

A SYSTEMATIC REVIEW ON THE IMPACT OF ARTIFICIAL INTELLIGENCE IN RETAIL

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Objective: This study aims to provide a systematic review of the scientific literature published between 2008 and 2023 related to the application of artificial intelligence (AI) technology in retail activities. **Originality/Value:** The research extends the observation period compared to previous studies and contributes to the analysis of aspects related to companies' managerial capabilities in using AI. **Design/Methodology/Approach:** The research is characterized as a systematic review in which bibliometric analysis techniques of co-authorship, keyword co-occurrence, and co-citation were applied, following the five-step flow recommended by Zupic and Čater (2015). The Web of Science (WOS) database was used, from which 433 documents were selected, of which 390 studies, 230 citations, 75 authors, and 54 journals were relevant to the research. **Results:** Four major thematic groups of concentration of research around AI application in retail activities were delineated. These areas are related to economic base, game theory and prices; administration, information, and model quality; anthropomorphism, engagement, and social networks; and artificial intelligence, deep learning, and machine learning. **Contribution/Implication:** The research organized the scientific production in the area, demonstrating the thematic groups of study concentration and proposing a less fragmented view of the findings and the relationship between the analyzed documents. Based on the findings, it was possible to identify gaps and themes that should be further explored, such as the consumer acceptance process, the use of AI for managerial decision-making, and cost optimization.

Keywords: Artificial Intelligence, Marketing, Retail, Systematic Review, Bibliometric Analysis

INTRODUCTION

The use of artificial intelligence (AI) in retail and the service sector has been a subject of growing interest and academic research. Comprehensive studies explore its application across various areas, from marketing strategies and consumer behavior to business models, sales processes, customer service, and trend forecasting (Chen et al., 2021; Davenport et al., 2020). Recently, there has been significant focus on the influence of AI on purchase intention and customer acceptance of products or services, highlighting the perceived value and personalized experience provided by the technology. The application of AI in e-commerce platforms has proven capable of assisting consumers in intelligent product search and selection, thereby influencing their purchase intentions (M. Li et al., 2021; Nagy & Hajdu, 2021). Additionally, studies have investigated the incorporation of AI in retail operations to enhance operational efficiency and contribute to the development of processes adapted to new consumer shopping habits, driving innovation and economic sustainability of retail organizations, while also identifying significant gaps and fragmentation in the theoretical knowledge built thus far on the use of this technology in competitive organizational environments (Bhagat et al., 2023).

AI plays a crucial role in driving precision in marketing processes, promoting the evolution of retail towards a smarter and more efficient logistics environment. This technology has transformed the processes of production, circulation, and sale of products, as highlighted by Li and Zhang (2019). Furthermore, the application of AI in retail spans various aspects, such as facial and musical biometrics, which have been shown to influence customer purchasing

behavior, further expanding the technology's impact on commercial operations (Rodgers et al., 2021), and connecting to essential concepts of environmental analysis and its impact on consumer behavior, as discussed by Bitner (1992). The usability and responsiveness of AI chatbots have also been explored, emphasizing AI's crucial role in enhancing customer interactions in e-commerce (Chen et al., 2021). Additionally, AI is used as a predictive sales tool in retail, with studies proposing models that combine AI to forecast sales and optimize pricing decisions (Ferreira et al., 2016; Silva et al., 2021). From a more internal perspective, AI has been applied in shelf auditing through image classification using semi-supervised deep learning, aiming to increase product availability on supermarket shelves (Yilmazer & Birant, 2021). These multiple applications demonstrate AI's potential to optimize and revolutionize retail operations.

Throughout the consulted studies, The primary concern of researchers has been to understand how AI can help retail and service companies add value to their goods and services. AI is seen as a tool capable of enhancing internal process efficiency and adapting to specific consumer habits and behaviors, thereby improving the shopping experience by assimilating new consumer purchasing habits, as well as being a catalyst for innovation and economic sustainability of retail organizations (Q. Li, 2022; Marín-García et al., 2021). The systematic review conducted by Heins (2023), based on studies published between 2005 and 2021, reinforces this perspective by evidencing that AI adoption exerts significant influence on the retail industry, resulting in commercial advancements and improved customer shopping experiences. However, this review also highlights the fragmentation of studies in the field and the limitation of methodologies employed.

Although there are gaps and concerns identified in academic studies regarding the ethical applications of this technology in the market, the most crucial aspect is undoubtedly the incorporation of this new process in consumer relations. This involves understanding and assimilating their preferences, personal values during consumption, and the entire shopping journey.

Based on this scenario, we structured this study to expand and complement the previous review (Hans, 2023), adding an original aspect regarding the analysis of studies related to AI application in retail, extending the research timeframe and examining aspects related to the managerial capacity of companies for using the technology. A different database was also chosen, which favored a more comprehensive bibliometric analysis concerning the previously identified sub-themes, contributing to the discussion on the evolution of the topic and reinforcing the main gaps that can still be scrutinized.

The organized synthesis of previously published research can contribute significantly to the advancement of studies on a specific research line (Zupic & Čater, 2015) and, considering the recency of the topic addressed in this article, it is also an opportunity to suggest approaches or in-depth studies on relevant and underexplored themes, with theoretical and practical impact on the construction of knowledge on the subject.

Thus, the objective of this review is to map published studies on the use of AI in retail and propose a representation of the structure of this research area, assisting researchers by organizing the field and indicating thematic areas that need initial investigation or further exploration. Additionally, we aim to identify the themes with the highest concentration of published studies and point out causal factors in the observed fragmentation in previous research. This objective is supported by the ability of a bibliometric review to identify shared interrelationships among publications and the existence of an already well-established study framework in topics related to marketing research (Chabowski et al., 2013).

Our study is structured in five sections, with the first being this introduction = contextualizing and presenting the study's objectives and theoretical relevance. In the next section, we will briefly address the theoretical concept and its implications for our investigation

within the field of AI use in marketing. Next, we detail the methodological procedures used for this study and describe the process of identifying, refining, and collecting the analyzed articles. In the fourth section, we discuss the main results obtained in this study, and finally, we present our concluding remarks with recommendations and observations on the limitations of this research.

THEORETICAL REVIEW

The role of AI in the retail sector has sparked growing interest among researchers and professionals. These studies provide a comprehensive analysis of the various complexities and opportunities that AI offers the retail sector, encompassing everything from understanding consumer behavior to optimizing commercial operations.

Heins (2023) conducted an analysis of the main themes and trends related to AI in retail. A significant rise in the number of publications in the last five years was observed, highlighting the growing relevance of this technology to the retail sector. The results revealed that the primary focus areas are technologies aimed at better meeting consumer needs and optimizing the retail value chain, as well as tools that facilitate direct interactions with consumers to assimilate their expectations.

De Bellis, Venkataramani, and Johar (2020) present a relevant discussion on potential unintended negative consequences of reliance on technology in retail. Among these consequences are a reduction in the sense of competence and free will, a decrease in perceived and actual consumer autonomy, and degradation of automated skills, that is, skills that have been handed over – offloaded – to technology. The authors also highlight seven essential topics for future research, including branding, time and meaning, control, social, and behavioral theories, offering valuable insights to guide future studies in this field.

Chopra (2019) investigated the motivation of young consumers for using AI tools such as chatbots, voice assistants, and augmented reality during their retail shopping. The results highlight consumers' preference for AI tools that are easy to use (expectation), effective in performance (instrumentality), and capable of providing satisfaction, trust, and gratifying experiences (valence). On the other hand, Grewal et al. (2020) focused on in-store technology more broadly, contributing to the understanding of AI's impact on the physical retail store experience.

Chinchanachokchai and Thontirawong (2021) emphasize that AI-based recommendation systems have the potential to enhance e-commerce performance. The authors investigated the impact of consumer knowledge on product ranking in two popular types of recommendation systems: user-based collaborative filtering and content-based recommendation. The results reveal that expert consumers rated products recommended by the collaborative filtering system higher than those from the content-based recommendation system. This suggests that consumers with higher expertise tend to prefer products recommended by collaborative filtering systems and are more likely to share these recommendations with others. However, novice consumers often lack the necessary knowledge to evaluate a product in-depth.

Pillai, Sivathanu, and Dwivedi (2020) point out that a range of factors influences the behavioral intention of consumers in retail. These factors include optimism, innovation, discomfort, insecurity, perceived enjoyment, customization, and interactivity. These elements play a crucial role in how consumers interact with retail environments and influence their purchasing decisions.

Shankar et al. (2021) examined the impact of AI on the transformation of the retail sector, noting that the short-term impact is less than initially anticipated, but the long-term effects are more significant than imagined. They highlight that AI technologies in retail benefit

different stakeholders in distinct ways: a) customer-facing technologies that enhance customer engagement with products, services, and brands; b) employee-facing technologies that provide new interaction tools in live retail environments; and c) supplier-facing technologies used by manufacturers and provided by retailers. These distinct approaches emphasize how AI is reshaping retail interactions and shaping the expectations of consumers, employees, and suppliers.

AI plays a crucial role in analyzing the consumer journey during purchases, as it is a resource that enhances the efficiency of the consumption process. AI enables the automation of specific processes that improve retailers' delivery to the market, such as inventory and supply chain management, through demand pattern analysis and the application of techniques for predicting customer consumption trends. This data-driven approach related to the consumer, environment, and transaction context gives retailers a competitive advantage, allowing them to anticipate elements that influence consumer expectations. This perspective is addressed by Anica-Popa et al. (2021), highlighting AI's potential to improve consumption process efficiency and enhance customer experience.

Although the use of AI-based technological resources has intensified across various sectors of the economy and academia, it is important to note that there is still much to be explored in the study and development of these solutions. Recent studies, such as that of Noble and Mende (2023), highlight the need to investigate the relationship between technology and humans, especially in the applied social sciences. The application of AI in various areas, such as product research, automated purchasing processes, service provision, personalized shopping experiences, and improving the relationship between customers and brands, offers a vast field for research. These studies aim not only to increase the efficiency of these tools but also to explore the behavior, profile, and cultural maturity of people in relation to their acceptance of and interaction through these channels. It is essential to consider the consumption context, type of product or service, and brand identification when analyzing the impacts of AI on consumer experience.

Alboqami (2023) identified five variables that contribute to the level of consumer trust in AI-created influencers in the retail context. The results revealed that physical attractiveness, congruence between influencer and consumer, and authenticity emerged as the main drivers of trust in AI-generated influencers. This study highlights the importance of these elements in building consumer trust towards virtual influencers and offers valuable insights for retail marketing strategies.

Divetia and Divetia (2023) conducted a study investigating the emergence of AI and the paradigm shift towards a more AI-driven shopping model. In this context, AI thoroughly analyzes consumer behavior through social media research and shopping histories. A prominent example is Amazon's "Alexa," an AI program designed to assist users with their daily household tasks and support their shopping experiences. This study highlights the growing integration of AI in the shopping process and its impact on how consumers interact with brands and make their purchases.

Tupikovskaja-Omovie and Tyler (2020) address the significant impact of smartphones on the retail sector, triggering substantial changes in consumer behavior. Their research proposes a new mobile consumer segmentation methodology based on consumers' shopping journeys using mobile eye-tracking technology. The results revealed three distinct types of shoppers: those directed exclusively by the retailer's website, self-selected journeys, and challenging shoppers. Additionally, they identified three corresponding shopper profiles: those who expand their self-selected journeys, challenging shoppers directed by the retailer's website, and focused challenging shoppers. This innovative approach provides valuable insights into how consumers use their smartphones during the shopping process, allowing for a deeper understanding of different behavioral patterns.

METHODOLOGY

This study aimed to conduct a structural mapping of research on the application of artificial intelligence in retail processes through a systematic review of the existing literature. Prior studies on the topic were identified and analyzed using the workflow recommended by Zupic and Čater (2015) to ensure the clarity and replicability of our study process.

Having defined the research objectives, the methodological design employed in this study was a bibliometric analysis of co-authorship, co-occurrence of keywords, and co-citation. This approach enables the identification and mapping of information related to the most recurrent authors, keywords, and citations in the researched topic. Aggregating and analyzing these data provides insights into the structure of the field, networks, and topics of interest (Zupic & Čater, 2015).

The second step of the bibliometric research workflow defined in our study involved setting the inclusion criteria for the works to be analyzed and the database used to search for published studies. After an exploratory reading on the use of artificial intelligence in retail, the keywords “artificial intelligence,” “retail,” and “management” were defined. The terms were used in English to adapt to the language of the database and expand the number of studies retrieved by the search.

The Web of Science (WOS) database, a platform that includes more than 21,000 high-quality, peer-reviewed journals published worldwide was used to find relevant works. The use of this platform for systematic reviews applying bibliometric analysis techniques is well-documented in previous marketing studies (e.g., Chabowski et al., 2013; Muñoz-Leiva et al., 2013).

The inclusion criteria adopted were studies published in journals related to the field of management that have undergone peer review, ensuring methodological relevance. It is important to highlight the delimitation of the area concerning the reviewed articles on the application of this specific technology, given the nature of this article, which does not focus on how AI is developed in terms of technical programming and computational language construction, but rather on its relationship to markets, target audiences, and the management context of organizations as a whole.

This initial search resulted in 433 documents, and after the refinement process by document type, a total of 390 articles, 230 citations, 75 authors, and 54 journals were identified over a 15-year period (2008 to 2023).

The third step of the protocol adopted for the evaluation of this bibliometric analysis was the choice of software for operationalizing the analysis, following the criterion of selecting tools capable of calculating similarity matrices among study items (documents, authors, journals, and words) (Zupic & Čater, 2015). In this study, the data were processed using VOSviewer software due to its ability to organize data in a viewer, which allows detailed examination of bibliometric maps in different displays, each emphasizing different aspects of the map (van Eck & Waltman, 2010). The graphical representation of the maps generated by the program consists of clusters, representing the analyzed "themes," and lines indicating the relationships between the clusters.

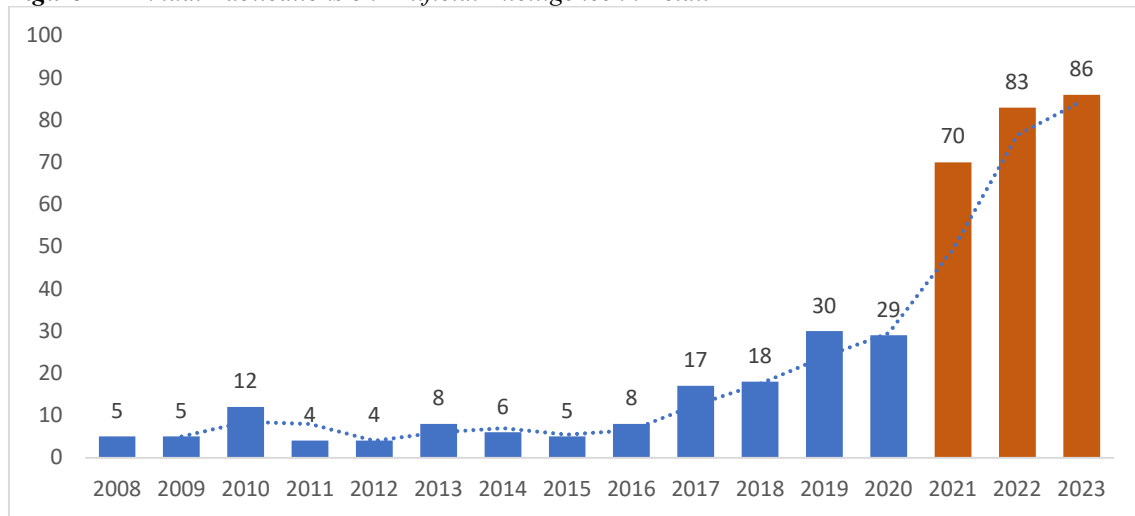
The next two steps involve visualizing the maps generated from the units of analysis and their relationships and interpreting these maps. At this point, the choice of the tool for operationalizing the analysis, discussed earlier, is fundamental to obtaining an appropriate and clear layout that allows researchers a comprehensive visualization of the studied information.

The adoption of this five-step protocol, along with the selection of the software and database supported by previous literature, aimed to provide a suitable standard for the systematic review procedure and ensure the quality and replicability of this study.

DISCUSSION

Figure 1 shows that there has been a recent increase in academic interest in the use of artificial intelligence (AI) in retail activities, with a significant rise in published studies starting from 2021. One factor that may have driven this trend is the effects of the COVID-19 pandemic. The World Health Organization's (WHO) recommendations for lockdown implementation in 2020 clearly impacted the market performance of organizations, particularly in retail. To maintain relevance in a competitive environment, retailers had to adapt their activities and adopt e-commerce technologies and platforms (Anker, 2021). The need to transition economic activity to the digital environment accelerated companies' initiatives to enhance customer relationships online, incorporating AI into this scenario.

Figure 1 - Annual Publications on Artificial Intelligence in Retail



Source: prepared by the authors

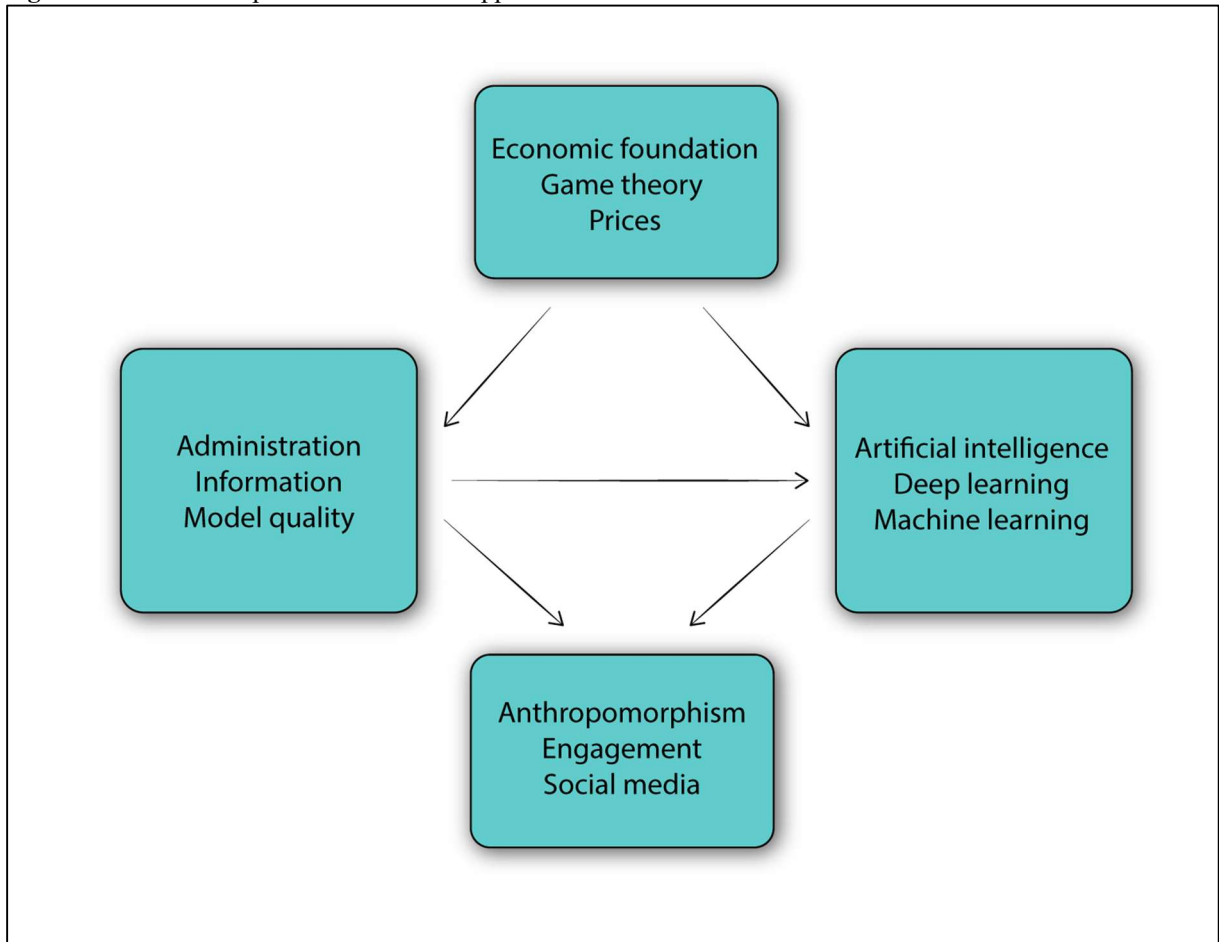
Table 1 displays the ranking of journals with the highest frequency of publications compared to the ranking of journals that have received the most citations over time.

Table 1 - Most Published and Most Cited Sources

Sources with most publications		Sources with most citations	
Journals	Qty. Articles	Journals	Qty Citations
1. Journal of Retailing and Consumer Services	35	1. International Journal of Information Management	926
2. Lecture Notes in Artificial Intelligence	19	2. Journal of Retailing and Consumer Services	613
3. Chinese Control and Decision Conference	14	3. International Journal of Retail Distribution Management	195
3. International Journal of Retail Distribution Management	14	4. Journal of Business Research	193
4. Procedia Computer Science	10	5. Annals of Operations Research	144

Source: prepared by the authors

Figure 4 - Macro Groups on Studies of AI Application in Retail



Source: prepared by the authors

Management, Information, and Model Quality

Studies within this cluster address various aspects of information acquisition in different contexts, providing diverse perspectives on data collection, ranging from consumer acceptance of technologies to the negative effects of information overload and operational efficiency.

Among the tools for information acquisition in the market, the development of scales to assess consumer willingness to integrate service robots and artificial intelligence into regular service transactions stands out. This reflects the search for information regarding consumer acceptance and adoption of these technologies.

These studies map consumers' willingness to share personal information with fashion sales robots, highlighting the importance of trust and perceived service quality in obtaining this information.

They also discuss how consumers' perceptions of AI chatbots influence their cognitive and emotional intentions, as well as their behavioral intentions. This reveals the importance of interaction and the quality of information provided by chatbots in gaining consumer trust and influencing purchase decisions.

Social networks are also evaluated as sources of information exchange and information overload, and how the use of technologies can affect service performance in specific economic sectors (Loske & Klumpp, 2021; Lu et al., 2019; M. Sharma et al., 2023; Song & Kim, 2021; Zhu et al., 2023).

Economic Base, Game Theory, and Pricing

The texts in this group highlight how the application of game theory and optimization in supply chains and various industries can be enhanced through artificial intelligence, enabling more efficient management and better adaptation to market and environmental demands.

The studies address different applications of game theory and optimization in supply chain contexts and various industries. Generally, the optimization proposal is through a supply chain model aiming to maximize the profits of those involved. Here, artificial intelligence is employed to further enhance decision-making processes, such as resource allocation and pricing strategies.

The discussion also considers the application of quantity flexibility contracts, taking into account the consumer's environmental sensitivity. The optimization of sustainability levels and retail prices is performed using game theory, aiming to maximize the supply chain profits. In this context, artificial intelligence emerges as a tool for market data analysis and dynamic adjustment of sustainability levels and retail prices according to demand patterns.

Pricing management in multi-channel sales over several periods is also addressed, proposing a dual-channel model in two periods. The analysis reveals pricing patterns over time and the influence of substitutability between channels on pricing strategy. Here, artificial intelligence is used to predict future demand and optimize prices over time across different sales channels, enabling more agile adaptation to market conditions.

Finally, the management of a closed-loop supply chain with retail competition is focused on, employing game theory and fuzzy theory to determine optimal decisions for the manufacturer and retailers. In this context, artificial intelligence could be applied to analyze large data sets and identify complex market behavior patterns, aiding in defining more effective competitive strategies (Jie Wei et al., 2010; H. Li et al., 2021; Philip & Marathe, 2022; Yuan et al., 2021).

The studies in this group also highlight the importance of generating models that help understand and deal with disruptive events, such as pandemics, from the perspectives of both marketing and operational efficiency, including data analysis and the adoption of emerging technologies to improve decision-making and adaptation to new market conditions.

Within the texts analyzed for this section, a conceptual framework is proposed to understand the characteristics and impacts of pandemics in the marketing context, addressing everything from macro forces to implications in specific sectors such as health, retail, education, hospitality, and tourism.

The importance of data analysis within databases is also discussed, highlighting the challenges faced by researchers in the cycle of feature selection, data export, and import for model training. A unified framework is proposed to train and evaluate statistical learning models within a relational database, aiming to optimize efficiency and avoid repeated data exports and imports.

Finally, the studies address the adoption of autonomous decision-making technologies in retail, highlighting the factors that influence consumer acceptance of these technologies. The study uses structural equation models to analyze customer responses, identifying that effort expectancy, performance expectancy, facilitating conditions, and social influence are positively associated with the adoption of autonomous decision-making processes. Additionally, collectivity and uncertainty aversion play a role in intensifying or mitigating these associations (Abo Khamis et al., 2018; Das et al., 2021; S. Sharma et al., 2024).

Artificial Intelligence, Deep Learning, and Machine Learning

The studies grouped here demonstrate the broad reach and potential of artificial intelligence in retail. While one of the analyzed studies highlights the general application of AI in the retail sector, others draw attention to specific aspects such as customer opinion analysis

and efficiency in food supply chain management, including packaging and labeling. This variety of applications shows how AI is transforming various aspects of retail, from customer interaction to the optimization of internal processes.

The use of artificial intelligence occurs in various contexts, including business administration, opinion summarization, and food supply chains. Numerous possible applications of neural networks, deep learning, and machine learning in sectors such as finance, retail, manufacturing, and business management are presented. It is emphasized that the rapid development of AI is expected to have a significant impact on an even wider range of fields.

This section discusses deep learning-based opinion summarization methods, which aim to produce concise summaries from a large amount of opinionated text. The method, called RDLS, uses recurrent neural networks (RNNs) and machine learning to perform sentiment analysis, extract relevant information, and select sentences to compose the summary. Experimental results demonstrate the superiority of the RDLS method compared to existing ones.

There is also the practical use of AI in the food supply chain, highlighting its importance for efficient and safe food production. Various techniques associated with convolutional neural networks, long short-term memory networks, and attention mechanisms are presented in experimental studies that address plant growth prediction, energy consumption optimization in refrigeration systems, and expiration date recognition on food packaging (Abdi et al., 2021; Kollia et al., 2021; Y. Li et al., 2018).

Anthropomorphism, Engagement, and Social Media

The studies in this cluster discuss the impact of brand anthropomorphism (BA) on user interactions with voice assistants, highlighting the growing use of these services and their influence on brand perceptions. A test of the model of the consequences of brand anthropomorphism is proposed, examining the relationships between brand anthropomorphism, brand trust, and multidimensional consumer-brand engagement (CBE), encompassing relevant cognitive, affective, and behavioral dimensions, as well as the moderating role of perceived privacy risk.

The studies indicate that anthropomorphism positively affects brand trust and the affective and behavioral dimensions of CBE. Additionally, perceived privacy risk positively moderates the relationship between brand anthropomorphism and brand trust. Specifically, the influence of brand anthropomorphism on brand trust is strengthened at higher levels of perceived privacy risk.

These findings contribute to a deeper understanding of the effects of anthropomorphism on user interactions with voice assistants, particularly regarding brand trust and consumer engagement. In terms of AI application in retail, this study suggests that brand anthropomorphism strategies can be effective in increasing consumer trust and promoting deeper engagement with brands, especially in contexts involving interactions with voice assistants. This highlights the importance of considering emotional and behavioral aspects in the design and implementation of voice assistants and other AI technologies in retail (Patrizi et al., 2024).

CONCLUSION

The bibliometric review proposed in this study identified a wide range of applications and impacts of artificial intelligence across various economic sectors from a marketing perspective, particularly in retail practices. The analysis of these studies provides a deeper understanding of the advancements, challenges, and implications of AI in different contexts,

offering an organized and visual framework that helps us comprehend the areas of greatest research interest, thereby somewhat mitigating the fragmentation noted in previous studies.

Based on the findings, we have identified several opportunities for future research that can contribute to advancing knowledge in this field. First, there is a need for additional studies on the adoption and acceptance of AI by consumers in various retail contexts. Understanding the factors influencing consumer trust in AI and their perceptions of privacy can inform strategies to increase acceptance and use of these technologies.

Furthermore, it is important to investigate how AI strategies can be optimized to enhance customer experience and promote consumer engagement. This includes exploring the potential of personalization and intelligent recommendations to offer more relevant and tailored products and services to meet individual customer needs, in line with marketing strategies related to personalization principles for gaining a competitive advantage (Palmatier & Crecelius, 2019).

Another relevant aspect for future research is the impact of AI on operational efficiency and managerial decision-making in various sectors. Additional studies can examine how AI technologies can be applied to optimize business processes, improve the accuracy of forecasts and analytical insights, and facilitate the automation of routine tasks.

Moreover, given the lack of studies verified in our research, there is a need to investigate the ethical, social, and legal challenges associated with the increasing use of AI in different contexts. This includes considering issues related to privacy, algorithmic bias, discrimination, and legal liability, and developing appropriate guidelines and policies to mitigate these risks.

During the analysis, challenges and limitations in the existing research were identified. Notably, there is a lack of data to assess the long-term effects of implementing AI systems in marketing strategies. Additionally, there is a pressing need for more comprehensive studies that consider different cultural and demographic contexts to better understand how AI influences consumer behavior in diverse social realities.

The research findings highlight significant practical implications for businesses, suggesting that investing in AI-based personalization strategies can improve customer engagement and loyalty. However, it is crucial to recognize that success in implementing these strategies requires a profound understanding of consumer needs and preferences. Moreover, companies must continuously adapt their strategies based on insights generated by AI, ensuring a dynamic and customer-oriented approach in an ever-evolving environment.

Given the identified gaps and opportunities, it is crucial for future research to focus on specific issues, such as the impact of AI on different consumer profiles and the effectiveness of alternative AI-based marketing approaches, including the use of virtual assistants and chatbots. Additionally, longitudinal studies tracking the evolution of AI strategies over time are necessary to provide more comprehensive insights into the long-term effects of these technologies on consumer behavior. Such research can significantly contribute to guiding business practices and enhancing companies' ability to meet the ever-changing demands and expectations of consumers.

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