances with end-to-end knowledge of the logistics ecosystem to bring innovative strategies like Connected Distribution Center, DC Next, and Micro-fulfillment Centers.

### **TAILORED SOLUTIONS FOR WAREHOUSE EFFICIENCY: LEVERAGING HONEYWELL IA'S EXPERTISE AND FLEXIBILITY**

With decades of experience and a global presence, Honeywell IA understands that every customer has unique challenges and requirements. Honeywell, as an OEM and an SI, allows customers to custom-tailor solutions to meet specific needs. Honeywell's design flexibility and innovative engineering capabilities to address complex problems allow them to understand the key requirements of the client and to design a robust automation strategy that can improve the overall efficiency of warehouse operations. Honeywell IA Engineering Services offer comprehensive solutions designed to address various industrial challenges across multiple sectors. Honeywell IA also provides consulting services to assess clients' needs, identify opportunities for improvement, and develop tailored solutions. This includes system design, feasibility studies, and conceptualization to ensure optimal outcomes.

For example, a leading producer and distributor of fruits globally selected Honeywell IGS as the preferred supplier and integration partner, to offer a custom-engineered palletizer with package-handling modifications. Honeywell IGS put their new solution through a month of tests to

see how fast it could handle products, how reliable it was, and how safe it was for workers. The system did even better than expected in all these areas, boosting production by 15% and getting set up ahead of time.

## **MITIGATING OPERATIONAL SHUTDOWN RISKS WITH HONEYWELL IA EXPERTISE**

When a warehouse experiences operational shutdown during the implementation of a new solution, there are several tangible losses for the business, ranging from revenue loss and increased expenses to broader consequences such as supply chain disruptions and reputational damage. Understanding these factors is crucial for businesses to assess the true cost of downtime, and an experienced partner like Honeywell IA is important to ensure that any downtime is kept minimal and operations are resumed as early as possible. Moreover, Honeywell IA can help implement warehouse solutions quickly due to their years of industry experience, saving upfront costs.

For example, Honeywell IGS was selected by one of the leading retailers to implement an updated conveyor system for their expanded warehouse. Honeywell IGS created a plan to upgrade the system gradually, with minor tie-ins performed at strategic times. The warehouse continued to use the old system until the new parts were ready, and as a result, they got a new conveyor system in a bigger building without disrupting their current operations. By implementing the new system, the client was able to achieve a 20% increase in productivity in the facility's breakpack area and a 10% increase in productivity in the facilities receiving area, with increased volume. The client experienced zero downtime to existing operations during the duration of the project implementation.

## **ENHANCING WORKPLACE SAFETY WITH HONEYWELL SOLUTIONS**

Honeywell eliminates high-risk and strenuous situations for workers by providing industry-leading vertical-specific safety solutions, such as Personal Protective Equipment (PPE) such as safety eyewear, hearing and respiratory protection, protective clothing, and fall protection equipment. Honeywell also offers gas detection and monitoring solutions that help companies detect and mitigate risks associated with hazardous gases and vapors in the workplace, such as portable gas detectors, fixed gas detection systems, and wireless gas monitoring solutions. Honeywell IA also offers training and consulting services to develop and implement effective safety programs for TLW companies. In addition, Honeywell IGS solutions such as the Smart Flexible Depalletizer, a fully automated solution, frees up the labor from high risk and injury-prone tasks.

## **HONEYWELL IA'S MOMENTUM WES: OPTIMIZING WAREHOUSE OPERATIONS WITH SEAMLESS INTEGRATION AND ORCHESTRATION**

In addition, Honeywell IA offers Momentum WES, which serves as a centralized platform for integrating and orchestrating diverse warehouse technologies, including robotics, conveyors, picking systems, etc. This seamless

integration ensures that all components work in harmony, optimizing workflow efficiency. A key feature of Honeywell Momentum WES is its ability to dynamically allocate tasks based on real-time conditions and priorities by analyzing factors such as order volumes, inventory levels, and equipment availability, minimizing idle time, and maximizing throughput. As a next-generation WES software platform, Momentum utilizes advanced machine learning algorithms and data-driven optimization techniques to orchestrate disparate automation systems and empower operators with dynamic decision-making intelligence. In addition, Honeywell offers several other solutions, such as Labor management solutions (Momentum Labor) and Control and operational software that helps in overall warehouse management. Moreover, with Momentum Integration, customers can connect their entire distribution center (DC) and warehouse execution ecosystem, including: MHE; labor management; automation systems (such as Honeywell Voice); AMRs; and automated guided vehicles (AGVs).

## **HONEYWELL IA'S COMPREHENSIVE LIFECYCLE SUPPORT SERVICES: MAXIMIZING EFFICIENCY AND LONGEVITY IN TLW SOLUTIONS**

Through its Lifecycle Support Services (LSS), Honeywell IA ensures that clients receive ongoing assistance, maintenance, and updates to maximize the longevity and efficiency of their investment, thus solidifying their position as a trusted partner in the TLW industry.

- Honeywell IA maintains **dedicated support teams** and **round-the-clock customer service** who are trained to provide technical support, troubleshooting expertise, and guidance throughout the entire lifecycle of the system.
- Honeywell IA implements **proactive monitoring and maintenance** protocols to identify and address potential issues before they escalate into problems. This includes remote monitoring of system performance, predictive analytics, and preventive maintenance schedules to optimize uptime and reliability.
- Connected Services from Honeywell Intelligrated empowers the process of **streamlining the entire maintenance task lifecycle** with advanced diagnostics, voice automation, and AR technology. As part of connected services and operational excellence, Honeywell also offers a flexible, outcome-based service solution called the Assurance 360, designed to help achieve continual performance optimization of material handling and warehouse automation systems.

# HONEYWELL IA SUCCESS STORIES IN TRANSPORTATION, LOGISTICS, AND WAREHOUSING

# 4

## CASE STUDY #1:

**Client Problem:** Following the relocation to an expanded facility equipped with ample space to accommodate both existing throughput demands and anticipated future expansion, a medium-scale distributor embarked upon a new endeavor: enhancing the efficiency of its fulfillment procedures.

**Solution:** In collaboration with Honeywell IGS, the client implemented a two-stage sweeper sorter system featuring wave picking to efficiently manage small packages within a

limited space. The wave-picking method involves employees selecting multiple batches of identical items for various orders, followed by the utilization of a bi-directional sweeper sorter to segregate them into 20 larger order batches for further processing downstream. Subsequently, each batch undergoes induction into a larger, 80-destination, bi-directional sweeper sorter equipped with dual-level chutes to undergo the final stage of sorting before packaging.

**Outcome:** This system facilitated a 40 percent decrease in annual labor

expenses, resulting in a reduction of labor requirements from the equivalent of 27 full-time employees to 16 and shortening employee workdays from 14 to eight hours, with substantial capacity to accommodate fluctuations in order volumes. The realized savings in labor costs alone allowed for a return on investment within a span of less than two years. Additionally, the automated system delivered added value by enhancing customer satisfaction through heightened accuracy, thereby fostering customer retention and attracting new business prospects.

## CASE STUDY #2:

**Client Problem:** The client is one of the largest confectionery and snack manufacturers in the world. Their SKUs change seasonally based on the demand from the marketing team. The packaging, logistics, and material handling solutions needed to be revamped and automated to simplify the overall process.

**Solution:** Honeywell IGS, as an SI, provided System Design and Integration services along with Honeywell's own offerings, such as Palletizers, Conveyors, and the Conveyor System. It also provided the Honeywell Intelligated control and programming software. Honeywell also provided on-site training for more than 30 employees and aggressively worked on installing

the palletizing system, completing the entire system in 5 weeks, and commissioning it in 3 and a half weeks.

**Outcomes:** The company saw increased palletizing speed with no reports of any problem with the equipment or system, saving on labor costs, as well as greater potential savings from reduced ergonomic complaints.

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Honeywell is an integrated operating company serving a broad range of industries and geographies around the world. Our business is aligned with three powerful megatrends – automation, the future of aviation and energy transition – underpinned by our Honeywell Accelerator operating system and Honeywell Connected Enterprise integrated software platform. As a trusted partner, we help organizations solve the world's toughest, most complex challenges, providing actionable solutions and innovations through our Aerospace Technologies, Industrial Automation, Building Automation and Energy and Sustainability Solutions business segments that help make the world smarter, safer, and more sustainable.

Honeywell Industrial Automation enables our customers to enhance the safety, sustainability, resilience and productivity of their people, plants, and assets. From refineries to distribution centers to retail stores, we help deliver results while improving worker safety and meeting sustainability goals – by leveraging connectivity, advanced data analytics, software, robotics, sensors, process automation and asset performance management solutions.

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