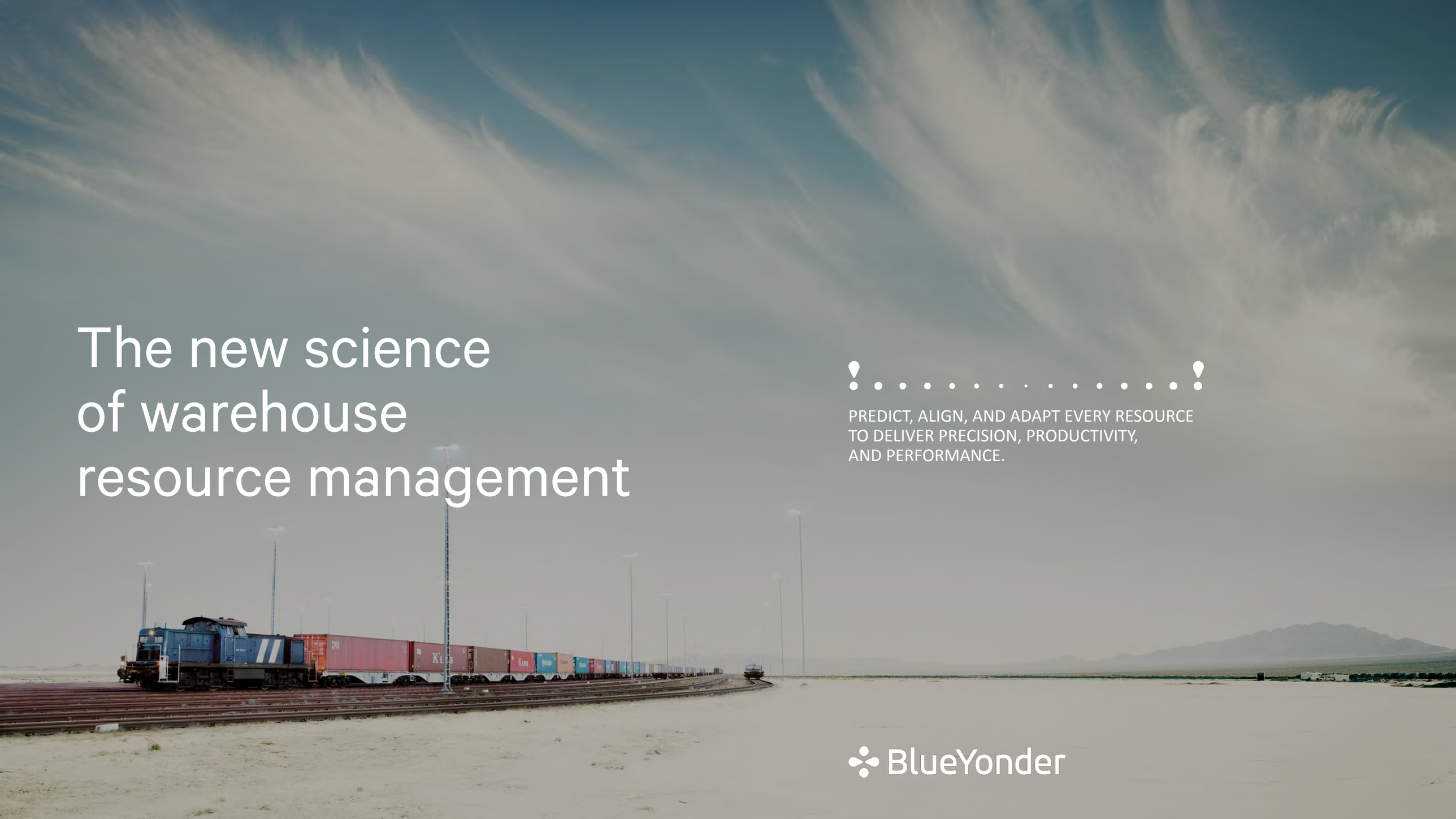
The new science of warehouse resource management

PREDICT, ALIGN, AND ADAPT EVERY RESOURCE TO DELIVER PRECISION, PRODUCTIVITY, AND PERFORMANCE.



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What resource management really includes today

Labor typically accounts for **50%-70%** of total warehouse operating costs.

Warehouses are no longer simple multichannel distribution centers. They now operate as complex multi-channel logistics hubs where performance depends on precise coordination of every warehouse resource. Yet when teams ask, “What’s included in resource management?”, answers often differ, creating misalignment before planning even begins.

Understand what truly makes up warehouse resources

Resource management must account for all human, equipment, and automated resources with equal and granular specificity, including human roles, certifications, and skill sets; equipment, such as pallet jacks, portable conveyors, and high-bay forklifts; automated technologies, such as Automated Storage and Retrieval Systems (ASRs), Autonomous Mobile Robots (AMRs), Automated Guided Vehicles (AGVs), Pick-to-Light Systems (PTLs); and dock doors that govern inbound and outbound flow and must be planned in coordination with these resources.

Recognize the gaps in traditional planning

Traditional planning often separates human and automated resources into different scheduling processes, leading to inconsistent readiness across the operation. These mismatched schedules lead to gaps when people are available, but equipment or automation is not, or vice versa. Such disconnects slow down task execution and create avoidable inefficiencies across receiving, picking, replenishment, and shipping activities.

Enable all resources to work together

Modern operations depend on coordinated interdependence. Tasks can’t progress if resources aren’t available. Hundreds of trucks cannot be unloaded unless the dock door is supported by the right people, automation and equipment at the right time. Ensuring all resource types work in sync prevents downstream bottlenecks and enables smoother task completion across the warehouse.

The challenge of resource management in a traditional warehouse

Up to **73%** of all data within enterprises goes unused for analytics.

Traditional warehouses struggle to manage resources effectively because their processes were designed for older, simpler operational environments. Today, demand variability, labor constraints, and heightened service expectations require faster, more precise, and coordinated decisions across zones. Without modern tools, teams are forced to make reactive decisions, creating operational volatility rather than predictable execution.

Resource silos prevent optimization

When human, automated and equipment resources are managed independently, aligned execution becomes nearly impossible. Siloed resource schedules create gaps on every shift, forcing supervisors to redirect workers or wait for equipment that isn't available when needed. These misalignments accumulate across tasks, leading to increased workload imbalances and reduced overall operational throughput.

Data overload limits decision-making

Warehouses generate more than 570,000 data points daily, yet only a small portion is used for planning or adjustments. Decision-makers are left relying on outdated information, backward-looking historical data, or lagging projections, which limits their ability to anticipate workloads, identify risks, or adapt resource allocations as conditions change.

Disconnected decisions create ripple effects

When decisions are made in isolation within specific work zones, issues quickly spread to adjacent areas. A shift in one zone's resource plan may cause congestion, delays or shortages downstream. Volatile demand and daily disruptions magnify these ripple effects, creating an environment where managers are constantly reacting and rarely able to stabilize operations.

Modern resource management replaces fragmented reactive planning with predictive models, machine learning, agentic intelligence, and end-to-end optimization from forecasting through post-shift analysis.

Resource management built for today's challenges and tomorrow's promise

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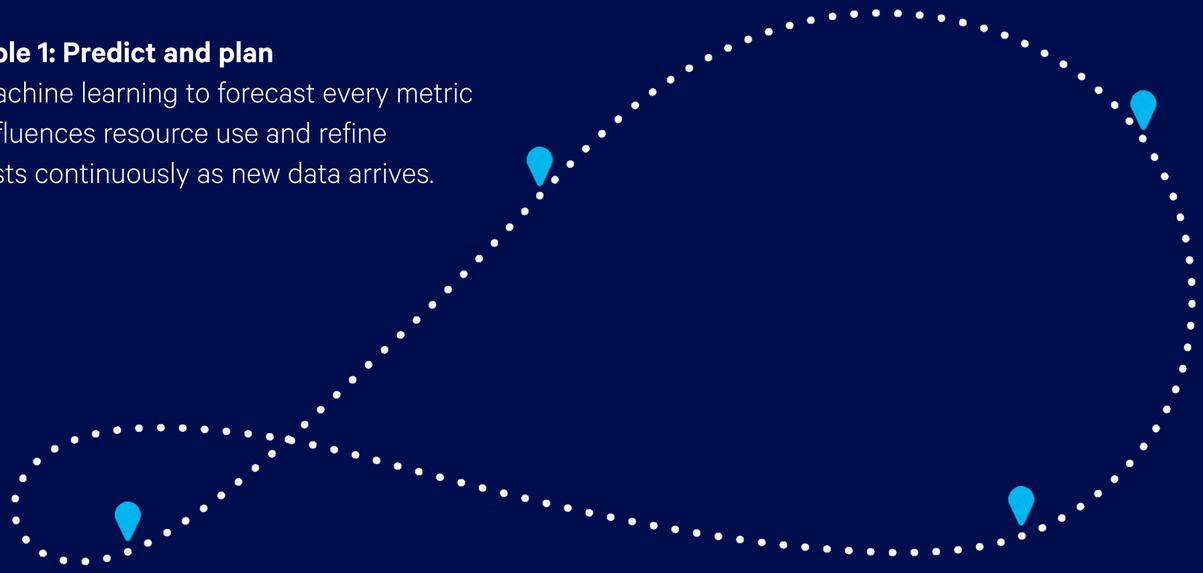
The modern approach to resource management addresses the gaps of traditional planning by connecting every step of the process into a continuous improvement cycle. It brings together prediction, preparation, orchestration, and learning, enabling warehouses to operate with greater precision and adaptability as conditions evolve.

Principle 1: Predict and plan
Use machine learning to forecast every metric that influences resource use and refine forecasts continuously as new data arrives.



Principle 2: Pre-shift brief
Provide agentic briefings, readiness checklists and AI-driven task allocation so teams begin each shift with complete clarity.

Principle 3: Intra-shift monitoring
Deliver proactive notifications on shift health versus plan with alerts on disruptions and recommended resolutions.

Principle 4: Improve the future
Identify underperforming KPIs, highlight root causes and recommend actions that strengthen next-shift readiness.

These four principles form a continuous virtuous cycle, supported by the warehouse operations agent that keeps teams informed via mobile and desktop interfaces, and an embedded AI-powered warehouse execution system that orchestrates and optimizes human, equipment, and automated resources.

Principle 1: Predict and plan

Predict workload and plan resources precisely

Warehouses using predictive analytics have seen up to **30%** fewer stockouts and **25%** faster order cycles.

Resource planning begins with data, and warehouses generate vast amounts that must be turned into accurate, forward-looking forecasts. Modern resource management ingests internal and external signals, including demand plans, inbound transportation forecasts, historical performance, promotions, seasonal patterns, and weather conditions, to build reliable projections that evolve as the execution window approaches.

Build forecasts using every relevant data source

Neural-network-driven forecasting incorporates warehouse history, demand signals, inbound schedules, promotions, and seasonality to predict upcoming task volumes days or weeks in advance. This ensures visibility into daily picks, replenishment work, cycle counts, receiving, shipping, and put-away activities

Forecast completion times with machine learning

Machine learning and a dedicated forecast optimizer calculate the time required to complete thousands of tasks by work zone and role. These insights generate a highly detailed view of daily resource needs across labor, automation and equipment, tailored to the specific workload conditions.

Refine forecasts continuously as conditions change

As execution nears, the optimizer adjusts resource requirements in 15-minute increments to account for labor availability, equipment downtime, unexpected spikes, or volume dips. At any time, supervisors can generate an updated forecast with a single click, eliminating manual replanning and improving confidence in the upcoming shift.

Predict and plan transforms raw data into precise forecasts, ensuring the right labor, automation, and equipment are ready when needed.

Principle 2: Pre-shift brief

Prepare teams and align resources before the shift begins

AI-powered pre-shift briefings have delivered **30%** less start-of-shift confusion and **20%** faster ramp-up times in warehouse environments.

Once resources are forecasted and scheduled, preparation continues well before the shift starts. Every manager and supervisor receives a tailored, role-specific agentic pre-shift brief delivered to their mobile device. This briefing consolidates all the information needed to begin the shift with clarity, alignment, and readiness across labor, equipment, and operational zones.

Review workload and inventory readiness

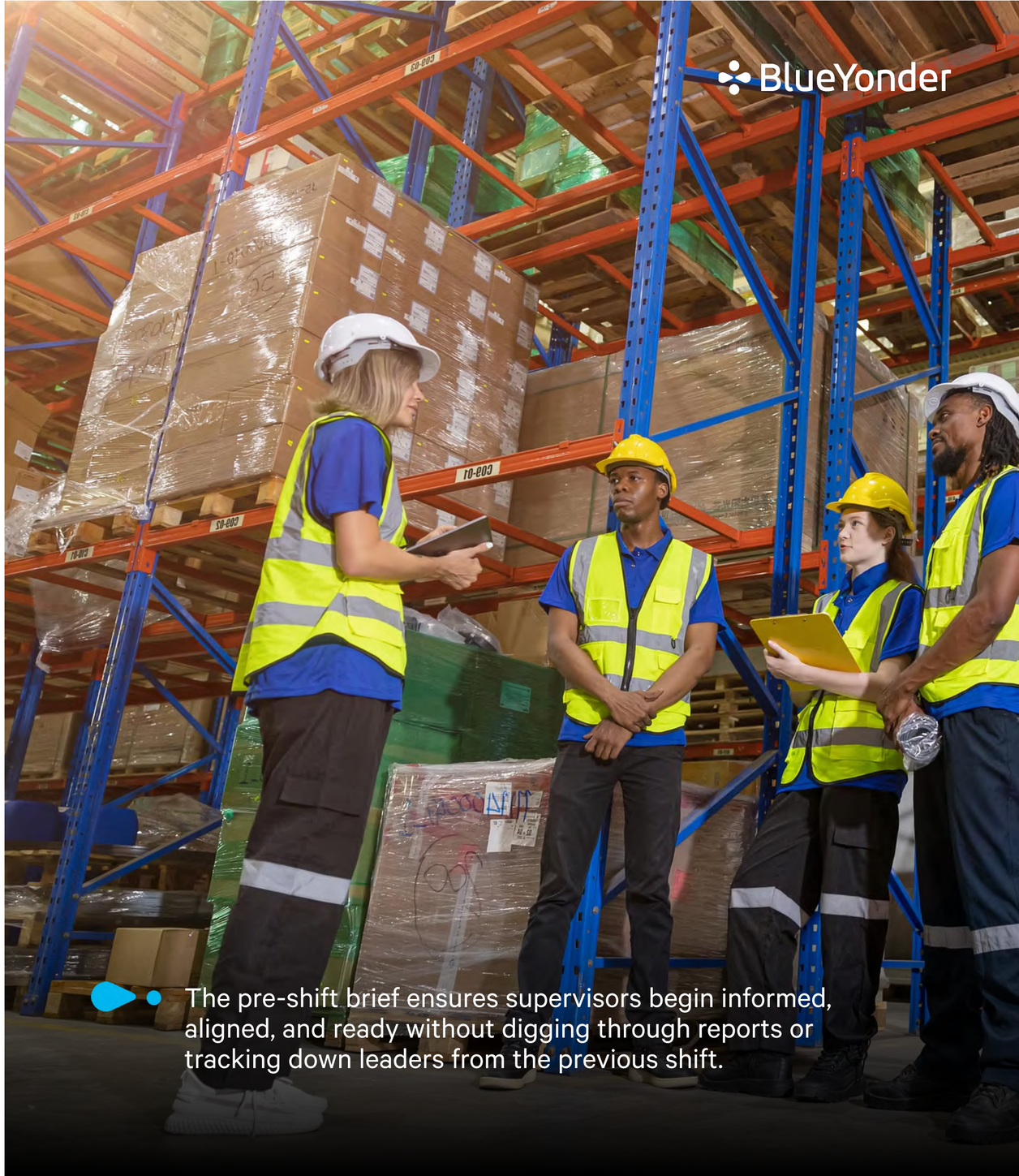
The brief highlights workload expectations, order reviews, inventory sufficiency, and variances between forecasted and actual demand. This ensures supervisors know precisely what volume to expect and where potential pressure points might arise at the start of the shift.

Validate labor, equipment, dock and yard readiness

Supervisors receive checks covering labor attendance, equipment availability, dock assignments, and yard readiness. Issues, such as no-show labor, missing equipment or dock-door constraints are identified early with recommended corrective actions, reducing delays during initial task execution.

Surface role-specific actions with AI guidance

The warehouse operations agent generates clear, role-specific actions for each supervisor, such as reallocating workers, adjusting workload across zones or shifting equipment to prevent early-shift congestion. These insights ensure leaders begin the shift informed and aligned, without having to search through reports or track down previous shift leads.



The pre-shift brief ensures supervisors begin informed, aligned, and ready without digging through reports or tracking down leaders from the previous shift.

Principle 3: Intra-shift monitoring

Monitor operations and adjust resources in real time

Real-time warehouse execution system implementations have shown up to **40%** higher picking efficiency and **30%** lower warehouse labor costs.

Once the shift begins, the warehouse execution system (WES) handles task orchestration and real-time resource allocation. With thousands of tasks occurring across multiple zones, the system uses live data and machine-learning predictions to keep resources aligned with priority work, reducing delays, and improving flow throughout the shift.

Monitor warehouse-wide task status in real time

WES continuously tracks task status across picking, replenishment, receiving, shipping, and put-away. Real-time insights show which tasks are on schedule, which are delayed and where resource gaps may emerge, giving supervisors complete visibility into execution.

Orchestrate and reassign tasks intelligently

WES reassigns the most productive available resources to high-priority tasks while balancing workload across all warehouse zones. This prevents bottlenecks, reduces idle time, and ensures that labour, equipment, and automation stay aligned with actual operating conditions.

Stay informed through the warehouse operations agent

Supervisors receive alerts on disruptions, recommended adjustments and predicted end-of-shift health. They can review, modify, or approve recommendations in real time, maintaining alignment between the plan and execution throughout the shift.

Intra-shift monitoring provides real-time orchestration, transforming unpredictable shifts into coordinated, efficient operations.

Principle 4: Improve the future

Review performance and enhance planning for the next shift

Companies that leverage data-driven decision-making are **19x** more likely to be profitable.

Before the next shift begins, a new pre-shift brief incorporates insights from the previous shift to strengthen planning and execution. This process ensures that every new shift is informed by what happened before, establishing a continuous learning loop that improves accuracy, reduces friction, and elevates resource performance.

Assess spillover and root causes

If any tasks remain incomplete, the warehouse operations agent provides root-cause explanations, such as labor shortages, equipment issues, or upstream delays, so incoming teams understand what must be addressed and why those tasks were not completed.

Identify underperforming KPIs

Supervisors receive notifications when KPIs underperform, enabling them to target improvement efforts in areas that directly impact resource productivity. This ensures corrective actions begin immediately rather than waiting for end-of-period reviews.

Strengthen forecasting and task models

All shift data feeds back into resource forecasting to refine travel time, task duration and resource usage patterns across thousands of data points. These updates improve future planning accuracy and strengthen model performance over time.

The measurable outcomes of intelligent resource management

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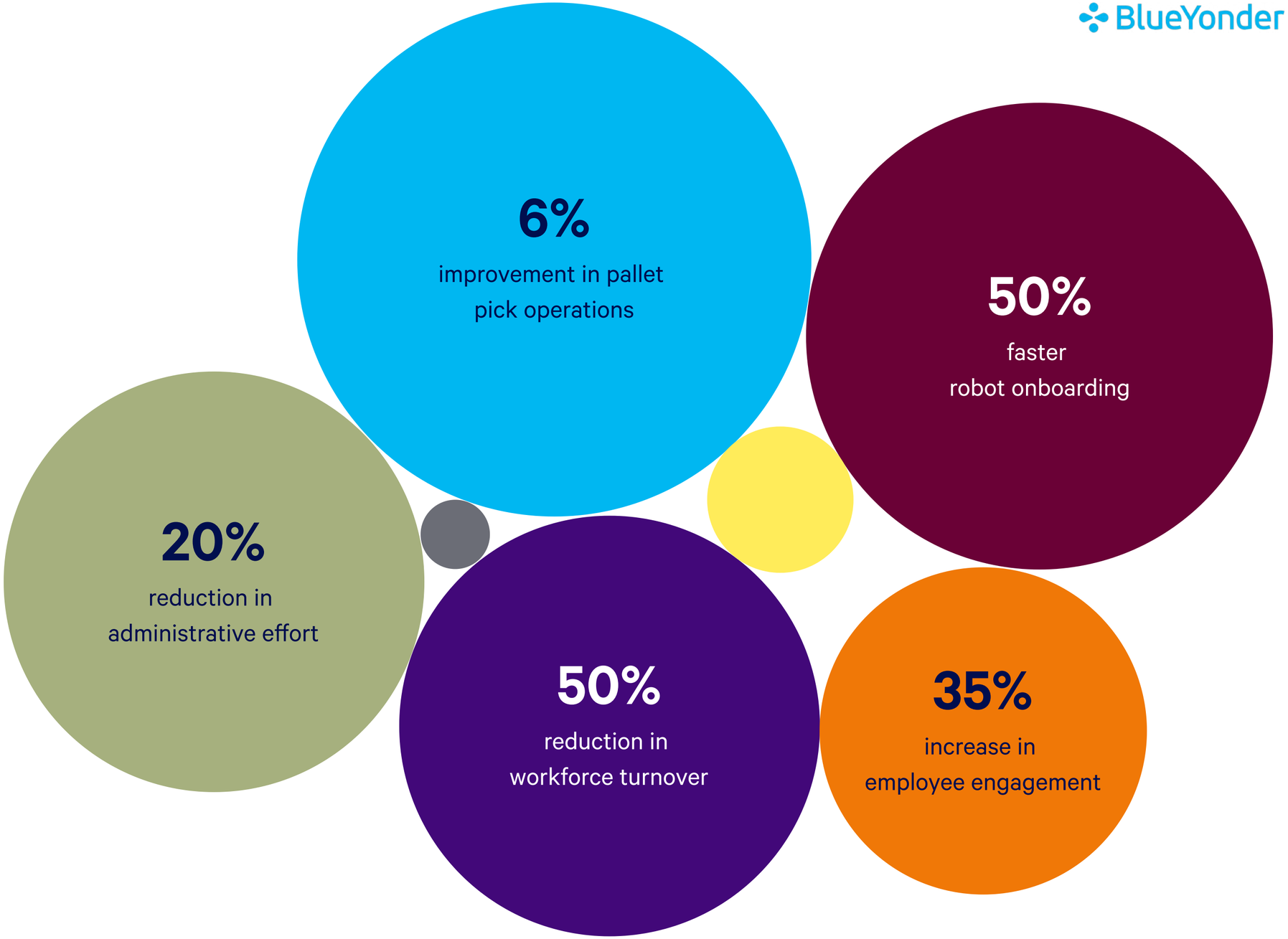

Proof in action

Intelligent Resource Management transforms warehouses into adaptive ecosystems—where forecasting, orchestration and workforce empowerment operate in sync. The next leap in performance lies in using data to anticipate, not react, ensuring every resource works at its highest potential.

By embracing intelligence and agility today, warehouses can move from managing operations to mastering them—becoming faster, smarter and ready for tomorrow.

— Supply Chain Development Manager

“Investment in innovation gives us the ability to adapt to the changing marketplace and our customers’ ever-changing needs. Operating more efficiently is core to our mission of being a global provider through innovation, experience and people, goals that can only be achieved if the right technology is in place.”

— President and CEO, Americold

“We have increased our employees’ productivity by around 75% of what they had previously achieved and gained cost advantage that generates growth and frees resources, so we can invest in other improvement initiatives.”

— Warehouse Manager, Pacific Star

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The warehouse of tomorrow is powered by intelligent resource management

Warehouses that combine predictive forecasting, dynamic orchestration, and data-enabled workforce management achieve unmatched agility and control. Intelligent resource management transforms operational complexity into clarity and empowers teams to act with confidence.

By adopting intelligence and adaptability today, warehouses move from simply managing daily operations to mastering them. This shift makes warehouses faster, wiser and ready for whatever the future requires.