

HOW AI IS ELIMINATING THE TRILLION-DOLLAR RETAIL INVENTORY CRISIS



*How Agentic AI is
transforming inventory
decision-making*



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Executive Summary

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Retail inventory distortion - the combined financial impact of out-of-stocks, overstocks, and misaligned buying decisions that cause lost sales, markdowns, waste, and excess carrying costs - has reached an estimated \$1.7 trillion globally, according to an IHL Group Report titled Fixing Inventory Distortion, released in July 2024. The study, which included a comprehensive analysis of worldwide retail operations, shows that the inventory distortion problem is currently about 6.8% of global retail sales.

Despite decades of investment in planning tools, forecasting software, and analytics platforms, most retailers remain trapped in reactive decision cycles that are too slow, too fragmented, and too dependent on human intervention to keep pace with today's fast-pace and volatility. This whitepaper argues that the root cause is not poor planning, but the absence of a real-time, autonomous inventory operating model.

1.7T

Worldwide 2024
Inventory Distortion
Source: IHL Group



We explore:

- *why legacy approaches fail under modern trading conditions*
- *how AI is fundamentally changing what is possible in inventory decision-making*
- *why the next era of retail will be defined by agentic inventory operating systems that move seamlessly from insight to action.*

Drawing on real-world retail outcomes, this paper shows how retailers adopting AI-led, autonomous inventory decisioning are improving availability, reducing waste, unlocking working capital, and protecting margin - even in highly volatile and regulated categories. The paper concludes with practical guidance for retail leaders preparing to transition from outdated manual planning cycles to AI-driven inventory execution.

6.8%

Inventory distortion
as a % of global
retail sales



Introduction

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Inventory at a Breaking Point

Inventory has always been one of retail's most complex balancing acts. Buy too much, and capital is trapped in unsold stock. Buy too little, and customers walk away disappointed, or worse go elsewhere to purchase successfully. Historically, retailers have accepted this tension as unavoidable - a cost of doing business in an industry shaped by seasonality, long lead times, and imperfect demand signals.

Today, that assumption no longer holds. Retail operates in an environment defined by compressed trend cycles, global supply chains, digital-first customer behaviour, and constant external disruption. The pace of retail decision-making has fundamentally changed. As decision windows compress, the cost of slow or delayed action rises sharply, turning yesterday's acceptable planning lag into today's margin erosion. Social trends can emerge and fade in days and weeks. Weather, events, promotions, and cultural moments now influence demand in real time. Yet most inventory decisions are still made using planning cycles, spreadsheets, and reports designed for another era.

The result is a growing disconnect between how retail demand behaves and how inventory is managed. Inventory distortion is no longer an operational inefficiency; it is a structural risk to margin, growth, and brand trust.

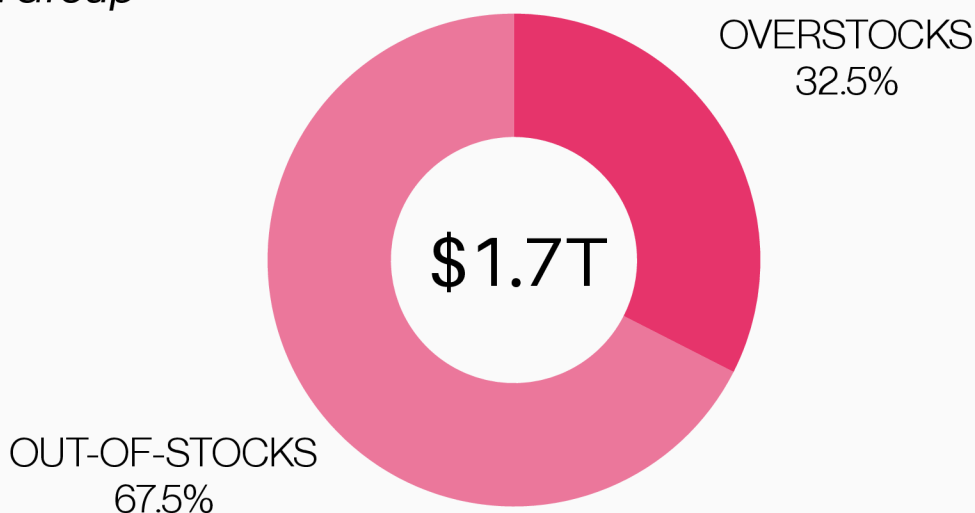
The Trillion-Dollar Inventory Crisis

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According to industry research, global inventory distortion now exceeds \$1.7 trillion annually, with roughly \$1.2 trillion from out-of-stock missed sales and \$554 billion from excess inventory markdowns. This imbalance suggests that retailers are struggling more with understocking than overstocking. And while supply chain disruptions from shipping choke points to fuel supply chain disruptions and cyber attacks have had significant impacts on distortion, technology adoption, particularly retailers using AI/ML in their forecasting, order management, merchandise planning/allocation and supply chain systems, can lift sales growth percentages by 2.3x and profit growth percentages by 2.5x - according to the IHL Study.

INVENTORY DISTORTION WORLDWIDE

Source: IHL Group



A key step for any retailer to attack their out-of-stocks and overstocks is getting good data. But it's no longer enough to be able to create and track metrics, they must be actionable in real time.

Most inventory decisions depend on humans interpreting static reports, reconciling conflicting data sources, and acting within rigid planning windows. By the time insights are reviewed and decisions are executed, conditions have already changed.

The financial impact runs deeper than missed sales. McKinsey research shows that in the US alone, retailers are sitting on \$740 billion in unsold goods. This drives heavy reliance on markdowns, increased waste, and long-term margin erosion. Excess inventory does not simply sit idle - it actively degrades profitability and brand equity over time.

The Decision-Speed Problem

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This lag creates....

Three Systemic Failures

1. **Demand is misread.** Trends break earlier or later than expected, regional differences are missed, and early signals are ignored.
2. **Action is delayed.** Replenishment windows are missed, purchase orders are not adjusted in time, and markdowns happen too late.
3. **Accountability breaks down.** When teams work from different numbers, trust erodes and decision-making slows further.

Inventory distortion is therefore not a forecasting problem. It is a decision-speed problem.

\$740bn



In US unsold goods, according to McKinsey (May 2023)

\$1.2 T



Lost from out-of-stock missed sales

Why Legacy Inventory Approaches Fail

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For decades, retailers have tried to solve inventory challenges by adding more tools: better forecasting models, more dashboards, more reports. While these investments have improved visibility, they have not fundamentally changed how decisions are made.

Industry analyses and vendor benchmarks show that SKU-level demand forecasts remain far from perfect for most retailers, with significantly lower accuracy in volatile or slow-moving categories.

These limitations explain why retailers continue to experience out-of-stocks alongside excess inventory - even with sophisticated planning tools in place.

Legacy systems share three critical limitations.

- **They are siloed.** Planning, buying, merchandising, finance, and store operations often rely on separate systems that produce different answers to the same question. This fragmentation forces teams to spend time reconciling data instead of acting on it.
- **They are static.** Most forecasting and planning tools operate on batch cycles - weekly, monthly, or seasonal. In a world where demand shifts daily, static plans quickly become outdated.
- **They are human-dependent.** Insights stop at the dashboard. Humans must interpret recommendations, assess risk, and manually execute actions. As complexity increases, this model becomes unsustainable.

From Forecasting Tools to Inventory Operating Systems

Leading online fashion retailers like Shein are taking the lead in addressing the problems. It has taken a savvy “test and learn” approach with its on-demand production model, driven by customer insights from the brand’s app, to help avoid unsold inventory. Today it is piloting new styles with fewer than 200 units and only produces more based on demand, to efficiently match supply to demand, reduce costs and minimise waste.

AI and agents accelerate the inventory equation even further not because they forecast better - but because together they enable a fundamentally different operating model.



Agentic AI-powered Inventory OS

An agentic AI-powered inventory operating system does not simply analyse data. It continuously ingests signals from across the retail ecosystem, interprets them in real time, and autonomously executes decisions within defined guardrails. Instead of humans chasing insights, the system acts first, within the defined remit, and escalates exceptions second.

This shift moves inventory management from a planning mindset to an execution-first mindset. Decisions are no longer confined to planning cycles. They are made continuously, at SKU level, across regions and channels, based on live conditions.

Crucially, this model does not remove human control. It removes human latency and the lag between understanding the data and taking action. Teams define strategy, constraints, and objectives, while agentic AI handles the complexity and speed required to execute those decisions effectively.

Evidence from the Field

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What Changes When Decisions Become Autonomous

Across retail categories, a consistent pattern emerges when inventory decisions move from manual, lagged processes to agentic AI-led execution. These outcomes are increasingly consistent with wider industry evidence. For example, McKinsey reports that autonomous, AI-enabled supply-chain planning can reduce inventory levels by 10-20% based on case studies of large CPG firms, while maintaining required service levels. Meanwhile, Deloitte finds that over 62% of retailers reported using external data sources to enhance their predictive analytics models, significantly improve their demand forecast accuracy and supply chain resilience. This is echoed by independent case studies - for example, Danone implemented an AI-powered demand model that led to a **30% reduction in lost sales** by ensuring products are in stock where needed



Even in highly regulated categories, such as wellness and pharmacy, AI-led inventory execution has proven transformative. By identifying early demand shifts and automating expiry and replenishment decisions, retailers eliminated waste from expired stock, met compliance requirements, and improved conversion and retention.

These outcomes are not isolated wins. They are the natural result of increasing decision speed, consistency, and confidence across the inventory lifecycle.

30%



Reduction in lost sales after Danone implemented an AI-powered demand model

62%



Of retailers report using external data sources to enhance analytics models (Deloitte Survey, 2023)

The Future for Retail Leaders

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The implication for retail leaders is clear: inventory excellence is no longer achieved by better plans alone. It requires systems that can act at the speed of the market. In a 2025 [NRF/Honeywell Retail Technology study](#) - polling 450 executives at large retailers in the US, UK, Germany, Brazil, India, United Arab Emirates and the Kingdom of Saudi Arabia - 89% of retail executives said they are implementing or planning AI in the next year or two specifically citing smarter inventory and demand forecasting as a top-three motivator for AI adoption (33%). AI's ability to ingest hundreds of data signals (weather, events, trends, etc.) and recompute forecasts continuously is a game-changer for retail operations.

Redefining where human expertise adds value

This does not mean replacing teams or abandoning human judgment. It means redefining where human expertise adds the most value - strategy, creative judgment, supplier relationships - and where machines are better suited to operate and support - data synthesis, prediction, and execution at scale. And companies like [Walmart](#) and [Target](#) are seeing the advantages of scaling intelligent automation and AI across borders, preventing stockouts and managing inventory.

Retailers Adopting Agentic AI-led inventory

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Retailers that adopt AI-led inventory operating systems gain three strategic advantages

- They **reduce waste and working capital** tied up in excess stock. [Deloitte's Working Capital research](#) (May, 2025) suggests companies can free up between 10 and 20% of invested working capital by tightening up inventory and related processes.
- They **protect revenue by keeping products available** where and when customers want them.
- They **build organisational confidence** by aligning teams around a single, real-time source of truth.



10–20%



Of invested working capital freed up by tightening of inventory and related processes

85%



Of retailers investing in AI solutions globally (Honeywell Retail Technology Study, May 2025)

89%



Of retail executives say they are implementing or planning AI in the next year or two, specifically citing smarter inventory and demand forecasting as a top-three motivator for adoption (Honeywell Retail Technology Study, May 2025)

From Insight to Execution

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How Merchmix Enables Agentic AI-Led Inventory



As retailers move from planning-led inventory models to continuous, AI-driven execution, a new class of platforms is emerging to support this shift. Merchmix is one such example - designed specifically to help retailers translate real-time insight into real-time action across the inventory lifecycle.

Launched in 2025, Merchmix was built to address a persistent gap in retail technology. While most organisations now have access to vast amounts of data, few systems are able to act on that data autonomously at the speed required by modern retail. Legacy tools continue to operate in functional silos across planning, buying, merchandising and store operations, creating delays, inconsistencies and missed opportunities.

Merchmix approaches inventory as an operating system rather than a planning tool.

The platform continuously ingests over 200 internal and external signals, including sales performance, weather, events, economic indicators, supplier lead times, competitor pricing and social demand signals, recomputing demand and inventory decisions in near real time.

Crucially, insights do not stop at dashboards. Using agentic AI workflows, Merchmix can autonomously trigger actions within predefined guardrails - from raising or adjusting purchase orders, to reallocating stock, surfacing replenishment risks, and flagging early markdown or exit decisions.

This execution-first model is enabling retailers to move away from reactive firefighting and toward proactive, confident trading - even in volatile and highly competitive categories.

Customer Stories

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Fira Mae

Fashion retailer [Fira Mae](#) suffered chronic stockouts when manual forecasting failed to predict SKU breakpoints. By adopting AI-driven stock anticipation and automated replenishment alerts, core category availability rose from 75% to 95%, recovering lost demand and protecting margin.

95%



Availability across core categories increased from 75% to 95%

+5%



Cashflow forecasting accuracy as a result of unifying data into a single operational layer



Valla Living

Luxury home and lifestyle retailer [Valla Living](#) faced persistent overbuying and used AI-driven range analysis to identify which product combinations truly drove margin and demand. As a result, wastage fell by 30%, gross profit improved by eight basis points year-on-year, and capital was reallocated from slow-moving lines to best sellers.

30%



Reduction in wastage

8%



Increase in gross profit YOY, as a result of reallocating capital to best sellers



Auriste

Premium comfort shoe retailer [Auriste](#) found planning and buying teams were overwhelmed by conflicting data. The move to a unified, AI-led decision layer eliminated internal disputes, accelerated decision-making, and supported 25% market share growth alongside a nine percent margin increase.

25%



Market share growth

9%

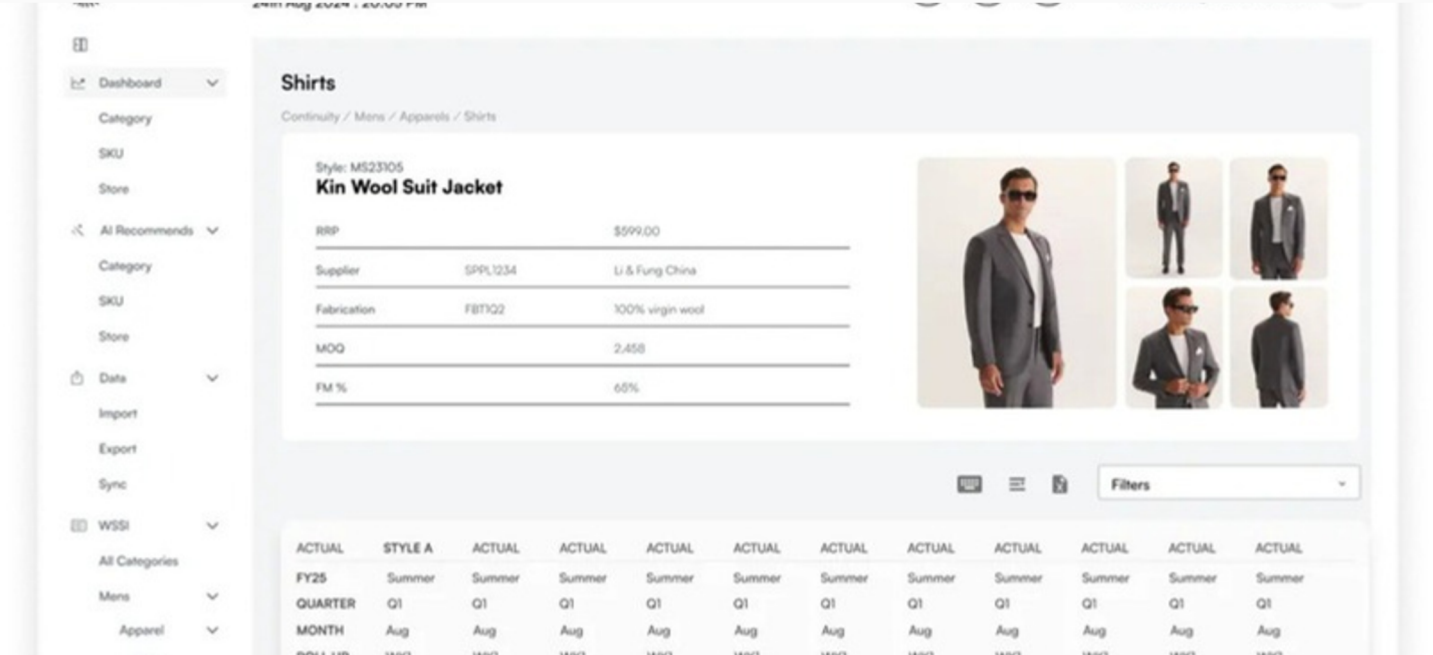


Margin increase

Designed for Modern Retail Complexity

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Merchmix is now scaling across the UK, Europe and the US, supporting retailers in fashion, pharmacy, home, wellness, FMCG and automotive. The platform is designed to complement, rather than replace, existing teams, allowing people to focus on strategy, creativity and supplier relationships while AI handles the speed and complexity of day-to-day inventory execution.



As volatility becomes the norm rather than the exception, platforms that can continuously sense, decide and act are moving from experimental to essential. Merchmix offers a practical example of how AI-led inventory operating models are already being deployed in the market today.

Conclusion

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Inventory as a Competitive Advantage

Inventory isn't an operational cost anymore - it's a competitive weapon.

Yet adoption lags the opportunity. Fewer than one in four retailers have successfully deployed AI or machine learning in the areas most exposed to inventory distortion, according to IHL Group research (September 2025). Performance also varies sharply by region. Asia-Pacific accounts for the largest share of global losses at \$642 billion (37%), but is showing a strong recovery trajectory with a 19.1% improvement. EMEA has delivered the fastest progress, improving 31.1% since 2020, while North America continues to struggle with \$415 billion in losses driven by theft, tariffs, and ongoing supply-chain pressure.

The Shift from Manual Decisions to Autonomous Retail

As volatility becomes the norm and customer expectations rise, the retailers that win will be those that sense demand shifts and act instantly. AI-powered, agentic inventory operating systems mark a fundamental shift in decision-making — from reactive to proactive, manual to autonomous. The impact is already measurable: [McKinsey](#) finds autonomous supply chain planning can drive up to 4% revenue growth, cut inventory by 20%, and reduce supply-chain costs by 10%. What was once a competitive edge is fast becoming an operational requirement.

Inventory Intelligence Is Becoming an Existential Issue for Retailers

“We’re witnessing a fundamental transformation in how successful retailers manage inventory,” said Greg Buzek, President of IHL Group. “The data shows a clear bifurcation: retailers deploying AI and machine learning are achieving 2.3× higher sales growth and 2.5× higher profit growth than competitors. It’s becoming an existential issue — evolve or get left behind. The future belongs to retailers who treat clean, integrated, real-time inventory visibility as table stakes. But visibility alone isn’t enough — success requires scenario planning and the organizational discipline to act. The next decade will deliver technology advances that rival the last 30 years of retail supply chain innovation.”

Retailers that embrace this shift will not only eliminate inventory distortion. They will unlock margin, resilience, and growth in a market where speed and precision are no longer optional.

About Merchmix



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Merchmix is an AI-powered Inventory Operating System that unifies planning, buying, merchandising, finance and store operations into a single source of truth. By transforming 200+ signals into real-time predictions and automated actions, Merchmix helps retailers reduce waste, increase sell-through and grow profitably.

Founded by former retail leaders with experience at Marks & Spencer, ASOS, Debenhams, Tesco, Kmart, Alshaya Group and Inditex, Merchmix operates globally from London, New York, Sydney and Melbourne.

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