

Joginder Chhabra^{1*}Dr. Vanita Bhoola²Dr. Suchismita Das³

How Artificial Intelligence technology adoption is transforming Retailing landscape and facilitating sustained Competitive advantage for Retailers



Journal of
Electrical
Systems

Abstract

The retailing industry is experiencing an exceptional transformation due to fast-changing consumer purchasing behaviour and recent technological advances. Artificial intelligence (AI) will have a considerable influence on the retailing industry in the future. In this paper, which is a qualitative analysis based on the literature review of various relevant research work, we have identified key factors that impact artificial intelligence technology adoption by retailers. We have also highlighted the extent to which key factors such as ease of use and purchase intention enhance customer satisfaction due to the technology interface. We have conceptualised a research framework that also discusses the scope of ethics and customer privacy dimensions and their impact on AI technology adoption. We have highlighted how retailers can build a sustained competitive advantage by adopting AI technology across all components of the organisation value chain and focusing on a smart and connected product portfolio. The research also elaborates on the outcomes of artificial technology adoption, which will enable the retailer to achieve high levels of customer satisfaction and operational efficiency. We conclude on an optimistic note about the impact of AI on the retailing industry and also lay out the scope for further research avenues on AI and retailing.

Keywords: Retailing, purchasing behaviour, artificial intelligence, ease of use, purchase intention, customer privacy, ethics, competitive advantage, smart products, customer satisfaction, operational efficiency

1.0 INTRODUCTION

The retailing industry worldwide has experienced significant transformation throughout the past decade. The rapid transformation is due to the fast-changing technology landscape and dynamic consumer behaviour. Retailers' conventional business strategy is facing continuous challenges from new-age retailing business models that are providing better customer value and improved revenue. The increasing adoption of artificial intelligence (AI) in retailing is impacting the key components of the value chain of the retailer's business (Oosthuizen et al., 2020). Artificial intelligence technology adoption by retailers is directly impacting the competitive advantage of the retailer by directly reducing the cost of operations and increasing revenues and profitability. AI is also enhancing the overall customer experience at the store through personalisation and convenience.

Artificial intelligence technology is being acknowledged as a large system that comprises big data, machine learning (ML) techniques and other technologies. Most of the AI technologies achieve their final objective through an unsupervised learning method. This method focuses on continuous learning from the captured data from various sources, which include both simple and complex audio/video/text formats. Many retailers are also experimenting with unmanned retail formats that use self-servicing AI technologies with an objective to reduce manpower costs, to further empower customers for in-store decision-making and to improve efficiency in operations (Chen & Shang, 2021).

The overall focus of the retailing industry is rapidly changing from physical only to hybrid and online. Artificial intelligence adoption is playing a critical role in this transformation in the retailing industry, which is worth an estimated 27 trillion U.S. dollars globally. The retailing industry in India will be worth 1.8 trillion U.S. dollars in 2030.

There are apprehensions in the retailing industry over full-scale AI adoption across the retail value chain as the current overall rate of AI adoption is moderate. There are exceptions, such as Walmart and Kroger, whose rate of adoption and willingness to use AI are significantly high. Retailers are currently facing a dilemma in having to choose between adopting AI for the customer experience or adopting it to improve operational efficiency. The selection of a relevant technology partner, the total adoption costs involved, customer convenience in using technology and privacy are some of the other issues that explain the current moderate rate of AI adoption by retailers.

2.0 RESEARCH PROBLEMS AND QUESTIONS

The structured literature review on artificial intelligence adoption by retailers is based on the following research problems and questions.

- How should retailers prioritise their core objective of artificial intelligence adoption: to drive customer engagement or to increase operational efficiency?
- How does artificial technology adoption at the retailer store level influence consumer purchasing behaviour and loyalty? Is privacy a risk perception for consumers as they use AI technology at the retailer store?
- How can retailers enhance their revenue and profitability by adopting AI technology at each value chain stage (mainly sourcing, production, inventory management and customer relationship management)?

^{1*}Research Scholar, SP Jain School of Global Management

²Associate Professor & Assistant Dean (EMBA & Executive Education), EMBA SP Jain School of Global Management

³Assistant Professor, UG Program (BDS & BDVA), SP Jain School of Global Management

3.0 RESEARCH OBJECTIVES

To answer the above questions, the following are the research objectives for this study:

- a. To identify the crucial factors that significantly influence the adoption of artificial intelligence technology by retailers, the factors impacting customer engagement and the supply side factors impacting retailer business directly.
- b. To evaluate the key barriers and perceived risks for AI technology adoption by retailers and assess the extent to which these barriers and risks can influence consumer purchasing behaviour and loyalty.
- c. To create a research framework that would provide a blueprint for AI technology adoption across all components of the retail value chain of a retailer.

4.0 SCOPE OF THE STUDY

Significant research and studies have been done regarding artificial intelligence adoption by retailers. This paper focuses on how retailers should approach adopting AI, taking into account the benefits, risks and other challenges. The paper tries to make a relevant contribution to the existing research in this area by analysing the gaps in the existing literature. We have proposed a framework that facilitates the adoption of AI effectively across all components of the retail value chain of a retailer. The objective of the research is to explore and evaluate critical factors that influence and impact artificial intelligence technology adoption in retailing. The study also analyses the critical issue of customer privacy and examines its role in artificial intelligence adoption from a customer's point of view.

5.0 LITERATURE REVIEW

Artificial intelligence technology works with various subdomains such as machine learning, big data and deep learning. It also works in parallel with related technologies such as the internet of things (IoT) and virtual augmentation to perform various tasks in critical functions across the retailer organisation. The technology has helped retailers attain a competitive advantage through superior product design, efficient delivery management, inventory optimisation, supply chain management, etc. and has also helped them engage more effectively with customers, who experience more comfort while shopping and enjoy price optimisation and customised product bundling. Smaller retailers have also benefitted in terms of enhanced visibility and global business expansion by successfully utilising general purpose machine learning algorithms (Anica-Popa et al., 2020).

The independent variables that impact the adoption of artificial intelligence technology by retailers are as follows:

- a) Ease of use
- b) Smart products
- c) Barriers to AI technology adoption
- d) Competitive advantage
- e) Purchase intention

a. Ease of Use

AI technology-enabled services have the capability to significantly enhance the comfort of customers by customising their product recommendations as per their needs and expectations. The technology also helps in improving customer service by employing chatbots, real-time responses for product queries, optimal pricing and store navigation, thus building long-lasting relationships with customers (Oosthuizen et al., 2020).

AI technologies such as wearable mobile smart speakers, AR and VR systems, smart mirrors, IoT and facial recognition are being employed by retailers to enhance the customer shopping experience and increase the convenience and ease of use of the customer while he or she is shopping (Shankar et al., 2020). Some prominent technologies that influence shopper convenience are Amazon Go's automated checkout, Zara's self-checkout, Kroger's digital price tag, the interactive window from Ted Baker, etc.

b. Smart Products

Smart products further help to enhance consumer preferences during shopping through a high degree of personalisation and automation. The highly interactive features in smart products help direct communication between the retailer and the consumer, thereby aiding in faster troubleshooting and customer service. Smart products are universally connected, and hence, retailers can plan assortments as per customer identities and preferences. To further enhance sales, retailers use machine learning algorithms to design customised bundles of products at a special optimised price, which has a direct impact on sales (Shankar et al., 2020).

c. Barriers to AI Technology Adoption

The ethics-related concerns of the customers, coupled with the security and privacy concerns of the customer while using technology at the store, cause anxiety and apprehension in the minds of consumers (Aytekin, 2021). Retailers use the transactional data of the customers to derive optimal pricing models, which include the use of sensitive information. Retailers make an effort to give personalised offers to minimise the privacy concerns of the customers who are shopping, but such trade-offs do not eliminate the customers' concerns completely. While there are legal and regulatory guidelines in various regions for dealing with the ethical issues from the use of AI systems, the algorithms that make up AI systems are not completely error-free, nor are they 100% efficient. They are prone to generating social discrimination while interacting with customers through unique messages based on their profiles (Anica-Popa, 2021).

d. Competitive Advantage

Technology adoption by retailers significantly impacts their competitive advantage as it gives the retailer a definite edge in terms of an optimised cost structure, the quality of the product offerings, marketing and branding, improved customer service and efficient supply chain and inventory management systems. Prominent retailers such as Walmart and Kroger have taken the lead in adopting the latest AI technology at stores; they are early adopters. Others are fast followers who adopt the technology after some time to minimise the perceived risk of technology adoption (Shankar et al., 2020). Retailers who have planned the AI technology adoption in products, the supply chain, inventory management, promotion and pricing with the relevant technology partner will have a definite competitive advantage over other retailers in the medium to long term (Grewal et al., 2021).

e. Purchase Intention

AI-enabled store promotions, transactions and marketing messages influence the prospective customer, from the consideration stage to the actual purchase. A planned product assortment as well as inventory optimisation also prevents stock-outs of high-demand stock-keeping units (SKUs) and minimises customer dissatisfaction. Some of the highly successful retailer promotional offers have been designed by machine learning algorithms and facilitated by AI technology. Retailers make extensive use of technology in integrating in-store and online promotions for customised targeting, which increases customer engagement and loyalty (Grewal et al., 2021).

6.0 PROPOSED METHODOLOGY

The methodology for the study is qualitative and is built on the GAP variable analysis based on the literature review.

1. We start by identifying and finalising the criteria to be used for searching the relevant research material. The latest year of publication has been decided as 2020, the chosen language is English and “Artificial Intelligence” and “Retailing” were used as the keywords for the search.
2. The key databases that were being researched for the literature review are DOAJ, ProQuest, EBSCO, Clarivate Analytics and Google Scholar.
3. Five independent variables were identified that impact the adoption of artificial intelligence technology by retailers. This is based on the detailed GAP variable analysis of the literature. The barriers and the perceived risks of AI technology adoption by retailers are also identified
4. Finally, a conceptual framework is developed, and further research gaps and limitations in the existing research are then analysed to arrive at likely areas of future research.

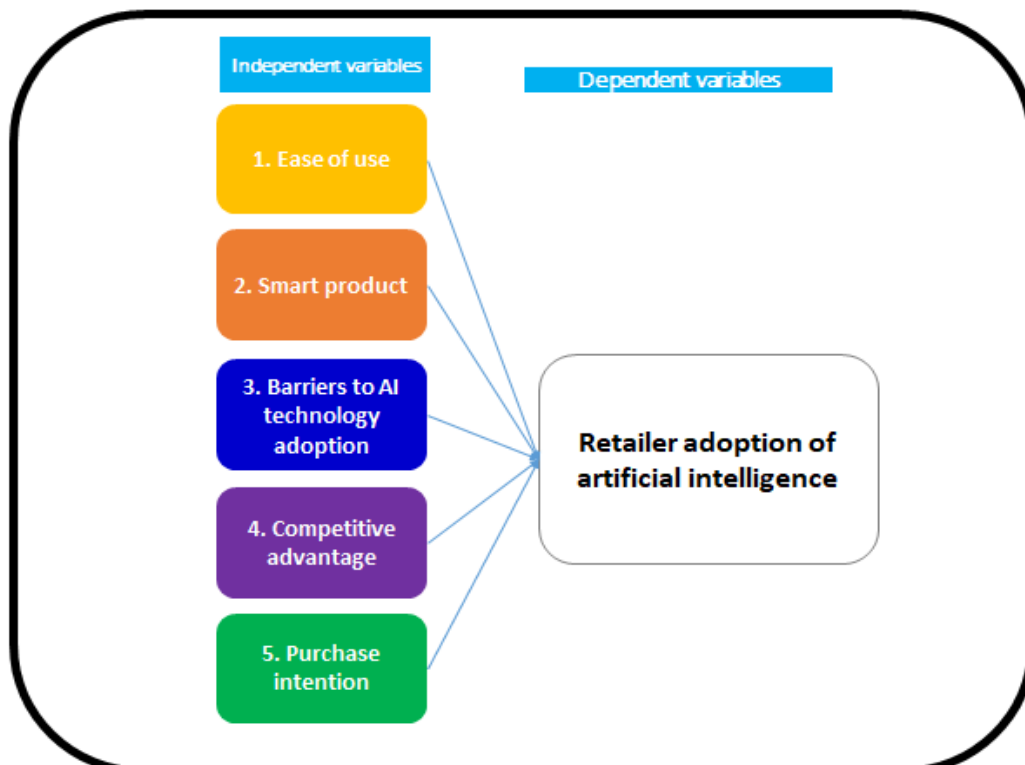
7.0 RESEARCH FRAMEWORK

We have created a basic research framework and also Research framework with outcomes

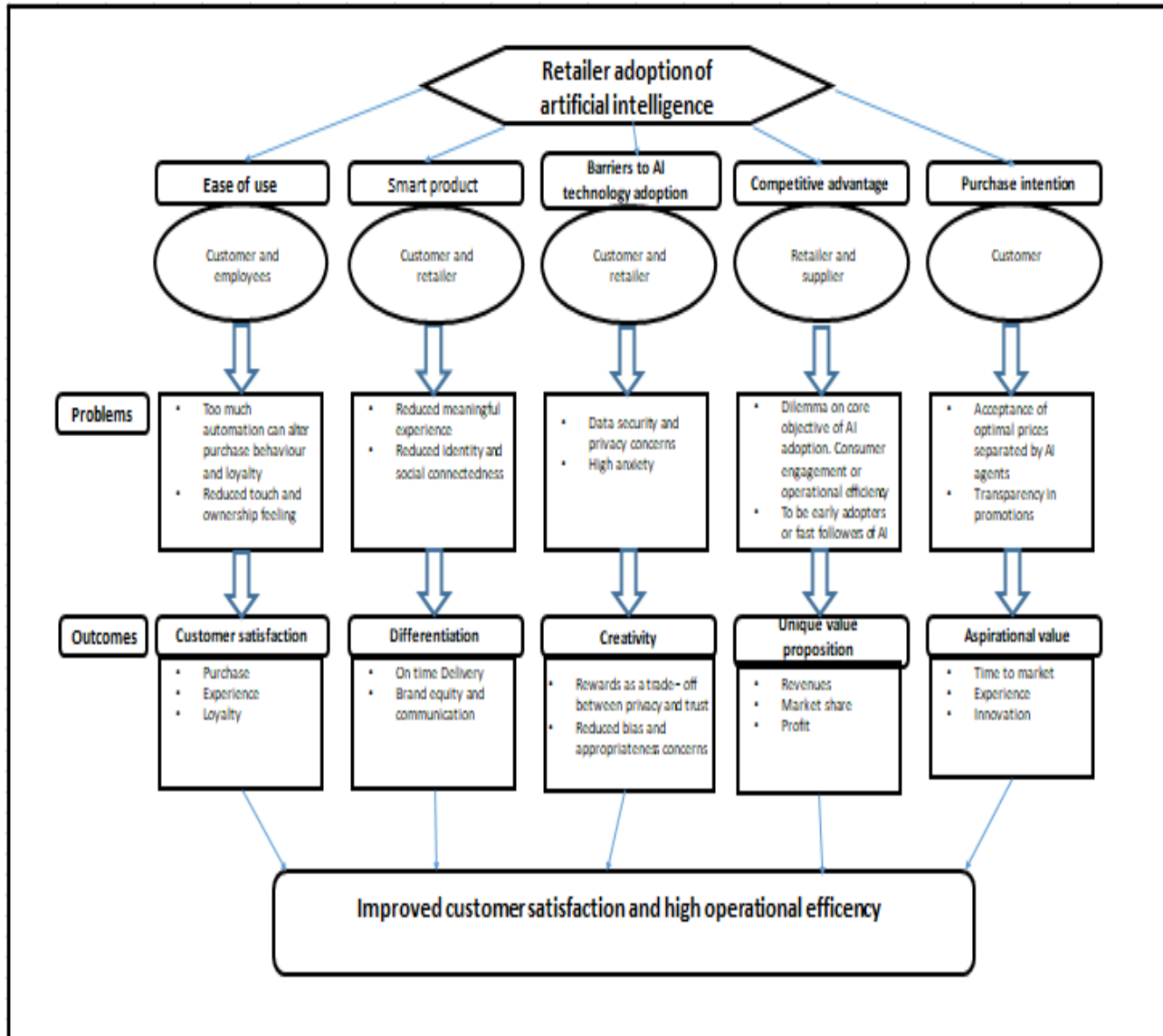
7.1 Basic Research framework

7.2 Research framework with outcomes

7.1 Basic Research Framework



7.2 Research Framework with Outcomes



8.0 DISCUSSION, ANALYSIS AND OUTCOME

8.1 Ease of Use

8.1.1 Accessibility: AI technology-enabled services enhance the customer's comfort as they allow the use of a mobile phone or other devices at different store locations for self-identification, in-store navigation, self-checkout, etc. while shopping.

8.1.2 Quick transaction: AI technology helps in speeding up payment using mobile wallets and does not require the customer to carry cash and cards.

8.1.3 Automation: automated communication aids in enhancing the customer shopping experience via reminders, in-stock notifications and price alerts.

8.1.4 Responsiveness: AI technology adoption by retailers aids in faster response times, faster resolution of customer issues and 24/7 availability.

8.1.5 Identification : the customer benefits from easy access to comprehensive product information, and AI technology also aids in faster identification of products for customers while they shop.

Outcome: artificial technology empowers customers not only to shop but also to investigate and assess their shopping experiences, with increased gratification in significantly less time for making purchase decisions and real transactions. Ease of use leads to higher customer satisfaction and loyalty, as well as more purchases.

Proposition 1: ease of use emanating from accessibility, automation, a high degree of responsiveness and customer service positively influences the adoption of artificial intelligence by retailers.

8.2 Smart Product

8.2.1 Individualisation: AI technologies such as recommender systems and individualised advertising help in individualised product searches and also give personalised recommendations to the customer, thereby differentiating a company's offerings from those of the competition.

8.2.2 Interaction: smart-connected products with automated interactive features enhance the customer experience and customer engagement. They also help in facilitating faster and more timely communication between the consumer and the retailer for troubleshooting.

8.2.3 Product bundling : customer choices of products can be influenced by using AI technology via hybrid product bundling, which offers customers the right combination of products as per their needs and aspirations.

8.2.4 Price optimisation: customers are receptive to optimised and best price offers as delivered by AI agents.

8.2.5 Product preference: more interaction with AI-enabled bots can lead to the absence of interactions with humans. Also, the lack of human touch will influence the product preference of the customer.

8.2.6

Outcome: a high level of differentiation can be accomplished by AI-powered smart products, thereby increasing the customer's interest and consideration and leading to a higher preference. Differentiation can be achieved by optimised delivery time, customised prices and a high degree of personalisation.

Proposition 2: AI-enabled smart products are capable of a high degree of differentiation, which increases the chances of artificial intelligence adoption by retailers.

8.3 Barriers to AI Technology Adoption

8.3.1 Ethics: with artificial intelligence technology, the customer is monitored on the internet and influenced to purchase through his/her preferences.

8.3.2 Personal privacy: the customer is concerned that his or her personal information can be captured while he or she is using artificial intelligence at various touch points of the consumer journey and that this information can be used maliciously.

8.3.3 Security: there is apprehension in the customer that products controlled by artificial intelligence technology (robots, cashiers, smart cars) can go out of control and cause harm while he or she is shopping.

8.3.4 Anxiety: the customer is sometimes anxious that the interaction with AI technology while shopping could lead to unpredictable and more spontaneous behaviour.

8.3.5 Social presence: customers are hesitant to engage with humanoids/robots all the time and prefer engagement with store employees as AI-enabled robots lack social presence feelings.

Outcome: the customer's understanding of the risk regarding artificial intelligence technology employed in trade is affected by the customer's apprehensions over privacy, security and ethics. It will require a high degree of creativity to alleviate the privacy concerns of the customer and trade off their concerns with personalised product offerings.

Proposition 3: customer privacy concerns add to the risk perception of the customer while he or she is using technology for shopping and are a significant barrier to the adoption of artificial intelligence by retailers.

8.4 Competitive Advantage

8.4.1 Brand equity: organisations can develop a unique brand identity in the way they enhance customer engagement by using AI-enabled services to empower customers.

8.4.2 Customer service: AI-enabled interactions result in improved overall product service. Also, sharing and using product experiences via AI-enabled peer-to-peer review sites empower customers to use products better.

8.4.3 Cost of operations: AI usage in each component of the retail value chain will reduce the overall cost of operations in the medium to the long term by creating more efficiency in the supply chain and the distribution network.

8.4.4 Quality of information: AI-enabled pre-purchase interactions empower customers with adequate information for purchase decision-making.

8.4.5 Communication: embedded marketing communications (right time, right device, right channel) with AI-enabled geotargeting will empower customers to make better decisions.

Outcome: early adoption of artificial technology will enable retailers to develop a core competency for internal operations and to create a unique value proposition for customers. This will lead to a significant competitive advantage for the retailer.

Proposition 4: early adoption of artificial intelligence technology enables retailers to develop a significant competitive advantage in the marketplace

8.5 Purchase Intention

8.5.1 Control: AI-enabled transactions via one-click buying at the store influence customers to purchase with greater control.

8.5.2 Marketing: marketing messaging with AI technology–aided geotargeting influences purchasing when the customer is in close proximity to a retail store.

8.5.3 Inventory optimization: technology-enabled stock replenishment at retailer shops enables customer purchases.

8.5.4 Store format: innovative store formats such as company-owned experience stores with the necessary AI technology orientation trigger customers to make impulsive purchases.

8.5.5 Promotion: retailer use of a variety of AI technology–enabled in-store promotions (digital display, kiosks, robots) and online promotions (bots) influences customer purchases.

8.5.6

Outcome: AI technology use improves the retailer's revenue and profitability by converting the customer's purchase intent into a real sales transaction. Aspirational value is created with a better experience for the customer and various innovations at the store. AI technology use also reduces the chances of non-transparency in promotions.

Proposition 5: enhanced purchase intention positively influences the adoption of artificial intelligence technology by retailers.

9.0 RESEARCH IMPLICATIONS

This is qualitative research based on the detailed GAP variable analysis of the relevant literature available. The study, in a scientific way, tries to address the research problem and propose a conceptual framework for artificial intelligence technology adoption by retailers.

The study identified five independent variables: ease of use, smart products, barriers to AI adoption, competitive advantage and purchase intention, which directly impact the adoption of artificial intelligence by retailers. The study focuses on how retailers can attain a competitive advantage by focussing on ease of use and convenience for the customer. Alleviating customer privacy concerns should be the top priority for the retailer to win the customers' trust and enhance their purchase intentions. The study also highlights likely areas of future research based on the limitations of the existing research.

10.0 LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

The study is based on a literature review of a limited number of articles. The methodology is qualitative and based on secondary research. Previous research being referred to for making the research framework has its own limitations. Hence, more evidence is required to establish the relationship between the independent variables and the dependent variable.

All five of the propositions are required to be evaluated using quantitative techniques with a representative sample. Empirical methods and A/B testing techniques can be used to quantify the results further to make the modelling reliable and valid.

Also, more research, backed with evidence, is needed to identify other independent variables that can directly impact artificial intelligence adoption by retailers.

Future research should further investigate and traverse the safety- and privacy-related concerns of the customer as this area is critical and needs more evidence-based outcomes for building customer trust. Also, future research should explore some possible future scenarios and how AI technology adoption will be impacted in those scenarios.

a) Smart distancing: What are the AI technologies that will aid in smart distancing? What are the chances of alteration of consumer behaviour for such technology use?

b) Ethics: Will the future AI technologies reduce the bias perception and privacy concerns of the customer? How does the retailer view the privacy and safety concerns of the customer?

c) Return on investment (ROI) from AI technology: How can retailers effectively measure the return on the investment made in AI technology?

d) Omnichannel strategy: How should retailers balance physical store operations with digital channels or operations? What dimensions of the omnichannel operations impact customer satisfaction?

11.0 CONCLUSION

Artificial intelligence technologies are progressing and growing very fast. Many of the AI technologies are impacting the way retailers are doing business. The majority of the global e-commerce companies have utilised the technology to enhance customer engagement and have successfully changed the retailing landscape. The worldwide penetration of AI technology in the retailing industry is gradually expanding but at a moderate pace. There are early adopters of AI technology, such as Walmart, while most of the other retailers are adopting AI technology gradually as there are apprehensions over various facets, such as the technology adoption costs and what the technologies are that need to be adopted. Another key decision for the retailers is the timing of the technology adoption and the quantification of adequate investment in this area to start with.

Research indicates that there is a positive impact from artificial intelligence technology adoption in retailing, with customers greatly benefitting from quick transactions and increased convenience due to automation. Global retailers who have full-scale adoption of AI technology have a definite competitive advantage by way of reduced cost of operations, inventory optimisation and specialised promotions. They are also able to increase the customer purchase intention with an AI-enabled smart and connected product portfolio.

Although there are indications of the retailers' dilemma over investing in customer-facing or non-customer-facing technologies and the privacy concerns of the customer, retailers need to adopt the technology across the value chain of the organisation to realise the maximum advantage.

Retailers need to focus on investing in both customer- and non-customer-facing technologies as there are retailers who have a narrow focus of utilising technology for increasing operator efficiency only, something that will not be beneficial in the long run. The research framework recommended can assist the retailers in creating a sustained competitive advantage. Retailers need to work diligently on the privacy concerns of the customers to win trust and also plan for full-scale AI adoption to thrive in terms of increased revenue, market share and customer loyalty in the times to come.

REFERENCES

1. Aly, M. (2020). Factors, barriers and attitudes affecting the adoption of digital technologies by NZ cooperative retailers. *Journal of Asia Entrepreneurship and Sustainability*, 16(5), 169–209.
2. Anica-Popa, I., Anica-Popa, L., Rădulescu, C., & Vrincianu, M. (2021). The integration of artificial intelligence in retail: Benefits, challenges and a dedicated conceptual framework. *Amfiteatru Economic*, 23(56), 120–136.
3. Aytekin, P., Virlanuta, F. O., Guven, H., Stanciu, S., & Bolakca, I. (2021). Consumers' perception of risk towards artificial intelligence technologies used in trade: a scale development study. *Amfiteatru Economic*, 23(56), 65–86.
4. Chaveesuk, S., Khalid, B., & Chaiyasoonthorn, W. (2021). Digital payment system innovations: A marketing perspective on intention and actual use in the retail sector. *Innovative Marketing*, 17(3), 109.
5. Chen, S. C., & Shang, S. S. (2021). Sustaining user experience in a smart system in the retail Industry. *Sustainability*, 13(9), 5090.
6. Devanesan, M. D., & Venkatesh, R. (2021). Impact of in-store retail technologies on enhancing retail footfall among physical retail formats in India. *Academy of Marketing Studies Journal*, 25(6), 1*13.
7. Dhruv, G., Noble, S. M., Roggeveen, A. L., & Jens, N. (2020). The future of in-store technology. *Journal of the Academy of Marketing Science*, 48(1), 96–113.
8. Giroux, M., Kim, J., Lee, J. C., & Park, J. (2022). Artificial intelligence and declined guilt: Retailing morality comparison between human and AI. *Journal of Business Ethics*, 1–15.
9. Grewal, D., Gauri, D. K., Roggeveen, A. L., & Sethuraman, R. (2021). Strategizing retailing in the new technology era. *Journal of Retailing*, 97(1), 6–12.
10. Guha, A., Grewal, D., Kopalle, P. K., Haenlein, M., Schneider, M. J., Jung, H., ... & Hawkins, G. (2021). How artificial intelligence will affect the future of retailing. *Journal of Retailing*, 97(1), 28–41.
11. Kaur, V., Khullar, V., & Verma, N. (2020). Review of artificial intelligence with retailing sector. *Journal of Computer Science Research*, 2(1).
12. Kishen, R., Upadhyay, S., Jaimon, F., Suresh, S., Kozlova, N., Bozhuk, S., & Matchinov, V. A. (2021). Prospects for artificial intelligence implementation to design personalized customer engagement strategies. *Journal of Legal, Ethical and Regulatory Issues*, 24, 1–18.
13. Low, F. S., & Lee, W. C. (2021). *Developing a humanless convenience store with AI system*. *Journal of Physics Conference Series (Vol. 1839, No. 1, p. 012002)*. IOP Publishing.
14. Mahmoud, A. B., Tehseen, S., & Fuxman, L. (2020). *The dark side of artificial intelligence in retail innovation*. Emerald Publishing Limited.
15. Martin, K. D., Kim, J. J., Palmatier, R. W., Steinhoff, L., Stewart, D. W., Walker, B. A., Yonggui Wang & Weaven, S. K. (2020). Data privacy in retail. *Journal of Retailing*, 96(4), 474–489.
16. Nichifor, E., Trifan, A., & Nechifor, E. M. (2021). Artificial intelligence in electronic commerce: Basic chatbots and the consumer journey. *Amfiteatru Economic*, 23(56), 87–101.
17. Oliveira, J. T. D. (2020). *State-of-art of artificial intelligence in the Portuguese food retail sector* [Doctoral dissertation].
18. Oosthuizen, K., Botha, E., Robertson, J., & Montecchi, M. (2020). Artificial intelligence in retail: The AI-enabled value chain. *Australasian Marketing Journal*, j-ausmj.
19. Prentice, C., & Nguyen, M. (2020). Engaging and retaining customers with AI and employee service. *Journal of Retailing and Consumer Services*, 56, 102186.
20. Purcărea, T., Ioan-Franc, V., Ionescu, Ș. A., & Purcărea, I. M. (2021). The profound nature of the connection between the impact of using artificial intelligence in retail on buying and the consumers' perceptions of artificial intelligence on the path to the next normal.. *Amfiteatru Economic*, 23(56), 9–32.
21. Purcărea, T., Ioan-Franc, V., Ionescu, Ș. A., Purcărea, I. M., Purcărea, V. L., Purcărea, I., ... & Orzan, A. O. (2022). Major shifts in sustainable consumer behavior in Romania and retailers' priorities in agilely adapting to it. *Sustainability*, 14(3), 1627.
22. Purohit, S., & Jain, A. K. (2021). Leveraging IOT and AI for delivering tailor-made customer experiences in Indian petro retailing. *Indian Journal of Science and Technology*, 14(7), 604–609.

23. Rodgers, W., Yeung, F., Odindo, C., & Degbey, W. Y. (2021). Artificial intelligence-driven music biometrics influencing customers' retail buying behavior. *Journal of Business Research*, 126, 401–414.
24. Roggeveen, A. L., & Sethuraman, R. (2020). Customer-interfacing retail technologies in 2020 & beyond: An integrative framework and research directions. *Journal of Retailing*, 96(3), 299–309.
25. Shankar, V., Kalyanam, K., Setia, P., Golmohammadi, A., Tirunillai, S., Douglass, T., ... & Waddoups, R. (2021). How technology is changing retail. *Journal of Retailing*, 97(1), 13–27.
26. Singh, H., & Chakrabarti, S. (2020). Defining the relationship between consumers and retailers through user-generated content: insights from the research literature. *International Journal of Retail & Distribution Management*.
27. Stanciu, V., & Rîndașu, S. M. (2021). Artificial intelligence in retail: Benefits and risks associated with mobile shopping applications. *Amfiteatru Economic*, 23(56), 46–64.
28. Weber, F., & Schütte, R. (2020). A domain-oriented analysis of the impact of machine learning—the case of retailing. *Big Data and Cognitive Computing*, 3(1), 11.
29. Wei, Y., Tran, S., Xu, S., Kang, B., & Springer, M. (2020). Deep learning for retail product recognition: Challenges and techniques. *Computational intelligence and neuroscience*, 2020.
30. Xu, J., Hu, Z., Zou, Z., Zou, J., Hu, X., Liu, L., & Zheng, L. (2020). Design of smart unstaffed retail shop based on IoT and artificial intelligence. *IEEE Access*, 8, 147728–147737.