



**Harvard  
Business  
Review**

ANALYTIC SERVICES

White Paper

# RESHAPING THE RETAIL INDUSTRY PARADIGM THROUGH AI

Sponsored by **TATA  
CONSULTANCY  
SERVICES**

## Creating an Algorithmic Retail Enterprise: From Digital First to Machine First

The time is ripe for retail leaders to shift to a machine-first mindset, and rightly so. Several retailers across the world have realized to their dismay that solving business challenges using the traditional solutions has neither helped them differentiate themselves nor helped them survive. Further, retailers are being severely challenged by “born digital” startups and “now digital” enterprises that have understood the power of data and algorithms to transform their business.

New-age retailing calls for superior, new, differentiated capabilities and dexterity. This can be realized only by harnessing the power of data by seamlessly integrating and orchestrating it across the retail value chain to unlock exponential value. This means training machines to mimic cognitive behavior such as sensing, understanding, deciding, and responding by processing millions of pieces of data and signals, and by correlating patterns and anomalies while responding swiftly to dynamically shifting environments. The real value can be derived when these capabilities coexist in harmony with humans, significantly amplifying and augmenting human ingenuity.

The uninitiated who are yet to begin their transformation journey need to bear in mind that those riding the data-powered algorithmic retail wave are winning by focusing on the big picture instead of just quick gains; their leitmotif has been to harness data and create a blueprint for an algorithmic enterprise that drives business value while reimagining entire value chains through automation and intelligence.

The most celebrated examples of algorithmic retail have been in areas such as personalization, online searches, and marketing, where there is an obvious availability of data. But we believe that the biggest gains lie in functions such as design and sourcing, assortment, space, store operations, supply chain, and logistics. Algorithmic interventions in these areas are shortening the “design to rack” cycle, speeding up last-mile fulfillment, improving availability, and transforming store experiences, thereby creating a far deeper impact on the future of retail.

Notwithstanding the often mentioned fallbacks such as lack of data, change management bias, and privacy, accelerating the leverage of algorithms is the only lifeline to survival. We are pleased to sponsor this research project from Harvard Business Review Analytic Services that brings you perspectives from retail leaders, AI practitioners, and retail analysts on how to craft unique growth and transformation strategies and unlock exponential value.



**PRATIK PAL**

**PRESIDENT AND GLOBAL HEAD,  
RETAIL, CONSUMER GOODS,  
TRAVEL, TRANSPORTATION,  
AND HOSPITALITY**

**TATA CONSULTANCY SERVICES**

# RESHAPING THE RETAIL INDUSTRY PARADIGM THROUGH AI

Fortune 1000 retailers were among the earliest and most aggressive backers of artificial intelligence (AI), especially with the arrival of e-commerce and, particularly, online pricing. Yet retailers have been hesitant to fully embrace AI deployments in many other areas of their business for a wide range of reasons, including underlying data inaccuracies, operational disruptions, and even perceptions of privacy issues.

In the next few years, though, most of that hesitancy is expected to change for multiple reasons. Business processes are projected to improve, and so is the underlying accuracy of some data, such as measurements of inventory. Retail executives will also likely change and adapt, especially as shoppers with no memory of a pre-internet world grow in numbers. Retail startups, built from an AI perspective, will fiercely compete in various market segments. Most critically, though, new oceans of retail-related data—derived from material collected through the internet of things (IoT), mobile, and even legacy telecommunications transmissions—will make advanced AI usage more viable and practical. Human analysts will be hard-pressed to keep up.

The impact of more progressive AI will be felt in two broad ways. First, it will help retailers do what they are already doing far better, boost profit margins, more accurately target prospects, and shave costs off an increasingly complex global supply chain. Second, AI will bring brand-new capabilities to retail. “That’s the potential of AI. It can do almost anything if you have enough data,” says Scott Hames, a former senior vice president and chief marketing and analytics officer at Bed Bath & Beyond, who left the retailer in 2018 after almost 18 years, having previously worked at both Macy’s and Foot Locker.

But the biggest roadblock to this bright future for retailers is data quality. “Why don’t they do more AI? The biggest thing is the lack of data,” says Eric Colson, the chief algorithms officer at Stitch Fix, a personal styling e-commerce site that had \$1.2 billion in revenue in 2018. “But don’t confuse volume of data with the amount of information [the data] contains. Just because the data gets big doesn’t mean it’s super valuable.”

## HIGHLIGHTS

- **AI Advantages**  
Retail has been one of the leaders in seeing massive benefits from AI efforts, but it’s been limited to a handful of areas, most notably e-commerce pricing.
- **AI Psychological Hurdles**  
Senior physical chain retail executives are hesitant to trust AI recommendations over human gut instinct, especially in areas such as apparel. The loss of jobs is very much a related concern.
- **AI Can Fuel New Ways of Retailing**  
AI machine learning can fuel better ways of running a retail chain, such as call centers that understand when a shopper is angry before answering the call.

## IMPROVING PROFITABILITY AND COMPETITIVENESS WITH SMARTER VENDOR NEGOTIATION

In a “see it, want it” Instagram-obsessed era, customers want the styles they see on the runway immediately, and at a sweet price point. A leading fashion retailer was struggling to pass sharp prices to its customers because it was losing millions of dollars in poor vendor negotiations. Unlike its closest competitors, which had their own manufacturing units and better control over the production cycle, this fashion retailer sourced products from outsourced vendors across the world. The buyers needed to determine the price points and the suppliers for a large portfolio of products during each season. They typically followed the traditional approach of seeking bids and choosing the low-cost provider in most cases. Often, buyers used similar products from past seasons as price benchmarks. They would spend several hours searching for a “close cousin” in previous orders. Because the data was spread across disparate systems and product descriptions were nonstandard, the hit rate of finding a match was under 10%, and buyers were unable to start the negotiation process on a strong footing. In a red-ocean competitive-bidding market, an erroneous decision of quoting even a few cents high due to suboptimal insights was costing the retailer dearly.

To address these inefficiencies, consolidating the information on disparate systems into a single platform was the first step. Powerful algorithms using NLP, computer vision, and ML combed millions of previous orders, evaluating item attributes such as composition, measurement, consumption, material, visual vectors, and description to come up with product matches with a high level of accuracy.

Now, buyers are armed with algorithmically generated benchmarks and no longer rely on vendor negotiations. And sourcing is a global data-driven process instead of the traditional country-specific negotiation process. Algorithmic price determination has resulted in increased profitability and reduced time to market by eliminating back-and-forth negotiations, enabling the retailer to be more responsive to fashion changes.

**AI HAS PROMISE IN MAKING RETAILERS MORE COMPETITIVE, ESPECIALLY WHEN IT COMES TO ENABLING THEM TO DIFFERENTIATE THEMSELVES.**

Most large retailers know very little about individual shoppers, at least when it comes to information that is meaningful and actionable. This deficiency means they have little hard data to justify AI investments. “They see the value as delivering slightly better decisions or improving operations in a slightly better way,” Colson says. “If you think it’s only slightly better, you’re not going to invest in it.”

Because Stitch Fix has been a pure-play online apparel retailer from day one—it has no physical stores—it is able to embrace AI far more easily, just as Amazon can push AI farther and more effortlessly than could Target or

Walmart. In other words, brick-and-mortar fashion retailers are in a very different position than strictly online operators are.

AI is now used by retailers for price optimization and loyalty programs, among other things, but the challenge lies in applying it to areas of their businesses where it hasn’t yet been extensively used, such as customer call centers, supply chains, and merchandise planning. While barriers such as data quality do exist, AI has promise in making retailers more competitive, especially when it comes to enabling them to differentiate themselves, and the technology continues to intrigue the sector. “AI is a very robust topic at this point,” says Robert Hetu, the Gartner vice president and analyst who covers the retail sector.

### E-commerce Allows First Foray by AI

When e-commerce emerged in the mid-1990s, it was an entirely new way of doing business for retailers. AI fit in nicely, since there were few legacy systems to disrupt and no decades-old mechanisms to replace. AI and other new methods were necessary to support e-commerce, so there was little resistance to any fresh technologies required for the task.

Also, the very nature of AI perfectly fit the new online operations. AI works best when dealing with massive data sets and a business’s need for extreme speed—a combination that would make using human analysts either impractical or impossible. E-commerce required tracking all stock-keeping units (SKUs)—meaning all products and variations thereof—and all customers, plus such things as what competitors charged. The results were the massive data sets that enable AI to perform best and faster pricing adjustments by retailers because of the speed that AI provided in making them.

But when discussing price optimization and AI, Hetu argues that a lack of sophisticated technology use is proving to be both an impediment and an incentive. “You can make a significant argument that most retailers struggle

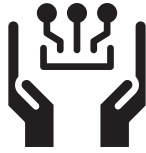
to use price optimization because their business processes are very dated and inefficient,” he explains. “Excel is still the number one planning tool for most retailers.” He sees a lot of potential in the next few years for retailers to use more AI in merchandising, planning, category management, space management, replenishment, and supply chain.

Anu Gupta, who assumed the COO’s role at Jyve after spending three years as Target’s senior vice president for strategy execution and operational excellence until 2018, views personalization as a place where the use of more advanced types of AI can be very powerful. But she asserts that retailers must be careful in deploying the technology. Gupta encourages retailers to limit how often demographic customization is used, warning that shoppers “might feel like they are being typecast.”

She argues that retailers should focus on the shopper’s “emotional and functional needs” when it comes to AI. For example, when grocery chains were struggling with how to get consumers to sign up for loyalty cards—CRM programs for the retailers—they initially stressed small discounts. But when the chains communicated to shoppers that having a loyalty account would enable them to receive a text or email notification if they bought something that had subsequently been recalled, sign-ups soared. It wasn’t merely the chance to save a few pennies that made the programs valuable. The grocery chains used AI to switch the value proposition altogether—from just saving money to potentially saving lives.

But retail industry executives are still apprehensive about wider uses of AI. “It’s not that the executives are not seeing (the benefits of advanced AI),” Gupta says. “It’s about the proliferation of and the speed with which you can actually deploy AI, figuring out where it makes the most sense.”

Greg Buzek, the CEO of IHL Group, a retail analyst and consulting firm, says some of the delay associated with the industry’s AI acceptance



**AI WORKS BEST WHEN DEALING WITH MASSIVE DATA SETS AND A BUSINESS’S NEED FOR EXTREME SPEED—A COMBINATION THAT WOULD MAKE USING HUMAN ANALYSTS EITHER IMPRACTICAL OR IMPOSSIBLE.**

**TCS INSIGHT**

## **MAKING EVERY SQUARE FOOT COUNT USING INTELLIGENT STORE PLANNING**

A leading U.S. retailer was making huge investments every year to remodel thousands of stores, but still had to contend with a drop in store space productivity and losses in the billions of dollars. Space planning was largely a manual process with heavy reliance on traditional performance metrics, tacit knowledge, and the aesthetic sensibilities of a large team of planners. This often resulted in cookie-cutter, nonlocalized layouts that failed to consider a wide range of factors that a human being cannot conceivably keep track of, and huge lead times, causing plans to become outdated even before implementation. Planners often ignored specific customer attributes in a particular locale, supply considerations, vagaries of weather (particularly nonseasonal/outlier weather events), and market dynamics with the various competitors in a trading area.

AI models such as deep neural networks, machine learning models, and classification algorithms were trained to unearth hidden patterns and generate insights across the big data sets. The algorithms then used these insights and patterns to generate optimal space recommendations for over a million store-category combinations within a matter of seconds. The AI amplifies human intelligence and codifies space and business considerations while maximizing key performance indicators for the retailer.

The interplay of art and science allowed the retailer to bring down the space-planning lead times from nearly six months to a couple of weeks, ensuring that the stores reflect the latest customer trends and local market dynamics. The scale and speed offered by AI and modern architectures ensure that the plans are hyper-localized, taking into consideration the innumerable intricacies of a specific trading area. The planners, instead of having to focus on mundane pattern-recognition tasks, are free to experiment with different strategies and rules. This has allowed the retailer to try up to eight times the number of strategies and layouts it was trying earlier. The space productivity gains were 5%–7%, a significant gain given the capital locked up in the retailer’s brick-and-mortar stores.

## INTERCEPTING THE VALUE CHAIN FOR ALGORITHMIC INTERVENTIONS

The race is on to get first-mover advantage to adopt AI for game-changing differentiation and competitive edge. But a long list of unknowns and blind spots are resulting in cold starts. Most algorithmic initiatives fail to see the light of day because organizations fail to consider factors such as feasibility, business benefits, time to adopt, and data availability.

A holistic “value discovery diagnostics” aligned with strategic direction and organizational vision is imperative for AI adoption. This requires a structured scan of the landscape that captures the key traits of the current state, including process repetitiveness, error probability, execution time, technology participation, and data leverage.

It needs to be followed by design-thinking workshops with stakeholders coupled with “day in the life” observations to create a backlog of business use cases with applicable interventions like robotic automation, AI-powered intelligence, and autonomous operations. This will unearth opportunities for operational efficiencies, enhanced customer experience, time to market, and associate satisfaction, thereby creating competitive advantage.

A strategic realization roadmap should leverage an ecosystem of built-for-purpose algorithmic capsules and market-leading products and platforms, startup solutions, and research emerging from leading academic institutions.

While the race has become about “first to start,” retailers should not forget that they also need to be “first to finish.”

beyond e-commerce has come from the business priorities of the many executives involved, from C-suite executives to line-of-business executives to IT people.

### AI Adoption Challenges

“There are so many other critical survival things that retailers are doing—low-hanging fruit—that most of the drive for AI, and especially machine learning, is being driven by marketers and other executives, not the CIO or anyone from IT,” Buzek says. “Some 80% of the CIO’s job is keeping the lights on and making sure that the current systems don’t break. That’s why the desire for AI and machine learning (ML) is usually coming from marketing and the sales side, people who are more forward-thinking. They are riskier people, personality-wise.”

Jon Duke, a research vice president at IDC, says AI is “really relevant when hitting the limits of human capacity. Some business leaders still don’t believe that the technology is mature enough for widescale adoption.”

A more concrete fear retail industry executives have is that the underlying data that exists is not accurate enough to benefit from the advanced analytics that AI and ML can deliver. Indeed, IHL’s Buzek argues that AI and ML can be counterproductive, potentially magnifying inaccuracies and making projections and recommendations even more misleading. “Most inventories are off by 25% or more, so the data the AI would be working off is not right,” Buzek says.

Although there are many logistical reasons for retail inventory errors—some product falling behind a pallet, shoplifting, someone miscounting—Buzek says hindrances to deploying approaches such as radio-frequency identification (RFID) and computer vision to address the inaccuracy issues are limitations forced by the generally accepted accounting principles (GAAP) for publicly held U.S. companies, which are also followed by many privately held companies. GAAP not only requires a complete inventory at least once a year, but also requires



## BRICK-AND-MORTAR FASHION RETAILERS ARE IN A VERY DIFFERENT POSITION THAN STRICTLY ONLINE OPERATORS.



## REALIZING ALGO RETAIL

Companies succeeding with groundbreaking innovation and faster growth aren't doing it on their own. They are leveraging collaborative ecosystems that extend beyond the enterprise, partnering with startups, academic institutes, and tech leaders across the globe to help enterprises enhance customer experience, boost productivity and profitability, and establish competitive differentiation. TCS has made significant investments to curate this ecosystem and enable customers to jump-start their AI initiatives with:



### PRODUCTS AND PLATFORMS

in some of the most transformational retail areas—intelligent merchandising, future fashion, connected stores, self-learning supply chains, and run-time personalization platforms—Optumera™, Omnistore™, Supplai, and iPrescribe. Additionally, TCS has built cognitive workbenches to accelerate adoption.



### TCS CO-INNOVATION NETWORK (COIN™)

that brings together more than 3,000 tech startups, 300 venture capitalists, and 120 venture capitalist firms to formalize innovation across a wide spectrum of industries.



### TCS PACE PORTS

in the U.S., Japan, and Europe that bring together advanced research, innovation, and digital business transformation offerings, and provide a physical hub for design-led innovation through collaborative and rapid experimentation with customers.



### ACADEMIC PARTNERSHIPS

with more than 50 leading universities and research institutes in emerging areas that require in-depth expertise. For example, predicting fashion trends based on social media posts and tracking freshness of produce using computer vision.



### AI TALENT DEVELOPMENT

through consistent and committed effort to democratize and scale the AI skill base within TCS with the talent transformation of 300,000 associates.

that it be done manually, he says. That prevents companies from using machine-counted inventory, via either RFID tags or computer vision, which are theoretically far more accurate. “Computer vision is a big part of it because RFID doesn't work on every item,” Buzek says. “Metals and liquids are more challenging for RFID tags.”

Even though GAAP rules certainly wouldn't stop a retailer from doing manual and automated inventory taking, Buzek says few have automated these processes, given that a manual count needs to be done anyway. “That's a piece of what is holding things back.”

### Making the Best of Less-Than-Perfect Data

The typical retail inventory today is, indeed, inaccurate—to one degree or another—but AI can be quite useful when extrapolating from less-than-perfect data, contends Prat Vemana, chief product officer at Home Depot.

“Even with human labor, item-by-item inventory is hard to calculate with 100% accuracy on a regular basis,” he says. “Modeling is being used to get you to a certain level of accuracy but won't get you to a precise answer. In most of these use cases, precision is not a must.”

Vemana says that he believes the retailer should be “using AI to guide you to where you need to go, where [you] need to focus. Today, the precision in AI is not there for financial quarterly forecasting. But when I am modeling a billion dollars of inventory to see where it is within a supply chain network at a moment in time, I want to use AI to get that rough sense.” And even many of the AI hurdles associated with inventory will become much less of an issue over the next few years, as AI becomes more sophisticated and better inventory controls address the underlying precision issues.

**THE TYPICAL RETAIL INVENTORY TODAY IS, INDEED, INACCURATE—TO ONE DEGREE OR ANOTHER.**



**“WHICH TYPES OF DATA ARE THE MOST VALUABLE? AI CAN TEST THE VALUE OF THE DATA YOU’RE COLLECTING AND HELP [YOU] SEE WHERE THE GAPS ARE.”**  
CHRISTIAN BECKNER, SENIOR DIRECTOR,  
RETAIL TECHNOLOGY, THE NATIONAL  
RETAIL FEDERATION



Christian Beckner, senior director of retail technology for the National Retail Federation, says most retail chains are still trying to understand where AI is most likely to offer benefits. “Can AI be used to help retailers better understand the value of the data they already have?” he asks. “Which types of data are the most valuable? AI can test the value of the data you’re collecting and help [you] see where the gaps are.”

Balaraman Ravindran, head of the Robert Bosch Center for Data Science and AI at the Indian Institute of Technology in Chennai, India, anticipates logistics as the next AI area for retail. Most retail logistics operations have a “well-entrenched, systematic approach to logistics that these companies have been using for a long time. They don’t think it’s broken yet,” Ravindran says. “Many of these logistics problems have multiple criteria. They assume some sort of a cap on capacity and fuel consumption. These are the kinds of simplifying assumptions that people employ to make things run. These are human seat-of-the-pants views. AI can do a far better job of making those assumptions across a wide range of operating conditions. AI can react to measurements that you make, and react to [them] much faster.”

The technology could also help with one of the most secretive decision-making elements of retail, namely which products to offer and in what colors, sizes, and shapes. The AI argument is that software can better absorb vast amounts of data—such as reviewing the contents of 14 million social media posts and identifying the likely gender, age, and income bracket of almost everyone—and can do so without bias or, when desired, with bias. For example, can a 46-year-old experienced apparel executive review social media posts of preteen girls and analyze that data without filtering any of it through the lens of a 46-year-old? The argument is not solely that AI can function without bias. It can also provide more targeted results, such as reviewing all the posts of a specific group of likely buyers of a specific age and gender and adopting

## TCS INSIGHT

# MAKING AI WORK

The potential for AI and machine learning in the retail industry will be determined by the following factors:

- 1 USE CASES**  
Identifying use cases core to business strategies in which AI can deliver the maximum impact will determine the success of AI.
- 2 HUMAN-MACHINE HARMONY**  
Creating an environment where humans and machines can peacefully coexist and machines are leveraged to amplify human ingenuity will accelerate adoption.
- 3 UNIFIED DATA FOUNDATION**  
To realize the full benefits of applying AI and machine learning to data, retailers must build a consolidated data foundation that will enable them to analyze, sense, and act on large volumes of heterogeneous data like voice, text, and images.
- 4 EXECUTIVE EDUCATION**  
Demystifying AI and helping board rooms understand what AI can and cannot do are critical to making AI a foundational enabler of business strategy.
- 5 NEUTRALIZING NAYSAYERS**  
A systematic approach to handle oft-cited pitfalls of AI, such as data sufficiency, ethics and bias, and societal considerations, is important to pave the way for frictionless adoption of AI.

---

“Retailers can optimize placement of products based on time of day, foot traffic, and buyers’ preferences, as well as pricing shifts and markdowns that can change minute to minute,” says Anu Gupta, COO at Jyve.

---

a software-replicated bias of how a member of that group would think.

Gartner’s Hetu says that he feels more AI development is needed, however. “The hardest area for AI is the traditional merchandising processes such as product selection, assortment planning, and pricing. Those are going to be the hardest to crack,” he says.

Hetu does see social media offering some attractive AI situations for retailers. When looking at social media input for fashion purchases, for instance, sites such as Snapchat offer a “tremendous amount of information,” he says. “If a customer likes an image [of what] a particular star is wearing, AI can take that image and break it down into its characteristics. But resistance to AI will be greater with a fashion retailer than with a grocery retailer.”

That is partially because grocery executives are much more used to different forms of calculation. Historically, fashion has been very emotionally driven. “There is an old argument in retail about art and science,” Hetu explains. “In fashion, they very much lean more toward art than science. That is not to say that the AI benefits aren’t potentially huge in fashion, but that executive resistance is likely to be greater.”

### **New Retail Tactics on the Way**

Retailers are still coming to terms with the many potential advantages of widespread use of AI, says Jyve’s Gupta. “Retailers can optimize placement of products based on time of day, foot traffic, and buyers’ preferences, as well as pricing shifts and markdowns that can change minute to minute,” she says, pointing

to dynamic staffing as a particularly attractive area for AI. “The ability to predict staffing needs and a flexible labor force to accommodate fluid demands, such as an unexpected need for more merchandisers or cashiers on deck, will help retailers provide a more seamless experience for shoppers.”

If nothing else, AI can help store associates stay current on the data they need and run a tight ship. “Today, in-store workers operate independently and disjointedly with little reason or ability to share information, ultimately resulting in a missed opportunity to increase efficiency,” Gupta explains. “When we implement processes to collect data generated by in-store operations, it becomes easier to leverage and coordinate that data, resulting in quicker, more effective in-store execution and tighter fulfillment logistics.”

Gupta also sees new retail tactics materializing because of AI. She points to how customer service call centers will detect emotion in the voice of a caller when, say, a company’s automated system asks about the nature of their inquiry. Depending on the tone of the caller’s voice, that automated system can potentially route the call so it can be answered more quickly. And a message could be sent to the associate who is about to answer the call that says, “This caller sounds angry. Try and be extra understanding.”

She believes those call centers could know more about the caller even before anyone has spoken with the person. The company rep can then leverage information the retailer knows. For example, a caller from the Bronx, might

---

be routed to a rep who is also from the Bronx. This might facilitate a natural, friendly conversation—perhaps about the New York Yankees. Or it might send a sports fan of one team to a rep who likes the same team. The system could even route a customer who has a food allergy to a rep especially familiar with that allergy. These are connections that are not practical for most businesses today, but AI will soon change that, and the retail industry could be on the leading edge of putting it into practice.

Others see AI becoming more of a force in the retail sector when it comes to analytics and predictive modeling. “I see even the more traditional areas of operations—be it finance or supply chain—moving closer to analytics and a predictive model,” says Home Depot’s Vemana.

On a scale of one to 10 in AI sophistication, Vemana says, “Ten is when I have a robot running around in a warehouse detecting every object and trying to pick and pack. Five for me would be applied machine learning” in areas including finance, fraud prevention, and styles.

Downstream, or interactions with customers, has embraced AI more than back-end functions, Vemana says, adding that most teams started small by testing known hypotheses, before moving into solving bigger problems.

But these are baby steps. “You’re seeing more and more models being applied to optimization of existing hypotheses rather than creating a new hypothesis,” he notes.

### The Seasonal Impact

Delving deeply into consumer interactions forces the discussion into a seasonal or at least calendar-based reality. Storms influence grocery purchases just as much as cold weather impacts how much apparel is bought, Vemana explains. Indeed, AI models will have to use historical and predictive weather data to project purchases well in advance of the actual sales. Vemana mostly anticipates a vast increase in data points, which he refers to as infosignals.

More data points could mean far more accurate AI results, “provided those signals can be read and understood accurately,” Vemana says. “Inventory is absolutely going to get better because we’re picking up more signals than ever before.”

He paints a scenario to explain his optimism. IoT and the connected home will be able to provide more information to homeowners about what is in their refrigerator and when they need to change the water filter. “So many signals are going to be available to customers that were not available a few years ago, which makes their lives easier,” Vemana says.

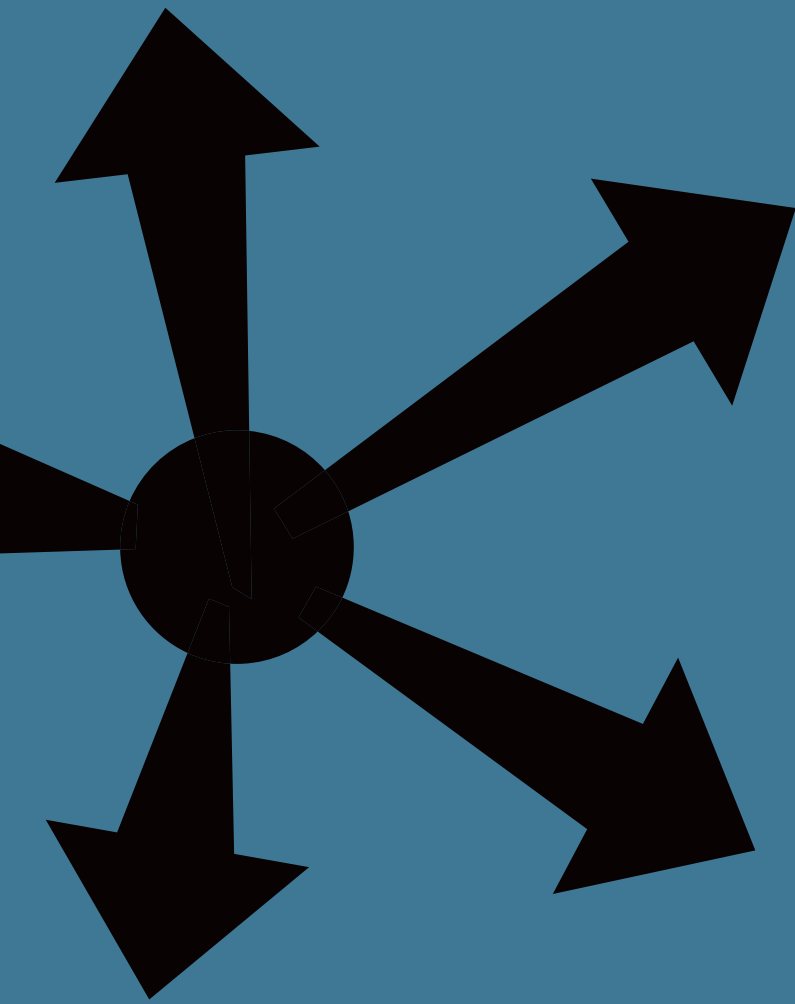
The role of the brick-and-mortar store is continuing to shift. A decade ago, Vemana says, selecting store locations was based on shopper traffic and flow. The idea was always to find the most convenient location for a shopper driving or on foot. In a few years, however, the location of the store will shift to a place of convenience, and not one strictly involving retail.

It might be part store, part storeroom—a temporary area for goods that are either being returned or en route to some online shopper. “Access to highways and train yards may be more important than access to people,” Vemana says. AI would be crucial to taking market research, GPS, and other data and figuring out just



---

**“STORMS INFLUENCE GROCERY PURCHASES JUST AS MUCH AS COLD WEATHER IMPACTS HOW MUCH APPAREL IS BOUGHT,” EXPLAINS PRAT VEMANA, CHIEF PRODUCT OFFICER AT HOME DEPOT.**



**THE FASTER THE RETAIL SECTOR WIDENS  
ITS USE OF AI, THE MORE EXPANSIVE COULD  
BE ITS RESPONSE TO CURRENT AND FUTURE  
COMPETITIVE PRESSURES.**

where this hybrid store/warehouse should be placed.

Curiously enough, price optimization, which retailers used AI to achieve early on, may not figure prominently in what the technology does in the sector in the future. Alberto F. Cavallo, the Edgerley Family Associate Professor of Business Administration at Harvard University and a macroeconomist, cautions against using AI to optimize prices. “Some [retailers] are worried about the ways that they could antagonize their customers, breaking the trust of their customers,” Cavallo says.

Although the retail industry hasn’t taken full advantage of being early to the AI party, it shouldn’t be paralyzed by a fear of testing AI’s limits. In fact, the sector should be energized by the challenge. High risk means high reward.

## Conclusion

Hames identifies supply chain, human resources, finance, and sales forecasting as the pockets within the retail industry where there’s the best potential for AI and ML. Using an ML algorithm could optimize a supply chain through which vendors are shipping various packages to and from thousands of different locations at all times of the day, he says. ML can be used to read resumes and better match candidates to jobs. AI can not only help retail managers analyze expense savings and labor rates by location, but also track how much each store is receiving in units, not in dollars, and feed it into a labor-planning model. “With AI, you can bring in many, many more forecasting variables,” Hames says. “You can have a predictive model all the way down to the item level while using more variables.” With retail morphing into a more responsive and customized business, the power of AI is going to become far more critical over the next few years, perhaps in these areas and even beyond.”

This future use of AI in the sector has as much to do with the changing nature of retail—Vemana’s argument about the store shifting even more into a virtual warehouse to support mobile

## PRICE OPTIMIZATION ILLUSTRATES THE RETAIL VALUE IN AI

Although a highly attractive business case can be made for using artificial intelligence in almost any business area, it was a natural for retail in the mid-1990s during the dawn of e-commerce as the world wide web became popular. The reason: AI solved what appeared to be a massive problem—online price optimization.

The online price optimization challenge was to track all of a retailer’s customer interactions with products—namely, which ones were popular and which ones were ignored—while monitoring the pricing of those products on the sites of as many rivals as possible. The ultimate goal was for the system to instantly change prices as its analysis suggested such an action—sometimes adjusting the price of one product many times in one hour.

One major book retailer, through such an AI-enabled price optimization system, realized it didn’t always have to reduce prices to compete. In fact, in some instances, it increased prices, as was the case with the Harry Potter books. Customers prioritized other things—a particular edition, author reviews, or the availability in hardcover, paperback, or Kindle eBook—over price.

Price changes also require context, which involves all kinds of linkages and rules involving various products that AI can help catalog and apply. Consider certain types of cheese, which, like wine, often gain value as they age. AI can optimize pricing strategy based on age and other variables by type and do so quickly and efficiently.

This dynamic had nothing to do with customized pricing, where specific customers are shown prices tailored for them, thus raising the sticky issue of some customers being charged more than others. Although the airline industry can get away with it, most retail executives believe their sector wouldn’t.

Price optimization was a better fit for the industry, since it could more naturally showcase AI’s potential because the tasks required assessing a vast amount of data extremely quickly. If Target is showing a price for a specific product that is 20% more than what Walmart is charging, it’s a problem.

That pricing disparity was not a problem before the internet got popular. But once sites deployed shopping bots to instantly compare prices and tell consumers the best site for the cheapest price on a specific product, the new transparency forced retailers to constantly change prices.

Tracking what competitors are charging is straightforward, but an even more potentially profitable analysis looks at a retailer’s own shoppers and site visitors. If a product is getting too few clicks—and absolutely too few purchases—the system can experiment with different prices for different durations and see if that improves the situation.

This price optimizing strategy is certainly something that human analysts could do, but it would be impossible for people to review enough data and to act on it quickly enough. An even higher level of analysis involves widely advertised special sales, during which an unusually large number of shoppers will be looking at a specific product. The ability to tweak prices repeatedly until the purchases are optimized is massive. It really becomes demand pricing, such as what Uber and other ride-share companies do.

And AI is the only viable way to do it.



## THE POTENTIAL IMPROVEMENTS IN PROFITABILITY AND EFFICIENCY FROM BETTER SUPPLY CHAIN EXECUTION AND MORE IN-TUNE-WITH-SHOPPERS PRODUCT MIXES ARE VAST.

purchases—as it does with the shifting capabilities of AI and, especially, ML efforts.

But it's the combination of these two trends that will color AI's expected massive growth in retail by 2022.

Retail AI got its start in e-commerce, but the trick for the next few years is taking the right lessons away from online shopping experiences and applying those to very different in-store physical realities. The potential improvements in profitability and efficiency from better supply chain execution and more in-tune-with-shoppers product mixes are vast.

Those goals, however, are based on logical, nonemotional analysis of where retail needs to go. To get there, much needs to change with the mindsets of many veteran retail executives.

The fear is understandable. AI done properly absolutely can sharply reduce, if not eliminate, various roles. Then there's the trust factor: Will executives trust algorithms to make decisions on fashion trends, which stores should be closed, and where the best locations are to open new ones?

Then there's the perception of bias. Will AI, used in situations such as HR hiring and screening procedures, remove human biases? Or will the programming of these analytics simply add a different kind of human bias?

The most exciting possibilities within retail AI are not merely improving existing operations, but in enabling entirely new approaches, such as the potential call center changes that Gupta detailed.

As physical retail chains look to the future, change that is sometimes radical is going to be unavoidable. Improving the retail in-store experience, for example, requires a major overhaul if it's to overcome the convenience advantages of pure-play online operations.

The faster the retail sector widens its use of AI, the more expansive could be its response to current and future competitive pressures. As Stitch Fix's Colson asserts, many of the executives at large chains "lack understanding of the value you can get with AI. Most retailers think their differentiation is brand or best assortment. They think the effective use of AI is just fine-tuning. They don't realize that it can totally differentiate the company."

## **ABOUT TCS RETAIL**

TCS Retail partners with over 100 global retailers, driving their growth and digital transformation journey. We are solving their toughest challenges by harnessing our deep consulting and technology expertise, amplified by strategic investments in products and platforms and research partnerships with top universities; a Co-Innovation ecosystem of over 3,000 startups; and Nucleus, our in-house innovation lab.

Retailers from diverse segments are unlocking exponential value through our comprehensive portfolio of innovative products and solutions: the AI-powered merchandise optimization suite Optumera™, universal store commerce platform OmniStore™, and AI-based supply chain solution Supplai™. Our solutions and offerings leverage the combinatorial power of new-age technologies to make businesses intelligent, responsive, and agile.

With a global team of 40,000 associates, we are powering growth and transformation among leading retailers worldwide.

For more information, visit us at [www.tcs.com](http://www.tcs.com).



#### **ABOUT TATA CONSULTANCY SERVICES (TCS)**

Tata Consultancy Services is an IT services, consulting, and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled infrastructure, engineering, and assurance services. This is delivered through its unique Global Network Delivery Model™, recognized as the benchmark of excellence in software development. A part of the Tata Group, India's largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

#### **CONTACT US**

[hbranalyticsservices@hbr.org](mailto:hbranalyticsservices@hbr.org)