Automated Decision-Making in the Warehouse

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Though warehouse management systems (WMS) are widely employed, they are not the ultimate answer to optimized warehouse operations. Moving to the next level — using automated intelligence for real-time decision-making and task-flow optimization — is now feasible.

While advanced process optimization has been employed in many manufacturing operations for some time, the added complexities of many warehouse operations have made this impractical until now.

In a manufacturing plant, there are typically one or more assembly lines that perform a limited number of tasks. In a warehouse — particularly in those handling e-commerce or consumer goods — an assembly line has to be essentially created for each of the hundreds or thousands of items being handled in real time, with the product mix continually changing.

Today, WMS requires people at all levels in the operation to make decisions based on complex information. Its capabilities are designed to ensure that data and inventory are not lost, providing detailed input, but not a clear story, of how that information should influence the next decision. Only now has computing power advanced to the level at which AI can successfully take over where manual decision-making has typically been required in most WMS systems.

Relieving Pressures on Decision Makers

When there's too much data for a human to process in real time, managers can be pushed to make decisions that are sometimes based on a "gut" feeling, or on historical practice in situations that seem similar to circumstances they've previously encountered.

In reality, a number of decisions need to be made almost simultaneously, including:

- What product needs to be released next?
- What path should the order take through the warehouse?
- Who should work on the order?
- How should a scheduling exception be handled?

With all this happening fast, managers frequently fall back to a simple logic such as "When this happens, I do that."

Automated decision-making eliminates or greatly reduces confusion, and instead employs software to recommend the actions a human needs to take — or automatically take an action based on current conditions in the operation and based on defined success metrics.

An automated decision system has the ability to understand everything that's happening in the warehouse at a given point in time, the facility's constraints, and the ability to understand what the definition of success is. Using this complex data, its recommendations are delivered in simple terms to human operators, requiring less analysis to understand and act on.

Automated decisions are also trackable and measurable, enabling the system to learn from its decisions and improve them over time.

Though available to any warehouse, automated decision-making is best suited to operations that:

- Require complex scheduling of work across multiple zones for downstream consolidations;
- Have dynamic order flow such as e-commerce where priorities can change in real time, and
- Have highly structured workflows such as full pallet and truckload shipping operations.

To Automate, or Not To Automate

This capability to automate decisions, however, doesn't mean all decisions should be automated all the time. There's a difference between a decision that has enough complexity to require human judgment versus one that's relatively procedural or rule-based and can be made automatically.

Circumstances that call for a subjective judgment, for example, still need to be made by humans. If half the warehouse team doesn't show up due to an extreme weather event, managers will need to assess the situation to decide which orders will or won't be fulfilled.

Automated decisions are best deployed in situations that have defined success criteria, so that answers can be provided to critical questions, including:

- When does an order need to be shipped to meet customer expectations?
- Is there the capacity to execute an order?
- Will the order cause any constraints or bottlenecks?

When the system can answer these questions, there is no need for a human to decide which orders to put into the next batch.

SLAs Show the Way

Among the core tools that support automated decision-making are service level agreements (SLAs). They specify expectations across stakeholders for customer service, inventory management and more. With an SLA target for a given order, the system can model all of the necessary work that has to occur to meet the target.

For example, when assembling multiple orders for a single shipment, there might be one order that can be picked and filled in three minutes, with another six minutes to reach the dock. That order can be issued 15 minutes before the shipment time.

Another part of that shipment might have to be each-picked and then consolidated onto a pallet with other products that were case-picked. This is a multi-step process that potentially requires the picks at each level to be done two hours in advance.

This is where automated decision-making can perform the complex scheduling of work across multiple zones for downstream consolidation. These decisions also produce results that can be analyzed to determine if there's a need to change decision parameters in the future.

Task Flow Optimization Maximizes Throughput

Task flow optimization is the application of real-time constraint-based flow control to a warehouse for the purpose of producing maximum throughput.

To do this, task flow optimization manages humans, robots, automation and information that must be integrated for complete operational visibility. With this capability, the system avoids problems that can result from human decisions that release too little or too much work to the floor. Instead, task force optimization supports a balanced system by understanding and having the ability to physically model the entire warehouse and everything that has to happen in it.

The result is maximized throughput and utilization while eliminating bottlenecks.

Modeling all the possible pathways requires careful analysis throughout the warehouse, to understand all the paths that a product takes through various zones, then being able to apply all of the data modeling to those pathways. This analysis of the physical setup of the warehouse is an important part of the process.

The final part of this process is the definition of success. Though there can be many nuanced definitions of success, it's important to rely on objective criteria such as SLAs. These can be based on carrier expectations, customer priorities or specific value streams within the customer's business. There are many customer business needs that can be modeled, but it's important to understand the customer's definition.

At the same time, it's appropriate to question why certain attributes are included in the definition of success, and to determine if other metrics are more pertinent.

Advanced Warehouse Planning and Optimization Software Make It Happen

Ultimately, the effects of automated decision-making and task-flow management must be integrated with constraint-based optimization. Doing so allows complex operations to be automatically balanced with an order flow that maximizes SLA attainment, efficiency and throughput.

The goal of an automated system making decisions in real time is to achieve the so-called Goldilocks approach, which says, "I'm going to get the best I can possibly get, given everything I have." This is something an automated system can do in a way that a human cannot.

For decades, warehouse managers have relied on WMS systems to provide the best available support for human decision-making. It's been "good enough," absent significant advances in computing technology. Now that the technology is available, it's time to review and adopt new automated warehouse decision-making systems.

For managers, this will reduce the frustration of making suboptimal decisions, and allow them to move to higher functions.

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