Fixing Inventory Distortion

WHO'S WINNING WHO'S FAILING, & WHAT'S WORKING

IHL GROUP

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Executive Summary

While retail has always had issues with inventory accuracy, the last several years have proven to be the most challenging in the last 50 years. From COVID to distributed supply chains to massive theft and now to tariffs, it seems every step forward includes two steps back. The new reality serves as a siren call to keep moving forward, adapt as needed, and avoid becoming immobilized by challenges – whether they be unexpected demand surges or surplus stock filling up warehouses. Survive and advance.

IHL Group has been studying this topic of Inventory Distortion (out-of-stocks and overstocks) for nearly 20 years, and this study serves as the latest snapshot of the global inventory distortion problem. Worldwide, retail inventory distortion amounts to over $1.7 trillion annually – equivalent to South Korea's entire GDP.

The roots of this study go back to a 2007 Wharton Business School case study that shared for a single retailer, what the consumer experienced at the store was vastly different than what the system's data said. While the data said the retailer was in stock 92% of the time, the customer only left the store with the merchandise 75% of the time.

The drivers of inventory distortion are as diverse as they are complex. Supplier issues, personnel challenges, internal process failures, and theft collectively account for the vast majority of global losses. Data from 2025 indicates that supplier-related problems alone are responsible for over $300 billion in distortion, while personnel and internal process issues contribute nearly $500 billion combined. Theft – both internal and external – remains a stubbornly high cost, exceeding $500 billion worldwide. Additionally, the rise of external disruptions, such as economic shocks and global health crises, has exposed the vulnerability of even the most sophisticated supply chains.

In this study, we present the scale of the problem in terms of the out-of-stocks and overstocks on a worldwide basis. We will also provide granularity on a regional basis, including the region-specific reasons for these conditions. The study quantifies the scale of the problem, examines regional and segment-specific patterns, explores root causes, and offers actionable recommendations for retailers, suppliers, and technology partners. By illuminating the true cost and complexity of inventory distortion, this research report aims to equip industry stakeholders with the insights and strategies needed to drive meaningful, sustainable improvements in inventory management.

ALL TOLD, INVENTORY DISTORTION REPRESENTS MISSED OPPORTUNITIES THAT AMOUNT TO ***OVER $1.7 TRILLION ANNUALLY*** WORLDWIDE, AN AMOUNT THAT APPROXIMATES THE GDP OF SOUTH KOREA.

Key Findings

- **Staggering $1.73 trillion global cost** represents a fundamental breakdown in modern inventory management, despite widespread digital transformation investments across the retail industry.

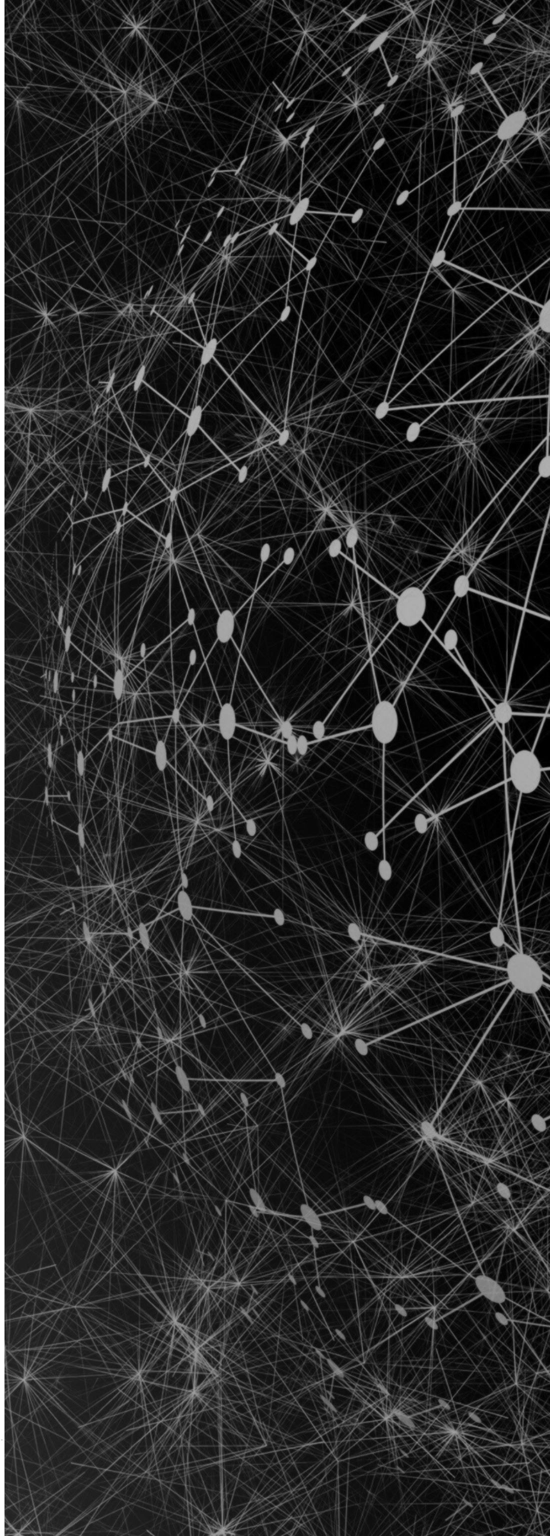
- **Digital transformation paradox persists** as retailers hemorrhage substantial capital on basic inventory management while possessing advanced technological capabilities, indicating critical implementation gaps between available solutions and operational execution.

- **There remain clear performance disparities across geographic regions and retail segments**, with EMEA achieving 31.1% improvement rates since 2020 while LATAM faces 7.9% distortion relative to retail sales despite implementing targeted optimization strategies. APAC leads absolute losses at $642 billion yet shows promising 19.1% improvement trajectory, while North America's $415 billion distortion reflects unique challenges from elevated theft rates, lockups, interest pressures, and tariff uncertainties affecting inventory decision-making processes are overwhelming the technology improvements.

- **Integrated solutions that demonstrate measurable impact** combine organizational discipline, human capital development, and advanced planning platforms that process real-time data across entire value chains, with successful implementations achieving 95%+ inventory accuracy through comprehensive technology integration.

- **Worldwide inventory distortion currently amounts to 6.5% of retail sales**, which, while showing a trend of improvement, illustrates that there is more work to do.

Analysis reveals inventory distortion extends beyond traditional stockout scenarios to encompass customer experience failures, operational inefficiencies, and systemic supply chain vulnerabilities. The crisis creates both significant operational challenges and competitive differentiation opportunities for retailers implementing evidence-based optimization strategies.



Anatomy of a **$1.73 Trillion Problem**

KEY POINTS:

- **The Global Economic Impact is Staggering**
- **Regional Variations Shape the Landscape**
- **Segment Vulnerabilities Intensify the Issue**
- **Operational, Financial and Customer Consequences are Wide-Ranging**

FIRST, SOME DEFINITIONS

Inventory distortion is the sum of the cost of out-of-Stocks and overstocks. For purposes of this study, we do not use the output of a retailer's inventory systems as the basis for what out-of-stocks or overstocks are. Rather, we look at both from the customer's perspective and therefore adhere to the following definitions.

Overstocks

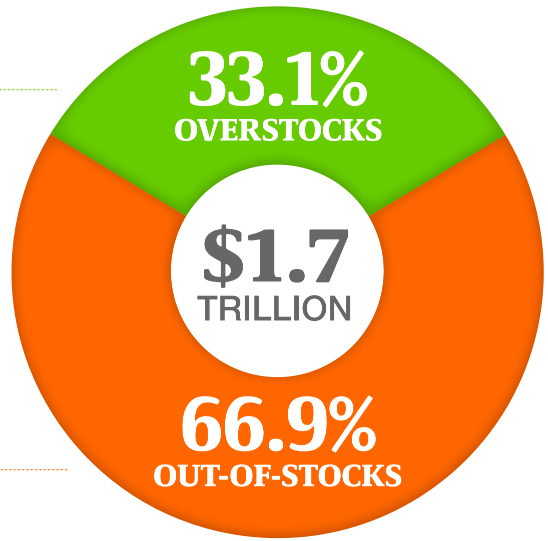
We view an overstock as any time a customer encounters a discount above 25%. Reasons may include:

- Buying/planning reasons
- Spoilage
- Vendor reasons
- Training/employee reasons
- Marketing/promotion not aligned with merchandise
- Competitive price match

Out-of-Stocks

We view an out-of-stock as any time when a customer comes ready to buy but leaves without purchasing for any reason other than price. Reasons may include:

- The customer encountered an empty shelf
- The customer could not find help (and items may be locked up)
- The customer found help, but the staff could not locate the item
- The price/offer did not match the advertised promotion



INVENTORY DISTORTION WORLDWIDE
Source: IHL Group

OUT-OF-STOCK REASONS ($1.2 TRILLION)

Empty Shelves ($690.9 billion)
This represents foundational inventory replenishment failures, indicating systematic gaps in demand sensing (including a short planning horizon), supplier coordination, and logistics execution or shrink across retail operations.

Customer Service Inadequacies ($165.6 billion)
This encompasses scenarios where customers cannot locate assistance, highlighting staff training deficiencies and organizational resource allocation failures that compound inventory accessibility issues.

Product Location Difficulties ($145.2 billion)
These captures losses when store associates fail to locate inventory that the system claims to be on hand. The item desired may be sitting in a dressing room, placed on the wrong rack or shelf, or in a locked case. The fact that the system claims the item is available doesn't address the foundational problem; items in inventory cannot be purchased by customers already in the store, and customer experience suffers.

Price/Offer Mismatches ($77.4 billion)
Promotional coordination failures between marketing initiatives and inventory availability suggest inadequate integration between marketing, merchandising and operational systems, particularly when there is a hiccup in the supply chain.

OUT-OF-STOCK REASONS WORLDWIDE ($ BILLIONS)
Source: IHL Group

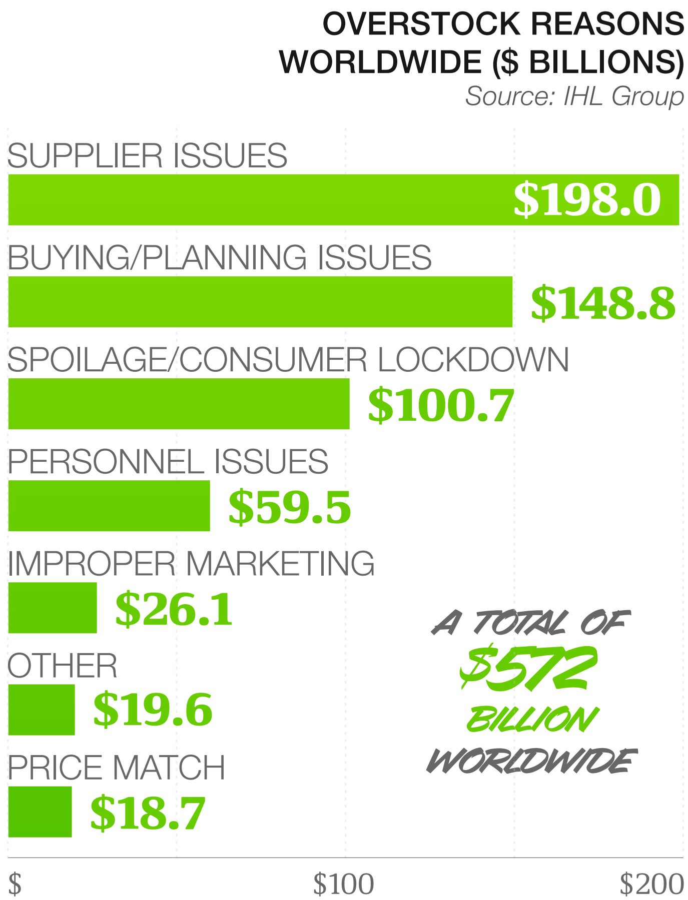
OVERSTOCK REASONS ($572 BILLION)

Supplier Issues ($198.0b)
These dominate overstock causes, and they indicate systematic breakdowns in vendor relationship management, delivery scheduling, and collaborative planning processes across supply chains.

Buying/Planning Issues ($148.8b)
This includes forecasting errors, seasonal miscalculations, and demand signal interpretation failures that result in excess inventory accumulation across retail categories.

Spoilage ($100.7)
This mainly impacts food and perishable categories, but it can also apply to batteries, OTC medications, cosmetics or any item that has an expiration date attached. These issues represent inventory turnover optimization challenges and first-in-first-out execution failures.

Personnel-Related Issues ($59.5b)
This category captures human capital inefficiencies independent of theft, including training gaps, process adherence failures, and organizational communication breakdowns.



FUNCTIONAL IMPACT

Store Operations ($742.5b)
Store-level distortion represents the largest single operational category, encompassing point-of-sale execution failures, customer service inadequacies, inventory visibility gaps, and theft-related losses. This concentration indicates critical need for enhanced front-line operational excellence and staff capability development.

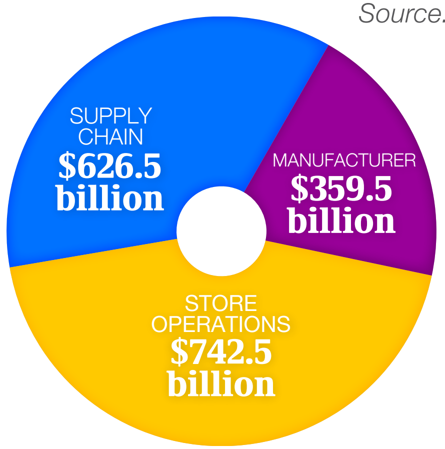
Supply Chain ($626.5b)
Supply chain inefficiencies encompass transportation delays, warehouse management failures, supplier coordination breakdowns, and logistics optimization inadequacies. These losses indicate systematic coordination failures across multi-tier supply networks requiring enhanced visibility and collaborative planning capabilities.

Manufacturer ($359.5b)
Manufacturing-related distortion includes production scheduling misalignments, quality control failures, packaging inadequacies, and product specification errors that cascade through retail channels. These upstream inefficiencies demonstrate the interconnected nature of inventory distortion across entire value chains.

The most important fact is that progress as a portion of retail sales continues to improve, down to 6.5% in 2025. But headwinds due to inflation, rise of theft, tariff uncertainties and a struggling private economy in the largest countries create a significant drag that amounts to 1-2% of retail sales.

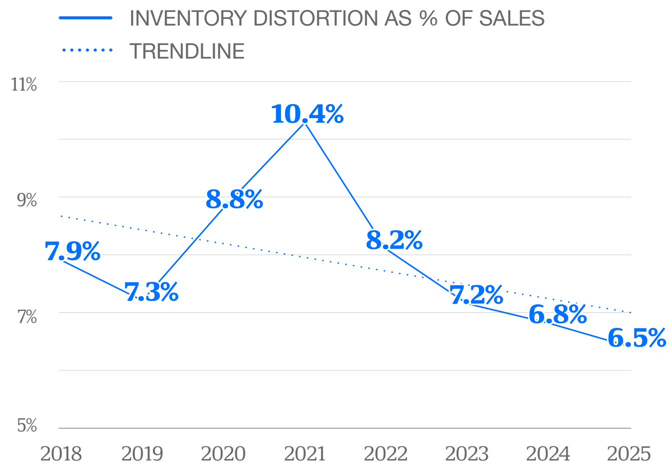
INVENTORY DISTORTION SOURCE WORLDWIDE IN $ BILLIONS

Source: IHL Group



INVENTORY DISTORTION AS % OF RETAIL SALES

Source: IHL Group



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Regional Winners & Losers: A Tale of Four Markets

KEY POINTS:

- **APAC Leads Global Distortion**
- **EMEA Faces Theft and Supplier Vulnerability**
- **Principal Challenge for North America is Process Inefficiency**
- **LATAM's Impact is Concentrated in Essential Segments**

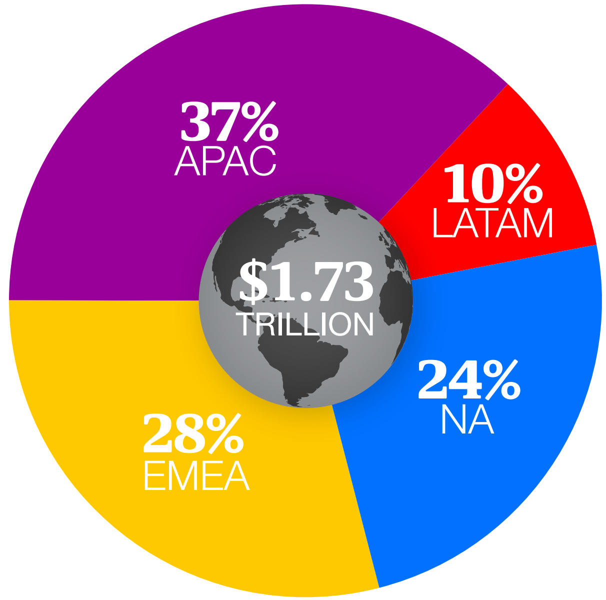
REGIONS DEFINED

- **North America (NA)** Consists of the United States and Canada
- **Europe, Middle East & Africa (EMEA)** Fairly self-explanatory, consists of all of Europe, Russia, the Middle East (to the eastern border of Iran), the continent of Africa as well as Greenland and Iceland.
- **Asia-Pacific (APAC)** Consists of everything between Iran and the Pacific Ocean west of Hawaii (excluding Russia).
- **Latin America (LATAM)** Consists of the Caribbean, Central and South America.

These four geographical regions all have distinct operational characteristics, improvement trajectories, and market-specific challenges.

INVENTORY DISTORTION SHARE BY REGION

Source: IHL Group



ASIA-PACIFIC (APAC)

The APAC retail industry is marked by rapid digital innovation, expanding e-commerce, and a large rising middle class, yet remains deeply diverse – with sophisticated, tech-enabled chains coexisting alongside traditional markets using minimal technology. While leading the world in absolute inventory losses – $438 billion lost to out-of-stocks and $204 billion from overstocks, totaling 7.1% of regional sales – the region also demonstrates the world's slowest improvement, with only a 19.1% reduction in inventory distortion since 2020. This reflects swift urban market growth (in terms of store footprint) and a lesser emphasis on store operations and supply chain modernization. While advanced markets like Japan, Korea, and urban China excel in analytics-driven planning, emerging APAC markets still face infrastructure hurdles that hurt otherwise strong progress.

NORTH AMERICA

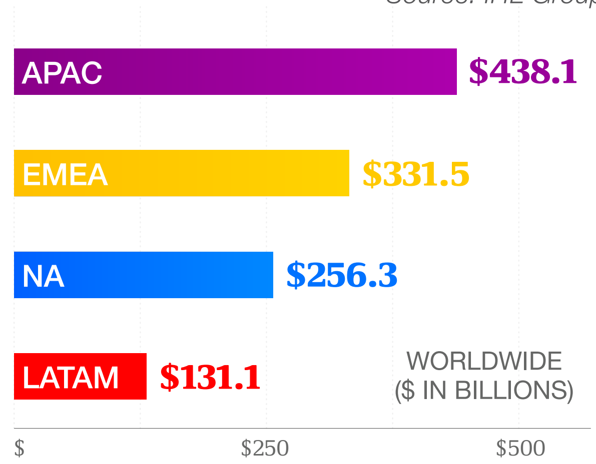
North America recorded over $256 billion in out-of-stock and $159 billion in overstock losses – over 5.7% of retail sales – while improving inventory performance by 24.2% since 2020. The region faces several ongoing challenges: the world's highest theft-driven losses, interest rate pressures impacting inventory financing, and tariff uncertainties disrupting planning. Retailers must navigate complex decision-making with enhanced forecasting and risk management while contending with legacy technology and the costs of upgrading systems. Organized retail crime has grown more sophisticated, prompting major investment in security, though often at the expense of customer convenience. Despite these hurdles, North America continues to make solid gains in inventory excellence. Performance would be considerably higher if it didn't seem like a perpetual game of whack-a-mole with these issues. Just as one gets solved, another pops up.

EUROPE, MIDDLE EAST, AND AFRICA (EMEA)

EMEA recorded nearly $332 billion in out-of-stock and $159 billion in overstock losses – over 6.2% of retail sales – yet leads the world in improvement, reducing inventory distortion by 31.1% since 2020. This progress reflects the region's rapid adoption of advanced inventory management technology, coordinated supplier practices, and process optimization. Out-of-stock losses, though significant, have comparatively less impact relative to market size, indicating effective demand and replenishment systems. However, EMEA now confronts rising theft and organized retail crime, mirroring North American trends. Retailers are responding with robust loss prevention analytics and security steps, ensuring ongoing improvement while protecting customer experience.

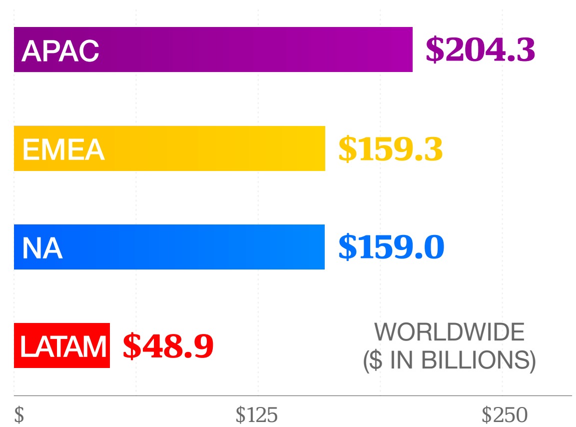
COST OF OUT-OF-STOCKS BY REGION

Source: IHL Group



COST OF OVERSTOCKS BY REGION

Source: IHL Group

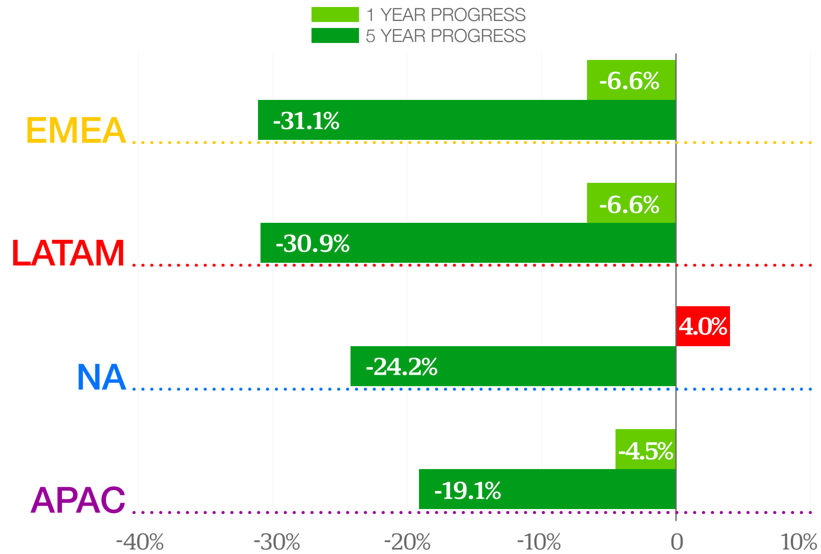


LATIN AMERICA (LATAM)

LATAM experiences the highest relative inventory distortion worldwide at 7.9% of retail sales, despite lower absolute losses ($131 billion in out-of-stocks, $49 billion in overstocks). This high percentage reflects infrastructure and operational challenges, including limited transportation networks, supplier consolidation obstacles, and technology adoption barriers. Nonetheless, LATAM has achieved an impressive 30.9% reduction in inventory distortion, driven by targeted optimization strategies tailored to local conditions. Retailers in the region innovate with demand forecasting, adaptable inventory placement, and enhanced supplier collaboration, developing resourceful, market-specific solutions that overcome infrastructure constraints and demonstrate significant progress in inventory management effectiveness.

INVENTORY DISTORTION IMPROVEMENT

Source: IHL Group



Segment Deep Dive: Why One Size Never Fits All

KEY POINTS:

- **Specialty Hardgoods retailers face the highest distortion**
- **Food/Grocery retailers run a close second**
- **Hypermarkets / Mass Merchants suffer most from Overstocks**
- **Hospitality segments suffer from volatility and perishability**

NO TWO INVENTORY CHALLENGES ARE ALIKE

In the realm of retail, no two companies are exactly alike – and neither are the segments in which they operate. Each retailer brings a unique combination of business models, customer expectations, store footprints, pricing strategies, and operational capabilities. Even within the same retail segment, what works for one retailer may not work for another. These differences shape everything from supply chain demands to merchandising tactics.

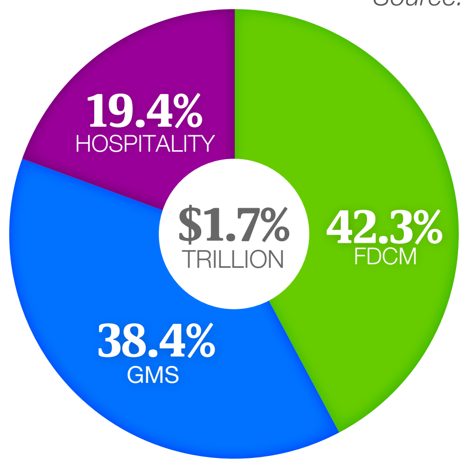
FDMC MARGIN PRESSURES AMPLIFY THEFT IMPACT

The FDCM super segment consists of Food/Grocery, Drug Stores, Mass Merchant/Warehouse Clubs and Convenience Stores. These were the "essential" retailers during the pandemic. Food and grocery retail demonstrates exceptional improvement performance while confronting unique operational challenges that differentiate inventory management requirements from other retail segments. The sector's 43.5% improvement rate represents the strongest performance across all analyzed segments, indicating successful implementation of targeted optimization strategies adapted to perishable product characteristics and rapid turnover requirements.

For Supermarkets, given their lowest-in-the-industry margins, every $100.00 loss, regardless of cause, requires another $7,500 in sales to cover the loss.

SEGMENT SHARE OF INVENTORY DISTORTION WORLDWIDE

Source: IHL Group



The Drug Store segment includes not just drug stores but also other health and beauty retailers. Their inventory distortion performance is one of the best, but the single biggest problem they face is empty shelves. Poor integration with suppliers and difficulties related to coordinating marketing promotions and inventory status are the main culprits here.

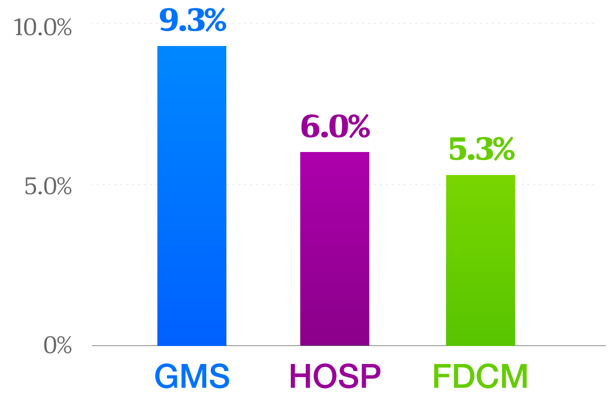
The sector faces persistent pharmaceutical supply chain disruptions that create inventory availability challenges across health and wellness categories. These disruptions require enhanced supplier diversification strategies, alternative sourcing capabilities, and flexible inventory positioning to maintain product availability during supply constraints.

Hypermarkets/Mass Merchants, with their large-format stores and networks, struggle to align vast, diverse inventories with volatile consumer demand, resulting in both excessive surplus and frequent product stockouts. Top drivers include vendor misalignment, suboptimal planning, and execution gaps at the store level.

Convenience stores have the highest inventory turns of any retail segment, which makes accurate forecasting and frequent replenishment critical. Overstocking results from conservative ordering and unpredictable consumer patterns, leading to waste and markdowns. Conversely, frequent out-of-stocks – driven by small format limitations and distribution lags – cause lost sales, especially for high-turnover items.

INVENTORY DISTORTION AS % OF RETAIL SALES 2025 WORLDWIDE BY SUPER SEGMENT

Source: IHL Group



Low-margin operational environments create disproportionate theft impact. This reality drives comprehensive loss prevention investments and sophisticated inventory protection strategies that balance security measures with customer accessibility requirements.

Perishable product management along with seasonal demand variations, promotional impact assessments, and shelf-life optimization requirements are all specific challenges for these retailers. Successful retailers implement advanced replenishment algorithms that balance inventory freshness with availability commitments while minimizing spoilage-related losses.

GENERAL MERCHANDISE AND SOFTGOODS: FASHION'S FORECASTING NIGHTMARE

General merchandise and softgoods face a perfect storm of operational challenges that make inventory optimization exceptionally difficult. The sector's 9.3% distortion rate – highest among all retail segments – combined with only 14.6% improvement since 2020 reflects fundamental forecasting complexities that traditional approaches cannot address.

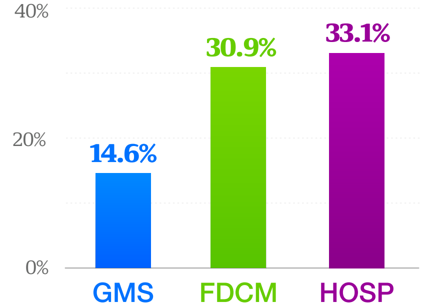
Specialty Softgoods retailers have the highest rates of Out-of-Stocks and Overstocks of any retail segment; hence, they have the highest inventory distortion as a percentage of retail sales at 11.9%. More than others, these retailers must deal with multiple SKU variants due to colors and sizes. They are also the most susceptible to changing fashion winds, so planning and supplier issues are the biggest drivers.

Specialty hardgoods retailers face the highest overall inventory distortion costs of all retailers. These stores manage vast assortments of durable goods with long lead times and great demand unpredictability, making accurate forecasting and inventory control exceptionally challenging. They face the highest level of just about every blame category for both out-of-stocks and overstocks. Personnel issues are especially poignant.

Department Stores have struggled the past decade with store closures, lack of remodels, and serious competition from those within and outside of their segment. These retailers actually have the lowest dollar value of inventory distortion of all

INVENTORY DISTORTION IMPROVEMENT SINCE 2020

Source: IHL Group



retailers, but the second-highest level of inventory distortion as a percentage of retail sales at 10.1%. Legacy systems and supplier issues abound, and some of these retailers simply have not yet recovered from COVID lockdowns and continue to downsize.

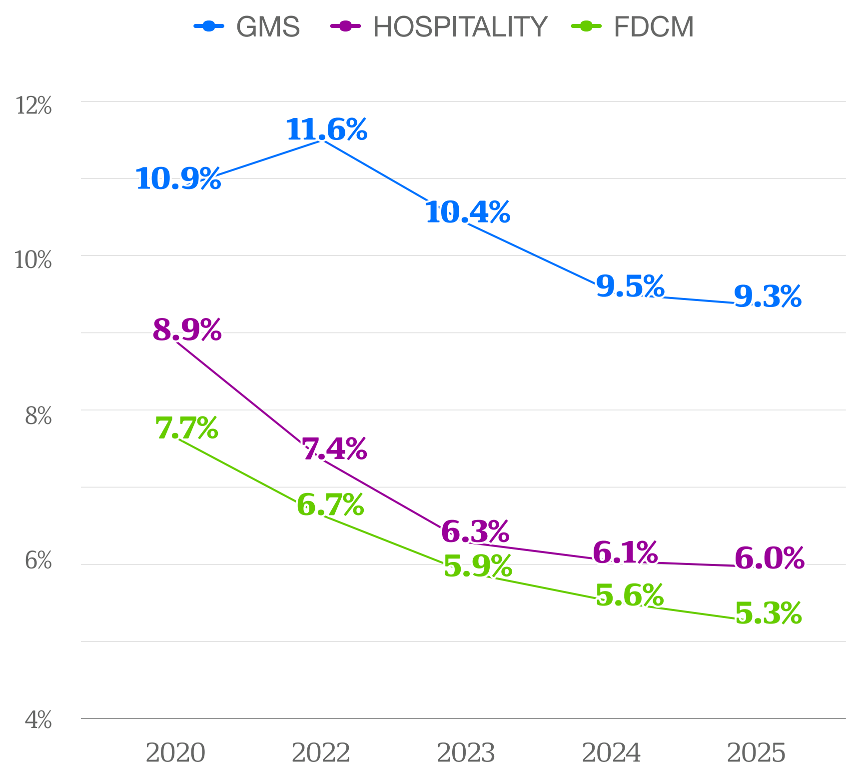
Fashion retail's inherent unpredictability, driven by volatile style preferences and extended planning horizons, creates amplified prediction errors. North American retailers face additional tariff pressures of 15-54% on clothing and 10-40% on electronics, forcing complex decisions around cost optimization versus supplier diversification. Electronics categories compound these challenges with rapid technology lifecycles and obsolescence risks, requiring sophisticated balancing of availability commitments against inventory devaluation. These interconnected challenges – extended lead times, seasonal volatility, and economic uncertainty – create persistent operational difficulties requiring sector-specific intervention strategies rather than generic optimization approaches.

RESTAURANTS AND HOSPITALITY PERFORMING FAIRLY WELL IN A DIFFICULT ENVIRONMENT

Restaurants and hospitality providers face significant challenges from inventory distortion on the best of days. Poor demand forecasting, manual inventory tracking, and inadequate staff training increase the risk of food spoilage, waste, or unexpected shortages. Seasonal fluctuations and menu changes make demand harder to predict, which leads to out-of-stocks (which cause poor customer experience) or overstocks (which lead to deep discounts or discarding surplus inventory). Manual and time-consuming stock processes elevate human error, causing inaccurate records. Additionally, shifting customer preferences and unpredictable supply chain disruptions further complicate inventory planning. In hotels, managing textile goods and consumables adds complexity due to fluctuating occupancy and guest needs. Altogether, inventory distortion erodes profit margins, drives up operational costs, and can hurt customer satisfaction if popular items are not available or quality declines due to mismanaged supplies.

INVENTORY DISTORTION HISTORY - % OF RETAIL SALES BY SEGMENT

Source: IHL Group



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Supply Chain Disruption: Adding to Perpetual Volatility

KEY POINTS:

- **Marked Reduction in Spoilage Losses**
- **Supplier, Theft and Personnel Issues Remain Persistent**
- **Technology is Driving Measurable Improvements**
- **Sustainability and Regulatory Pressures are Growing**

Contemporary supply chain disruption represents the largest single contributor to global inventory distortion, accounting for $301 billion in annual losses through coordination failures, delivery disruptions, and capacity constraints.

GEOGRAPHIC ISSUES

Geographic chokepoints create cascading effects across retail networks. The two current most-impactful chokepoints are the Suez and Panama canals.

- **Suez Canal and Strait of Hormuz Disruptions –** Ongoing problems in the Suez Canal are causing long shipping delays – sometimes for several weeks – for retailers in Europe and North America. Because inventory arrives late, it often misses the right season, making it hard to run promotions as planned.

- **Panama Canal Constraints –** Low water levels in early 2025 and limits on how many ships can pass through the Panama Canal are affecting shipping from Asia to North America, especially to the West Coast. This means fewer containers get through, causing delays throughout supply chains. As a result, companies need to keep extra stock in storage and look for different shipping routes.

TARIFF ISSUES

Tariff implementation compounds these challenges, with 58% of retailers identifying supply chain disruptions as significant operational challenges directly attributable to trade policy uncertainty. Nearly half (49%) implemented accelerated purchasing strategies, extending average advance purchasing timelines by three months – representing an entire seasonal planning cycle. This forward inventory positioning creates working capital pressures while generating oversupply risks if consumer demand fails to materialize at anticipated levels.

PERSONNEL ISSUES

Human capital challenges further exacerbate disruption impacts, contributing $248 billion globally in personnel-related inventory distortion. Labor shortages create operational bottlenecks across warehouse, transportation, and inventory handling functions. Evolving capability requirements meet persistent wage pressure environments. Personnel development priorities include cross-training initiatives enhancing operational flexibility during disruption periods.

PERSONNEL ISSUES IMPACT INVENTORY DISTORTION TO THE TUNE OF

$248 BILLION

(OR THE ANNUAL REVENUE OF COSTCO)

Source: IHL Group

HOW RETAILERS ARE DEALING WITH THESE ISSUES

Companies are fighting back against supply chain problems in two main ways: better technology and stronger partnerships with suppliers.

New computer systems help companies spot problems before they get worse and coordinate their response across the supply chain. These systems also use past data to predict when disruptions might happen again, so companies can prepare ahead of time. Meanwhile, companies are creating partnerships where they share both the risks and rewards with their suppliers, which encourages everyone to communicate openly when problems arise.

The biggest change is how companies think about disruptions. Instead of treating supply chain problems as rare emergencies, smart companies now plan for them as part of normal business. This new approach means companies need to get better at planning for different scenarios, keep their inventory strategies flexible, and build operations that can adapt quickly.

Companies are also spreading their risk around more. Instead of relying on just one supplier, one shipping method, or one region for their products, they're diversifying across multiple options. This way, if one supplier has problems or one shipping route gets blocked, they have backup plans ready to go. The goal is to avoid putting all their eggs in one basket while still keeping costs reasonable.

The Technology Paradox: More Data, Same Problems?

KEY POINTS:

- **AI and Automation are Essential Enablers**
- **Integrated, Data-Driven Processes Reduce Distortion**
- **Supplier Collaboration and Talent Investment are Imperative**
- **Focus on Shrinkage, Resilience, & Performance Monitoring**

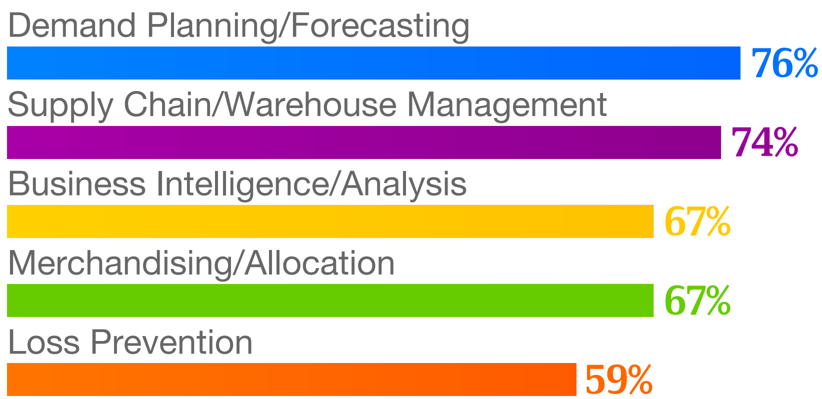
One may find it puzzling that retailers are spending more money on technology than ever before, but they're still struggling with many of the same inventory problems. Those retailers might have access to massive amounts of data as well as powerful computing tools with which to analyze that data, but they continue to make costly mistakes with inventory management. The real issue here is a combination of disconnected decision-making and a failure to recognize the difference between data and ground truth. Platforms that connect merchandising, supply chain and financial planning can help translate the insights gained into coordinated actions. Despite more data, it is often disconnected from decision making due to siloes. Those that have an integrated view of supply chain, merchandising, and financial planning can translate insight into coordinated action.

ARTIFICIAL INTELLIGENCE ADOPTION

Retailers are rapidly adopting AI to optimize inventory, using predictive analytics and real-time tracking to address the costly issues of out-of-stocks and overstocks. AI-driven systems forecast demand more accurately, automate replenishment, and dynamically adjust stock, resulting in fewer empty shelves, reduced excess inventory, and improved customer satisfaction. Currently, less than one-fourth of retailers have rolled out AI/ML in the areas most impacted by inventory distortion, and few of them have actually optimized it. This is leading to AI "Haves" and "Have-nots" that are separating performance of customers in a segment.

RETAILERS USING **AI/ML**
EXPECT **PROFIT GROWTH**
50% HIGHER
THAN THOSE NOT USING.
Source: IHL Group

**POSITIVE RESULTS BY APPLICATION
FOR RETAILERS THAT ROLLOUT OUT AI/ML**
Source: IHL Group



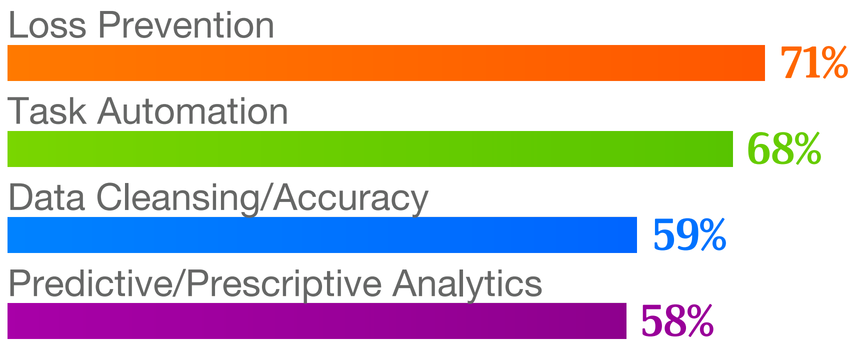
Established artificial intelligence and machine learning implementations demonstrate superior performance across core operational functions:

The results for Demand Planning/Forecasting and Supply Chain/Warehouse Management both indicate mature algorithmic capabilities and successful integration with existing planning processes. This is especially important for the supply chain part, since successful implementation involves so many moving parts, such as logistics optimization, transportation coordination, and supplier collaboration. Taking it a step further, when AI/ML is paired with cross-functional planning environments, forecast accuracy is not only enhanced, but it also translates directly into supply chain and merchandising readiness.

Business Intelligence/Analytics and Merchandising and Allocation are the next tier down in terms of success to date. Included in these packages are product positioning, assortment optimization, and inventory distribution strategies, all enhanced through analytical capabilities. Loss Prevention at 59% is the least successful of the apps to date, which helps explain part of the problem retailers are having with theft. Among the various barriers to success for these retailers are data quality deficiencies, policy inconsistencies and market uncertainty. In general, IHL has seen retailers that are deploying AI/ML solutions in these areas are achieving sales growth 2.3x and profit growth 2.5x that of competitors.

POSITIVE RESULTS BY APPLICATION FOR RETAILERS THAT ROLLOUT OUT GenAI

Source: IHL Group



Legacy systems make it hard for modern inventory management tools to work well. These older systems can't easily connect with newer ones, don't process data in real time, and don't meet today's standards for good data, which are needed for advanced analysis. Enterprise resource planning (ERP) systems built for past business needs aren't good enough for what modern retail requires, like making instant decisions, tracking inventory across different sales channels, and using data to predict customer needs.

Using individual pieces of technology on their own doesn't lead to big improvements because the data gets stuck in separate areas, it's hard to connect everything, and the workflows don't come together smoothly. Retailers that succeed tend to use integrated, scenario-ready platforms that support real-time inventory, demand, and financial visibility across both short and long planning horizons. These platforms can bring together many technologies and can allow for full data sharing, better teamwork across departments, and ongoing improvements in performance. This shared planning approach helps prevent inventory distortion in both the planning and execution phases, and is more effective and easier to manage than using separate solutions for each problem.

IMPLEMENTATION ISSUES

Three things that are essential for successful AI deployment in a retail inventory distortion setting are Foundational Data Requirements and Change Management.

Foundational Data Requirements – Successful technology implementation requires comprehensive data quality enhancement, standardization protocols, and integration capabilities that enable accurate analytical processing. Retailers attempting to deploy AI without foundational data improvements experience systematic failure regardless of how sophisticated their algorithms are. Clean, integrated, real-time inventory data visibility represents fundamental prerequisites for technological effectiveness rather than optional enhancements. Retailers achieving superior performance demonstrate systematic data management capabilities that support advanced analytical applications. Further, the ability to integrate external data sets and demand signals (sentiment, weather, etc.) can improve forecast accuracy by up to 50%.

Change Management – Successfully using new technology depends on how well a retailer can adapt, manage change, and shift its culture away from static planning cycles to more continuous scenario-driven planning. Just having the right technical tools isn't enough – one also needs to train the employees, improve the processes, and strengthen performance management. Teams in different departments must work together, make decisions together, and use shared goals and planning so that technology really leads to lasting improvements.

Rooted in Ground Truth – The most disruptive component in all of this is shrink at the store level, warehouse and supply chain. Organized Retail Crime Gangs are intercepting entire trucks or containers on trains. The systems are only as good as the data fed into them. Laws and processes at the front-line level must be in sync with the system truth to get full benefits.

What's Actually Working: Key Solutions That Win

KEY POINTS:

- **Clean, Integrate, Real-Time Data is Essential**
- **Technology Integration Drives Major Performance Gains**
- **Automation and Collaboration Optimize Outcomes**
- **Unified Platforms and Proactive Performance Management are Critical**

The bottom line for any retailer wanting to have a good handle on their inventory distortion is to view clean, integrated, real-time inventory distortion data visibility as table stakes. Without this view, a retailer can count on floundering. That said, simply having visibility is not enough. Knowing what to do with the visibility one has is the next step, and that is where scenario planning capabilities for merchandising and supply chain activities come into play.

8,143% INCREASE

IN RETAILER ADOPTION OF COMPUTER VISION BY 2027

Source: IHL Group

TECHNOLOGY INTEGRATION SUCCESS METRICS

RFID and Computer Vision have repeatedly demonstrated in our research to show dramatic improvements in data accuracy. Sales winners were shown to have already been using RFID at a rate 16x higher than Laggards in their segments, the highest differential we have ever seen in our data since managers were freed from the back office with mobile devices:

- **RFID** – Retailers expect a 291% growth in deployment over the next two years, indicating substantial market confidence in RFID capabilities for inventory accuracy enhancement and real-time visibility optimization.
- **Computer Vision/Image Recognition** – Retailers claim an increase in adoption of 8,143% over the next two years. This unprecedented growth demonstrates market recognition of visual analytics capabilities for inventory monitoring, shelf plan compliance, theft prevention, and operational optimization applications. The key benefits here are on shelf availability and planogram compliance.

Performance Achievement Benchmarks – Companies that focus on systematically improving their workflows see a reduction in inventory errors of over 25% through operational excellence initiatives, showing that disciplined process management can make a significant difference in performance.

DATA FOUNDATION AND INFRASTRUCTURE REQUIREMENTS

Real-Time Visibility Implementation – Most successful retailers manage their data thoroughly, using standardization protocols, quality assurance processes, and integration frameworks that support advanced analytics. Top-performing companies focus their investments on unified data platforms rather than scattered point solutions. This approach gives them a complete view across stores, distribution centers, and supplier networks, all thanks to well-integrated technology architectures.

Predictive Intelligence Evolution – The most advanced retailers are moving beyond simply analyzing past trends and are now using predictive intelligence to improve demand forecasting allowing companies to balance speed with control. By combining their own operational data with external market factors, seasonal trends, and consumer behavior signals, they achieve greater accuracy in anticipating demand. When machine learning algorithms are tailored for retail and used within well-developed data frameworks, they perform better, producing more reliable and insightful results because the quality of their training and analysis is ensured.

85% INCREASE IN RETAILER USE OF A SINGLE DATA LAKE OVER THE NEXT 2 YEARS.

Source: IHL Group

CHANGING SUPPLY PATTERNS

Exception Management Frameworks – Successful retailers use automated exception management systems that allow machines to handle routine replenishment decisions, while still keeping human oversight in place for strategic choices and more complex situations. The most effective approaches strike a balance between automation and human expertise by setting clear decision-making guidelines that outline when machines can act on their own and when people need to step in.

Collaborative Planning Enhancement – When vendors and retailers establish partnerships that include sharing both risks and rewards, they create incentives for closer collaboration, greater transparency, and better planning and coordination – especially during operational difficulties or volatile market conditions. The most successful partnerships also involve jointly managing forecasting responsibilities, aligning planning timeframes, and developing shared ways to measure performance. This integrated approach leads to more effective coordination across the entire supply chain.

END-TO-END PLATFORM INTEGRATION

Comprehensive Solution Architecture – End-to-end planning platforms that connect demand signals with supply capabilities in real time offer much better insights and performance than using scattered, standalone solutions. By integrating cross-departmental functions such as merchandising, IT, and operations, these unified platforms support collaborative decision-making and break down the traditional silos that often cause coordination problems and get in the way of effective optimization.

OF RETAILERS CLAIM AVAILABILITY OF REAL-TIME INVENTORY DATA IS A TOP CHALLENGE

Source: IHL Group

Financial Planning Optimization – Successful merchandise financial planning adapts its processes to address the unique challenges of different product segments, seasonal trends, and specific market characteristics, while still maintaining unified goals for measuring and optimizing performance. Leading retailers use continuous planning frameworks that strike a balance between meeting immediate operational needs and achieving long-term strategic business objectives, relying on integrated performance management and optimization capabilities to support this approach. Aligning the strategic objectives and short-term trading decisions are key to avoiding inventory distortion.

PERFORMANCE MANAGEMENT & MEASUREMENT

Leading Indicator Tracking – Performance management systems that track leading indicators allow companies to intervene proactively rather than just react to problems after they occur, giving them a lasting competitive advantage through forward-looking operational improvements. When key performance indicators are designed to encourage desired behaviors instead of simply reporting on past results, they help align the organization and build ongoing momentum for continuous improvement, both of which are crucial for achieving and maintaining excellence. When these forward-looking indicators are tracked inside the planning model retailers are able to make rolling plan adjustments rather than reactive course correction.

25% OF RETAILERS CLAIM LACK OF SYSTEM INTEGRATION AS A TOP CHALLENGE

Source: IHL Group

STRATEGIC IMPLEMENTATION SUCCESS FACTORS

Systematic excellence requires integrated approaches combining technological sophistication, operational discipline, and organizational capability development. Successful implementations demonstrate balanced strategies that optimize multiple performance dimensions simultaneously while maintaining sustainable improvement trajectories and competitive differentiation advantages.

7

The Future of Inventory Management

KEY POINTS:

- **Real-Time, Integrated Inventory Visibility is Foundational**
- **AI/ML (and soon GenAI) Drive Forecasting and Operational Improvements**
- **Unified Commerce and Blockchain Create Transparency**
- **Strategic Technological Investment To Build A Sustainable Competitive Advantage**

The future of inventory management is not just about mitigating the inventory distortion problem to a manageable level...it's about migrating from there to a position of competitive advantage through the use of AI, automation and better data.

CORE RESEARCH PARAMETERS: NEXT-GENERATION CAPABILITIES

Real-Time Inventory Visibility Infrastructure – Integrating technologies like cloud-based systems, RFID, and smart shelves enables businesses to track products comprehensively across all areas of their operations and throughout the supply chain. With these integrated systems in place, companies gain real-time visibility into inventory – from store operations and distribution centers to transportation networks and supplier facilities – allowing for immediate assessment of inventory status and quick, informed decision-making. These advanced tracking capabilities significantly reduce inventory errors by providing more accurate data, improving the ability to sense and respond to demand, and streamlining replenishment processes across multiple retail channels.

OF RETAILERS ARE GETTING POSITIVE RESULTS WHEN DEPLOYING AI/ML FOR DEMAND PLANNING & FORECASTING

Source: IHL Group

KEY PERFORMANCE INDICATORS: AI-DRIVEN FORECASTING EXCELLENCE

Operational Control Enhancement – AI/ML and GenAI deployment enables automated reorder point optimization, inventory allocation enhancement, and demand prediction accuracy through sophisticated algorithmic processing of internal operational data and external market variables.

Planning Horizon Extension Benefits – If a retailer is able to extend the planning horizon, the following are the benefits they can expect to experience:

- Operational Control and Flexibility
- Demand Forecasting Accuracy
- Supply Chain Disruption Mitigation
- Inventory Distortion Minimization
- Cash Flow and Profitability Improvement

Unified Commerce Integration Framework – Getting away from data silos helps retailers to experience:

- Inventory Synchronization – Full System View
- Cross-Channel Optimization Evidence-Based Guidance: Autonomous Supply Chain Vision

Technology Investment and Implementation Strategy – the end goal is to achieve a truly autonomous supply chain, capable of self-adapting and making real-time decisions with minimal human intervention, relies heavily on strategic technology investment and careful implementation. This will be the Holy Grail for retailers, leveraging advanced technologies to improve decision making confidence.

One thing is clear, this next decade will see technology advancements that rival 30 years or more of innovation previously in how the retail supply chain operates. That means the systems of today will seem like pre-internet level systems in the next decade compared to the advancements coming. Staying static and not radically improving processes and systems is simply not an option for retailers. Those retailers who attack this issue of inventory distortion as if it is an existential threat to their survival will not only survive but thrive while competitors languish in outdated systems and processes as the world passes them by.

ABOUT BOARD

Board is the Enterprise Planning Platform built to accelerate business performance, enable continuous planning, and drive confident, aligned decisions. It powers more accurate forecasts with real-time visibility into enterprise and external data. It unifies finance and operations with a single source of the truth. And with AI-augmented experiences for every role, teams can continuously make smarter decisions for predictable, profitable business outcomes. That's why visionary global brands including H&M, BASF, Burberry, Toyota, Coca-Cola, HSBC, and thousands more trust Board to navigate complex markets with confidence. For more information, visit www.board.com.