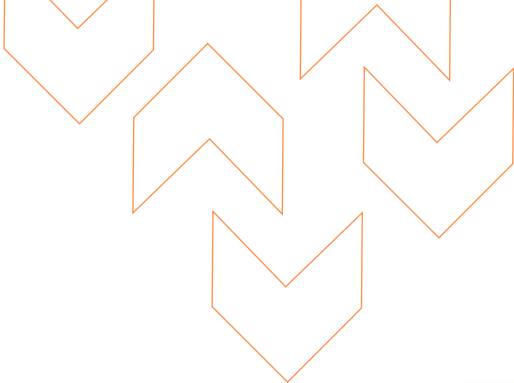




## WHITE PAPER

LEVERAGING A **DATA-DRIVEN  
WAREHOUSE EXECUTION  
SYSTEM** TO REVOLUTIONIZE  
PHARMACEUTICAL DISTRIBUTION



## INTRODUCTION

Pharmaceutical companies and distributors operate at the heart of medication delivery. These operations manage complex warehouse ecosystems as they process orders and maintain inventory for pharmacies, hospitals, and healthcare providers. They also face mounting challenges in managing warehouse operations and fulfilling orders efficiently, cost-effectively, and securely. Inefficiencies in inventory management, unpredictable demand fluctuations, regulatory

compliance pressures, and the persistent threat of counterfeit medications can also undermine their ability to deliver medications reliably.

To combat these challenges, pharmaceutical distribution centers (DCs) can leverage next-generation warehouse execution system (WES) software to increase their operational scalability, flexibility, and reliability. Such a solution transforms warehouse operations by ensuring medications are managed and delivered with precision.



According to market research firm Metastat Insight,<sup>1</sup> utilizing a WES is:

«*...vital in pharmaceutical warehouses to maintain strict inventory control, adhere to regulatory compliance, and ensure the secure and efficient distribution of critical medications. Accuracy, traceability, and security are of utmost importance in this market, making WES an indispensable tool.*»



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Optimally, the ideal WES for pharmaceutical distributors is both data-driven and not tied to the systems and equipment of a specific original equipment manufacturer (OEM). Instead, the architect of the WES solution takes an open approach to data and integration.

This white paper details how an open-architecture, data-driven WES empowers pharmaceutical operations with a sophisticated platform that synchronizes inventory handling, order fulfillment, and compliance tasks. It also explores how these features enhance operational efficiency, reduce costs, and ensure medication availability.

## KEY WES APPLICATIONS FOR PHARMACEUTICAL DISTRIBUTORS

The ideal, open-architecture WES incorporates versatility that addresses specific challenges faced by pharmaceutical distributors. Use cases include:

### Demand Forecasting for Seasonal Medications

Distributors often struggle with seasonal demand spikes, such as flu medications. The ideal WES analyzes years of order data and regional health trends to predict surges, enabling warehouses to stockpile inventory ahead of peak seasons. For example, a distributor can ensure rural pharmacies are equipped with flu vaccines without overstocking urban centers.



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## Inventory Optimization for High-Demand Drugs

Stock imbalances can delay critical orders. The optimal WES monitors inventory in real-time, triggering automated replenishment when thresholds are breached. For instance, a distributor managing a high-demand antibiotic like amoxicillin receives alerts and reorders before shortages impact hospital orders, maintaining service levels.

## Cold Chain Management for Vaccines



Temperature-sensitive medications, such as mRNA vaccines, require precise handling. The ideal WES integrates Internet of Things (IoT) sensors to monitor storage conditions (such as 2–8°C) in warehouse zones. If a refrigeration unit fails, the system alerts staff instantly, preventing spoilage and ensuring compliance with distributor quality standards.

## High-Velocity Order Fulfillment for Emergency Needs

During public health crises — like pandemics, for example — distributors face urgent, high-volume orders. The optimal WES incorporates waveless flow and pick path optimization capabilities.

This allows it to prioritize and synchronize tasks,

enabling a distributor to fulfill a 10,000-unit order for antivirals within hours and meet tight delivery deadlines.

## Counterfeit Prevention with Blockchain

A distributor receiving a batch of high-value oncology drugs can use the WES' blockchain capabilities to verify authenticity and log inventory movements. This ensures only legitimate products are stored and shipped, protecting patient safety and regulatory standing.



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# COMPONENTS OF THE IDEAL PHARMACEUTICAL DISTRIBUTION WES

The ideal open-architecture WES for pharmaceutical distributors integrates six foundational pillars, enhanced by advanced features, to create a smarter warehouse system. These include:

## 1. Real-Time Visibility

The optimal WES synchronizes and analyzes data gathered from IoT-enabled sensors, RFID tags, and cloud-based dashboards to provide

distributors with live insights into inventory levels, order statuses, and product locations within the warehouse. This eliminates operational blind spots, enabling rapid responses to inventory shortages or order delays.

## 2. Predictive Analytics

Using machine learning and historical order data, the ideal WES forecasts demand with precision, analyzing trends like seasonal spikes or regional health events. This allows distributors to proactively adjust warehouse inventory, preventing stockouts of critical drugs or overstocking of slow-moving items.

## 3. Automated Order Processing

The optimal WES replaces error-prone manual order management with intelligent automation, handling order entry, validation, and fulfillment. For distributors, this means faster processing of high-velocity orders, such as urgent hospital requests, with reduced human intervention.



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#### 4. Blockchain Integration

Counterfeiting threatens medication integrity, a critical concern for distributors. For maximum security, the ideal WES uses blockchain to create a tamper-proof record of inventory and order history within the warehouse, ensuring traceability and authenticity while simplifying regulatory audits.



#### 5. Adaptable Software Integration

With a flexible API gateway and integration bridge, the optimal WES connects seamlessly to all major warehouse management software (WMS) and enterprise resource planning (ERP) systems — whether from leading suppliers, legacy setups, or custom solutions. This adaptability enables distributors to enhance existing operations without overhauling their software infrastructure.



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## 6. Modular Hardware Configurability

The ideal WES integrates with a wide array of warehouse hardware, including conveyors, automated storage and retrieval systems (AS/RS), autonomous mobile robots (AMRs), light-directed picking, palletizers, and voice-directed picking systems. This ensures smooth order fulfillment in high-throughput DCs.

### Other Key Features...

The ideal WES also incorporates advanced features that specifically address the unique needs of pharmaceutical distributors. These include:



- **Sophisticated Container Management:** The WES should be capable of optimizing inventory and order flow with strategies like container routing, pick path optimization, replenishment, and waveless flow, ideal for managing diverse pharmaceutical SKUs.
- **Multiple Deployment Options:** Available in cloud, on-premises, or hybrid configurations, the ideal WES adapts to pharmaceutical distributors' connectivity and real-time data needs.
- **Intuitive User Interface:** A web-based dashboard delivers real-time key performance indicators (KPIs), such as order throughput and inventory turnover, helping managers address issues proactively.



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# SUCCESSFUL WES IMPLEMENTATION RECOMMENDATIONS FOR PHARMACEUTICAL DISTRIBUTORS

A smooth, successful deployment of a WES in a pharmaceutical DC requires strategic planning:



- **Technology Infrastructure:** Invest in IoT devices, cloud computing, and blockchain to support the capabilities of the WES. It is also important to verify the WES compatibility with existing hardware like AS/RS or AMRs.
- **Stakeholder Collaboration:** Align warehouse managers, order fulfillment teams, and IT staff to standardize processes and data integration.
- **Training and Adoption:** Train staff on the WES' interface and automation tools, emphasizing real-time dashboards for decision-making.

- **Regulatory Alignment:** Collaborate with compliance teams to tailor blockchain records to local and international standards, such as the U.S. Drug Supply Chain Security Act (DSCSA) or European Union's Falsified Medicines Directive (FMD).
- **Scalability Planning:** Start with a pilot in one DC, then scale to regional hubs as return on investment (ROI) becomes evident.

Initial costs may be notable, but the long-term savings from reduced waste, improved throughput, and compliance efficiencies make deploying the optimal, open-architecture WES a strategic investment.



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## CONCLUSION: DATUM, THE IDEAL WES FOR PHARMACEUTICAL DISTRIBUTION

DATUM — an open-architecture WES developed by DCS — leverages advanced data analytics, real-time tracking, and technologies like blockchain to optimize warehouse-based pharmaceutical distribution.

With over four decades of expertise in integrating material handling equipment and fulfillment automation, DCS designed DATUM as an independent, scalable, and reliable solution, free from the constraints of OEM software. It seamlessly integrates with existing WMS and ERP platforms, blending warehouse control with intelligent order planning and inventory management.

By delivering real-time visibility, predictive inventory insights, automated order processing, and robust compliance tools, DATUM ensures medications are managed and fulfilled with both precision and speed.



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Its independence from OEM software, coupled with flexible hardware and software integration, allows pharmaceutical distributors to future-proof their operations.

As pharmaceutical distributors navigate rising demand, regulatory scrutiny, and operational complexity, DATUM offers a clear path to improved efficiency and adaptability. Adopting this platform not only boosts warehouse performance but also better supports distributors' critical role in ensuring medication availability for patients.

### **Is DATUM right for your pharmaceutical distribution operation?**

Connect with one of DCS' software experts to discuss your facility's unique needs, as well as to access a virtual demo of DATUM.



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## ABOUT DCS

Headquartered in Franklin, Tenn., Designed Conveyor Systems (DCS) has 40 years of experience serving major clients in multiple industries by providing material handling, full-scale warehouse operations, and conveyor design solutions that are custom crafted for their needs. DCS does not sell ready-made conveyor systems but builds relationships that empower collaboration to craft custom warehouse designs together. DCS utilizes consulting, engineering design, project management, installation services, and client support to ensure our customers can keep their promises to deliver on time.

## ENDNOTES

1 *Warehouse Execution System Market Size, Share, Trends by 2030*. (10 July 2024). Metastat Insight. <https://www.metastatinsight.com/report/warehouse-execution-system-wes-market>



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