
MOVISTA
WHITEPAPER:
ARTIFICIAL INTELLIGENCE IN RETAIL
The Emerging Role of AI in Store Execution
PRODUCTION
Automatic mode
MONTHLY TARGET
Group and tag
Configuration
External
TEMPERATURE CHART

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THE INTERSECTION OF AI AND RETAIL

In 1956, Dartmouth College launched the field of artificial intelligence (AI) as we know it. After only six decades, AI underpins most aspects of daily life, and retail is no exception.

We encounter AI dozens of times every day, likely without realizing it. Anyone with a smartphone uses AI when they ask Siri about the weather or Google for the best route to their destination. When you click on a "recommended for you" link on a shopping website, that link is generated by AI.

AI has become so firmly established in society that we can't go back without significant market disruption. The global market for AI is projected to grow from $84 billion in 2021 to $1.6 trillion by 2030,[1] and AI drives much of the innovation and optimization in the retail industry. In fact, the global retail AI market is projected to grow from $2.9 billion in 2021 to $17.1 billion in 2028.[2]

Retail was a complex business before the pandemic and has only become more so since. AI promises to solve, or at least dramatically improve, issues such as:

- The increased pressure to develop and maintain an omnichannel presence
- Persistent supply chain issues, starting with raw goods and manufacturing, and rippling through all layers of commerce
- The need for more flexible, decentralized work that fits the available retail labor marketplace

All of these factors have culminated in a perfect storm of miscommunication, stockouts, and employee turnover. AI, however, is a beacon of light guiding retail teams back to shore.

CUSTOMER EXPERIENCE Depends on Retail Execution

Around the time the Dartmouth gang cooked up the foundation for artificial intelligence, the consumer marketing world began to shift focus from the product to the customer, ultimately leading to the ascendance of customer experience (CX) as a leading indicator of in-store success.

In a 2017 survey on AI implementation priorities, 55 percent of the North American retailer respondents indicated their top AI priority was to optimize the customer experience.[3] A 2020 MIT Technology Review Insights survey focusing on the consumer goods industry found a similar concern, noting that the top AI use-case priority (48 percent) was customer care.[4]

In 2016, Lowe's introduced the LoweBot, a roving kiosk on wheels that engaged customers via voice or touchscreen.[5] In 2019, Giant Food Stores and Stop & Shop deployed a service robot called Marty across 200 stores to run price checks and report aisle hazards.[6] People, and the press, often get excited about robots, but these retail AI projects fail to address a crucial piece of the retail value chain.

A 2018 Capgemini survey revealed that 74 percent of AI use cases serve customer-facing projects, while only 16 percent serve operations.[7] This heightened focus on customer experience overlooks the foundation of in-store success: retail execution.

Everything a retailer does depends on a customer finding the right product in the right place at the right time. Consequently, behind-the-scenes operational execution has just as much, if not more, impact on CX as any consumer-facing effort.

Consider Walmart's approach. In 2019, Walmart equipped a neighborhood market in Levittown, NY, with interactive displays and a massive data center known as the Intelligent Retail Lab. The IRL doesn't employ robots; instead, it uses AI-enabled cameras to monitor the 50,000-square-foot store, compare the quantities on-shelf to the projected sales demand, and trigger notifications to alert associates in real-time what to restock and when, with granularity down to the part number.[8]

Walmart leverages AI to enhance customer experience, but they have a clear focus on automating in-store execution, and for good reason.

ARTIFICIAL INTELLIGENCE and Retail Execution

While services like Buy Online Pickup In-Store (BOPIS) have added new use cases to the retail work day, the basic challenges of retail execution are easily quantifiable and measurable:

- How much of each product is on the shelf/in storage in the back?
- When should product be restocked?
- Did a new display get built to planogram specifications?

Retail teams on all sides of the aisle can benefit from the added efficiency of AI, from store managers tracking shelf status to field reps verifying planogram compliance.

According to Juniper Research, retailers, service providers, CPGs, and distributors will spend $7.3 billion on AI by 2022, compared with the $2 billion spent in 2018.[9] Some surveys indicate that AI in retail is quickly moving toward ubiquitous adoption at all levels of brick-and-mortar retail.

Some benefits of retail-execution-focused AI include:

- Scheduling automation
- More accurate labor forecasting
- Quicker response to volatile changes in customer traffic and demand
- More efficient and effective inventory management
- More empowered front-line workers
- Streamlined compliance

While these various use cases are often lumped under the term artificial intelligence, AI is an umbrella term that encompasses a plethora of algorithms. Traditionally, AI refers to what is known as artificial general intelligence (AGI), which describes a system that replicates the functionality of the human brain. At the 2009 Conference on Artificial General Intelligence, an optimistic 10 percent of the participants thought we would achieve AGI by 2022. Half of the participants thought it would not be possible until 2040, and 90 percent thought it would take until 2075 to achieve AGI.

While AGI makes for interesting cocktail conversation, practical AI promises profitability without all the disturbing byproducts of the singularity.

MACHINE LEARNING (ML)	Systems that learn from experience. This area comprises the bulk of real-world applications of AI currently in use in retail. The algorithm is trained on real-world data to replicate decisions performed by humans.
DEEP LEARNING (DL)	ML trained on large data sets over an extended period of time.
ARTIFICIAL NEURAL NETWORKS (ANN)	Systems that use models of human neural networks to help computers learn. Commonly used in conjunction with image recognition.
NATURAL LANGUAGE PROCESSING (NLP)	Systems that can process human language. Used most often for virtual assistants and chatbots.
AUTOMATED SPEECH RECOGNITION (ASR)	Systems that identify and process human voice, such as Siri, Alexa, Google, etc. Used for vocal commands and speech-to-text applications.
COMPUTER VISION	A subsegment of AI (also known as Photo AI) in which systems interpret information from digital images, video, and other media types.

AI is well-suited for in-store execution. Retailers, manufacturers, and labor companies can use the collected data to work smarter, observe shopper buying behaviors, identify underutilized or over-tasked employees, optimize store-level execution, and verify that shelves are neatly stocked with purchasable merchandise.

More retail execution tasks suited for AI:

- Product availability
- Shelf inventory management
- Visual search
- Virtual assistants
- Payment services
- Supply chain management
- Fraud detection
- Predictive merchandising
- Programmatic advertising
- In-store visual monitoring
- Location-based marketing

The following use cases stand to provide the largest and most immediate return on investment for retail teams.

INVENTORY MANAGEMENT

Inventory management, sitting at the heart of in-store execution, suffers from costly challenges that have plagued retail teams for decades. According to Gartner, only 18 percent of organizations report fulfillment accuracy rates of 95 percent or higher.[10] Considering that shoppers place on-shelf availability (OSA) in their top three reasons for choosing a store at any given time,[11] fractional percentage improvements in inventory management (and corresponding reductions in OSA) represent huge revenue increases.

Getting product to a store is only part of the problem. Holding excess inventory (i.e., overstocking) results in a 32 percent increase in costs annually.[12] Additionally, more than 50 percent of product categories fail to meet planogram compliance at the shelf level,[13] leading to an incalculable amount of lost sales and compliance penalties.

Maintaining the ideal quantity of store inventory, keeping shelves consistently stocked and in accordance with planograms—these costly inventory management challenges have haunted retailers and suppliers since the dawn of modern retail, and they are only growing more complex as omnichannel shopping and supply chain complexities push the evolution of the brick-and-mortar store.

Store-level inventory management has been a heavily manual, time-consuming, and error-prone process. Store associates and service providers roam the aisles around-the-clock recording inventory levels only to find their numbers outdated by the time they can take any meaningful action on them. Some of these teams have employed mobile-first software to replace antiquated, sluggish, paper-based reporting, but many have yet to do so.

Retail stores lose upwards of one trillion dollars annually from out-of-stocks alone.[14] Even mobile-equipped teams struggle to keep pace with the volatility of store inventory and the huge quantities of data that mobile-execution tools generate. AI is paving the way for more efficient, timely, accurate, and cost-effective inventory management processes. Smart shelf technology, electronic shelf labeling (ESL), and photo AI (image recognition) are three particularly promising retail applications.

SMART SHELVES

Smart shelves, also known as intelligent shelving, utilize radio-frequency identification (RFID) in conjunction with weight sensors to track and report shelf inventory levels in real-time. As soon as a customer takes a product off a smart shelf, the shelf sends that event data to the store's database, helping store teams extract sales insights, stay on top of inventory, and even detect theft.

Thanks to RFID, smart shelves have the capability to interact with apps on shoppers' phones, opening the door to new customer experience features. For example, shoppers can receive personalized promotions based on past purchase history while they stroll the aisles, providing a digitized substitute to traditional print promotions.

Because smart shelves rely on weight detection, they are not a feasible solution for all product categories, especially apparel and smaller-sized items, and cannot assist in planogram compliance. Due to these limitations, retailers may not be able to rely fully on smart shelf technology for all inventory management needs.

ELECTRONIC SHELF LABELING (ESL)

Electronic shelf labeling is a branch in the intelligent shelving family tree. ESL replaces traditional print-based pricing labels with digital labels that update instantaneously and store-wide, eliminating the need for costly and time-consuming labeling by hand. ESL is a relatively straightforward technology that provides substantial time-saving and CX benefits to retailers.

Grocers, of all the retailer types, have the most to gain from implementing ESL in their stores due to the high product churn and relabeling volume inherent with perishable goods. According to Hussman, some grocers spend upwards of $10 million

annually on price-changing labor, making them prime candidates for ESL.[15]

While not technically a form of AI, ESL can integrate with AI systems to optimize in-store pricing. Product promotions, inflationary changes, and price matches become much easier to manage when retailers combine electronic labeling with artificial intelligence.

With all these benefits, you may be wondering why all stores haven't transitioned to ESL. The short answer: ROI. Rolling out ESL across a large number of stores is expensive and laborious, and the ROI at a large scale is still uncertain, making many retailers hesitant to buy in.

In the meantime, big-box retailers like Walmart are experimenting with ESL in select locations to establish a proof of concept before scaling.[16] Specialty retailers, who can execute an ESL roll-out with much greater ease and certainty, will likely lead the charge in ESL adoption.

PHOTO AI

Photo AI, also known as image recognition, utilizes computer vision and machine learning to process and interpret in-store images of products. Like smart shelves, photo AI can monitor and report on shelf stock without the need for human review; but unlike smart shelves, it can also analyze product placement and planogram compliance, further streamlining traditional in-store work.

Retail-focused image recognition hardware falls into three categories:

1. On-shelf cameras
2. Aisle-scanning robots
3. Mobile apps

On-shelf cameras are an exciting application of photo AI because they are the closest substitute to intelligent shelving in terms of reporting speed. With photo AI-equipped cameras in every aisle, retailers can track both on-shelf stock and planogram compliance in real-time. However, the effectiveness of shelf cameras comes at a cost, both literally and figuratively.

Equipping every aisle of a store with advanced cameras can quickly become expensive. When you multiply roll-out costs across a number of stores, the benefits may not outweigh the price for some retailers. Furthermore, aisle obstructions, either from products or people, may inhibit shelf cameras' accuracy and result in skewed metrics.

Aisle robots, on the other hand, may prove to be a more cost-effective application of photo AI. While they cannot match the speed of smart shelves and on-shelf cameras, they are still quicker, more accurate, and cheaper than traditional labor-based inventory management.

Many retailers have already begun rolling out aisle robots of their own, including Walmart, Giant Eagle, and Woodman's to name a few. Sam's Club got creative by equipping their existing floor-scrubbing machines with computer vision technology from AI company Brain Corp. [17]

Retailers clearly find value in aisle robots, but the limitations of that value are not yet understood. For now, and well into the future, retailers must use some combination of traditional labor for tracking inventory while computer vision technology matures. During that maturation process, retail teams can still reap the benefits of computer vision by supplementing photo AI technology into their existing inventory management processes.

Many retail teams utilize mobile-based retail execution systems to capture and share images of products in-store; these images (taken by employees) are sent to a database for managerial review. Historically, managers have manually reviewed hundreds

of thousands of these images a month, often in sample sizes due to the overwhelming volume, to verify shelf conditions. Photo-AI integrations with mobile execution software automate this painstaking and error-ridden process, allowing teams to spend 33% less time on inventory management, according to an internal Movista study.

Whether through on-shelf cameras, aisle robots, mobile apps, or some combination of the three, photo AI provides immense benefits to retail teams, and it will only become more ubiquitous as computer vision matures.

LOGISTICS OF RETAIL EXECUTION

In-store teams aren't the only retail constituents who benefit from AI. The logistics industry is a prime candidate for AI, and many enterprises have already jumped on board.

AI can track merchandise during transportation, reducing costs by identifying the most efficient shipping process. Other AI applications help with real-time route optimization. They track road and weather conditions and give route recommendations, saving time and money by reducing drive time.

Remember that Capgemini survey that said 74 percent of retail AI initiatives are customer focused, while only 16 percent focus on operations? It might be time for retailers to expand their use of AI beyond the front of the store. The same study pointed out that using AI to optimize the supply chain could save retailers $340 billion annually.[18] This is the point where we move past the sexy, headline-grabbing aspects of AI in retail and drill down into the execution details that have a real, outsized impact on CX.

ROUTE AND SCHEDULE OPTIMIZATIONS

Route optimization can improve the efficiency and cost-effectiveness of store visits. Effective route optimization helps you maximize completed orders and deliveries by taking into consideration the many factors that impact delivery performance, such as driver schedules, available hours, total stops, fulfillment estimates, and legal requirements. Routing isn't about finding the shortest path from point A to point B; it's about finding the most efficient and profitable path.

The days of manually creating store routes and schedules are fading quickly. AI-powered route automation takes the guesswork out of route creation, helping teams save time and maximize the efficiency of store visits, no matter the scale.

OMNICHANNEL EXECUTION

The retail store has become increasingly complex in recent years due to the merging of physical and digital retail. Retailers and brands are trying to meet customers where they are, and where they are is—well—complicated.

Shoppers rarely buy products exclusively through one channel (brick-and-mortar or e-commerce). In the vast majority of cases, shoppers fluctuate between physical and digital depending on their needs and the type of product(s) they are purchasing. Brick-and-mortar retailers, eager to meet customer expectations, have adopted BOPIS, curbside pickup, and direct-to-home e-commerce of their own. This evolution, though great for customers, has created chaos among the various retail teams responsible for executing across these channels.

Store associates must find and retrieve products off shelves for pick-up orders, magnifying the intense need for better shelf replenishment and monitoring practices. Brands must balance their inventories across an even greater number of channels, clarifying the need for better business intelligence and real-time stock management. And service providers must navigate an increasingly complex store ecosystem, exposing the need for better cross-functional collaboration.

Thankfully, AI automation can help resolve all of these pain points and more. As the store continues to evolve, the status quo manual processes and disconnected workflows become increasingly inadequate. Retail teams have hyper-focused on using AI to enhance customer experience, but the most valuable use case for AI is keeping pace with rapidly expanding customer expectations.

LOOKING FORWARD

There's no stuffing the AI genie back into its lamp. In our data-rich environment, AI enables retailers, suppliers, MSOs, and other retail teams to operate at a level of efficiency unachievable through traditional manual processes. Recommendation engines, a critical element of any digital retail presence, run on AI. In physical stores it takes on high-volume, tedious, error-prone tasks such as pricing, inventory management, and scheduling, freeing up front-line and back-office workers to focus on higher-value tasks.

A recent Forbes survey showed that nine out of ten leading businesses have investments in AI technologies, but only 14.6 percent deployed AI capabilities in their work.[19] The two main technologies in use are machine learning (e.g., planogram compliance and price optimization) and autonomous machines (e.g., customer service robots and product pickers).

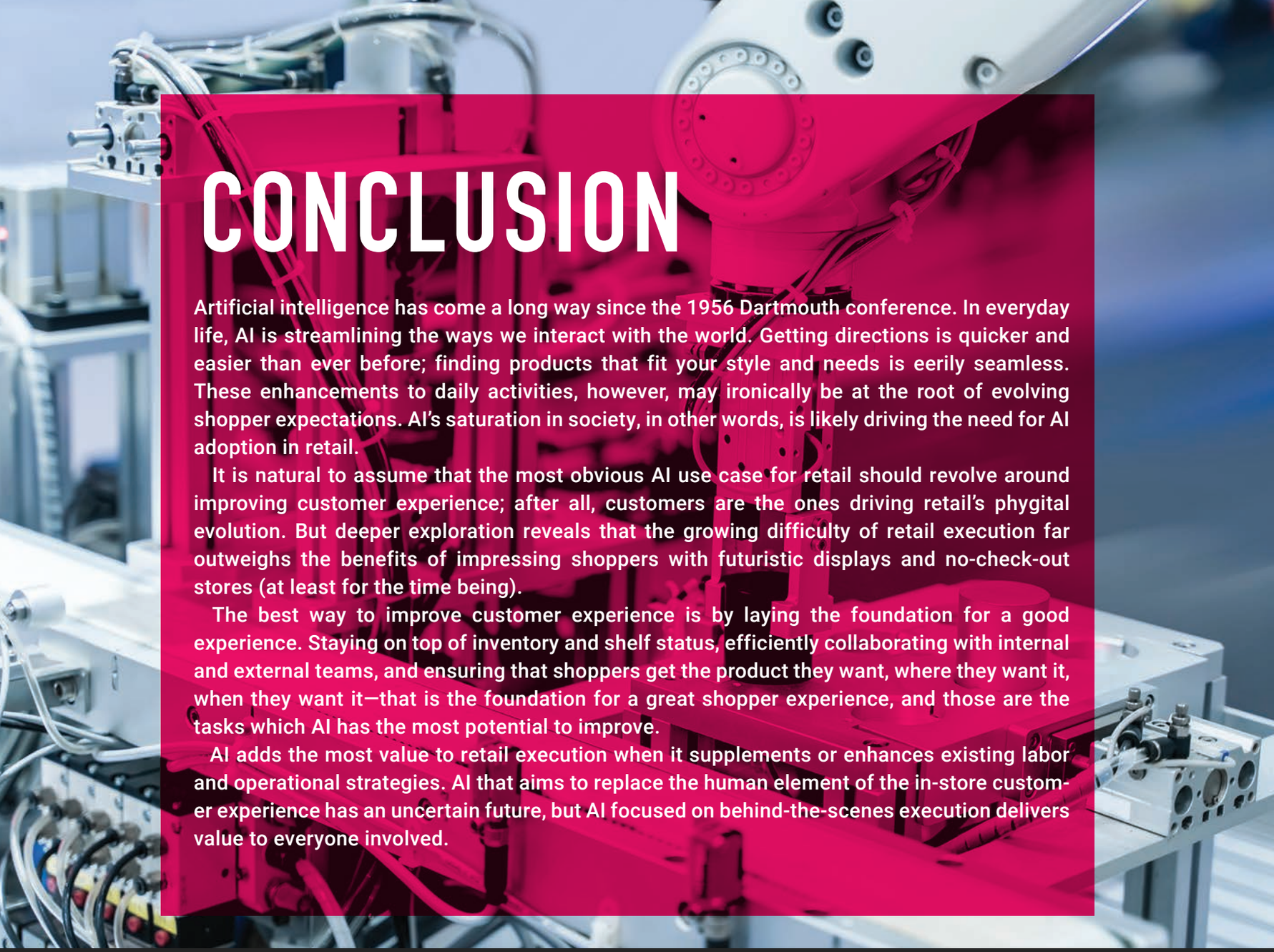
Many retail teams are still trying to understand the best uses for AI in a phygital (physical + digital) model. A Capgemini study of the 250 largest retailers by revenue showed a year-over-year drop from more than 80 percent who were confident they had the data tools and systems to implement AI across their organization to 55 percent.[20]

A November 2021 AI software forecast from Gartner projects that worldwide AI software revenue will total $62.5 billion in 2022, an increase of 21.3 percent from 2021.[21] The categories of knowledge management, virtual assistants, autonomous vehicles, digital workplace, and crowdsourced data represent almost half of all spending.

According to our own projections, AI focused on retail execution provides tangible improvements to inventory management, in-store sales, and shelf compliance, improvements such as:

- 8 percent improvement in on-shelf availability
- 5 percent increase in sales
- 10 percent improvement in compliance

AI stands poised to move into new areas such as staff planning, recruitment (selecting the right person for the right job), predicting product orders before they happen, and moving the orders up the supply chain faster than ever before. AI will become deeply integrated within retail organizations and affect every aspect of a business.



CONCLUSION

Artificial intelligence has come a long way since the 1956 Dartmouth conference. In everyday life, AI is streamlining the ways we interact with the world. Getting directions is quicker and easier than ever before; finding products that fit your style and needs is eerily seamless. These enhancements to daily activities, however, may ironically be at the root of evolving shopper expectations. AI's saturation in society, in other words, is likely driving the need for AI adoption in retail.

It is natural to assume that the most obvious AI use case for retail should revolve around improving customer experience; after all, customers are the ones driving retail's phygital evolution. But deeper exploration reveals that the growing difficulty of retail execution far outweighs the benefits of impressing shoppers with futuristic displays and no-check-out stores (at least for the time being).

The best way to improve customer experience is by laying the foundation for a good experience. Staying on top of inventory and shelf status, efficiently collaborating with internal and external teams, and ensuring that shoppers get the product they want, where they want it, when they want it—that is the foundation for a great shopper experience, and those are the tasks which AI has the most potential to improve.

AI adds the most value to retail execution when it supplements or enhances existing labor and operational strategies. AI that aims to replace the human element of the in-store customer experience has an uncertain future, but AI focused on behind-the-scenes execution delivers value to everyone involved.

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