Business and Management Theory and Practice 2025, 2(2), 3180.
https://doi.org/10.54517/bmtp3180

Article

Artificial intelligence in retailing: Strategic implications and key areas of concern

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CITATION

Jones P, Wynn M. Artificial intelligence in retailing: Strategic implications and key areas of concern. Business and Management Theory and Practice. 2025; 2(2): 3180.
https://doi.org/10.54517/bmtp3180

ARTICLE INFO

Received: 24 December 2024
Accepted: 15 April 2025
Available online: 24 April 2025

Abstract: Within the retail industry the continuing introduction of AI is generating considerable excitement. While there is a rapidly growing literature on the role of AI in retailing, how individual retailers have publicly reported on their introduction of AI has attracted little or no attention in the business and management literature. This article makes a contribution to addressing that gap by providing some simple illustrations of how four leading retailers, namely Amazon, Carrefour, J. Sainsbury and Walmart are developing their relationship with AI. The paper concludes that while the four retailers paint a very positive picture of the benefits AI will generate, there are also a number of issues surrounding the increasing use of AI within retailing that will require careful and vigilant management. These include ethical concerns, balancing personalization and privacy, cybersecurity, the upskilling challenges for retailers, impacts on their employees, sustainability and consumption, environmental problems and corporate social responsibility. This is an exploratory paper and is limited to a secondary research focus, but may provide a useful platform for future research endeavors that could include, for example, empirical research on one or more of the large retailers.

Keywords: retailers; artificial intelligence; AI; case examples; impact areas; future concerns

1. Introduction

In the corporate environment, there is a rapidly growing awareness that artificial intelligence (AI) offers seemingly limitless opportunities to improve efficiency and create more profitable business strategies. Within retailing, for example, there is an evident belief that AI can inform target marketing and provide personalized recommendations and pricing based on a customer's past shopping behavior, optimize the layout of shops and stores, predict consumer demand, streamline supply chain management and facilitate customer charging and payment. While there is a rapidly expanding body of literature on the role of AI in retailing, how individual retailers have publicly reported on their introduction of AI has attracted little or no attention in the business and management literature, and this represents a gap in that literature.

In the late 1980s, Simmons and Chappell [1] observed "the term artificial intelligence denotes behavior of a machine that, if a human behaves in the same way, is considered intelligent". More recently, but in a similar vein, IBM [2] noted, "artificial intelligence is technology that enables computers and machines to simulate human learning, comprehension, problem solving, decision making, creativity and autonomy", while Schuett [3] argued that "there is a vast spectrum of definitions", and that the term is "highly ambiguous". At the same time, there is growing concern

regarding the potential downsides of AI. Elliot et al. [4] suggested that "such concerns are revealed in public perceptions and uncertainty surrounding AI's future in society from technology executives overseeing the development and implementation of AI to the general public".

AI is perhaps best seen as an umbrella term that embraces a range of cognitive functions in that it can see, understand and respond to spoken or written language and sounds, analyze data and make recommendations, learn, reason, plan and act to solve complex problems, and create original images and text. AI can be used in many applications, including customer support, personalizing customer experiences, and analyzing data from smart sensors and monitoring tools, and more specifically includes machine learning, deep learning, optical recognition, and the creation of new content from large amounts of training data. There are thus many potential applications in retailing, but perspectives from the retailers on their approach to AI have scarcely been covered in the extant literature.

This exploratory article attempts to address that gap by providing some simple illustrations of how four leading retailers are introducing AI into their operations. More specifically, it addresses the following research questions (RQs):

RQ1. How is AI currently impacting the retail industry?

RQ2. What are the key challenges and concerns for the future deployment of AI in retailing?

There are four further sections in this article. Section 2 sets out the research method and in Section 3, relevant literature is reviewed and an outline conceptual framework for examining the case study retailers is identified. Section 4 presents the results of the study, being based on a combination of the literature and an analysis of the retailers' deployment of AI. Section 5 provides a conclusion to the study, pointing out limitations and possible areas for future research.

2. Research method

Within the last decade the potential introduction of AI within retailing has generated considerable excitement in and around the retail industry, but very few retailers have publicly illustrated their relationship with AI. With this in mind, an interpretivist philosophy was adopted, combined with an inductive, qualitative approach to this exploratory study. Gill and Johnson [5] suggest that such an approach is most appropriate when the research aim is exploratory in nature, and the researchers seek to develop an explanation of the phenomenon being studied. There were two main phases in the research (**Figure 1**). Phase 1 centered on a narrative synthesis of available literature to identify key themes, identify relevant case examples from the industry, and develop the research questions. It provided a summary overview of the subject matter and allowed the mapping of the key concepts within the area of study, and the identification of the types of evidence that are available [6]. In essence, it was a "broad scan of contextual literature" through which "topical relationships, research trends, and complementary capabilities can be discovered" [7]. A range of search strings was used to find appropriate material available on the Internet between July and September 2024, but a systematic literature review was not pursued. Once some initial key sources were located, these

provided references to other literature, which was then assessed, which in turn provided other relevant sources. Bell et al. [8] have observed that "the narrative review may be more suitable for qualitative or inductive researchers, whose research strategies are based on an interpretative epistemology". Relevant materials were found in various academic databases, including Google Scholar and ScienceDirect, but the main objective was to identify retail companies that posted details of their use of AI in their published reports. In this context, the internet searches revealed that four large retailers, namely Amazon, Carrefour, J. Sainsbury and Walmart, recently posted some details on the internet of how they are employing AI, and these four companies were thus selected as the case examples for the study. Amazon, established in 1994, is a US online retailer and marketplace, operates on a global basis with 1.5 million employees, and has a market capitalization of US$ 2 trillion. Carrefour, established in 1959, is a French multinational retailer and wholesaler, operating some 14,000 stores in over 40 countries, with 320,000 employees and a market capitalization of US$ 14 billion. Sainsbury, established in 1869, is a UK retailer, and the company operates 1500 supermarkets and convenience stores in the UK, has 160,000 employees and has a market capitalization of US$ 8.3 billion. Walmart, established in 1962, is a US multinational retailer with over 10,000 hypermarkets, discount outlets and grocery stores in 24 countries; it has 2.1 million employees and a market capitalization of US$ 665 billion. Yin [9] notes that such cases can be used "to develop sharper and more insightful questions about the topic".

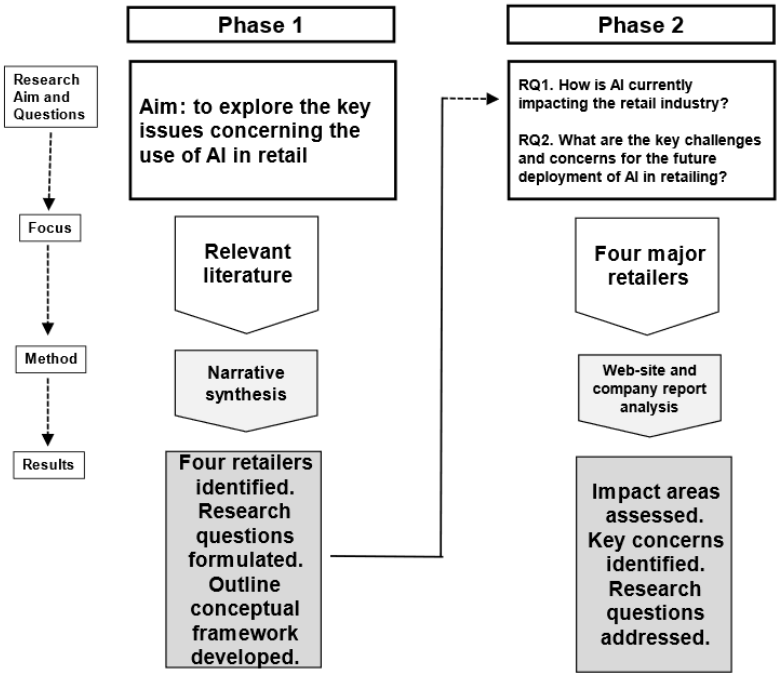

Figure 1. The two-phase research process.

In phase two, the four retailers noted above were studied to provide the basis for addressing the research questions. As leading players in retailing, these four companies might be seen to offer valuable insights into the ways in which the industry as a whole is approaching the use of AI. Case studies have been seen as a useful tool in exploratory research, and for examining new topics [10], although

generalization from such a limited sample must be treated with caution. Flyvbjerg [11], for example, noted that case studies should focus on the generation of a deep understanding of the complexity of each case, producing "concrete, context-dependent knowledge". The four case studies draw on material posted by the retailers, and while they do not offer a comprehensive nor a comparable picture of how the selected retailers have employed AI in their companies, they provide valuable illustrations of AI in retailing. The authors looked to capture the retailers' approach to AI in the retailers' own words, in the belief that such quotations helped to convey corporate authenticity.

3. Literature review and conceptual framework development

Heins [12] reported a recent increase in publications on AI and retailing but she suggested that the scope of research in this field was fairly fragmented. The intent here, then, is to address this lack of clarity by identifying key themes in this literature to provide a conceptual framework for assessing the retailers' public pronouncements on AI, detailed in Section 4 below.

Wilson and Daugherty [13] claimed that AI was now having a transformative effect in the retail sector, promising major advances in business operations, customer management and market positioning. The authors suggested that retailers are increasingly leveraging AI to streamline processes but argued that the implementation of AI faces a number of obstacles, including high costs, the need for skills, and concerns about data privacy and ethics, and the impact of AI on employment. Further, the authors also emphasize the need for retailers to adopt a strategic approach to the integration of AI, and the need to recognize ethical considerations. Wang et al. [14] investigated AI adoption in retail platform operations, and the authors studied an online retail platform and a physical store both selling experience-based products to consumers. Their findings revealed that both AI application and service efforts within store strengthened the consumers' showrooming effect, especially when the cost of AI application is relatively low.

In research into the impact of AI-powered technologies on Indian consumer buying behavior in online fashion retailing, Sharma et al. [15] found that AI-powered systems, such as recommender systems, virtual assistants, and chatbots, had positively impacted consumer buying behavior and that online retailers could leverage their benefits to enhance the customer experience, increase sales and gain a competitive edge in the marketplace. Jain and Gandhi [16] looked to examine the impact of AI on the impulse buying behavior of Indian shoppers in fashion retail outlets. The findings revealed that the relationship between the use of some AI parameters, notably purchase duration, product information and human interaction, had a significant impact on the impulse purchase decision of the customer. The authors concluded that their results would be useful in enabling fashion retailers to gauge the effect of the impact of AI on attracting shoppers to their stores and in driving sales.

Hague et al. [17] argued that the retail sector was at the forefront of the AI revolution and presented a bibliometric and content analysis of AI applications in retail marketing. Their findings revealed six primary research streams, namely

consumer behavior, marketing, business performance, sustainability, supply chain management and trust. Further, the authors argued that their contributions helped to outline future research agendas, notably AI's role in consumer behavior, and that it helped to enhance customer experience. More specifically, Alboqami [18] looked to explore the main causal factors that can lead to high levels of trust in AI influencers in the retail industry in Saudi Arabia. The findings indicated that a mixture of source attractiveness (for example, physical attractiveness and homophily), and source credibility (for example, authenticity and expertise) were the drivers for consumer trust in AI influencers.

Moore et al. [19] looked to develop "an understanding of the novel social consequences and opportunities afforded from consumers' interactions with AI digital humans as part of the in-store shopping experience". The findings reveal that three social themes are associated with the introduction of AI. These are social tension, the transformation of the in-store situation so that AI becomes "the life and soul of the party", and both the need to avoid and to have real human interaction. These three themes are seen to have important practical implications for the use of AI, and its impact on the customer experience. Ameen et al. [20] noted that there was a lack of empirical research into AI-enabled customer experiences, and their work sought to examine how the integration of AI into shopping can lead to the development of an improved customer experience. Kondapaka [21] suggested that "the cornerstone of efficient retail supply chain management hinges on the ability to accurately predict demand", but that "achieving this objective remains a formidable challenge due to the inherent dynamism and capriciousness of consumer behavior". However, he claimed that AI opens up a number of possibilities for revolutionizing demand prediction within retail supply chains, before going on to explore how leading-edge AI techniques can be leveraged to transform demand forecasting.

Nimmagadda [22] explored the application of AI-powered predictive analytics as a transforming tool to mitigate supply chain risks. More specifically, the author revealed that AI-powered predictive analytics helped to foster agility and adaptability within supply chains and that machine learning could be profitably employed to optimize transport routes and to automate procurement processes. Some attempts have been made to develop theoretical frameworks of AI in retailing. Jayadatta [23], for example, puts forward a framework for leveraging AI-based predictive analytics to optimize visual merchandising layouts in retail stores, while Deryl et al. [24] reviewed the theoretical underpinnings of AI-driven branding, and argued that their approach extended the existing understanding of consumer-brand relational dynamics with AI that retailers could profitably use to transform their brands.

Mahmoud et al. [25] recognized that many scholars were keen to stress the many positive benefits of AI retailing but argued that such benefits could be catastrophic in the long run, notably for the retailers, for their employees, for customers and for society. The authors argued that the progressive introduction of AI will put increased pressure on retailers to find and train AI-skilled employees, particularly if training opportunities do not keep pace with the development of new AI technologies. For employees, increased automation and the removal of low-skilled tasks will see a decline in retail labor requirements, and while it is not

unusual for retailers to downplay the downsizing impact of AI, it is not easy to predict the number of jobs that will be lost as AI becomes more commonplace within retailing. While customers are generally seen to be in a position to derive the greatest benefits from the introduction of AI, they will also be subjected to the increasing need to share their private information, and could become mistrustful of AI. More generally for society, the authors voice concerns that AI will co-create inequalities and discrimination, and have damaging effects on diversity. In looking to the future, Guha et al. [26] were optimistic that AI will have a positive impact on retailing. More specifically, they explored the extent to which AI was customer-facing, the amount of value creation, and the extent of ethical concerns. They also assessed how these issues would affect senior retail managers' approach to the adoption of AI. Noble and Mende [27] claimed that within retailing, "the impact of AI and AI-enabled robotics will be far-reaching".

From the above review, a number of coherent and interlinked areas where AI impacts retailing can be discerned: in retail operations, in retail supply chains, in customer buying behavior, in retail marketing, and in the retail customer experience. These impact areas are considered below in assessing retailers' use of AI (**Table 1**).

Table 1. AI impact areas in the four retailers studied.

AI Impact Areas/Retailers	Amazon	Carrefour	J. Sainsbury	Walmart
Retail operations		Generative AI for internal purchasing processes	Microsoft AI/ML strategic partnership for efficiency gains and improved customer service	Chatbots
Retail supply chains		Generative AI for drafting invitations to tender and in analyzing quotes		
Customer buying behavior	Personalized customer recommendations			Wallaby GEN IA platform
Retail marketing		Creation of dynamic marketing campaigns using generative AI		
Retail customer experience	AI shopping guides	AI Chatbot for customer support	Microsoft AI/ML strategic partnership	Conversational AI; Chatbots

4. Results

This section addresses the two research questions set out in Section 1, using a combination of material from the four retailers studied and the above literature analysis.

4.1. RQ1. How is AI currently impacting the retail industry?

4.1.1. Amazon

In October, 2024, Amazon [28] highlighted its "new AI shopping guides to make it easier to research product types and buy smarter". The company recognized that "shopping for products you're unfamiliar with can take time. Many of us have spent hours researching features and options that exist for any one particular type of product", but claimed that "Amazon simplifies product research, leveraging generative AI to bring together shopping guidance and product recommendations on

over 100 product types". Further, Amazon [28] claimed that "to help customers quickly get up to speed on products they might be less familiar with, we're introducing AI Shopping Guides in our U. S. app (iOS and Android) and mobile website". A diverse product range, including television sets, rugs, dog food, running shoes, headphones, and face moisturizers is included in this development. In short, Amazon claims these guides "help you to reduce the time spent researching before you make a purchase", thus "making it easier to find the right product for your needs quickly and easily".

At the same time, and with a focus on fashion retailing, Amazon [29] reported that four AI-powered innovations—namely, personalized size recommendations, review highlights, re-imagined size charts, and fit insights—are helping customers shop with confidence. More specifically, Amazon [29] claimed to want "customers to shop with confidence", which was seen to include "developing features that help customers to find great-fitting fashion items from the comfort of their own homes". Here the company reported the development of a deep learning-based algorithm to find the best-fitting style in any size for the customer.

4.1.2. Carrefour

In September 2020, Carrefour [30] launched "Horizons by Carrefour", a new blog "open to all where the major initiatives of our digital transformation are directly highlighted by our employees". More recently, in February 2024, Horizons by Carrefour reported the development of the Carrefour Marketing Studio as part of the company's Generative AI Initiative. The Marketing Studio is a platform designed to empower marketing teams by providing them with AI-powered tools and looks to streamline the creation of dynamic campaigns across a range of social networks. In particular, marketing teams can customize their campaigns by setting various criteria to specifically target their desired audience. A tone of voice can be selected that resonates with the product, which can provide a personalized touch. A real product image can be used in the picture display, which can be created autonomously by generative AI. "This platform serves as a command center for marketers, enabling them to create campaigns quickly and efficiently. With features like automated brief generation and image creation, marketers can save time and streamline their workflow. By leveraging generative AI, Carrefour is helping marketers deliver campaigns with ease while maintaining the brand's consistency and message across different channels" [31].

In 2023, Carrefour [32] reported that the company had launched Hopla, a chatbot based on ChatGPT, which was integrated into its corporate French website. Customers will be able to use this natural language AI to assist them with their shopping, in that they will be able to ask for help in selecting products, based on their budget and their menu ideas. The chatbot is also able to make real-time suggestions designed to reuse ingredients and reduce waste. Carrefour also reported using generative AI for its internal purchasing processes and in drafting invitations to tender and in analyzing quotes.

4.1.3. J. Sainsbury

In May 2024, J. Sainsbury announced a five-year strategic partnership to use Microsoft's AI and machine learning and its datasets to continue its strategy of putting

food back at the heart of the company. The strategy is designed to "improve store operations, drive greater efficiency for employees, and provide customers with more efficient and effective service, delivering stronger returns for shareholders" [33]. The company also reported that it will "put the power of AI in the hands of store colleagues and make shopping more engaging and more convenient for millions of customers across the UK—both online and in store", and that "this will be supported by upskilling programs for Sainsbury's colleagues, helping them learn and grow in the new AI-driven economy".

More generally, J. Sainsbury [33] reported that it plans to focus its AI initiatives in three specific areas, namely: enhancing customer experiences; empowering employees; and data powering the business. In enhancing the customer experience, for example, the company uses generative AI to create a more interactive online shopping experience and to improve the customers' search experience. The drive to empower employees will involve combining and coordinating multiple data inputs, such as shelf-edge cameras, to save time and to ensure that the company does not miss out on sales opportunities. Data powering will "enable Sainsbury's to continue driving returns" by "transforming operations, driving better decision-making, and running a more efficient business. This will be delivered through Microsoft Azure as part of Sainsbury's cloud ecosystem, reducing time to market for new services and innovations".

4.1.4. Walmart

In 2023, Walmart [34] reported that it was "leveraging conversational AI to help our customers and associates around the world save time and have a better experience", namely by enabling shoppers to shop as fast as they can talk and text; using chatbots; and making it easier for employees to find items in store. In addressing the first of these developments, Walmart claimed "Voice shopping is a convenient way for customers to reorder items, and Walmart customers can do so via Walmart Voice Order, which enables customers to pair their Walmart accounts to their smart speakers and mobile devices". By way of a practical example, the company suggests, "If a customer says, 'Hey Google, add Great Value orange juice, a loaf of Great Value bread and a dozen eggs to my cart', our system uses natural language processing to understand the request, product name entity recognition to identify the products, and then prior purchase information to determine brand preferences". In addition to voice ordering, Walmart's customers can also text the company to order through their iOS and Android devices to do their shopping.

The following year, Walmart announced that proprietary GenAI platforms had been developed by the company to support AI applications, including Wallaby—a series of retail-specific LLMs (large language models) that will primarily be used to create customer-facing experiences. Wallaby "is trained on decades of Walmart data and understands how Walmart employees and customers talk. It is also trained to respond in a more natural tone to better align with Walmart's core values of customer service" [35]. The company also reported that by "leveraging a combination of GenAI platforms, Walmart had also created a more personalized version of its AI-powered Customer Support Assistant", and that the Assistant "recognizes who the customer is right from the start and goes beyond just

understanding the customer's intent in taking actions, like finding orders and managing returns" [36].

4.2. RQ2. What are the key challenges and concerns for the future deployment of AI in retailing?

The case examples from Amazon, Carrefour, J. Sainsbury and Walmart provide some valuable illustrations of how these four major retailers are developing their relationships with AI. The four retailers paint a very positive picture of the business and the customer benefits that AI will generate. However, there are also a number of key challenges and concerns about the future of AI in retailing that emerge from the literature that warrant further review (**Figure 2**).

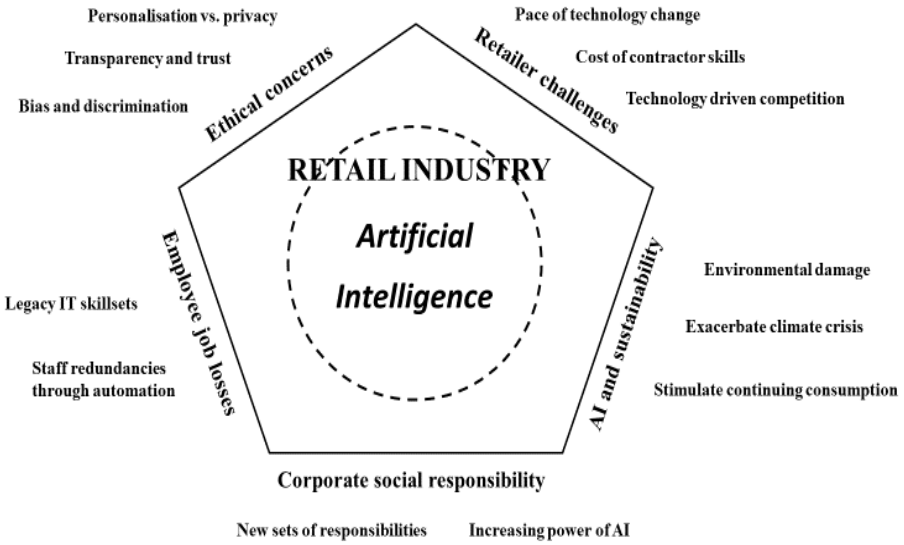

Figure 2. The future of AI in retailing: Key concerns.

Firstly, there are a series of interlinked ethical and financial issues that include the balancing of personalization and consumer privacy, the need for transparency, accountability and trust, and algorithmic bias. One of the perceived strengths of AI is its ability to personalize the shopping process at speed. On the one hand, retailers are increasingly looking to be able to establish personal links to their customers and to tailor their offers to individual customers. As the illustrations above demonstrate, AI seems very well, in many ways ideally, placed to deliver such personalization. On the other hand, AI systems rely on large volumes of consumer data to personalize these experiences and to make predictions, and this, in turn, raises major concerns about the collection, storage and use of such data. Here, there are arguments that consumers should be informed about how their data is used and that they should have the ability to access, review and, where deemed necessary, to delete or change their data. For their part, retailers need to have robust security measures in place to protect consumers' data from unauthorized access and misuse. In terms of transparency, accountability and trust, many consumers may be largely unaware of the data the retailers hold about them, and they may be reluctant to share personal information, for example, on their age, health, dietary habits, and their shopping history, preferring to keep such information private. At the same time, consumers

should be able to understand how AI systems make decisions, particularly those decisions that have a significant impact on their shopping experiences. Retailers should be accountable for the actions of their AI systems, and this should embrace addressing any harm caused by their AI systems. More specifically it is important to recognize that AI can be used to create highly personalized marketing messages that exploit consumers' vulnerabilities, which can, in turn, lead to unwanted or harmful purchases. AI algorithms can also perpetuate or amplify existing biases in data, leading to unfair or discriminatory outcomes, including biased product recommendations or targeted marketing [37]. Retailers should look to ensure that their AI systems are fair and equitable, and that they regularly audit these systems for bias and, where necessary, implement corrective measures.

Secondly, retailers themselves face a variety of challenges as they look to adopt AI. Developments in AI are occurring very rapidly and it is unlikely that many retailers will have the in-house expertise to harness AI effectively, and they will have to buy in expertise, skills and training programs from AI developers. The likely cost of such contract IT skills may raise concerns about whether AI is seen to represent a good return on investment, and there may also be concerns about the extent to which the acquisition of costly external expertise can be effectively customized to meet the retailer's needs. More generally, the successful introduction of AI by some large retailers, who may be better placed to capitalize on innovations in AI, may enable them to gain, or increase, their competitive advantage over their rivals. This in turn may see changes in the wider retail landscape, as the retailers who can harness AI effectively may be able to increase their market share, while others go to the wall.

Thirdly, AI poses a number of challenges for retail employees and for employment in the retail sector. While there is a broad consensus that AI can, and will, transform the retail workplace, there are concerns about the need for upskilling, job displacement, employee recruitment and resistance to change. Upskilling is a potentially major issue for retail employees. Employees will need to adapt to new technologies and acquire new skills to work with AI systems. AI has the capability to automate a wide range of mundane and repetitive retail tasks, including stock management, pricing and customer service, and this may lead to job losses within the industry. While many retailers take a positive stance on the role of AI in undertaking mundane tasks, arguing that it will free up employees for more engaging tasks, particularly an enhanced, and AI-powered level of customer service, in truth it may provide an opportunity to cut employment costs. Indeed, such reductions in staff overheads are likely to be part of the cost-benefit case for such investment. At the same time, retailers need to be aware that some employees may resist the introduction of AI systems and look to guard against disruption and conflict. AI may be increasingly used in employee recruitment and the algorithmic bias in such systems may lead to discrimination. More generally, retailers should look to protect employee data and to ensure that AI systems are used responsibly.

Fourthly, there are issues about AI and sustainability. Here, there are general concerns that in making shopping easier and more convenient, AI will stimulate the continuing consumption of an ever-wider range of goods and services. Within western societies, retailing, and the seemingly continually growing consumption that it drives, make increasing demands on the earth's natural resources, contribute to

carbon dioxide emissions, and generate large volumes of waste. Where does AI fit into this continuing evolution of retailing? On the one hand, AI is often seen to offer genuine potential for sustainable practices, by optimizing inventory management, predicting demand and improving the efficiency of supply chains. In addressing optimized inventory management, as discussed earlier, AI can analyze very large data sets to forecast demand accurately, which can, in turn, lead to optimized inventory levels, reduced overproduction, and minimized waste. On the other hand, the level of energy consumption and negative environmental impacts raise major concerns. Deploying and training AI systems requires significant computational power, which generates high levels of energy consumption and greenhouse gas emissions; and the expanded use of data centers will lead to increases in carbon dioxide emissions and to accelerated use of fresh water for cooling purposes. As such, the continuing deployment of AI within the retail industry might be seen as the antithesis of sustainability and of a transition to a more sustainable future. In this context, AI can also be seen to have a negative impact on the environment. More specifically, the Brookings Institution [38] argued that "AI systems play a significant role in exacerbating the climate crisis", and that "as the popularity of chatbots and image generators surges—intensifying the integration of generative models and spurring competition between tech titans—it will propel explosive growth in daily queries and further deepen environmental concerns". At the same time, while Friends of the Earth [39] certainly shares such concerns, it also suggested that "generative AI has the potential to turbocharge climate disinformation, including climate change-related deepfakes".

Finally, retailers' increasing use of AI raises issues about corporate social responsibility [40]. As retailers adopt AI across their operations, they face, and may need to address, new sets of responsibilities, which extend across many of the issues raised above. However, while the four retailers studied in this article have publicly provided some illustrations of how they are developing their relationships with AI, they have yet to provide details of how they are addressing these new responsibilities. Rather they have focused on emphasizing the benefits to their businesses and to their customers. In truth, in many ways, the customer focus also benefits retailers, in that it also promotes their business strategies. However, if people become increasingly aware of the influence AI is having over their lives, and the role that retailing is having in that process, retailers may have to address their social responsibilities concerning the use of AI much more publicly.

5. Conclusion

This exploratory paper offers some simple illustrations of how four large retailers, namely Amazon, Carrefour, J. Sainsbury and Walmart, are introducing AI into their operations. While the four retailers paint a very positive picture of the benefits AI will generate, the authors also highlight a number of concerns and related issues surrounding the increasing use of AI within retailing. As such, the paper looks to make a modest contribution towards addressing a gap in the business and management literature, and complements the growing volume of work examining how new technologies are driving retail change. Malekpour et al. [41], for example,

looked to enhance understanding of customer expectations and experiences in grocery shopping within the metaverse, and their work provides some valuable insights into the drivers and barriers to metaverse adoption in retailing. Other authors also point out the risks and responsibilities associated with the use of the metaverse and the need for appropriate regulation [42,43].

The authors are aware that the paper has its limitations, not least in that it explores how just four retailers are introducing AI into their operations, and it is based exclusively on secondary Internet sources. Nevertheless, the paper can be seen to provide a platform for future research agendas, which may help to lay the foundations for a more comprehensive review of AI deployment in the retailing sector. As Yahaya et al. [44] observe "The AI revolution is upon us, and the way we live, do businesses, run economies and countries is already being transformed. Additionally, the continuous investment and research focus on further development of artificial intelligence show that the future of individual lives, businesses and economies will continuously be influenced by numerous everyday artificial intelligence functions".

These impacts will inevitably be evidenced in retailing, which has been at the forefront of previous technology innovations, including the move to e-business, the use of e-CRM (customer relationship management) systems and advanced data analytics, as well as in-store planning systems. Future development of AI applications in retail, including experimentation with metaverse environments, will inevitably grow. Related research studies could include, for example, primary research on one or more, large retailers, which could provide some deeper insights into the impacts of specific AI applications on retailers' business operations and on customers' shopping behaviors, into customers' awareness of, and potential concerns about, how their personal data is being used to train AI applications, and about the impact of AI on retail employment. Researchers might also look to explore and develop theoretical approaches to understanding the role of AI in retailing and to locating its development within a wider business and social context.

Author contributions: Conceptualization, PJ and MW; methodology, PJ and MW; validation, PJ and MW; formal analysis, PJ and MW; investigation, PJ; data curation, PJ and MW; writing—original draft preparation, PJ; writing—review and editing, MW; visualization, PJ and MW; project administration, PJ and MW. All authors have read and agreed to the published version of the manuscript.

Data availability statement: All sources used in this article are available via the cited reference list.

Institutional review board statement: Not applicable.

Informed consent statement: Not applicable.

Conflict of interest: The authors declare no conflict of interest.

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