

GUIDEBOOK









Industry Introduction

Current Challenges in the Retail Industry

Retail is undergoing a profound transformation as consumer expectations rise and economic pressures intensify. Shoppers now demand seamless, personalized, and ethical experiences across digital and physical channels, while retailers must navigate increasingly complex operations, shrinking margins, and fragmented systems. In this environment, delivering consistent value, speed, and convenience is no longer optional.

Three critical challenges are shaping the retail landscape:

Growing Operational Complexity and Experience Expectations

Consumers expect fast, frictionless experiences—whether browsing online, buying in-store, or returning an item across channels. However, meeting these expectations requires more than surface-level integration. Retailers must coordinate inventory, customer data, and fulfillment processes in real time while ensuring trust and transparency. For example, 67% of consumers reported delivery issues¹, while 68% unknowingly purchased counterfeit products². This underscores the urgent need for traceability, secure supply chains, and personalized experiences-all of which depend on scalable, integrated technologies.

Rising Costs and ROI Pressures

Retailers are under financial strain due to rising labor and logistics costs, growing shrinkage, and the increasing expenses of adopting new technologies. For context, inventory shrinkage results in over \$132 billion in annual losses globally³, while return fraud adds another \$101 billion4 —underscoring the urgency of cost control and stronger ROI. Although automation, Al, and cloud computing offer long-term efficiency gains, they often require significant upfront investment, complex system integration, and ongoing maintenance-challenges that can delay measurable returns.

Supply Chain Visibility and Integration Gaps

Retailers face mounting challenges in orchestrating supply chains—from climate disruptions to data silos and outdated infrastructure. The shift from omnichannel to unified commerce demands real-time visibility and a fully integrated tech ecosystem. Yet many retailers still operate fragmented systems, limiting their ability to respond swiftly and securely. For example, inventory distortion led to a staggering \$1.77 trillion in global losses⁵, yet only 35% of companies reported having reliable, up-to-date visibility into their end-to-end supply chains⁶.

Sustainability Matters in Retail

Sustainability is no longer a nice-to-have—it's a business imperative. Regulatory demands, consumer expectations, and the need for supply chain transparency are pushing retailers to rethink how they operate. From sourcing to packaging, inventory to returns, inefficiencies lead to both financial loss and environmental impact. Product spoilage, overstock, and returns all drive emissions and resource waste. Reducing waste and improving traceability are now essential for compliance, resilience, and long-term brand trust.

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ACW, e-commerce grows but 67% of consumers face delivery problems, March 20, 2025, https://aircargoweek.com/e-commerce-grows-consumers-face-problems/

² Saleem Alhabash, Anastasia Kononova, Patricia Huddleston, Heijin Lee, and Moldir Moldagaliyeva, Global Anti-Counterfeiting Consumer Survey, 2023, https://a-capp.msu.edu/article/global-anti-counterfeiting-consumer-survey-2023/

Invue, 6 Retail Shrinkage Statistics and What They Mean for Your Business, July 19, 2024, https://invue.com/resource-center/blog/6-retail-shrinkage-statistics

⁴ National Retail Federation, NRF and Appriss Retail Report: \$743 Billion in Merchandise Returned in 2023, December 26, 2023, https://nrf.com/media-center/press-releases/nrf-and-appriss-retail-report-743-billion-merchandise-returned-2023

Marianne Wilson, Study: Global retail losses due to inventory 'distortion' hit \$1.77 trillion, July 23, 2023, https://chainstoreage.com/study-global-retail-losses-due-inventory-distortion-hit-177-trillion

⁶ SUPPLYCHAIN 360, Visibility Isn't the Problem—Leadership Alignment Is, March 23, 2025, https://supplychain360.io/resilient-supply-chains-demand-end-to-end-visibility/?utm_source=chatgpt.com

Solution Overview

AIDC as the Foundation for Unified Commerce

As retailers move toward unified commerce, connecting operations across physical and digital channels becomes essential. This shift relies on real-time data, seamless integration, and intelligent automation—none of which are possible without accurate data capture at scale.

Automatic Identification and Data Capture (AIDC) technologies—such as RFID, barcodes, mobile scanning, and IoT sensors—enable automated, precise data collection across products, assets, and transactions. They form the bridge between physical operations and digital systems.

Rather than standalone tools, AIDC powers the data infrastructure behind:

- Al-driven forecasting and personalization
- Cloud-based inventory and fulfillment
- Real-time tracking and automated logistics

With AIDC, retailers gain the visibility, speed, and accuracy to reduce waste, eliminate silos, and respond faster to change—laying the foundation for a smarter, more agile retail ecosystem.



Points to Consider

Strategic Factors for Successful AIDC Adoption

Before investing in AIDC technologies, retailers must align their strategy with real operational needs and long-term goals. While the benefits of automation and data accuracy are compelling, successful adoption depends on careful evaluation of several key factors.

- Q: What specific problems are you solving with AIDC?
- **Q:** Can your current systems support seamless integration with AIDC devices?
- **Q:** Will the solution scale with your business as it grows across stores or fulfillment sites?
- **Q:** Is the technology suited to your physical environment, workflows, and frontline teams?
- **Q:** Do you have a clear view of long-term costs, including maintenance, training, and ROI?

With these considerations in mind, the following section outlines key retail workflows where AIDC technologies deliver tangible value. Each application is supported by solution recommendations and selection tips aligned with four decision-making pillars: Operational Fit, System Integration, User Experience, and Longevity & ROI.



Receiving & Putaway

Slow or inaccurate receiving disrupts downstream operations. In both store backrooms and DC docks, barcode and RFID scanning enable fast, accurate identification of inbound goods. Real-time data synchronization ensures traceable putaway, while mobile printers support on-the-spot labeling to reduce backlog and improve inventory visibility.

Selection Tips

- Match printer type to environment—rugged models for DCs, and compact or cart-mounted units for store backrooms or dynamic fulfillment areas.
- Use RFID for faster scanning of cartons and barcodes for item-level accuracy.
- Choose long-lasting labels with strong adhesive to prevent peeling during handling and stocking.





Inventory Management & Replenishment

Accurate, real-time inventory visibility is essential to avoid stockouts, overstock, and misplaced items. Barcode and RFID technologies enable store and DC staff to verify counts, locate items, and execute replenishment efficiently. Mobile computers support on-the-move scanning, while label printers ensure that shelves and bins reflect current product information.

Selection Tips

- Combine RFID handhelds for cycle counts and fixed readers for automated tracking across key inventory zones.
- Select printers by workflow—mobile units for on-the-spot labeling, desktop for moderate tasks, and industrial for high throughput.
- Use durable, adhesive-matched labels for shelves, bins, or stock locations to ensure lasting readability.

Order Picking

Order picking methods vary across environments, from paper-based pick lists to guided mobile workflows. In both DCs and store fulfillment areas, mobile computers with barcode or RFID scanning help workers locate and confirm items efficiently. Pick labels—printed on demand via mobile or stationary printers—enable accurate sorting, packing, or staging for final delivery.

Selection Tips

- Use mobile computers with scanning to guide pick paths and confirm accuracy in real time.
- Deploy mobile printers for on-the-spot pick labeling, or use desktop/industrial models for batch label printing.
- Choose direct thermal labels with strong adhesive for short-term use on totes, cartons, or staging containers.



Packing & Shipping

As stores take on micro-fulfillment roles, packing and shipping now happen across both DCs and retail locations. Barcode and RFID ensure accuracy at every step, while mobile computers support final checks and status updates. Labels produced by mobile, desktop, industrial, or print engine systems enable accurate routing. Linerless labeling is especially effective for store-based BOPIS—accelerating packing and picking, reducing waste and saving space.

Selection Tips

- Use mobile computers to confirm packing accuracy and sync shipping data in real time.
- Match printer type to volume—mobile for flexibility, desktop for moderate output, and industrial or print engines for automated high-throughput lines.
- Choose direct thermal or linerless labels with strong adhesion and high readability for error-free barcode or RFID scans.









In-Store Fulfillment (Click & Collect)

Store-based fulfillment—such as BOPIS and curbside pickup—requires accuracy and efficiency on par with DCs. Mobile computers offer guidance for item picking, barcode or RFID checks, and staging. Labels printed via mobile, desktop, or industrial printers support order identification and handoff. Linerless labeling is ideal for compact stores—saving space, reducing clutter, and speeding up order handoff.

Selection Tips

- Use mobile computers to locate items, update status, and verify fulfillment.
- Match printer type to store size and order volume—mobile for flexibility, desktop for standard tasks, and industrial for high-throughput hubs.
- Choose linerless or direct thermal labels with quick-dry adhesive for efficient, clean pickup labeling.





Checkout & Payment

Checkout is a defining moment for both customer satisfaction and operational flow. RFID self-checkout accelerates the process by enabling multi-item scans without line delays. For assisted checkout, mobile POS terminals and receipt-capable mobile printers allow staff to complete transactions anywhere in-store—reducing queues and improving service responsiveness.

Selection Tips

- Enable line-busting and flexible checkout with mobile payment terminals that support receipt printing and secure payment.
- Use mobile computers to assist with barcode scanning, price checks, and loyalty lookups at the point of interaction.
- Ensure front-of-store devices are built for long shifts with dependable battery life and stable wireless connectivity.

Returns Handling

Returns are a growing operational burden in retail, from e-commerce to in-store purchases. RFID and barcode tracking improve accuracy in identifying returned items, while mobile computers and printers streamline inspection, relabeling, and restocking. Real-time updates ensure smoother reintegration into inventory or faster routing for disposal.

Selection Tips

- Use mobile computers to scan and assess return items, with real-time status updates to inventory systems.
- Pair with mobile printers for relabeling or tagging returned goods at the point of processing.
- Apply barcode or RFID labels suited for handling, restocking, or logistics sorting—durable yet readable throughout the return path.







Labeling & Price Management

Retail pricing is constantly in motion—driven by promotions, demand, and inventory changes. Portable or cart-mounted printers support efficient markdowns and shelf label updates, while RFID handheld readers verify prices to reduce errors. Durable, scannable labels ensure shelf accuracy and help maintain pricing consistency across channels.

Selection Tips

- Use mobile or cart-mounted desktop printers to support large-volume, on-the-spot labeling for price changes.
- Apply RFID handheld readers for price validation and faster markdown workflows.
- Choose security-scored, high-contrast labels with strong adhesive to prevent tampering and support shelf visibility.

Customer Engagement & Personalization

Modern shoppers expect personalized, informed interactions at every touchpoint. Mobile computers help associates access product information, check availability, and manage loyalty programs on the spot. Barcode and RFID technologies support smart fitting rooms, dynamic shelf displays, and personalized labels—bridging physical products with digital experiences.

Selection Tips

- Deploy mobile computers for guided selling, loyalty lookup, and on-the-floor customer support.
- Use scannable shelf labels or RFID tags to enable smart features like real-time pricing and product discovery.
- Select label materials with high scan accuracy and strong readability for both staff and shoppers.



Table 1: Device Selection Considerations Across Store and DC Environments

Category	Store Environment	Distribution Center (DC)
Operational Fit	Compact, mobile-ready devices for moderate scan and print tasks.	Rugged equipment built for high-volume, fixed or cart-mounted use.
System Integration	Seamless connection to POS, loyalty platforms, and pricing systems.	Native integration with WMS, ERP, and order fulfillment platforms.
User Experience	Easy to learn, fast to deploy, ergonomic for frontline staff.	Long battery life, remote manageability, and optimized for long shifts.
Longevity & ROI	Modular, upgradable hardware with replaceable components.	Industrial-grade durability, scalable for peak volume and long-term use.

Additional Consideration — Data Security Matters

As retail becomes increasingly data-driven, protecting information is essential. Ensure AIDC solutions support secure data transmission and storage, with encryption, user access control, and device-level protections. These safeguards protect both customer and operational data while supporting safe scaling across systems and geographies.



Our Offerings

Purpose-Built Solutions for Retail Realities

Modern retail runs on speed, accuracy, and coordination—across stores, DCs, and everything in between. At TSC Auto ID Group, we deliver solutions that are proven in the field, easy to integrate, and built to handle the real demands of retail. Whether it's daily operations or system-wide upgrades, we help you stay one step ahead.

Enabling Mobility Across Retail Workflows

From shelf labeling to BOPIS and line busting, TSC Auto ID Group offers a complete range of mobile printers and enterprise mobile computers. Our devices are built for real-world retail use: long battery life, stable wireless connectivity (Wi-Fi, Bluetooth, 5G), and a wide selection of accessories -making them ready for continuous shifts and dynamic workflows.

Software That Supports Your Team

From integration to management, our software solutions simplify every stage. Bluebird BOS™ Suite includes ZeroTouch provisioning, remote diagnostics, and device finding, while TSC Console (Web and PC editions) and SDKs help IT teams manage printers, deploy updates, and streamline labeling workflows efficiently.

Embedded Security for Enterprise Peace of Mind

Our devices include security features designed to meet enterprise retail standards. Bluebird computing devices support secure data transmission, device tracking, remote lock, and user-level access control. TSC Auto ID printers offer encryption, rolebased permissions, and configuration lockdown to protect sensitive data and ensure compliance.

Built to Last, **Designed for High Demand**

Our rugged hardware is optimized for both harsh warehouse environments and busy store operations. Whether mounted on forklifts or carried by staff, our devices offer fast throughput, IP protection, and drop resistance to reduce downtime and ensure investment protection.

Seamless Integration with **Existing Retail Systems**

All our products are cross-tested for compatibility and workflow continuity. Whether integrating with POS, WMS, ERP, or loyalty platforms, our solutions reduce integration time and support third-party MDM tools for streamlined operations.

Scalable RFID Solutions Proven in Retail

With a complete RFID ecosystem covering mobile, fixed, and desktop use, we help retailers automate processes, prevent loss, and improve traceability. Our encoding and reading technologies are trusted by leading global brands for their reliability and ease of deployment.

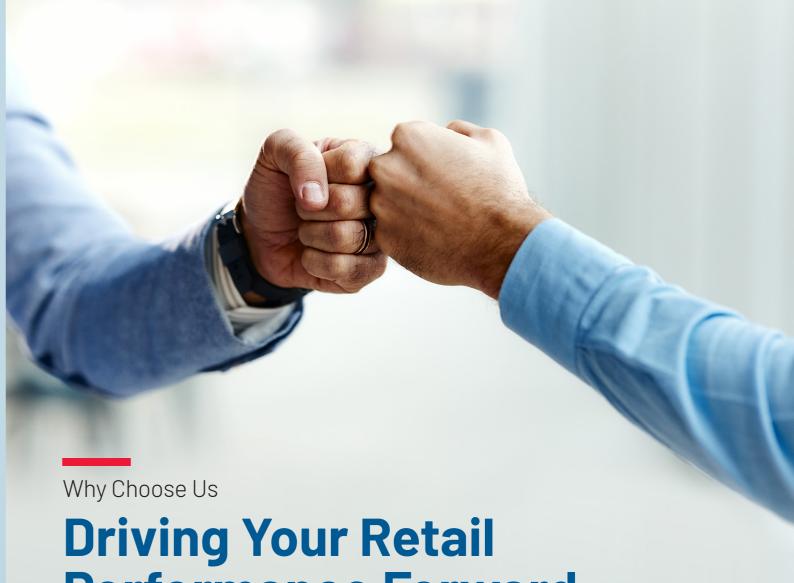
Reliable Supplies for **Retail Applications**

Our in-house label supply capabilities support a broad range of retail needs from shelf labels and signage to shipping and return labels. We offer both stock and custom materials designed to deliver strong adhesion, durability, and consistent print quality in stores and DC environments.

Table 2: What Retailers Value - How We Deliver

Retail Priority	What We Provide
Fast, Error-Free Work	Mobile devices with real-time scanning and label printing.
Durable Performance	IP-rated, drop-tested hardware for store and DC use.
Easy Integration	Proven compatibility with POS, ERP, and WMS platforms.
Simpler Deployment	BOS Suite. TSC Console, SDKs for remote updates and fleet management.
Label Reliability	Consistent label quality for shelf, shipping, and return needs.
Data Security	Encryption, secure transmission, access control, and remote lock.





Performance Forward

TSC Auto ID Group is more than a product provider—we're a long-term partner for retailers navigating complex operations and fast-changing customer expectations. With a proven track record and deep technical expertise, we help retailers scale with confidence, innovate with purpose, and operate with greater efficiency.

What Retailers Value - How We Deliver

Strategic Priority	TSC Auto ID Group Advantage
End-to-End Retail Enablement	One trusted source for printers, mobile computers, RFID, and tested supplies—built to work together across stores and DC workflows.
Practical Innovation at Work	Our RFID capabilities are trusted by global retailers, while our full portfolio is built with intuitive designs, modular architecture, and smart software tools that scale with retail demands.
Long-Term Value & ROI	Rugged and scalable retail-ready designs—paired with in-house manufacturing that ensures consistent quality and responsive supply—help retailers reduce downtime and extend product life.
Trusted Support & Rollout Success	Backed by 30+ years of AIDC experience, our experts help translate concepts into reality—supporting fast rollout and stable daily operations across global retail.

Case Studies

Success Stories

Enhancing E-Commerce Logistics with Reliable Label Printing

Overview

A leading logistics provider required a scalable, cost-effective label printing solution to support 7,000+ sellers shipping directly to customers or parcel lockers.

Solution

Deployed 7,000+ DA220 printers to replace aging units, ensuring better print quality, lower maintenance, seamless software compatibility, and faster setup across thousands of online sellers using the platform.

User Benefits

- 40% fewer breakdowns, minimizing disruption.
- Sharper print quality reduces delivery errors.
- Multi-language emulation ensures smooth transitions.





RFID Enables Scalable Inventory Operations for Global Retail Expansion

Overview

A variety store chain adopted RFID to replace labor-intensive barcoding, enabling scalable inventory management and cost control as it expanded into high-wage North American markets with complex product assortments.

Solution

The T66R4e printers enabled high-speed RFID encoding, rapid label switching, and seamless WMS integration—supporting peak volume needs and ensuring accurate encoding with single-write tags across diverse product lines.

User Benefits

- 300,000 labels/day with only 14 RFID printers.
- Quick-access presets eliminate recalibration, reducing label-switching downtime.
- PGL-based WMS integration ensures reliable encoding with single-write RFID tags.

Cloud-Based RFID Labeling Meets Retailer Mandates

Overview

Retailers required manufacturers to implement RFID tagging across many categories. FUDA and TSC Auto ID delivered a cloud-based labeling solution that simplified encoding and printing to help manufacturers achieve compliance.

Solution

FUDA's cloud system converts UPC/EAN to EPC, sending data to T6000e printers for on-demand RFID encoding and printing, ensuring quick integration and flexible, accurate label production.

User Benefits

- User-friendly cloud conversion reduces errors and training.
- Pre-matched system enables fast implementation and saves costs.
- On-site on-demand printing cuts lead times and eliminates pre-printed labels.





Scalable RFID and Barcode Solutions for High-Mix Fulfillment

Overview

Weyco ensures one-scan barcode accuracy and reliable RFID tagging, enabling retailers to boost inventory visibility and checkout speed while maintaining operational flexibility across high-mix fulfillment lines.

Solution

We provide modular RFID and barcode inspection (ODV) upgrades, enabling phased enhancements without hardware replacement—supporting long-term scalability and compliance across evolving retailer requirements.

User Benefits

- Barcode quality verification ensures a one-scan read rate.
- Modular RFID/ODV upgrades extend printer lifecycle.
- Centralized printer management streamlines operations.



RFID Inventory Made Easy for Optical Retail with T800 & WaveRFID

Overview

Manual inventory counting was slow and inaccurate for opticians. WaveRFID and TSC Auto ID's RFID printer enabled real-time, accurate stock visibility, improving operations and reducing shrinkage for optical practices.

Solution

WaveRFID's solution was paired with the T800 RFID printer to enable fast RFID label encoding. Inventory counts now take minutes, not hours, and staff can locate frames instantly with RFID readers.

User Benefits

- Inventory count time reduced from hours to 10 minutes.
- Accuracy improved from 70% to nearly 100%.
- The "Find my tag" tool locates lost or misplaced frames.

Mobile Printers Unlock Speed and Flexibility for E-Commerce Warehousing

Overview

Amid pandemic-driven order surges, a leading e-commerce company upgraded its mobile printing capabilities to reduce labor strain, accelerate fulfillment, and break free from legacy WMS hardware lock-in.

Solution

The Alpha Series mobile printers with custom firmware integrated seamlessly with existing WMS, enabling rapid deployment, full-shift operations, and migration without changing label templates or retraining warehouse staff.

User Benefits

- Custom firmware enables instant WMS compatibility.
- Auto calibration and smart battery boost productivity.
- Printer language emulation allows smooth, disruptionfree migration.



Product Selection

Select the Right Solutions for Your Applications

DC Operations

	Application Scenarios	Receiving & Putaway	Inventory Management & Stock Replenishment	Order Picking	Order Packing	Shipping & Distribution	Returns Processing
	RE310*	V	V	V	raoming	Distribution	V
Mobile Printer	TDM-20		-				
	TDM-30						
	A30R			V			
	A30L	V	V	V			V
	A40L	V	V	V	V	V	V
	DA	v	·	V	v	v	v
Desktop	TH			V			V
Printer	DH			V			V
	T800			V			V
	ML*	V	V	v	V	V	V
	MB	V	V		V	V	V
Industrial	MH	V	V		V	V	V
Printer	T4000	V	V		V	V	V
Tillici	T6000e	V	V		V	V	V
	T8000	V	V		V	V	V
Print Engine	PEX-2000	V	V		V	V	
T Till Lilgille	A40L RFID	V	V	V	V	V	V
	TH240 RFID	V	V	V	V	V	V
RFID Printer	MB241RFID	V	V	V	V	V	V
KI ID FIIILEI	T6000e RFID	V	V		V	V	V
	PEX-2000 RFID	V	V		V	V	V
	EF550	V	V	V	V	V	V
	EF550R	V	V	V	V	V	V
	S10*	V	V	V	V	V	V
Mobile	S20			V	V		
Computer	S50	V	V	V	V	V	V
Computer	S70	V	V	V	V	V	V
	EK430	V	V	V		V	V
	X40	V	V			V	V
	RFR901	V	V	V	V	V	V
RFID Handheld	KFK3UI	V	V	V	V	V	V
Reader	X40			(rugged case)			
RFID Fixed Reader	FR901	V	V		V	V	V
RFID Desktop	DR900						
Reader	DR901						
	T10				V		
Tablet	T30		V (rugged case)		V		V (rugged case)
Kiosk	T10 Kiosk				V		

^{*}Not currently available in the US and Canada.

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Store Operations

	Application Scenarios	Checkout & Payment	Inventory Management & Stock Replenishment	Order Fulfillment & Click-and-Collect	Customer Engagement & Personalization	Loss Prevention & Security	Dynamic Pricing & Labeling	Backroom Operations – Receiving & Shipping	Product Returns	Cloud & Al In-Store Operations
Mobile Printer	RE310*	V	V	V	V		V	V	V	V
	TDM-20			V						
	TDM-30	V		V	V				V	
	A30R	V	V	V	V		V	V	V	V
	A30L		V	V			V	V	V	V
	A40L		V	V			V	V	V	V
Desktop	DA		V	V	V		V		V	V
	TH		V	V	V					V
Desktop Printer	DH		V	V	V		V		V	V
	T800		V	V	V					V
	ML*		V	V				V		V
	MB		V	V				V		V
Industrial	MH		V	V				V		V
Printer	T4000		V	V				V		V
	T6000e		V	V				V		V
	T8000									
Print Engine	PEX-2000									
	A40L RFID		V	V				V	V	V
	TH240 RFID		V	V				V	V	V
RFID Printer	MB241 RFID		V	V				V		V
	T6000e RFID		V	V				V		V
	PEX-2000 RFID									
	EF550		V	V				V	V	
	EF550R									
	S10*		V	V				V	V	
Mahila Oananatan	S20	V	V	V	V		V	V	V	
Mobile Computer	S50		V	V				V	V	V
	S70									
	EK430									
	X40	V			V		V		V	V
RFID Handheld Reader	RFR901		V	V				V	V	V
	X40				V		V		V	V
RFID Fixed Reader	FR901	V	V	V		V		V		
RFID Desktop	DR900	V							V	
	DR901	V							V	
	T10					V				
Tablet	T30		V	V		V		V		
Kiosk	T10 Kiosk	V			V	V				

^{*}Not currently available in the US and Canada.



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