

# The AI Revolution in Retail

Artificial intelligence is transforming the entire retail journey from supply chain to check out

By Sharon Fisher



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## Executive Summary

Shoppers interact with artificial intelligence (AI) every time they shop, whether it is with a major online retailer or a corner store. But the role of AI varies depending on factors such as the merchant’s size, where the transaction is being conducted, and where you are looking along the customer journey.

Some ways that AI is being used in retail include transforming the supply chain to be more predictive, efficient and flexible to meet the customer’s increasing demands for customization and convenience. AI in online shopping not only helps customers find the right products they want at the right time, it also helps the environment by minimizing the impact of product returns.

AI is making chatbots smarter so they can answer questions better from shoppers and it is being used to fight fraud, with online vendors pooling together their fraud lists. AI in bricks-and-mortar ‘smart’ stores eases the transaction process in the post-Covid world with touchless payment systems that aim to protect shopper privacy.

This report features interviews with top executives at Walmart and Amazon, two of the world’s largest retailers, as well as AI vendors and their solutions. While much hype still exists about the capabilities of AI, retailers are showing how AI can be pragmatically used in a way that increases ROI by delighting the customer, making supply chains more efficient and defeating fraudsters along the way.



# Retail in the Age of AI

AI can give retailers a competitive edge in the marketplace to drive sales while raising efficiency and reducing fraud

Shoppers interact with artificial intelligence (AI) every time they shop, whether it is with a major online retailer or a corner store. But the role of AI varies depending on factors such as the merchant's size, where the transaction is being conducted, and where you are looking along the customer journey. Here are some ways that AI is being used in retail.

## AI in the supply chain

Whether a business is selling its products through online stores or bricks-and-mortar, it does not do any good if products are not available when and where customers need them. When both suppliers and customers

are global, making sure they connect is a big problem merchants are helping to solve using AI.

"Customers are changing how they shop," said Prakhar Mehrotra, vice president of machine learning, U.S. Omni Tech, for Walmart Global Tech. A customer wanting chips and salsa might pick up chips at the store and order salsa online, which could be shipped from the same store or a fulfillment center. Such complex problems could be solved only through AI, he said.

Certainly, COVID-19 was a factor in accelerating this trend, but it is a journey Walmart was taking anyway, Mehrotra said. "COVID was just a different dynamic."



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One example of how Walmart uses AI is with its Mobius supply chain simulator, Mehrotra said. “I have customer demand, and I have a supplier,” he explained. “How do I flow that item throughout my warehouses and distribution centers so customers have it when they need it? That decision is very crucial.”

Walmart developed the AI technology in-house, using open-source software, Mehrotra said. “The secret sauce is not the library,” he said. “It’s how you put them all together.”

Typically, Walmart would have several supply chain options, but the AI simulator helps the company figure out which is the most optimal – especially in case of a disruptive event such as a hurricane, COVID, missing trucks, or unavailable distribution centers, Mehrotra said.

As an example, the company recently had a fire in one of its fulfillment centers when customers had already placed orders. Walmart used the simulator to find similar



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items at other fulfillment centers and figure out how to route it to those customers, Mehrotra said.

What if the product just is not available? In that case, Walmart uses smart substitution, which uses AI to track what alternatives exist and which alternatives the customer has chosen in the past. For example, if the customer orders Dannon strawberry yogurt, and it is not available, AI helps the system

have an idea whether the customer would prefer Dannon blueberry yogurt or Chobani strawberry yogurt instead.

“At the end of the day, we have a customer, and we give them several options: order online to be delivered, order online and pick it up, or shop in a store,” Mehrotra said. “It is a complex, heterogenous world. We want to make sure our customers get what they want and when they want it.”

### AI in online shopping

Not surprisingly, AI is prevalent in online shopping as well, ranging from what a website shows customers and the recommendations it makes to checking for fraud.

“Through machine learning, we figure out what you are interested in hearing about – such as a new sale or new products – to increase the likelihood that you will not put it in the spam folder,” said Xun Wang, chief technology officer for Bloomreach, which develops AI-based engagement software that generates email messages for e-commerce websites.

Using AI in online stores is not just a matter of selling more, said Wang. “We have a social responsibility to help people find the right things, to optimize people’s time and the environmental impact of returns,” he said. A returned item might end up in the garbage. “If we make relevancy better, it saves time and is better for the environment,” he said.

Online stores are also using AI to power



chatbots that interact with customers. Walmart is using chatbots in the U.S., Canada, Mexico, Chile, and India, said Shankar Bhargava, senior director of software engineering for Walmart Global Tech. The chatbots reduce the number of times customers need to talk to associates, meaning associates have more time to answer more complex questions, he said.

AI is also being used to help detect fraud in online ordering, and is gaining access to more data by online vendors pooling their fraud lists, said Ashley Kiolbasa, senior director of product marketing for Signifyd, a commerce protection provider. “If you don’t leverage machine learning, you are relying on just the data within the four walls of your own business, which pales in comparison to a network-based approach,” she said. “The bigger the network, the more powerful the fraud prevention is going to be.”

AI-based fraud detection also helps in the opposite situation: Vendors that decline too

large a percentage of orders by following a too-broad set of rules, such as declining orders where the shipping address does not match the billing address, Kiolbasa said. While fraud amounts to \$40 billion per year, false declines amount to \$443 billion, she said.

At the same time, vendors have to be careful

that collecting information on customers does not cross over into being intrusive. “There’s a line between checking into a hotel, and remembering that I want a king-sized bed with a high mattress on a high floor, and sending me a toothbrush every time because once I forgot to pack a toothbrush and asked

for one,” said Sanjay Srivastava, chief digital strategist for Genpact, which uses AI to extract information from unstructured data in documents and PDFs. Humans still need to be involved, particularly in setting limits on how to do more or less of a particular action. “You can’t let the AI run by itself.”



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## AI in ‘smart stores’

As desirable as it is to shop in one’s pajamas, there will always be an occasion when someone has to run out for a quart of milk. Retailers are using AI to streamline that process as well, with companies such as Intel and Amazon working on technology for ‘smart stores’ where the customer can walk in, grab what they want, and walk out again – with the added benefit, in the COVID era, of not requiring touching additional surfaces or interacting with people.

Amazon’s ‘Just Walk Out’ technology uses the same technologies self-driving cars use: computer vision, sensor fusion, and deep learning, said Gerard Medioni, vice president and distinguished scientist for Amazon Web Services Physical Stores Technology. The technology senses when a customer puts a product in his or her cart – or takes it back out again – and charges only for the items that leave the store, including sending a receipt.

Similarly, the company has developed the

Amazon Dash Cart, a smart shopping cart where customers log in to the cart and scan items as they put them into the cart, which also shows the customer a receipt in real time. “The Dash Cart uses a combination of computer vision algorithms and sensor fusion to help identify items placed in the cart -- simply grab an item, scan it on one of the Dash Cart cameras, and place it in the cart like you normally would,” Medioni said. The Dash Cart even includes a scale to weigh items such as produce.

Another way Amazon uses AI in physical stores is with Amazon One, which lets customers use their palm to enter the store, identify themselves, and pay. “The service uses custom-built algorithms and hardware to create a person’s unique palm signature,” Medioni explained. That comes in handy – no pun intended -- for when the customer forgets their wallet.

Why the palm? “Palm recognition is considered more private than some

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**“We know that bias may occur when some subset of the data with specific attributes is underrepresented during training.”**  
— Gerard Medioni, vice president and distinguished scientist for Amazon Web Services Physical Stores Technology

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biometric alternatives because you cannot determine a person’s identity by looking at an image of their palm,” Medioni said. “It also requires someone to make an intentional gesture by holding their palm over the device to use. And it is contactless, which we think customers will appreciate, especially in current times.”

Amazon is also using AI-generated ‘synthetic data’ to help train the palm recognition system, which the company hopes will prevent some issues that AI systems have had recognizing minorities. “We know that bias may occur when some subset of the data with specific attributes is underrepresented during training,” Medioni said. “That’s why we add many synthetic

instances of such a subset during training to mitigate any residual bias.”

Thus far, these technologies are in use at some stores in airports and stadiums, as well as in Amazon’s own Amazon Go and some Amazon Fresh and Whole Foods Market stores.

AI in retail has the potential to expand even further, said Wang. “Finding a product is not as efficient as it could be,” he said, noting he was looking for socks with Lego blocks on them and had to search 16 screens of Lego toys before finding socks on the 18th page. “AI is a huge disruptor,” he said. “Companies not doing this are going to be left behind.”

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