

## WMS: THE HUB OF THE MODERN WAREHOUSE



Warehouse management systems reign in today's high-pressure warehousing, fulfillment and logistics environment.

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# WMS: The hub of the modern warehouse

BY BRIDGET MCCREA, CONTRIBUTING EDITOR

Warehouse management systems reign in today's high-pressure warehousing, fulfillment and logistics environment.



**E**fficiency is king in the warehouse, where a dizzying assortment of products are constantly being received, stored, picked, packed and shipped. The e-commerce boom and persistent labor shortage is forcing companies to rethink and reimagine how to operate these critical supply chain links.

Through it all, warehouse management systems (WMS) have held their reign as hubs of the modern warehouse. For no matter how much automation, robotics or artificial intelligence (AI) companies infuse into their fulfillment centers, they need a WMS to orchestrate every step of a product's journey—from the time it arrives onsite to the moment it's loaded onto a truck for delivery.

Without WMS to serve as the ultimate traffic director at these busy supply chain “intersections,” issues like lost inventory, inefficient picking processes, poor inventory visibility and delayed shipments would be commonplace. With a configurable, best-of-breed WMS, shippers can avoid these

*“Without WMS to serve as the ultimate traffic director at these busy supply chain “intersections,” issues like lost inventory, inefficient picking processes, poor inventory visibility and delayed shipments would be commonplace.”*

problems, fulfill orders faster and improve their overall supply chain efficiency.

### **Command center for the modern warehouse**

As mainstays of the supply chain, fulfillment operations need software that keeps their inner workings running smoothly, quickly and efficiently. As “command central” for these operations, WMS is the core software system that improves

inventory visibility, optimizes picking, improves labor efficiency and minimizes errors.

Warehouse management systems are time-tested applications—the first computer-based WMS was installed and used by retailer J.C.

Penney in 1975—that are really proving their value in today's automated warehouse environments. Robotic components are handling some of the “heavy lifting” that humans previously managed and people and robots are working side-by-side to complete tasks more efficiently.

And while automation is great for driving efficiencies, those robotics systems require software to tell them what to do, when to do it

and how to do it. That's where WMS steps in to orchestrate all of the processes that occur within the four walls of a warehouse or DC. From this vantage point, WMS helps companies manage and drive processes; collects data that's then used for both short-term and long-term planning; and operates in a more cost-efficient manner.

Amit Levy, executive vice president of sales and strategy at Made4net, which develops WMS platforms for dynamic supply chains, says current labor market trends are creating major challenges for warehouse operators. Finding and retaining labor are both difficult in this environment, where warehouse jobs aren't always at the "top of the list" for potential job candidates.

The general unemployment rate is hovering below 4%, according to the Bureau of Labor Statistics, with transportation and warehousing being one of the most active "job gain" categories at a time when 11,200 Baby Boomers are expected to reach retirement age every day between now and 2027.

This "perfect storm" of challenges is putting new pressures on busy DCs and warehouses, which are also managing higher demand and changing customer expectations. "Customers expect more, better and less expensive orders, all of which puts new demands on the warehouse," Levy explains. "Warehouse operations across all industries have to

be more efficient, faster and more accurate or risk losing customers to the next closest competitor."

### **The brains behind the modern fulfillment center**

The modern warehouse operation relies on a high level of human involvement, but there are limits to what these individuals can handle on a daily basis. Human error also comes into play in these work environments, where accuracy is of utmost importance but mistakes are fairly common. To minimize the physical workload, reduce the risk

of errors and increase productivity, more companies are turning to automation, robotics and other innovative technologies for help.

Levy is seeing a lot more engineered robotics systems like automated storage and retrieval (AS/RS), palletizing, and other automated solutions making their way onto

the warehouse floor. These systems not only perform a wide range of tasks, they also help facilities optimize their current space and make use of vertical height that may have been sitting empty. Other organizations are using pick-to-light and put-wall systems to better organize and orchestrate order picking and packing.

Goods-to-person systems developed by companies like AutoStore and Exotec are also helping companies store and pick orders more efficiently. Levy is also seeing more transport



AMIT LEVY,  
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robots being used to move pallets—versus needing a forklift and driver to handle the work of moving goods from one place to another in the DC—and a growing number of collaborative robots or “cobots” to reduce physical strain on workers and speed up fulfillment times.

Now, imagine a DC where autonomous robots zip around all day, goods-to-person systems manage myriad different tasks and cobots autonomously scan shelves and track inventory levels. Without a central system controlling these activities, chaos would quickly ensue. That’s because robots may excel at physical tasks, but they lack strategic thinking.

“Each of these solutions has its own software system managing only that specific component,” Levy explains. “This is where WMS comes into play and takes ownership of the entire, end-to-end process.” The WMS analyzes real-time data on stocking levels, order priorities and robotic capabilities. Then, the software assigns the most efficient tasks to each automated component in the chain, effectively maximizing their productivity and serving as the “brains” behind modern fulfillment centers.

## Don’t let your automated systems become orphans

In the absence of automation and robotics, warehouses relied heavily on pickers, receivers, loaders, forklift drivers and other employees to run their operations. These resources were all managed by a WMS, which receives, crunches and processes that data. “WMS has always been seen as the control

tower for everything that takes place within the four walls of the warehouse,” says Levy. “The difference being that in the past, it was mostly about controlling people. Now, it’s about controlling people, automation and robots.”

Warehouse management systems must also manage or act as the warehouse execution systems (WES) that are

used to manage the real-time execution of tasks in the fulfillment center. The WES needs data from a WMS to translate into those “actionable steps” that workers or robots use to pick, pack, move or ship the right items.

“The WMS itself is the center of the integration, and whether that happens directly or via middleware doesn’t matter,” Levy explains. “The warehouse management system is the platform that has visibility into all of the components that live

*“WMS has always been seen as the control tower for everything that takes place within the four walls of the warehouse. . . . The difference being that in the past, it was mostly about controlling people. Now, it’s about controlling people, automation and robots.”*

– Amit Levy, *Made4net*



within the warehouse.”

These are important points that don't always resonate with warehouse managers who think they can just use WES to manage their new automated systems without the help of a WMS to integrate all of those solutions on a single platform. The automated solutions come with software that only manages those components, Levy reiterates, “and basically operate as orphans with nothing else to manage them or integrate with them.”

### **Always looking at the complete picture**

Made4net provides a full suite of supply chain execution solutions that companies of all sizes can use to improve their supply chain operations. Its WarehouseExpert™ is a robust real-time WMS that improves productivity, service levels and order fulfillment times while reducing overall operational costs.

WarehouseExpert was engineered to include an execution layer that can communicate with a warehouse's otherwise “orphaned” components, each of which has its own connector that runs all of the data that moves between different automation systems. That data feeds back into a centralized engine that optimizes all these resources and tasks, and assigns the right tasks and the right resource (i.e., a person, robotic system or automated system).

“The system looks at the complete picture,” Levy explains, “and knows exactly

how to synchronize tasks between the systems in order to meet the overall work key performance indicators (KPIs) within the DC.”

With a single point of control managing their fulfillment operations, warehouse operators always know inventory status and location. There's no reason to look at multiple different systems to get these insights; it's all right in the WMS, which also provides a high level of flexibility and scalability. If a robotic system doesn't meet expectations, for example, that single component can easily be swapped out or removed completely from the WMS without impacting the rest of the warehouse ecosystem.

“With your main WMS controlling the entire hub, you can replace components instead of being held hostage by a solution that—for whatever reason—isn't working for your operation,” Levy says. This level of flexibility and scale is invaluable in a business environment where customer requirements are changing quickly and new competitors are constantly entering the market.

“As they continue to grow, add more customers and expand their physical footprints, companies need flexible technology solutions that can grow right along with them,” says Levy. “WMS continues to fulfill this role regardless of which person or what type of equipment is handling the actual work.” •



# Give your WMS a boost

New types of third-party software solutions can enhance WMS in many ways, including gains in inventory accuracy, better tools for creating workflows and user interfaces for task execution, and simplified integration with mobile robots and other forms of automation.



BY ROBERTO MICHEL, CONTRIBUTING EDITOR

**W**arehouse management systems (WMS) remain the transactional and process management foundation for inventory control and order fulfillment in most DCs. In recent years, when we have surveyed readers about WMS use, close to 80% have told us they use some type of WMS.

That widespread adoption is because a well-implemented WMS will control inventory, and manage key processes like putaway, picking and replenishment.

But WMS doesn't do everything well, especially older legacy systems that lack functionality like a labor management system (LMS) module, prebuilt connectors to automation, or flexible tools for creating new workflows. That's giving rise to software solutions that make existing WMS solutions better.

These software vendors are focusing on new types of solutions that give WMS processes a boost, either by orchestrating multiple

resources, building new workflows and screens for task execution, or simplifying the use of robotics. Here's an overview of how they help.

### Sequence and optimize

Keith Moore, CEO of AutoScheduler.AI, whose AutoScheduler warehouse resource planning and optimization software platform is touted as a "WMS accelerator," says WMS is essential for governing DC processes, but WMS solutions typically lack the ability to optimize and plan all the machine and labor resources and material moves and staging to ensure orders get out the door complete.

In practice, adds Moore, many steps need to be synchronized, such as dock schedules, staging of pallets for outbound shipping, any new pallet builds or repalletizing that needs to take place, or any crossdocking that should be triggered, to achieve end goals.

Most WMS are not generating sequenced, optimized plans, notes Moore. Because of that, Moore says he likes the analogy that WMS—in terms of getting you to a goal—is like having a good, working car. A car will get you to your destination, but if all you have is a static, printed map for navigation, you might take a wrong turn or run into a traffic jam, fouling up your plans.

By contrast, Moore says, a mobile map app is both dynamic and instructive, which is why people today use both cars and mobile maps to get places efficiently.

"What was transformative about Google Maps is that instead of only telling you where to start and where to end, it was with you every step of way, so that even if you do make a wrong turn, it will tell you, 'just take a U-turn here to get



**Autonomous drones are visually striking, but much of their value lies in the accurate view of current inventory they provide, which can be leveraged to update WMS.**

back on track," Moore says. "That is like what our solution does for warehousing. The software considers all the limitations and constraints that are going to keep you from getting to where you need be operationally and with service levels."

### Orchestrating activities

The term "orchestration" gets used in several ways with warehouse-level software. One way is to orchestrate robotics with people and with other forms of automation, which has given rise to the category Gartner calls multi-agent orchestration (MOA) platforms, a complement to WMS.

However, orchestration happens on many levels, such as staging and loading pallets, directing pick-to-pallet activities, efficient crossdocks, and importantly, sequencing all those in the right

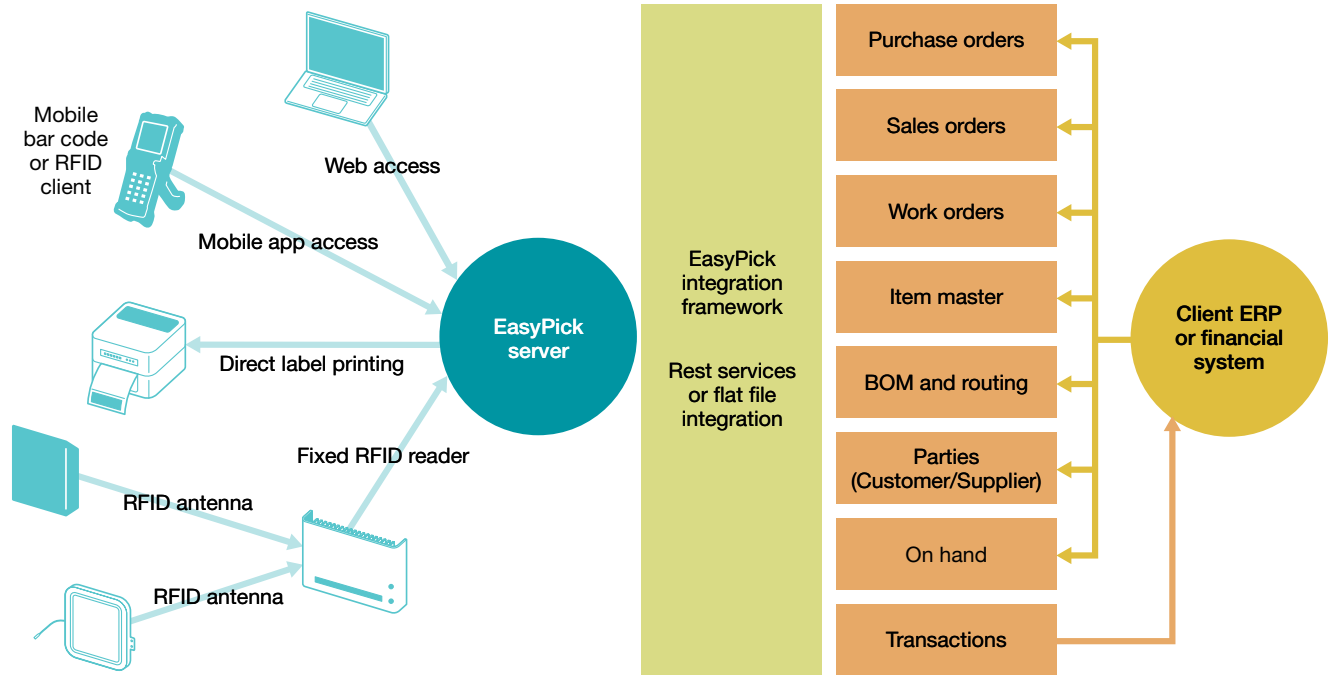
order, explains Moore.

"At the end of the day, top line revenue is driven by product that gets where it needs to go on time. Suppliers can get charged tens of millions in penalties for shipments that aren't on-time and in full (OTIF), so being able to optimize all the activities that go into that carries high value," says Moore.

AutoScheduler's resource optimization platform uses artificial intelligence (AI)-based logic to determine the best sequence of actions and allocation of resources to hit commitments.

Companies that have used the solution include P&G, which helped develop the software, and a major snack food manufacturer. A key focus for most users, adds Moore, is to improve fill rate. Even a 1% improvement in what Moore calls "controllable fill rate," can add up to

## Picking and task execution overlay solution



Source: Inyxa

**Inyxa’s EasyPick is a task execution solution that overlays a host system like an ERP solution.**

substantial savings in a year.

Next up in focus for AutoScheduler is a network view of actionable metrics to improve fulfillment performance. Because the software already does resource planning for what needs to happen by site to meet order commitments, while also having a window into transportation and what is in the yard, AutoScheduler has developed and will soon introduce a dashboard solution for “Centralized Distribution Orchestration,” according to Moore.

The dashboard, which would highlight recommended actions, could be used across disciplines, Moore adds, such as by customer service managers to see if a delivery promise can be adjusted, if the software predicts a problem like an impending inventory shortage, or if unloaded trailers are starting to build up beyond an acceptable level, or, if there won’t be enough labor,

or too much labor, over the short term. That provides time for adjustment, either on the customer service side, or perhaps a tweak to a transportation schedule, so a particular shipment gets routed to a DC that would otherwise be short.

“Because we are optimizing for each site, and we know what we have to work with, and what we don’t have, we can predict what actions are going to help hit service level commitments for orders that won’t even start getting picked until the next day,” says Moore.

While some WMS have orchestration features, most stop short of real-time coordination of details like which stretch wrapper a newly built pallet should be sent to. But the right overlay solution can optimize multiple processes and systems around all these steps that have to happen to get orders fulfilled on time, says Vishal Choudhari, practice director with Inyxa.

“What happens is that in many cases a company will go with our overlay solution because it goes beyond what standard WMS can provide,” Choudhari says. “Those kinds of actions that involve logic and processes that go across systems are handled by us.”

Inyxa’s roots are as an implementation services provider for Oracle enterprise resource planning (ERP) projects. Over the years of working in that capacity, Inyxa developed software at the warehouse execution level to orchestrate a WMS or ERP system with automation such as automated storage and retrieval systems (AS/RS), while also providing front-end order picking functions for other parts of a warehouse, such as picking cases to a pallet.

While releasing orders down to an AS/RS may seem simple, Choudhari explains it can be complex to release orders that enforces inventory alloca-

tion rules and drives high utilization, but also releases work to the AS/RS in the order pallets need to be staged for shipment.

For example, in some industries, a company may want to allocate goods held in an AS/RS to specific customer or set limits on how large orders can be. Or, adds Choudhari, it might be that you want a rule that would allow a customer to receive an order early, if doing that saves on transportation.

Inyxa's software also has check-in functions for receiving, and order picking functions, with the WMS getting updated as needed. "We trigger things in an ERP system, but many of the key interactions that the warehouse does, take place using the Inyxa system," says Choudhari.

Users of Inyxa's software include global pharmaceutical company Aurobindo. At Aurobindo's DC in New Jersey, Inyxa's software is used to release orders to the AS/RS and manage its inventory allocation rules, while providing front end tools for functions such as staging and loading.

Drawing on its software capabilities for larger enterprises, Inyxa also has developed a solution called EasyPick—a configurable mobile and web-based solution to direct materials handling workflows, such as order picking to carts or pallets, to directing which dock door a load should go to.

While EasyPick could be an extension to a legacy WMS, it can also be deployed as an order fulfillment solution that ties into a midmarket ERP, which might be all some organizations need versus WMS, says Choudhari. "The software provides an overlay that directs critical tasks, but it has some transactional capability as well, which allows some of our smaller customers to integrate it straight onto an



**Solutions that simplify the creation of new workflows and mobile or wearable device execution screens can be a high-value extension to a WMS.**

ERP system like one from Sage, Epicor or NetSuite," he says.

### **Robot-savvy workflows**

Because fulfillment operations increasingly rely on a mix of fixed automation, human labor and mobile automation, a key trend in WMS-enhancing solutions are software platforms that handle creation of workflows and user interfaces for tasks that have frequent interplay between machine and labor resources.

This is more than traditional terminal emulation (TE) in the sense these newer add-ons may also feature some logic for pick path optimization or for synchronized handoff of goods between associates and autonomous mobile robots (AMR).

For example, in 2019, Zebra Technologies introduced FulfillmentEdge,

software that wraps around a WMS to enable dynamic workflows and real-time, routing mobile workers for picking, packing and put-away. The solution also can be used to coordinate the movement of associates and AMRs, to support efficient collaborative picking.

When it comes to orchestrating WMS processes with AMRs and other forms of robotics, some WMS players have integration and orchestration capabilities, but so do third-party vendors that specialize in integrating robotics with WMS.

For instance, Roboteon recently emerged from stealth mode to launch its robotics fulfillment software platform. The solution uses pre-built adapters and gateways to streamline integration, and it also offers pre-built fulfillment workflows for tasks like picking

and replenishment, and an orchestration engine to coordinate the flow of goods.

Dan Gilmore, Roboteon's chief marketing officer, says the solution can extend what legacy WMS can do when it comes to quickly integrating with robotics and devising new and efficient workflows that span systems.

To fully optimize robotics processes, adds Gilmore, the solution can synchronize labor resource availability and location with AMR movements to specific nodes or points in the material flow.

"Our robotics-assisted fulfillment becomes an enhancement to the WMS capabilities when it comes to warehouse automation with robotics," says Gilmore. "When the WMS passes information such as orders and tasks to our platform, Roboteon has a common user interface across multiple application screens to perform the work and pass back the information to the WMS. This approach facilitates WMS to optionally keep some segments of the work and pass robot-assisted fulfillment work to the fulfillment platform. This phased approach for brownfield warehouses or older WMS systems minimizes and mitigates the risks in implementation."

### Computer vision and sensors

Sensor-enabled solutions that boost WMS inventory accuracy are another trend. In particular, multiple vendors offer autonomous drones that feed data into AI-based software to gain a highly accurate view of inventory.

The beauty of an autonomous drone solution is that it can always be giving operations a highly accurate view of what is actually in the racks, and passing discrepancy data back to a WMS, without all the labor time and effort involved in manual cycle counts and

### LiDAR and sensors on forklifts feed data into IdentPro's software to provide real-time locating of all pallet placements and a digital twin view into where inventory sits.

hand scanning of labels, says Sean Mitchell, vice president of customer success with Gather AI, which offers a drone solution.

"A WMS is only as valuable as the accuracy of the information," says Mitchell. "Our solution allows customers to conduct cycle counts 15 times faster than a human on a lift can. The increased counting volume ensures that discrepancies are fixed quickly, so the WMS truly reflects what is in the physical warehouse."

With IdentPro's real-time locating system (RTLS) and execution software, LiDAR and other sensors fitted to lift trucks are used to provide real-time positioning data, which helps improve inventory control, while feeding a digital twin of the warehouse to optimize pick paths and pallet transport missions.

"When you track and trace the forklifts, and you know what is on your forklifts, then when you move goods with a sensor enabled truck, you know exactly where those goods have been left," says Erik van Rikxoort, chief marketing officer for IdentPro. "And with that, you've got a 100% visibility into both your fleet and your inventory, and error-free inventory accuracy, without scanning."

A flat screen added to the cab is used to present a simplified, real-time map of the warehouse showing the operator's next mission and route to take. "Every truck operator gets an optimized and updated map of the environment," says van Rikxoort.



Users of IdentPro's solution include international brewer Asahi, as well as Warsteiner, another brewing company. According to van Rixooort, at Warsteiner, the system slashed turnaround times for loading trailers, from close to 40 minutes on average down to about 25 minutes, due to more efficient pallet staging and loading.

Most sites average a 20% to 25% gain in fleet productivity, he adds, enabled by the precise handle on inventory locations from the LiDAR sensors that pinpoint the location where pallets were placed to within 2.5 inches.

"Your operators don't have to search anymore for missing inventory because we know exactly where everything was placed," van Rixooort says. "If you are not using RTLS technology and an operator placed a pallet in the wrong rack and your verifications didn't catch it to send an alert, forget about it—you're going to be wasting time looking for inventory." •



# The pluses propelling cloud WMS

**The cloud-based subscription model for acquiring and running warehouse management system software has gained ground, but some misgivings persist. The model's value propositions are evolving around factors like bypassing the need for big upgrade projects or offloading worries about tuning a WMS.**



The concept and practice of running warehouse management system (WMS) software through cloud hosting and subscription arrangements, rather than deploying WMS in-house, is no new kid on the block. Leading WMS vendors have had cloud options for many years. Yet cloud isn't quite the dominant model for WMS as it is in some other enterprise software niches.

What might be holding cloud WMS back? According to WMS vendors and market observers, the reasons why cloud WMS has been slow to develop range from its relative maturity as a software niche to concerns about data intrusion under "multi-tenant" architecture to the view that on-premise costs, at least for the software, are less costly over the longer term.

On the plus side for cloud WMS, it's steadily become the most common choice for new WMS deals, especially among small to medium enterprises (SMEs). Vendors are also touting how cloud WMS leaves heightened data security concerns to global specialists in security, as well as offloading any internal information technology (IT) worries about tuning WMS IT infrastructure to handle peaks in order fulfillment volumes.

"It really comes down to vendors helping the top decision makers—the C-level—fully understand the value proposition behind cloud WMS," says Howard Turner, director of supply chain execution systems with St. Onge Company, a supply chain consulting firm.

It's not like cloud WMS is in a rut. It's considered to be the leading acquisition model for new WMS solutions, but the software has been around for many decades, and the base of installed on-premise systems in the market is huge, making the overall market shift to cloud slow.

According to Dwight Klappich, research vice president and fellow with analyst firm Gartner, while Gartner hasn't surveyed the market to determine the exact breakdown between cloud and on-premise WMS for a few years, cloud is winning out on new deals, based on trends from client inquiries and interactions. "WMS solutions have finally evolved to a cloud-first market where more than 75% of new WMS deals are now cloud," Klappich says.

### Cloud headwinds

Cloud WMS hasn't taken over completely for a few reasons. For one, notes Klappich, WMS is a global market, and in some regions cloud computing faces resistance due to concerns about data security, and in some places, telecom bandwidth.

While cloud WMS vendor fees vary, says Turner, as a general rule, subscription fees under a software-as-a-service (SaaS) model significantly cut upfront implementation costs versus on-premise deals, since license fees are spread out on an operational or "OpEx" basis, with no server hardware to acquire.

However, some potential user companies project software costs over a longer horizon, say five years or more, and figure running a WMS on-site, even with an annual maintenance fee, is less costly over the long haul, Turner notes.

But a narrow outlook on cloud software costs versus on-premise software costs may overlook some key advantages of the cloud model, adds Turner. One of the most important is that with cloud and SaaS, vendors regularly send out updates to the system to keep users on the latest software. That can avoid big "migrations" to new WMS versions every few years, which Turner notes "can end up being almost as costly as the original project."

WMS providers agree. "All new customers and upgrades for Tecsyst's Elite WMS are now exclusively cloud based," says Bill Denbigh, vice president of product marketing at Tecsyst. "We have made this transition to leverage cloud technology, which enables us to offer our customers enhanced service levels, reduced costs, and the ability to provide continuous updates. By moving to the cloud, we eliminate the need for on-premise installations and ensure customers always have access to the latest versions of our solution."

Another evolving driver is the increased risk of sophisticated ransomware attacks over the last several years, notes Denbigh. "Many customers realize they either struggle to maintain adequate security measures, regular backups and failover capabilities on their own, or they simply don't have the resources to do so effectively. By moving to the cloud, customers no longer have to worry about these complex and costly tasks," he says. "They can rely on our expertise and infrastructure to ensure their systems are properly managed, secure and protected."

### Adapting to peak

Customer concerns about data security, but also the increasing complexity of optimizing systems to perform well to support peaks in business volume are driving organizations toward cloud WMS, says Amit Levy, executive vice president of customer solutions and strategy at Made4Net. On the other hand, he adds, some companies still insist on an on-premise option, or if they are interested in cloud, they prefer to avoid the concept of a multi-tenant architecture, and have a dedicated cloud environment.



**Farmers Business Network was able to rapidly rollout a cloud WMS to 20 sites using remote implementation methods and educating “super-users.” Here, the internal team collaborates with the vendor using a Microsoft Teams session.**

With Made4Net’s WMS offering, these considerations mean giving users options, including cloud WMS that runs in a private cloud environment, and also on-premise options, including a subscription-based on-premise option that factors in the end-user is running the IT infrastructure, Levy explains.

“WMS is a mission critical system, and I think that people have learned to accept that cloud WMS can work well, if it is done right, but there are companies with real concerns,” Levy says.

Under Made4Net’s private cloud approach, it partners with major cloud infrastructure providers who have deep expertise in areas like data security and data center load balancing. Each company has its own dedicated cloud, which removes data intrusion concerns some companies may have about multi-tenancy, Levy adds. “There are companies who essentially will say, ‘wait, I don’t want my data to be in the same database with other customers that are using your system,’” he says. “They just don’t want any chance at all of data access by others, even if that

chance is the slimmest of the slim.”

Dedicated private cloud offers the advantage of offloading the IT burdens of running a WMS, which along with a subscription model are two key advantages companies are after, notes Levy. They also want a modern, modular system that uses a microservices architecture to make it flexible as an operations system, but overall, they don’t want the IT headaches of securing the data and tuning the IT environment.

Levy, whose background is in IT, says running a WMS in-house today takes significant expertise in areas like database management and knowing how to tune virtualized server resources, so much so that many don’t want to take it on. “There are some companies that have the IT resources and expertise to do this on their own, but that doesn’t always necessarily apply to the market we are playing in, which is the high end of the mid-market and edging into the lower end of Tier 1 enterprises.”

The level of volatility in peak seasons is an under-appreciated factor driving interest in cloud WMS offerings that tap leading infrastructure partners, adds Levy.

“With cloud WMS, you don’t have to worry about increasing data center resources or otherwise reconfiguring the backend properly to handle spikes in fulfillment volume, because we do all that for you,” says Levy.

Some companies do prefer a private cloud for WMS, Denbigh says. Tecsys offers two WMS cloud solutions: Elite, a higher-end market solution hosted on AWS under a private cloud; and Omni, a mid-market cloud WMS that can be deployed in a private cloud or on a shared server with Microsoft Azure as the infrastructure partner. Neither of these solutions are multi-tenant, adds Denbigh, and especially within the Elite target market, there are customers who prefer to keep their data separate, or have regulatory requirements that prohibit data co-mingling.

### **Remote implementation**

Another way cloud WMS helps end-users is supporting remote implementation, says Smitha Raphael, chief product and delivery officer with SnapFulfil, a cloud WMS provider and part of Synergy Logistics.

SnapFulfil's WMS has been cloud based since its inception 14 years ago, and prior to the pandemic, it began doing remote implementations as a way to further accelerate time to value, Raphael explains. Remote implementation, she adds, is made simpler by the fact that with a cloud WMS, there is no set-up of on-premise servers or database.

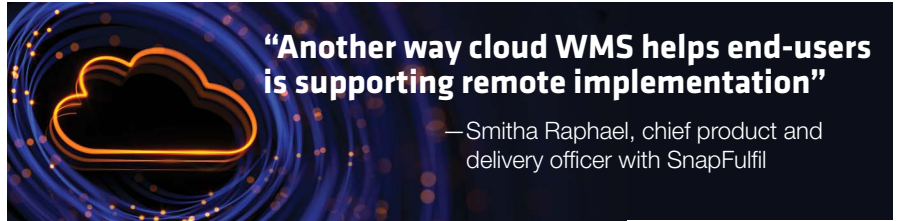
While technically, an on-premise WMS could be implemented remotely, it would likely call for a special layer of secure remote access software to permit the WMS vendor to assist with setup of IT infrastructure, and many user companies don't want any outside access into internal IT networks, Raphael explains.

By contrast, with a cloud WMS, both the vendor and end user company can securely access the application software as it's being deployed to check configurations are functioning as planned, with SnapFulfil's hosting partner providing secure access from anywhere with an Internet connection.

Other cloud-based tools can help with remote implementation, says Raphael, including device management software for remotely provisioning and managing devices used with the WMS, such as RF handhelds. SnapFulfil's implementation staff also use Microsoft Teams for video conferencing to train users and walk them through any set-up questions. With SnapFulfil, she adds, the configurations use pull-down choices and other graphical settings that don't require programming skills, though sometimes users want a Teams meeting to discuss options or check how a configuration functions.

Today with remote implementation, Raphael says, most deployments can be finished in 45 days, compared with closer to 60 days several years back with on-site projects.

"We've found that with cloud WMS, excellent support tools and remote implementation, deployments happen



much faster compared with on-site, and it doesn't take away from the user experience or the functional objectives of the project," Raphael says. "Overall, we've found remote implementation speeds up time to value for our customers, and for us, it makes better use of our resources, because we can have different team members in different time zones assist when needed, as opposed to having to wait for a team member located at one physical site to answer the concern."

SnapFulfil also embraces a train-the-trainer approach combined with remote implementation where designated people at the end-user company are trained as "super-users" of the system, with those people able to lead future implementations.

Raphael says this results in a do-it-yourself (DIY) approach to rapid, remote WMS implementation, which is useful for rollouts to multiple sites, using the first deployment as a blueprint for how the business wants the software configured.

This DIY-approach enabled one of SnapFulfil's users, Farmers Business Network (FBN), a farmer-to-farmer network and ag-tech company with an online store and a distribution network that spans North America, to rapidly deploy SnapFulfil to 20 warehouses sites in the U.S. and Canada. SnapFulfil's remote implementation team led the first deployment of the system for a warehouse in Iowa, assisted heavily with a couple of more, and FBN's super-user took it from there to rapidly lead deployment to the rest of the sites with minimal assistance from SnapFulfil.

The result was that FBN was able to rollout SnapFulfil to 20 sites all within 15 months, all during the pandemic, when agriculture and food industry needed to be more agile than ever.

The value proposition for cloud solutions has long centered on reducing IT overhead and concerns, and essentially that hasn't changed, though it has evolved to address growing user concerns around data security, and offloading the IT complexity of keeping WMS infrastructure resilient and responsive to operational peaks.

At the same time, notes Denbigh, the notion that cloud WMS forces users onto rigid software that doesn't allow for business-specific configurations, has diminished as users see cloud software can be adapted to company requirements with those settings carrying forward through frequent updates to the core system.

"SaaS solutions have evolved to offer low-code/no-code add-ons, allowing users to adapt the system to their specific needs, thus addressing the issue of control and adaptability," Denbigh says. "Additionally, the increasing prevalence of sophisticated hacking and denial of service attacks has made companies realize the value of partnering with experts in data security. As more stories of security breaches become known, companies are recognizing the importance of having well-run SaaS solutions backed by deep expertise in data security and risk mitigation. This trend is contributing to a shift in mindset toward embracing cloud-based WMS solutions." •



# 2024 WMS Update: At the intersection of warehousing and e-commerce

We explore the role that WMS plays in today's e-commerce fulfillment centers and how it will continue to drive these busy operations in the future as it becomes more intelligent—and, in some cases, intertwined with other applications within the warehouse's four walls.



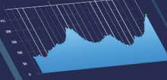
# WAREHOUSE MANAGEMENT SYSTEM

Dashboard

Overview

- Client order
- Stockchecks
- Replenishments

Monthly Summary



32.04%

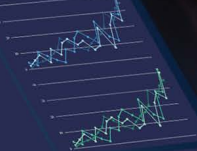


Remaining Inventory



72%

Orders by week



Online Orders



25%



67%



For example, St. Onge is currently working with several different companies that have had their current WMS in place for 30 years to 40 years (Fun fact: the first WMS was developed and installed by retailer J.C. Penney in 1975), and now need more functionality, advanced technologies and integration capabilities. “They’ve had legacy systems in place for their entire lives and their ‘systems of the day’ can no longer keep up,” Saenz explains. “E-commerce is one of the key drivers behind these changes.”

Other drivers include the desire for better inventory visibility, improved warehouse labor management and to simply have more efficient operations. Saenz says the need to compete effectively within the constraints of a tight labor market is another driver behind companies’ search for new WMS platforms. In an interesting twist, he’s seeing more companies exploring best-of-breed WMS with the goal of moving away from their legacy systems.

“Best-of-breed WMS platforms are available at more attractive rates than in years past, and many of them are cloud-based and come with more options,” says Saenz. “Complex e-commerce fulfillment operations need more automation and integration points to remain competitive. I think this area of WMS will continue growing rapidly.”

### **You can’t just throw more people at the problem**

As Gartner’s Dwight Klappich ponders the role of WMS in the e-commerce fulfillment center of the future, he sees the software becoming even more intelligent and, in some cases, intertwined with other applications within the warehouse’s four walls.

According to Klappich, Gartner’s research VP, the focus will be on managing work more effectively and intel-

## **“Complex e-commerce fulfillment operations need more automation and integration points to remain competitive. I think this area of WMS will continue growing rapidly.”**

—Norm Saenz, St. Onge Co.

ligently, and using advanced analytics, artificial intelligence (AI) and other advanced technologies to optimize the work queue. He says that robotics and automation also come into the picture here, and that many companies are investing in both to help augment their human workforces during this period of labor constraints.

These considerations are especially critical in the e-commerce fulfillment environment. “If you’re just moving pallets and cases, using advanced analytics and AI for activities like labor forecasting is less of a priority,” says Klappich. “But e-commerce operations are very interested in adding that other intelligence to WMS.”

Fast-paced e-commerce operations are also using more “indoor locating” technologies that help them better understand where their people are, where the actual work is taking place, and then using that intelligence to do a better job of assigning work. Klappich is also seeing renewed interest in radio frequency identification—an “RFID 2.0” movement, so to speak—with much of that momentum being driven backward from physical store locations.

“Sourcing tagging, where the factory or supplier puts RFID tags on merchandise, was primarily meant to help stores,” says Klappich. “Now, warehouse operators are saying: ‘Wait a second. If I have all of these RFID tags on all these products, how can I put them to use in the warehouse?’”

Klappich says most of these relations and advancements are being driven by the uptick in e-commerce and

direct-to-consumer (D2C) sales volumes. It wasn’t long ago that huge CPG companies like Procter and Gamble and Gillette were loading goods onto pallets and into cases to ship to stores where the shipments were broken down and items sold to individual customers.

Today, much of that “breaking down” has to take place either at the point of manufacture or distribution, based on the fact that a D2C order may be for a single pack of razor blades.

“Companies have had to figure out when customer A is supposed to get his pack of razor blades that are being sent direct,” says Klappich. “That’s just one example of how high-volume, high-velocity fulfillment environments are forcing companies to rethink their strategies at a time when ‘throwing more people at the problem’ isn’t a viable option.”

### **Playing well with others**

Cloud computing, application programming interfaces (APIs), and interoperability have all made it easier for software systems to “talk” to one another. And while the WMSs that were put in place 30 years to 40 years ago may still struggle in this area, newer systems were built to be able to play well with others.

Amarendra Phadke, CTO at Capgemini Engineering, sees this trend continuing and expects it to favorably impact warehouse operations that want to be able to manage more from a single platform.

“It’s about establishing independence between [systems] so that

**“Historically, WMS only had to deal with human actors, as in people moving items using forklifts or other means... Now all of a sudden you have an entity that has an automated, semi-automated, and manual labor force. The question is: How do you coordinate orders, picks, and other activities across all three?”**

—Amarendra Phadke, Capgemini Engineering

WMS can be more modularly linked with individual warehouse sizes and operations,” says Phadke, who also envisions a time when WMS is more closely linked with warehouse control systems (WCS) and warehouse execution systems (WES) to create a closed loop that includes all three core systems.

Realistically, however, he says that there’s still much work to be done before such integrations become commonplace. Here’s why: From the WMS perspective, the inputs are orders, labor sites, and enterprise resource planning (ERP) systems; and the outputs are the company’s manual, semi-automated or automated labor force. Marrying the two in a cohesive way requires quite a bit of system engineering.

“Figuring out how to solve the end-to-end problem requires multiple algorithms,” Phadke explains, “that can then be used to design software systems that interact with hardware-based, controls-based, automation-based and/or manual labor-based operations.”

Phadke also expects to see more companies using WMS to coordinate orders and picks across their part-manual/part-automated workforces—something that WMS hasn’t really had to deal with in the past. And the more e-commerce companies use AGVs, AMRs and other automated or semi-automated material handle equipment, WMS is now being asked to step in and handle these non-traditional tasks.

“Historically, WMS only had to deal with human actors, as in people moving items using forklifts or other means,” Phadke points out. “Now all of a sudden you have an entity that has an automated, semi-automated, and manual labor force. The question is: How do you coordinate orders, picks, and other activities across all three?”

The solution may be that WMS

**“An e-commerce operation may have some goods-to-person, pick assist or robotics automation in place, but probably also has some traditional pick-to-belt zones... Some WMS companies are starting to say: ‘We’re developing highly-intelligent tools within our platform that are either standalone or connected to a WMS.’ These tools can be used to orchestrate everything that’s happening in the warehouse.”**

—Howard Turner, St. Onge Co.

providers incorporate the functionalities into their own systems or create integrations with existing WES and WCS applications. “This is still futuristic in nature,” says Phadke, “and probably we’ll begin to see happening within the next one to three years.”

### **Operations management for WMS**

In surveying the current e-commerce fulfillment landscape and the innovation taking place on the WMS front, Howard Turner envisions a time when WMS and other systems work together to become the “decision-making brains” behind a

busy warehouse operation.

This probably won’t happen for another five years or so, but, at that point, operations management tools may be used to orchestrate different warehouse “zones” that are being manned by both human and automated labor forces.

“An e-commerce operation may have some goods-to-person, pick assist or robotics automation in place, but probably also has some traditional pick-to-belt zones,” says Turner, director, supply chain systems at the consultancy St. Onge Co. “Some WMS companies are starting to say, ‘We’re developing highly-intelligent tools within our platform that are either standalone or connected to a WMS.’ These tools

can be used to orchestrate everything that’s happening in the warehouse.”

For example, companies will be able to use the operations management tools to balance labor right down to the hour based on expected order volumes, and then allocate the human and automated labor resources accordingly.

“Companies struggle with having all of the data across all these different areas or zones of the warehouse, and then trying to figure out how to manage and run it effectively,” says Turner, “so this is one futuristic area that holds a lot of promise.” •

# M A D E 4 N E T

## About Made4net

With over 800 customers in 30 countries and solutions in 20+ languages, Made4net is a leading global provider of warehouse management systems and supply chain execution solutions that help organizations of all sizes improve the speed and efficiency of their supply chain. The company's end-to-end SC Expert platform is adaptable, configurable and scalable to provide maximum Speed-to-Pivot™ for ever-changing supply chains. Made4net solutions provide real-time inventory visibility, labor management, and equipment productivity with performance analytics that drive faster, more accurate order fulfillment and improved throughput.

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