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## ANTICIPATING DRAWBACKS: WALMART'S VENTURE INTO AI-PREDICTED CUSTOMER PURCHASES

*Shopping is about to become easier than ever...but at what cost?*

In the ever-evolving landscape of technology and commerce, companies are continually seeking innovative solutions to enhance customer experiences and streamline operational processes. One of the ways in which this has been carried out is by the continuous leveraging of artificial intelligence (AI) to revolutionize traditional business models. This adoption was forecasted to be applied by 85% of retailers by the year 2020 (Marotta, n.d.). Similarly, retail companies are increasingly harnessing the power of AI to revolutionize traditional shopping experiences, where predictive algorithms and data-driven insights define the essence of consumer engagement.

Walmart, a stalwart in the retail landscape, has been at the forefront of this technological evolution, making significant strides in AI adoption. From predictive inventory management to personalized shopping experiences, Walmart has leveraged AI to enhance operational efficiency and cater to the ever-changing preferences of its diverse customer base. The process involves fine-tuning models with historical data, online behavior, and future data while anticipating demand and potential disruptions. Recently, via their website, Walmart vowed to deliver one of the most seamless and gratifying holiday shopping experiences to their customers; this was to be achieved by availing an array of items, from sought-after gifts and festive decor to delectable treats (Musani, 2023). The retail giant's push into AI reflects not only a commitment to technological innovation but also a strategic vision to stay ahead in an industry marked by relentless evolution.

However, in the pursuit of convenience, it becomes essential to investigate the potential pitfalls and limitations that may accompany this technological advancement. This case study embarks on an exploration of Walmart's pioneering initiative—the AI-powered InHome Replenishment service. The case study also seeks to discuss the possible outcomes of this new initiative, delving into its genesis, development, and possible challenges that may underscore the transformative impact of AI in the retail sector. By critically examining the promises and potential negatives, we aim to comprehensively understand the multifaceted implications of Walmart's AI-powered approach, offering valuable insights for companies navigating the intersection of technology and customer-centric strategies.

## Problem Statement

Walmart's InHome system represents a significant advancement in the realm of retail technology, offering automated household item replenishment for customers. However, despite its potential benefits, the implementation of such a system is not without challenges. This research aims to address the precise challenges faced by the InHome system, including technical glitches, predictive algorithm inaccuracies, shifts in consumer behavior, economic uncertainties, emerging trends, data privacy concerns, customer resistance, and financial implications.

Understanding and addressing these challenges are paramount due to the transformative impact of the InHome system on retail operations and customer experiences. Resolving technical issues and improving algorithm accuracy can enhance system reliability while addressing consumer behavior shifts and economic uncertainties can optimize the system's predictive capabilities. Additionally, mitigating data privacy concerns and addressing customer resistance is essential for fostering trust and widespread adoption.

## Background

### In-Home Replenishment Service

The In-home delivery service is an innovative program used by Walmart that is pushing the boundaries of convenience by offering customers the option to have groceries and various products delivered directly to their homes, even stored in their refrigerators. While the service is available in select markets, Lin (2023) found it superior yet reasonably priced after trying it out for one month. The unique selling point lies in the proximity of the delivery, with items brought right into the customer's garage or kitchen refrigerator. Notably, the service is executed by rigorously screened workers equipped with fully illuminated body cameras, masks, and shoe covers, ensuring a secure and reliable delivery experience.

Recently, Walmart announced a groundbreaking additional feature to the InHome service, which will see the program automatically order essential items at optimal times and deliver them directly to customers' homes, where a delivery person places the items in their refrigerators. While the seamless drop-off feature is already accessible to shoppers with the \$20 monthly InHome membership, the new development aims to go further by automating grocery item selection (Pierce,2024).

Traditionally, customers utilizing delivery services have been required to choose the items they need actively. However, Walmart's vision is to streamline this process using advanced technology. The corporation envisions a scenario where it can autonomously generate personalized grocery lists for customers by training its models on individual purchasing history and a broader understanding of consumer behavior. This marks a significant shift from the conventional approach of manual selection to a more automated and predictive model.

The InHome replenishment service aligns with Walmart's broader strategy of leveraging AI and machine learning to enhance the shopping experience. By integrating historical purchasing data and consumer behavior insights, Walmart aims to create a service that fulfills immediate needs, anticipates, and caters to customers' preferences over time. The \$20 monthly membership fee grants users access to this seamless delivery process, emphasizing Walmart's dedication to offering cutting-edge solutions that redefine the conventional boundaries of grocery shopping.

### Rationale for AI Integration

The rationale for AI integration among retailers lies in the pursuit of enhanced operational efficiency, personalized customer experiences, and a competitive edge in the rapidly evolving commerce landscape. Retailers leverage AI to analyze vast amounts of data, ranging from customer preferences and buying patterns to inventory management and supply chain optimization. By harnessing the power of AI, retailers

can make data-driven decisions, predict consumer behavior, and optimize processes, ultimately leading to improved customer satisfaction, streamlined operations, and increased profitability. Additionally, AI enables retailers to offer personalized recommendations and targeted marketing campaigns, ensuring they stay ahead in an increasingly digital and competitive marketplace. The integration of AI in retail reflects a strategic response to evolving consumer expectations and a commitment to staying at the forefront of technological advancements in the industry. Figure 1 below shows AI's projected retail market size incorporated in North America from 2019 to 2030.

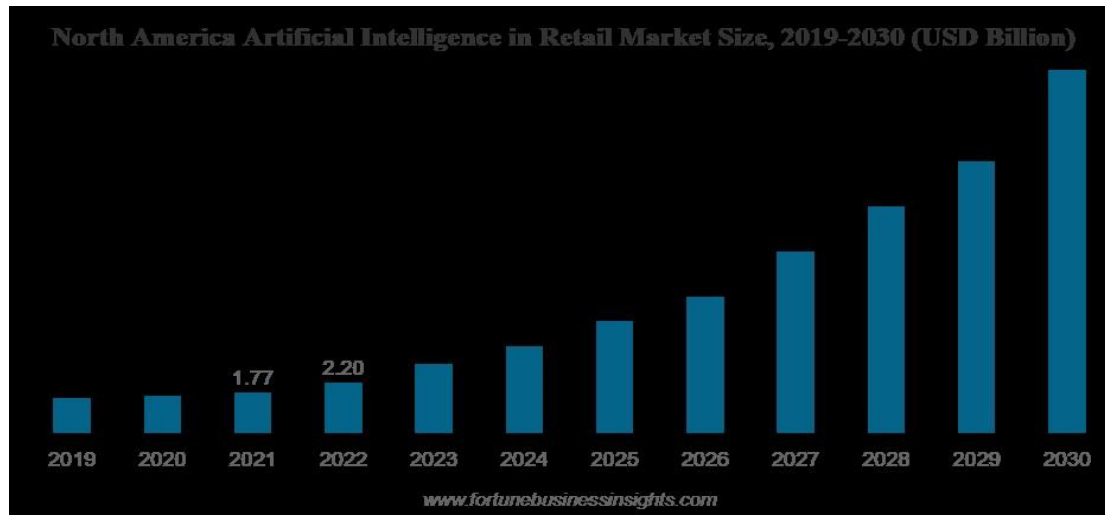


Figure 1: Projected Trend in AI in Retail Market Size [Source: *Fortune Business Insights*]

## Case Analysis

### Factors Affecting the InHome AI Project

For a comprehensive analysis of the feasibility of Walmart's AI project, a closer look at the factors affecting it becomes essential. From external forces such as competition and technological advancements to internal elements like pre-existing technology and user requests, this examination seeks to understand all the challenges and considerations the project is likely to face.

#### **Internal Factors**

Examining internal factors is crucial as they are the bedrock of an organization's operations and strategy. By understanding these factors, Walmart can enhance the efficiency of its AI project, ensuring seamless integration with existing systems and fostering an organizational environment conducive to innovation and adaptability.

#### **Information Technology (I.T) Department**

The technical expertise within Walmart's IT department is instrumental in the development, deployment, and maintenance of the new InHome Replenishment System. Due to the amount of data, it will need to handle, while having systems continually monitor customer pattern behaviors, there ought to be robust, well-coordinated and ever maintained systems. Resource allocation within the IT department is also vital to support the InHome Replenishment service while addressing other organizational needs.

### ***User Requests***

User requests are a vital feedback mechanism for the InHome Replenishment service. This data can be obtained from the Walmart App's review section, or review prompts sent to InHome subscribers after making a purchase. This way, they can get direct feedback on areas they might need to improve and have a general view on the level of acceptance the innovation has in the market. Incorporating user feedback enhances usability and functionality, ensuring the service remains user-centric while managing expectations within the project's capabilities.

### ***Existing Systems and Data***

Integrating AI seamlessly with Walmart's existing data infrastructure is a critical aspect of the InHome Replenishment service. Their current utilization of AI in enhancing catalogs and refining product recommendations provides a solid foundation for any further technological advancements. For example, according to Walmart Global Tech's article "A Closer Look at Top AI Trends in Retail in 2023", Walmart was able to determine how many pumpkin pies Sam's Club (Walmart's owned store chain) subscribers would require during the festive holiday season, with the help of AI. As Walmart transitions into a new era of personalized retail experiences, the existing AI systems become pivotal in shaping subsequent projects' success.

### ***External factors***

Other than what Walmart can control within the organization, they must be wary of the external factors that they have little to no control over but must only adjust accordingly.

### ***Government Regulations***

Being in the retail sector, Walmart must comply with government policies and regulations. Despite there not being a direct regulation on A.I. as a unit, any of its use, development, or advancements should be in check with government policies concerning data privacy and consumer protection. With time, more suggestions on regulating the use of AI have been brought up, with the most recent proposal being brought up by U.S. Senators Brian Schatz and John Kennedy called the "*AI Labeling Act*" in a bid to prevent fraud or misinformation caused using AI. Adapting to changes in laws governing technology and data usage is pivotal to the successful deployment of the InHome Replenishment service.

### ***Technology***

The success of the InHome Replenishment service hinges on staying technologically relevant. Based on the research conducted, Walmart deploys three main types of AI technology for their customer-related systems.

- **Generative AI** – This technology enhances customer experience by summarizing sentiment and offering personalized suggestions. Furthermore, it optimizes supply chain processes and aids in cost management.
- **Conversational AI**- Walmart uses natural language understanding (NLU) to understand queries and customer needs.
- **Machine learning**- Walmart uses machine-learning models to track inventory levels, predict demand, and anticipate demand. These models are fine-tuned using historical data, online searches, and page views by online shopping customers.

In their recent statement during the CES Tech Event in Las Vegas this year, Walmart CEO Doug McMillon announced that the company would be partnering with Microsoft to introduce AI-powered shopping experiences. The integration across Walmart's online platforms will analyze shopper behavior

and suggest future purchases using large language models from Microsoft, utilizing retail-specific search functions (Saleh, 2024).



Figure 2: Walmart CEO Doug McMillon at the CES 2024 Event. [source: *Las Vegas Review-Journal* 2024]

However, Walmart only gave a sneak peek at the intended purpose of their InHome Replenishment Project without going into technological details. It is, therefore, difficult to assess whether this new technology will have significant impacts on the current ones being used at the company.

Constant monitoring of emerging technologies is crucial to ensure the AI project remains cutting-edge. Simultaneously, the integration of AI with existing technologies poses a challenge that necessitates careful navigation.

### Competitors

Like most companies in the customer-based market, Walmart needs to monitor the strategies and innovations of competitors in the AI and retail space. Auto replenishment services are mainly used in warehouses and other businesses that require restocking of predictable items. These systems require less complex AI and machine learning models, as there is little variation in the targeted data. However, Walmart's projected replenishment service system will probably require more complex models due to the high variation of customer-based data. Walmart's InHome Replenishment Service is ideologically similar to Amazon's Dash Replenishment Service and Dash Smart Shelf but differs in many ways.

- **Amazon Dash Replenishment Service-** This system enables automated reordering of select items sold through Amazon such as washing machines, printers, smoke detectors, etc. With the help of Amazon's virtual assistant technology, Alexa, reordering these items or their spare parts is made easy.
- **Amazon Dash Button Service-** This was an older version of the current Alexa-integrated replenishment system, which enabled customers subscribed to Amazon Prime to have an auto-detecting physical button to help with reordering select items such as laundry detergents whenever one is running out of supplies. This service was discontinued in 2019 due to its use being superseded by automatic reordering and product subscription (BBC News, 2019).
- **Amazon Smart Shelf-** This system is the closest resemblance to Walmart's InHome Service, as it is used to restock common household items such as groceries and beverages. Items bought are

placed on a “weighing scale” like a device that monitors the weight of the items in question. When one runs out of items, which will be replicated by the drop in weight, the system automatically reorders the items. However, just like the other Amazon services, it is available on select items.

Unlike the discussed Amazon’s replenishment services, Walmart’s InHome replenishment service is intended to be used for all household items being sold on its platform.

Furthermore, when compared to its competitors, Walmart only falls second to Amazon in being ready to implement AI in its operations, as seen in Figure 3 below.

### Top 7 in AI Readiness for Retail Overall

Readiness Scale 0-100

Source: IHL Group

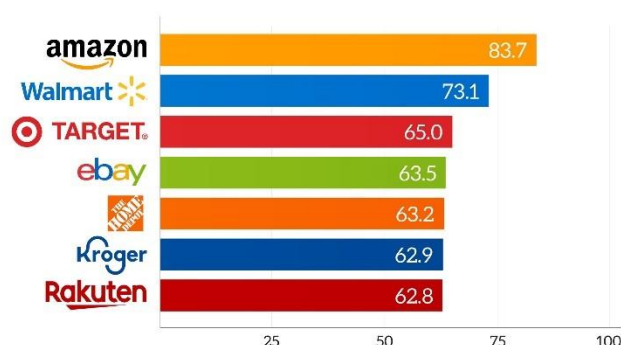


Figure 3: Comparison of AI readiness among popular retail companies (Source: IHL Group-AI Readiness Index (AIR) Rankings – Retail)

### Customers

Consumer preferences play a central role in the success of the InHome Replenishment service. Walmart needs to consider whether their InHome customers would be welcoming to the idea of a system automatically making purchases on their behalf. Adapting to evolving customer expectations and incorporating feedback ensures the service aligns seamlessly with consumer needs and desires.

### Economy

The economic environment significantly influences consumer spending habits. This can vary from the frequency in which they buy household items to the type and brand of those items based on their prices.

According to an article by Scott Horsley (2022), Walmart's recent sales surge of over 8% contrasts with a decline in profits, indicating a shift in consumer behavior. Chief Financial Officer John David Rainey attributes this to heightened sensitivity toward rising food prices. Consumers are adapting by prioritizing more budget-friendly items in their shopping carts. The observed trend suggests that economic factors, specifically the increase in food prices, are influencing consumer spending habits.

The InHome Replenishment service must remain adaptable to economic fluctuations, adjusting strategies based on the prevailing economic conditions.

## Findings

After analyzing the internal and external environment of the upcoming InHome Replenishment Service system, the following problems were anticipated to be faced by its implementation.

### Problems facing the Internal environment

#### ***System glitches***

Technical issues within the InHome system could manifest as glitches affecting its core functionalities. For instance, a glitch might cause incorrect items to be reordered or result in delays in the replenishment process. Such issues could erode user trust and satisfaction. Thus, while setting up the system, a lack of frequent inspection and site maintenance might lead to a glitch that leads to delays or wrong order timings.

#### ***Inaccurate Assumptions***

Some bold assumptions should be made while formulating the system to predict customer purchases. Assumptions made during the design phase, such as predicting user preferences or consumption patterns, may prove inaccurate. For example, assuming that users consume a particular product weekly may lead to overstocking or understocking issues if their actual consumption patterns differ. The chances of customers changing preferences are significant enough to be ignored due to the several factors that may cause this. Such factors can be a new product being introduced to the market and changes in purchasing power, among other things.

### Problems facing the External environment

#### ***Unforeseen Customer Behavior Shifts***

Rapid shifts in consumer behavior, like sudden preference changes for specific brands or products, may pose challenges. This can be brought about by sudden findings in health research, leading to a sudden U-turn by customers in their liking for a particular brand. For instance, if a customer has a sudden preference for consuming organic food only, the system might struggle to adapt to a sudden surge in demand for organic products if the algorithms were not trained to anticipate such shifts.

#### ***Economic challenges***

Economic downturns or changes in disposable income can influence consumer spending habits. For instance, during the COVID-19 pandemic, when there were several layoffs and downsizing due to unsustainability in many companies and firms, many people changed their purchasing habits, being as economical as possible. This might have included switching to cheaper alternatives or introducing new items to the shopping list such as hand sanitizers and face masks. In the context of the InHome system, economic challenges might lead to users tightening their budgets, impacting the accuracy of the system's predictions regarding the frequency and volume of purchases.

#### ***New trends***

In the modern digital era, new trends found in TV commercials, website blogs, or social media outlets are available to many people worldwide. These emerging trends, like adopting new dietary preferences or sustainable living practices, may not be promptly integrated into the system's algorithms. For example, if there is a sudden surge in demand for plant-based products, the system might struggle to adapt if it has

not been updated to recognize and respond to this trend. This will eventually lead to unreliable predictions by the system's AI.

### ***Data Privacy Concerns***

In the current era where cybersecurity crimes have been rampant, or popular social media platforms handling large amounts of personal data, the growing concerns about data privacy could result in users questioning the system's data handling practices. For instance, if users perceive that their purchase history or personal information is being constantly monitored or not being adequately protected, it might lead to a loss of trust and reluctance to use the InHome service. This will lead to those appalled customers preferring to buy the items personally from the store, or worse off, shifting to a competitive e-commerce retailer that is perceived not to make such intrusions into personal data. This might lead to the new system doing more harm than good.

### ***Resistance from customers***

Consumers deciding what and when to buy household items has been the conventional method for quite some time now. This could be due to the lack of AI-automated systems for the majority of the century. In most situations, a group of people usually prefer conventional ways of doing things, or what you would call '*old school style*'. According to Kanter (2012), changes cause a disruption in autonomy, thus instilling a feeling of losing control over one's own territory. Some users may resist automated reordering due to loss of control or privacy concerns. For instance, individuals may be uncomfortable with the system making decisions on their behalf, especially if they prefer to be on the lookout for any new brands and compare them with their current favorites. This would deter customers from using the new system set in place.

### ***Financial concerns***

Automatic reordering may lead to unexpected financial burdens if customers are not adequately informed about the costs associated with reordered items. Sudden and automatic purchases initiated by the system could disrupt users' budgeting and financial planning, impacting their ability to manage expenses effectively. This can lead to customer dissatisfaction or question the reliability of the InHome system, affecting their willingness to use the service if it is perceived as a source of financial unpredictability.

## **Alternative solutions**

The following are possible solutions that Walmart can consider, if they have not already done so, to mitigate the possible drawbacks and backlash from both current and potential customers.

### ***Continuous system monitoring***

The company should implement a proactive maintenance protocol involving regular inspections and system checks. These scheduled inspections of the InHome system's backend can identify and rectify coding errors or technical malfunctions before they affect users. For instance, automated checks can catch issues like delays in the replenishment process or incorrect items being reordered, maintaining a seamless user experience. This ensures early detection and resolution of potential glitches, preventing disruptions to the InHome system's core functionalities.

Algorithmic audits are also necessary for ensuring the ongoing accuracy, fairness, and reliability of the InHome system. Regular reviews of the predictive models can help identify and rectify biases, errors, or inaccuracies that may emerge over time. Suppose the InHome system's algorithms are designed to suggest meal options based on user preferences. Through routine algorithmic audits, it is discovered that the system consistently favors certain cuisines over others, potentially reflecting a bias in the training data.



Adjustments can then be made to address this bias, ensuring a more personalized user experience. This systematic approach is essential to maintain the integrity and effectiveness of the AI-driven algorithms.

### ***Privacy Measures***

This can be achieved by implementing stringent data security measures, complying with privacy regulations, and communicating transparently with users about data usage. Furthermore, the users can be allowed to control and customize their privacy settings, such as opting out of data tracking for specific product categories, hence emphasizing the protection of personal information. This transparent approach builds trust and ensures Walmart's customers feel in control of their data.

### ***Use of Adaptive Algorithms***

The Home Replenishment System should use adaptive algorithms capable of quickly responding to sudden shifts in consumer preferences. Suppose there is a sudden surge in demand for organic products. Adaptive algorithms recognize this shift, adjusting the system's recommendations to include more organic options. This responsiveness ensures that the system aligns with evolving customer preferences.

Similarly, the system should use dynamic machine learning models that adapt to evolving user behaviors and feedback. If, for example, the system initially assumes a user purchases a particular product weekly but notices a shift in the purchasing pattern to a monthly basis. This adaptation will prevent overstocking or understocking issues, thus enhancing the accuracy of predictions.

### ***Communication and Transparency***

The company needs to prioritize customer awareness, highlighting the benefits of the AI-driven system. This can be achieved by supplying them with informative guides on the system's features and emphasizing the benefits of a personalized auto-purchasing system. Let them know they can customize preferences, set limits, and choose whether to accept or modify the system's recommendations, thus providing control.

Furthermore, there should be transparent communication about the costs associated with automatic reordering. Customers should be provided with clear information on product prices, potential substitutes, and an option to set budget limits. They should also receive detailed breakdowns of costs associated with each recommendation while being able to set budget limits. The system can also communicate any potential financial impact to the user before switching from the conventional InHome system to the automatic reordering system, ensuring users make informed decisions aligned with their budget constraints.

### ***Obtaining regular customer feedback***

Regular customer feedback is vital for the ongoing improvement and user satisfaction of the InHome system. Users' preferences and expectations evolve, and obtaining feedback provides valuable insights into these changes. Consider a scenario where users provide feedback indicating a preference for more locally sourced products. By integrating this feedback into the system, the InHome algorithms can prioritize recommending locally sourced items, aligning with the changing preferences of users. This regular feedback allows the system to adapt continuously to user expectations, remain responsive, and be aligned with the dynamic needs of its users. Customer feedback will also foster a sense of user involvement and empowerment, enhancing overall user experience and acceptance.

## Conclusion

In conclusion, this project has provided valuable insights into the challenges and opportunities associated with the implementation of Walmart's InHome system. Through comprehensive analysis and research, we have identified various factors impacting the system's effectiveness by looking at both its internal and external environment. Some of the problems we anticipated included predictive algorithm inaccuracies, shifts in consumer behavior, and customer resistance.

Despite these challenges, it is evident that the InHome system holds immense potential to revolutionize retail operations and enhance customer experiences. By addressing the identified challenges and implementing strategic solutions, Walmart can optimize the system's performance, reliability, and adoption.

Moving forward, it is crucial for Walmart to prioritize ongoing monitoring and refinement of the InHome system, ensuring that it remains responsive to evolving consumer needs and market dynamics. Additionally, proactive measures must be taken to safeguard data privacy, address customer concerns, and foster trust in the system's capabilities.

Overall, this project underscores the importance of continuous innovation and adaptation in the retail industry, particularly in leveraging technology to meet the changing demands of consumers. With strategic planning, collaboration, and a commitment to excellence, Walmart can maximize the potential of the InHome system and lead the way in shaping the future of retail.

## References

- BBC News. (2019, March 1). *Amazon stops selling Dash buttons*.  
<https://www.bbc.com/news/technology-47416440>
- Fortune Business Insights. (June 2023). *Artificial Intelligence (AI) in Retail Market*  
<https://www.fortunebusinessinsights.com/artificial-intelligence-ai-in-retail-market-101968>
- Horsley, S. (2022, August 17). *Walmart says inflation is helping it to attract more upper-income shoppers*. NPR. <https://www.npr.org/2022/08/17/1117835126/walmart-says-inflation-is-helping-it-to-attract-more-upper-income-shoppers>
- IHL Group. (n.d.). *AI Readiness Index (AIR) Rankings – Retail*. <https://www.ihlservices.com/product/ai-readiness-index-air-rankings-retail/>
- Kanter, R.M. (2012, September 25). *Ten Reasons People Resist Change*. Harvard Business Review. <https://hbr.org/2012/09/ten-reasons-people-resist-change>
- Lin, S. (2022, November 9). *For \$20 a month, Walmart will deliver groceries and put them away for you. Here's what the service is like to use*. Business Insider. <https://www.businessinsider.com/guides/home/walmart-inhome-delivery-review>
- Marotta, D. (n.d.). *Artificial Intelligence: How AI Is Changing Retail*. Hitachi Solutions. <https://global.hitachi-solutions.com/blog/ai-in-retail/#:~:text=Retailers%20looking%20to%20stay%20competitive,market%20share%20to%20their%20competitors>
- Musani, P. (2023, October 25). *Decking the aisles with data: How Walmart's AI-powered inventory system brightens the holidays*. Walmart Global Tech. [https://tech.walmart.com/content/walmart-global-tech/en\\_us/news/articles/walmarts-ai-powered-inventory-system-brightens-the-holidays.html#:~:text=Our%20AI%20driven%20systems%20leverage,to%20differentiations%20by%20zip%20codes](https://tech.walmart.com/content/walmart-global-tech/en_us/news/articles/walmarts-ai-powered-inventory-system-brightens-the-holidays.html#:~:text=Our%20AI%20driven%20systems%20leverage,to%20differentiations%20by%20zip%20codes)
- Pierce, D. (2024, January 9). *Walmart is betting that AI can help you shop faster- and maybe do your shopping for you*. The Verge. <https://www.theverge.com/2024/1/9/24032017/walmart-ai-shopping-replenishment-in-home>
- Ross, M. (2024, January 9). *Walmart introducing AI tech to shopping experience, CEO says at CES*. Las Vegas Review-Journal. <https://www.reviewjournal.com/business/conventions/ces/walmart-introducing-ai-tech-to-shopping-experience-ceo-says-at-ces-2978936/>
- Saleh, M. (2024, January 10). *Walmart makes a rare CES appearance to promote AI-powered shopping*. Engadget. <https://www.engadget.com/walmart-makes-a-rare-ces-appearance-to-promote-ai-powered-shopping-005538465.html>
- Walmart Global Tech. (n.d.). *A Closer Look at Top Artificial Intelligence (AI) Trends in Retail*. [https://tech.walmart.com/content/walmart-global-tech/en\\_us/news/articles/a-closer-look-at-top-artificial-intelligence-trends-in-retail.html](https://tech.walmart.com/content/walmart-global-tech/en_us/news/articles/a-closer-look-at-top-artificial-intelligence-trends-in-retail.html)