



**AUTO
SCHEDULER**

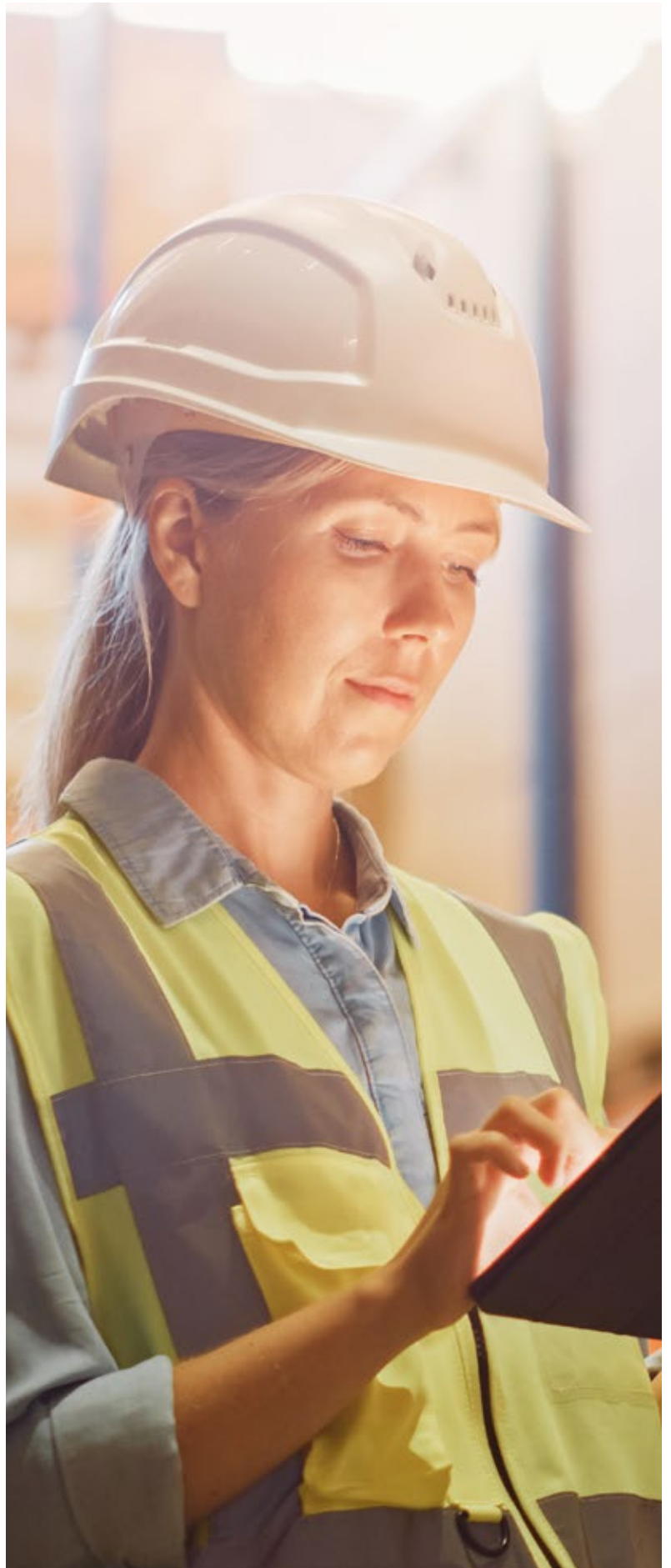
WAREHOUSING PRODUCTIVITY

The Logistics Technology Hierarchy

WHAT EVERY WAREHOUSE WANTS

No matter the size, workforce, SKU count, or complexity, every warehouse aims to do the same thing: maximize service levels while minimizing costs. Achieving this goal requires a deep understanding of warehouse operations and the right technology strategies to optimize them.

Our goal is to examine the fundamental components of warehouse technology and determine how they impact productivity. We will build a toolkit for technology you can introduce to run a successful operation. By the end, our hope is that you will understand how to leverage these elements to create a highly efficient warehouse.





DEFINING PRODUCTIVITY

Let's start by defining productivity. It's output / cost. No warehouse is willing to trade output for cost, so from here on out, let's assume that the sole objective is to maximize this function while supporting the rest of the supply chain.

PRODUCTIVITY:

Given the simplicity of the equation, productivity in a warehouse can really only be improved through two methods:

Working harder: This approach focuses on enhancing the efficiency of the workforce. Techniques include better training programs, motivational incentives, and performance management systems. These methods work well if you are able to adequately hire labor for your facilities so that you can consistently reward top performers.

Working smarter: This involves streamlining processes, implementing advanced systems, and adopting new technologies to reduce the need for manual labor. By working smarter, warehouses can achieve higher productivity without overburdening their staff. These methods are especially effective if you're struggling to hire or retain labor.

On the following pages, we'll create a "technological hierarchy" of tools that will help you to work both smarter & harder in your operations, along with an order in which you should consider these tools.

THE FOUNDATION

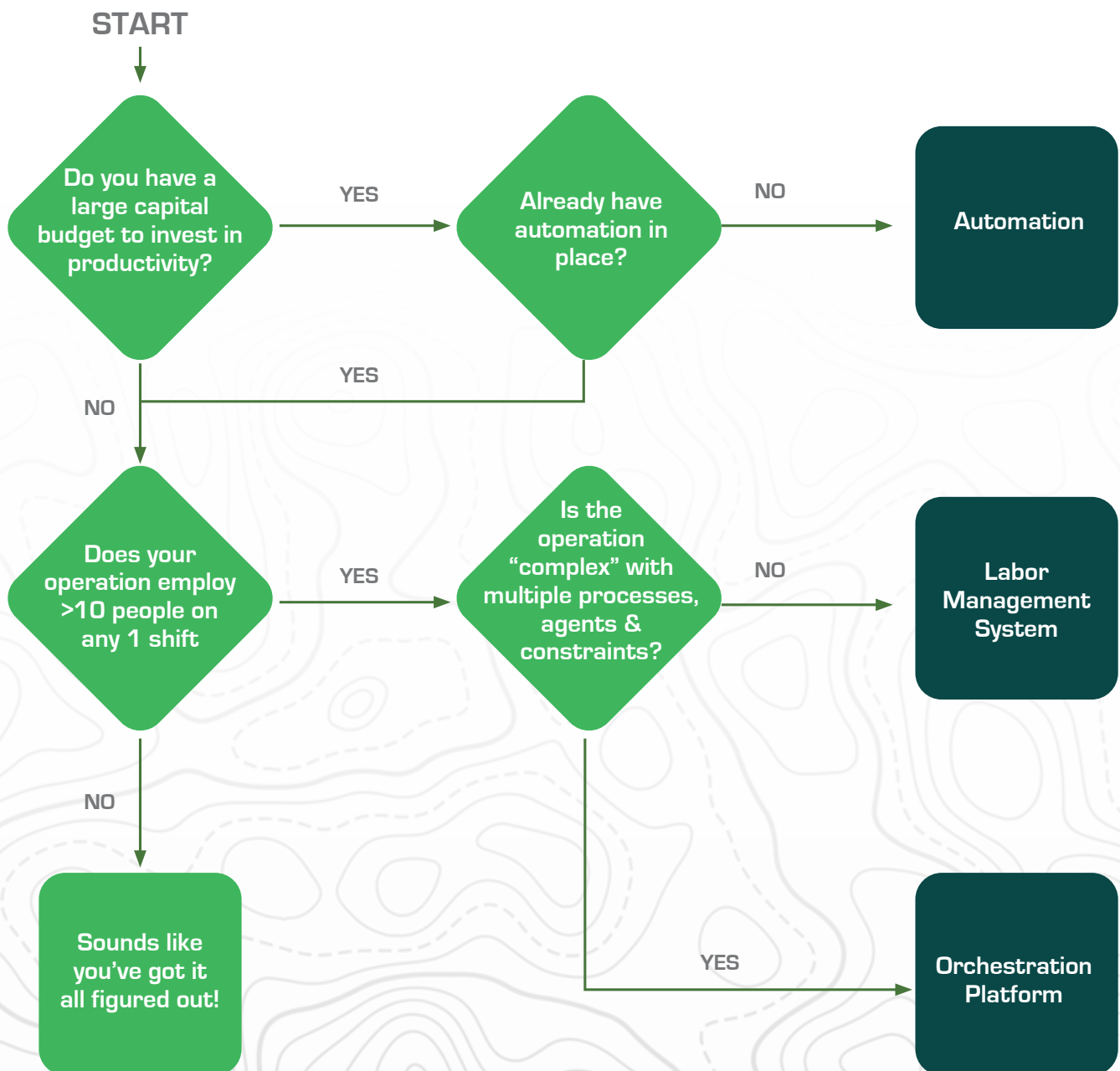
A GOOD WMS



The foundation of an efficient warehouse is data, which starts with implementing a Warehouse Management System (WMS). A WMS provides the critical data backbone necessary for accurate tracking, inventory control, and overall management. It ensures that all inventory movements are recorded and monitored, offering real-time visibility into stock levels and locations. This capability helps prevent issues like overstocking and stockouts while improving order accuracy and fulfillment speed, leading to enhanced customer satisfaction. Investing in a robust WMS is the must-have first step towards building a data-driven, efficient warehouse.

CHOOSE YOUR OWN ADVENTURE

Once a WMS is in place, there are 3 different technology paths you might want to pursue: Automation, Labor Management Systems (LMS), and Orchestration. Which one is most important to you really depends on how your network operates. Automation involves using machinery and technology to perform repetitive tasks, thus reducing the reliance on manual labor. Labor Management Systems focus on optimizing workforce performance by analyzing labor data to identify areas for improvement and ensuring that the right people are in the right roles. Orchestration, on the other hand, integrates and coordinates all warehouse activities, ensuring that resources are used optimally and tasks are completed efficiently. Each of these approaches has a distinct impact on productivity and efficiency.



SUPPLEMENT LABOR WITH AUTOMATION



Once a warehouse management system is in place to track inventory & moves, the next logical step in this labor-short environment is to supplement the existing workforce with automated processes. Automation, supported by a Warehouse Execution System (WES) to ensure the automation actually gets the required work done, supplements manual labor with machinery and technology.

Though it requires significant capital investment, automation ensures consistent productivity and mitigates the challenges of labor shortages. Automated systems can operate continuously, increasing throughput and reducing errors caused by human fatigue. Furthermore, automation can handle hazardous or repetitive tasks, improving worker safety and job satisfaction. Investing in automation can yield long-term benefits by providing a stable and scalable solution to meet growing demand. However, balancing automation with human oversight is essential to maintain flexibility and adaptability in operations. impact on productivity and efficiency.





MAXIMIZE OUTPUT WITH LABOR MANAGEMENT SYSTEMS

Regardless of automation strategy, once a WMS is running, maximizing your workforce is critical by ensuring that each employee is hitting their target levels of productivity. To help with this, a Labor Management System (LMS) is extremely valuable.

An LMS provides insights into workforce performance, identifying which workers are struggling and which are thriving. By tracking key performance indicators (KPIs) such as pick rates, accuracy, and attendance, an LMS offers a clear picture of workforce efficiency. Managers can use this data to provide targeted training, reward high performers, and address performance issues promptly.

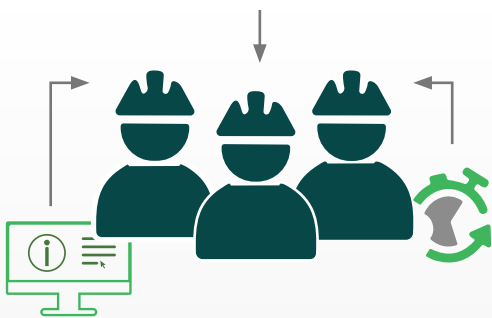


UNDERSTANDING THE DIFFERENCE BETWEEN LABOR MANAGEMENT & ORCHESTRATION

Labor Management Systems (LMS) and Warehouse Orchestration serve distinct yet complementary roles in optimizing warehouse operations. LMS primarily focuses on tracking and improving individual worker performance by comparing their output against historical benchmarks or set standards. It identifies areas where workers may be struggling or excelling, enabling targeted interventions to improve productivity. In contrast, Warehouse Orchestration takes a broader approach, balancing and optimizing the flow of work across various agents, including human workers, robots, and automated systems. Orchestration ensures that tasks are assigned and completed in a way that maximizes overall efficiency and throughput, considering real-time constraints like inventory levels, equipment availability, and order priorities.

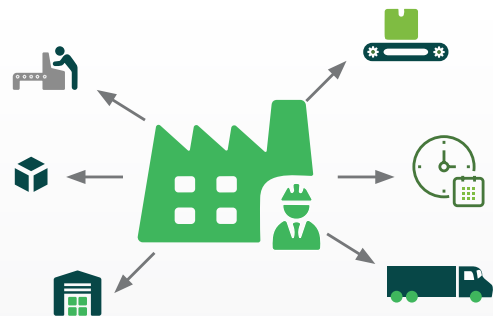
The key differences between the two include their focus and scope: while LMS is centered on individual performance optimization, Orchestration is concerned with the holistic optimization of the entire warehouse operation. whereas Orchestration looks outward, continuously adjusting workflows to respond to current operational needs and constraints.

LMS



LMS looks inward, evaluating people against past performance metrics.

ORCHESTRATION



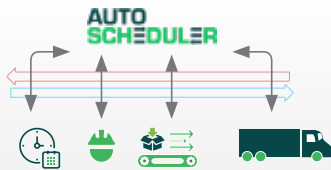
Orchestration looks outward, continuously adjusting workflows to respond to current operational needs and constraints.

Together, these systems provide a comprehensive strategy for enhancing both individual and system-wide productivity in the warehouse.

MANAGING COMPLEXITY WITH ORCHESTRATION

For sites that have an abundance of process flows, actors to manage, and bottlenecks that are shifting by the minute, value can be created using an emerging category of software known as a Warehouse Orchestration platform. These orchestration platforms optimize operations by dynamically coordinating tasks and resources across labor & automation. This system integrates with existing solutions in place to provide a comprehensive view of warehouse operations now and in the future. By analyzing real-time data, an orchestration platform can dynamically adjust workflows to maximize efficiency and minimize downtime. This reduces the need for a large workforce by eliminating redundant tasks and ensures that resources are allocated where they are needed most to flow inventory through the facility. This also helps with planning, as orchestration platforms should look at the next 1-2 days of operation and all visible orders to plan out labor needs in context to inventory flow. On top of all of that, orchestration enhances service levels by improving order accuracy and fulfillment speed.

Productivity metrics on top of existing systems



Better visibility



ORCHESTRATION PLATFORMS DRIVE VALUE IN TWO STAGES:

#1

Manual - Orchestrated plans are taken & presented to site leaders in a dashboard, informing them of what decisions to make and when. These planners can then interact in the platform and communicate with each other to ensure that everything gets executed on time in concert (traditionally by performing actions in the WMS).

#2

Systematic - Orchestration output is programmatically inserted back into the WMS, automating many of the manual planning steps like waving, allocating, work release, work prioritization, dock assignment, labor movement, and more. This automation frees critical team members to deal with fires and exceptions, which are constantly occurring in the warehouse.

A PRODUCTIVE SITE LEVERAGES MULTIPLE PLATFORMS TO MAXIMIZE SERVICE

Combining a WMS, Automation, LMS, and Warehouse Orchestration creates the ultimate productive warehouse. This integrated approach ensures maximum efficiency, cost-effectiveness, and superior service levels. A well-implemented WMS provides the data foundation, while automation handles repetitive tasks and reduces labor costs. LMS optimizes workforce performance, and orchestration ensures that all systems work together seamlessly. This combination allows warehouses to operate at peak performance, adapt quickly to changing demands, and maintain high service levels. By leveraging these technologies, warehouses can position themselves for long-term success and remain competitive in a rapidly evolving market.

