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A PRACTICAL GUIDE TO USING DIGITAL TWINS IN YOUR DISTRIBUTION CENTER

We live in the era of Amazon.com. Fast isn't fast enough, and same-day delivery is the new standard. In today's supply chain, the distribution center is the profit pressure zone.

Your distribution center is probably one of the most expensive, yet fixable, links in your supply chain. Labor alone can make up as much as 70% of your operating costs. Add to that a volatile labor market and underutilized space, and, well … we feel your stress.

But it's fixable.

This white paper tackles a high-level version of the question we hear in nearly every ops conversation:

> ***How do you upgrade your distribution center with modern technology, without operational risk or wasted capital?***

We have an answer. We'll walk through how digital twins and simulations can be applied to transform performance across the distribution center (DC).

This isn't theoretical. These are technologies we've deployed for our customers to solve their problems.

At each stage of distribution operations, you'll see how digital modeling and AI-powered insights improve **return on capital** before a single change hits the floor.

Goodbye to gut decisions, hello to modeled outcomes

In distribution centers, decision-making still mostly relies on instinct and experience: Change the layout, reroute labor, introduce new automation, and hope for better results.

But gut decisions don't scale. And in high-velocity, high-cost distribution centers, trial-and-error can get expensive fast.

You need a digital twin

A digital twin gives you a virtual version of your distribution center, complete with real-world constraints, workflows, and volumes. It models the flow of products, people, and machines across your operations.

This means you can test changes without touching live operations, like:

- What happens to throughput if you add two autonomous mobile robots (AMRs)?
- What if you move fast-moving SKUs closer to pick zones?
- Can you eliminate a shift without sacrificing on-time delivery?

Because the model reflects actual operational data, it becomes a shared decision-making tool across operations, engineering, finance, and even the boardroom.

But aren't digital twins a big project to take on?

They can be. But they don't have to be. The scope and fidelity of a digital twin depend on data availability, operational complexity, and the specific decisions being modeled.

Today's digital twins scale to fit the problem. Sometimes they're full-scale simulation engines. Other times, lightweight dashboards with built-in decision logic.

But when applied correctly, they consistently improve ROI.

Where to start inside the DC and why it pays

Digital twins build an environment where labor, automation, space, and throughput can be tuned together. And while every operation is unique, the highest-value improvements often come from the same places.

Here's where simulations have already delivered major returns.

Inbound: control the chaos before it starts

When truck arrivals are unpredictable or unloading is inefficient, the ripple effects are immediate: congested storage, delayed picking, missed cutoffs, and outbound overtime.

A digital twin lets you spot those upstream breakdowns early and test fixes before they disrupt the entire flow.

If you're looking to make some real gains, here's where to start:

Truck arrival patterns and scheduling: Identify spikes, dwell time trends, and where idle labor piles up.

Dock utilization under peak conditions: Model capacity and reconfigure if congestion is causing slowdowns.

Labor shifts and unloading times: Align staffing to actual trailer volumes, not assumptions.

Drop zone congestion: Simulate different layouts to reduce footprint and free up space for higher-value activity.

Let's say you suspect trailers are idling too long during peak hours. With a digital model, you can test new scheduling logic, traffic flow, and task priorities, all without touching live operations.

And what if you're wrong? No cost. No disruption. Just answers.

Storage and layout: fixing the floor before you touch it

Layout changes are expensive to reverse but cause too many problems not to. Misplaced SKUs. Inefficient slotting. Bottlenecks in high-traffic aisles. And associates walking miles per day just to complete standard picks.

That's why digital twins are so valuable for modeling aisle widths, rack placements, congestion points, and SKU velocity zones before the first pallet is moved.

To change the layout, most teams rely on observation and best guesses. But simulation gives you proof.

Here are four layout variables worth modeling:

1. **Travel paths and congestion zones:** Where are people and robots slowing each other down?
2. **SKU velocity and slotting logic:** Are your fast movers where they should be or just where they've always been?
3. **Vertical storage and capacity utilization:** Are you maxing out space or working around old constraints?
4. **Layout and equipment spacing:** Are you solving today's demand with yesterday's aisle design?

Planning a major slotting reset? A digital twin lets you test how SKU shifts impact travel time, congestion, and replenishment without touching a single rack.

Picking and movement: where every step costs you

Picking is the most labor-intensive part of the DC, and where most labor dollars go.

Yet many operations still rely on static routes, default task assignments, and siloed automation.

The result? Overlapping paths. Idle equipment. Underused AMRs. Overworked people.

Simulation fixes that friction before it hits your margins.

These are the high-impact questions to model first:

- **Task prioritization and routing:** Who's picking what, when, and in what sequence?
- **Human-robot workflows:** Where are your people and AMRs helping or hindering each other?
- **Dwell time and congestion:** How often are assets stuck waiting instead of moving?
- **Interleaving and batching:** Are you grouping tasks in the most efficient way possible?

Digital twins let you model AMR interactions, traffic flow, and even real friction scenarios like sensor interference or wait times. You can tweak assignments, simulate congestion, and watch how shifts in logic affect throughput, all without touching live operations.

Human + robot: simulating the perfect pick

Because case picking is one of the most physically demanding, repetitive, and time-sensitive tasks, many operations are introducing AMRs to work alongside human pickers, not to replace them, but to move smarter, faster, and together.

With digital twins, you can model **AMR** interaction down to the second, including how they pass each other in tight aisles, coordinate pallet handoffs, or avoid sensor conflict from LiDAR and cameras.

We use real robotic software and AI models running inside the simulation. Before a single robot hits the floor, you can:

- Test traffic scenarios and aisle logic
- Model different order structures and wave patterns
- Fine-tune workflows for efficiency, safety, and speed

For high-volume retail DCs, collaborative picking simulation means fewer delays and better ROI on automation.

Outbound: where mistakes get expensive

This is the final handoff where service promises are either kept or broken. It's also where minor issues become major costs. Missed staging windows, last-minute labor adjustments, or carrier delays all stack up fast.

And yet, outbound is often the least-modeled part of the distribution center.

Here are the areas to focus on:

Staging area logic: Are orders flowing efficiently, or piling up in the wrong places?

Carrier scheduling: Are dock slots matched to actual readiness or just legacy rules?

Drop zone congestion: How do pallets, people, and machines interact at the edge of departure?

Load sequencing: Are shipments being built in the right order to meet tight retail delivery windows?

You can test outbound logic under pressure, simulate peak load with actual order volumes, or model trailer load sequencing for tighter dock turns. And you can do it all without disrupting live fulfillment.

The executive view

Digital twins and AI-powered systems give you a way to simulate outcomes before committing capital. They provide the answers executives and boards need. Answers grounded in modeled cost, throughput, and return on investment.

Here's what that looks like in practice:

1. **Cost per unit.** Run side-by-side comparisons of labor shifts, SKU slotting, or AMR routing and see exactly how each variable impacts unit economics.

2. **Throughput.** Model volume scenarios like peak season, compressed delivery windows, or facility expansion to see how the system holds up under pressure.

3. **ROI planning.** Justify automation spend with modeled payback timelines and risk profiles based on actual simulations, not broad industry benchmarks.

4. **Capital allocation.** Avoid costly overbuilds or underused assets by simulating layouts, labor plans, and equipment deployment before spending a dollar.

In short, digital twins and simulations turn operational complexity into financial clarity.

Modern distribution centers need digital twins to make high-stakes decisions with confidence. By shifting experimentation out of live operations and into simulation, organizations improve ROI by testing more options at lower cost and with less risk.

See what's possible

SoftServe brings deep expertise in AI, robotics, and simulation to help retailers modernize their distribution centers with speed and confidence. As NVIDIA's 2025 Service Delivery Partner of the Year, SoftServe is leading some of the most advanced digital twin and automation projects in the field.

In one project, SoftServe simulated case picking where humans and autonomous mobile robots (AMRs) work side by side. The team modeled real traffic patterns, order logic, and safety interactions before anything hit the warehouse floor, avoiding rollout risk.

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In another, we built an AI-powered virtual factory with NVIDIA Omniverse™ and OpenUSD, letting engineers test layout and workflow changes entirely in simulation. With a Generative AI co-pilot in the loop, they accelerated planning and cut downtime by 10%.

READ ABOUT THIS PROJECT

NVIDIA

Explore more of our joint work with NVIDIA here.

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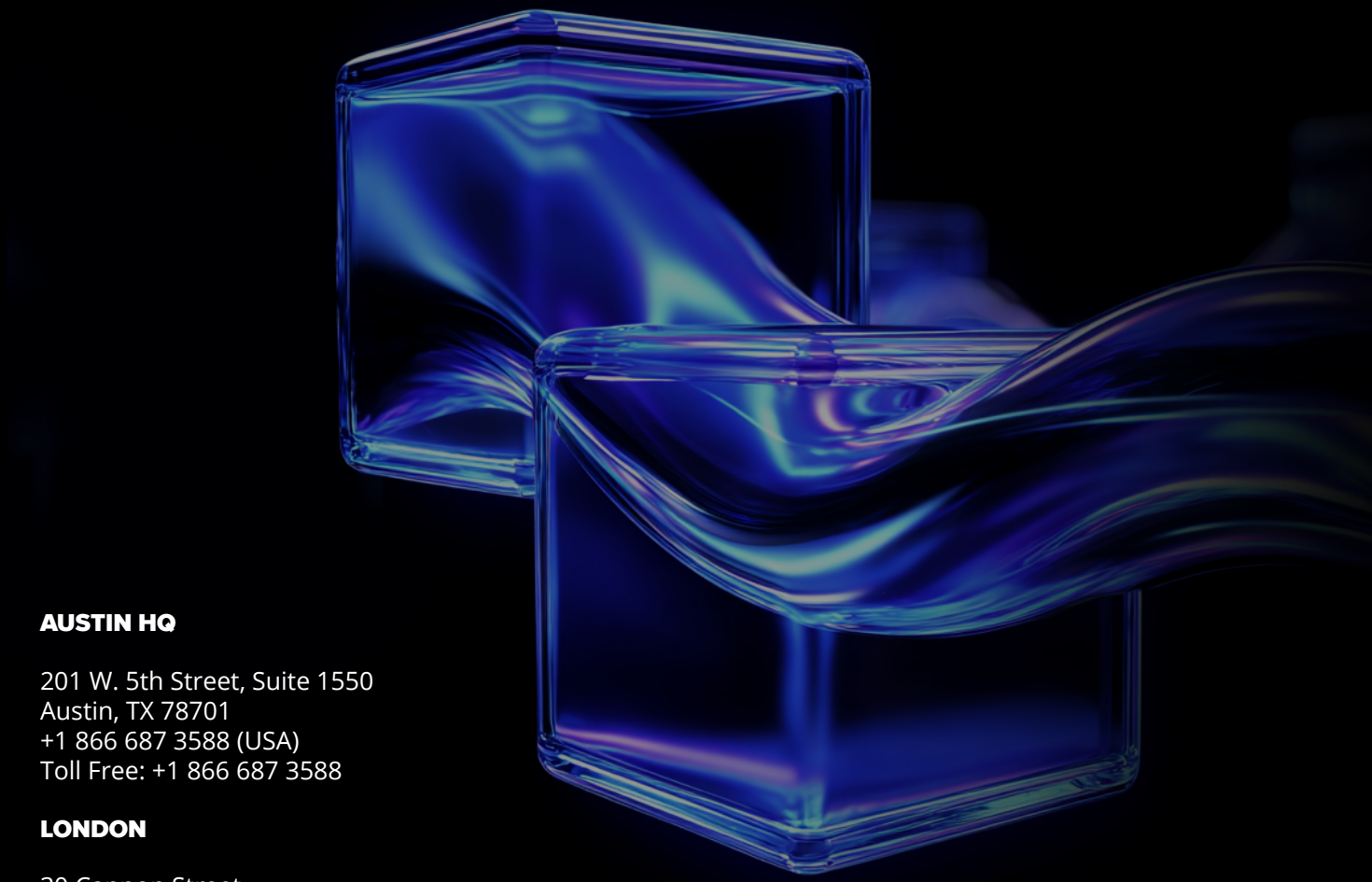
About Us

SoftServe is a premier IT consulting and digital services provider.

We expand the horizon of new technologies to solve today's complex business challenges and achieve meaningful outcomes for our clients. Our boundless curiosity drives us to explore and reimagine the art of the possible. Clients confidently rely on SoftServe to architect and execute mature and innovative capabilities, such as digital engineering, data and analytics, cloud, and AI/ML.

Our global reputation is gained from more than 30 years of experience delivering superior digital solutions at exceptional speed by top-tier engineering talent to enterprise industries, including high tech, financial services, healthcare, life sciences, retail, energy, and manufacturing.

Visit our website, blog, LinkedIn, Facebook, and X (Twitter) pages for more information.



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