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# Artificial Intelligence in E-commerce and Digital Marketing: A Systematic Review of Opportunities, Challenges, and Ethical Implications

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The transformative power of AI has only just begun to redefine how businesses function and relate to their customers within e-commerce and digital marketing. In fact, AI really does help firms adjust to changes in consumer preference and market fluctuations by improving operational efficiencies. Big data analytics, aided by artificial intelligence, really boosts the understanding of the customer journey-hence, optimizing and finally allowing for tailor-made marketing campaigns in real time. This leads to great growth for the business. The COVID-19 pandemic pushed companies into adopting AI-driven solutions in the quest for their resilience; this consequently led to an increase in the need for effective digital marketing strategies. E-commerce activities are integrated with

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artificial intelligence in order to better understand consumer behavior, support market dynamics forecasting, and enhance risk management strategies. Hence, it becomes an indispensable aspect. It is relevant that ethical frameworks and further research address the problems of data privacy and scalability in order to optimize the intrinsic potential of AI. A focus on innovative applications of AI, alongside interdisciplinary collaboration, can empower an organization to develop genuinely inclusive and effective marketing strategies. Embracing the AI-driven initiatives, this will result in long-term relationship building with the customer for growth in a sustainable manner and maintaining competitiveness at an exponential pace in changing digitization.

*Keywords: Artificial intelligence; digital marketing; marketing strategies; e-commerce; business.*

## 1. INTRODUCTION

The COVID-19 pandemic has acted as a catalyst for a massive transformation in business operations, underpinning the critical need for digital progress in marketing to keep up with competitive advantage (Limna et al., 2022; Majedkan et al., 2020). Artificial intelligence-the replication of human cognitive functions within machines-induces big changes in e-commerce because of the possibility of data-driven decision-making (Sakhvidi & Saadat, 2024). It is of paramount importance in the development of marketing methodologies; hence, there is a need for comprehensive evaluations that chart the landscape of AI research in this area (Mariani et al., 2022). E-commerce rapid growth has changed business-consumer interactions, which therefore require big data analytics and AI to drive actionable insights in order to enhance customer journeys and operational efficiency (Nalla et al., 2024). Integrating AI with big data analytics really provides real-time insights, predictive analytics, and personalized recommendations, which substantially enhances customer experiences (Amelia et al., 2023). Although e-commerce has experienced tremendous growth, the existing literature remains quite fragmented, which further complicates an already challenging task: identifying precisely where the research gaps are located (Bawack et al., 2022). Globally, AI has become a part of business operations in transforming AI-driven automation into emulating human intelligence to make informed marketing decisions (Haleem et al., 2022). AI has emerged as a transformation force in digital marketing, making it very important for stakeholders to understand its implications (Ziakis & Vlachopoulou, 2023). AI allows for innovative marketing strategies and practices; hence, companies have to seek effective AI solutions (Verma et al., 2021). This shift to digital platforms makes the approach of CRM and sentiment analysis crucial in devising any marketing

strategy (Kyaw et al., 2022). Technological changes are an uphill task for effective marketing strategies that will lead to better sales conversion and keeping competitive advantages (Purnomo, 2023). AI-driven customer interaction and brand engagement shapes the future of the fashion sector (Rathore, 2023). Recent advancements in e-commerce like S-Commerce and Sharing Commerce need proper research as most of the gaps exist in current literature (Attar et al., 2022). Global poverty, increased by conflicts, climate change, and the pandemic, needs new approaches that emphasize e-commerce and the collaboration of SMEs (Cordes & Marinova, n.d.). Fast-growing research in digital marketing and technology underlines that an integrated perspective on the impact of AI is imperative (Vlačić et al., 2021). The relationship between digital marketing strategies and consumer online purchasing behavior has to be considered in a wide context with regard to their effects (Antczak, 2024). AI restructures business-consumer relationships through accurate marketing strategies run by predictive models (Vidhya, 2023). Emphasizing the significance of digitalization in e-commerce, AI technologies enhance marketing strategies and decision-making processes (Apriani et al., 2024; Qurtubi et al., 2022). This technology employs techniques from machine learning to analyze facial data, enabling applications in industries like forensics and biometrics (Abdulrazaq et al., 2021). It also highlights the importance of integrating artificial intelligence (AI) with IoT for efficient resource management and real-time responses, calling for further research to explore new advancements (Armya et al., 2023). AI facilitates a more nuanced understanding of document relationships, leading to better grouping of documents based on meaning rather than just keywords (Haji et al., 2023). AI is a transformative technology that enhances efficiency and sustainability by processing complex data and automating tasks (Issa et al., 2024; Yasin, 2025). Introduces the concept of AI

and its relevance to marketing, focusing on Chat GPT as a tool for enhancing content strategies (Saputra et al., 2023).

## **2. BACKGROUND THEORY**

Digital marketing has evolved with the integration of AI and ICT, significantly improving e-commerce efficiency through automated processes and personalized customer interactions. AI and big data analytics tailor customer experiences and enhance business outcomes. Predictive AI and ML technologies anticipate consumer trends, while disruptive AI technologies drive continuous innovation in marketing strategies.

### **2.1 Digital Marketing and ICT**

The theoretical framework of digital marketing and service marketing underlines the role of information and communication technology (ICT). In fact, ICT has considerably changed business practices-before, during, and post-pandemic times-including enabling companies to readjust to new market realities and changing consumer behaviors (Limna et al., 2022).

### **2.2 AI Principles and Cognitive Processes**

AI's ability to simulate intelligent processes and massive data processing capabilities is at the core. AI improves operational efficiency in many different sectors, e-commerce included, through automated processes, personalized customer interactions, and better market trend predictions (Sakhvidi & Saadat, 2024).

### **2.3 Technology Acceptance and Consumer Behavior**

Discuss the foundational theories relevant to AI applications in marketing, including technology acceptance and the other psychological frameworks that help in understanding and influencing consumer behavior-integral in creating effective digital marketing strategies (Mariani et al., 2022).

### **2.4 Big Data and Analytics**

Principles of AI and big data analytics. Combining these technologies can create tailored customer experiences and improve organizational outcomes. In e-commerce, huge

volumes of generated data demand advanced analytics to tap into it for driving business directions with informed decisions (Nalla et al., 2024).

### **2.5 Big Data and Customer Journey Optimization**

Big data and AI technologies are functioning together to optimize the customer journey in e-commerce. In this regard, particular AI techniques applied can contribute to a better level of customer satisfaction and loyalty, rendering personalized experiences and timely recommendations (Amelia et al., 2023).

### **2.6 Predictive Analytics and Consumer Behavior**

Artificial Intelligence (AI) and Machine Learning (ML) technologies increase the understanding and prediction of customer behavior through the use of data. These technologies encourage the development of predictive models that can predict consumer needs and trends (Haleem et al., 2022).

### **2.7 AI Applications and Marketing Strategies**

A theoretical framework allows the understanding of the interaction between applications of artificial intelligence and marketing strategies. Data-informed decision-making and immediate analytical capabilities are among the major principles in formulating successful marketing initiatives (Ziakis & Vlachopoulou, 2023).

### **2.8 Disruptive Technologies in Marketing**

Discuss how disruptive technologies like AI impact business operations and customer expectations. The evolving nature of these technologies drives continuous innovation and adaptation in marketing strategies (Verma et al., 2021).

## **3. LITERATURE REVIEW**

Singh, (2021), discussed the ways in which Artificial Intelligence (AI) and Machine Learning (ML) impact e-commerce in terms of improving the experiences of customers and raising operational efficiency. AI will enhance customer relationship management, logistics, and marketing, which will result in more purchases

and increased customer satisfaction. AI systems bring forth concerns of privacy and ethics in using the data. A holistic view must balance the benefits and drawbacks of artificial intelligence in e-commerce.

Sohaib et al., (2022), tried to find the importance of SMMAs in the e-commerce context of China using the stimulus-organism-response (S-O-R) framework. The findings show that effective SMMAs lead positively to improved relationship quality, which consecutively results in more consumer loyalty and repurchase intention. More importantly, this study they indicated the possibility of improvement in both AI-driven customized marketing strategies and data analysis for better SMMAs to improve organizational performance in the e-commerce business.

Singh et al., (2024), examined online shopping assistant adoption in e-commerce, with a view toward the role that AI plays in personalizing customer shopping experiences. OSAs can enhance the shopping experience through natural language processing and providing tailored suggestions to answer customer queries. Various factors, such as trust in and ease of use and privacy, influence consumers' acceptance of OSAs in their digital marketing strategies. This shows how AI could help increase customer satisfaction and build an ongoing relationship with customers in e-commerce.

Reddy et al., (2024), investigated the influence of big data and AI on e-commerce marketing, underlining that these technologies allow companies to address each customer with adaptability based on their behavior. AI-driven algorithms support companies in analyzing large data, identifying complicated patterns, and in real time, delivering relevant content that increases engagement and conversion rates. Proper personalization enhances customer satisfaction and loyalty, which means business success within a highly competitive landscape. Ethical implications and privacy issues related to the process of data gathering are further discussed, putting emphasis on having a balanced approach toward building consumer confidence.

Goriparthi, (2020), discussed the role that artificial intelligence may play in the optimization of e-commerce through personalized recommendation based on big data analysis. It underlines the effectiveness of AI-driven recommendation frameworks since they result in

huge gains with respect to precision, interactions with users, and conversion rates. This research also underlines important ethical issues of data privacy and algorithmic bias while applying AI technologies to foster customer loyalty and drive sales expansion in a competitive landscape.

Khrais, (2020), discussed the role of artificial intelligence in e-commerce and digital marketing, covering its efficiency and quality. AI helps businesses understand customer preferences, which enables them to create hyper-personalized marketing strategies. Explainable AI guarantees transparency in the decision-making processes driven by AI and enhances the level of customer trust and satisfaction. Despite the loss of jobs, the deeper contributions AI makes in smoothing operations and improving interactions with consumers place it at the forefront of change in the growth of the digital marketing field in e-commerce.

Mahapatra et al., (2022), investigated the effect of AI on customer behavior in e-commerce and digital marketing. This research underlines those areas of change brought about by digital developments, more so the integration of AI and machine learning technologies. Similarly, the study tries to explain how AI enhances the customer experience through personalized recommendations, targeted advertising, and seamless shopping experiences. This paper concluded that AI enhances the effectiveness of digital marketing strategies by better understanding and anticipating customer needs for a more engaging and efficient online shopping environment.

Putha et al., (2024), investigated the impact of AI-driven personalization in e-commerce, underlining how advanced data analytics and machine-learning models have transformed the landscape of digital marketing strategies. The discussion spans methodologies such as collaborative filtering and content-based approaches, which enhance consumer experiences and stimulate sales. Empirical case studies from prominent platforms demonstrate practical applications, yielding quantifiable enhancements in customer satisfaction and organizational performance. Furthermore, the manuscript examines obstacles such as data privacy concerns and algorithmic bias, proposing future directions for AI ethics and technological integration to optimize personalization techniques within the digital marketplace.

Cao, (2021), investigated the significance of artificial intelligence in e-commerce and digital marketing. This study depicts that AI enhances customer service through intelligent robotics, fastens the processing speed, and analyzes consumer behavior in order to develop personalized shopping. Moreover, through intelligent store design, it automates the product showcasing, hence increasing efficiency. Adaptive pricing models and targeted marketing campaigns are also supported by AI, which ultimately drives engagement and fosters loyalty among customers in the new e-commerce landscape.

Rustholkarhu et al., (2022), reviewed the role of artificial intelligence in enhancing B2B customer journey management in e-commerce and digital marketing, highlighting four key management areas: analyze, design, engage, and guide. AI-empowered tools can enhance these activities at pre-purchase, purchase, and post-purchase stages. AI functions drive managerial decisions, efficiency in operations, insight into data, simplification of tasks, and collaboration between humans and machines. The results provide actionable insights for marketers on the application of artificial intelligence tools to improve customer engagement and satisfaction, hence informing B2B marketing management.

Tolstoy et al., (2022), discussed the determinants of international performance for e-commerce SMEs and highlights the role of OMCs in achieving success. It stresses the necessity of marketing ambidexterity: a balance between market-driven and market-driving approaches. The study also shows how digital tools, including AI, may help improve customer engagement, optimize business processes, and adapt marketing strategies in light of the competitive digital landscape. The authors note that SMEs have to continually develop OMCs in order to be able to succeed internationally.

Chen et al., (2022), examined the role of Artificial Intelligence in e-commerce firms' performance by exploring how AI capabilities contribute to firm performance through dimensions related to creativity, artificial intelligence management (AIM), and AI-driven decision making (AIDDM). Identifying through a resource-based view framework, the study explained how firms use AI for better customer service through enhanced product recommendations and increased operational efficiencies. The findings are presenting the critical role that artificial

intelligence plays in analyzing consumer data, predicting market trends, and developing digital marketing strategies that have contributed to better business outcomes and competitive advantages in the e-commerce industry.

Sabharwal et al., (2022), investigated the link between digital advertising (DA) and artificial intelligence (AI), and their joint effect on marketing strategy. It highlighted how AI, through data collection and analysis of consumer behavior, enhances e-commerce and digital marketing by predicting customer behavior and improving engagement. AI technologies allow for real-time solutions, enabling organizations to respond swiftly to market demands and thus gain a competitive advantage. The results revealed that the successful incorporation of artificial intelligence (AI) into marketing approaches not only improves operational effectiveness but also enhances the processes of acquiring and retaining customers, thereby increasing profitability within an ever-evolving digital environment.

Andrzejak, (2023), examined the application of artificial intelligence (AI) in advancing e-commerce and digital marketing, with a particular emphasis on the Polish market. It highlights the potential of AI-powered tools, including machine learning and natural language processing, for bringing efficiency in marketing and user experiences and optimizing online advertising. Challenges have also been pointed out in skilled IT personnel and the management of customer interactions through AI-driven systems like chatbots. Still, this integration of AI in digital marketing is perceived as transformative-bringing operational improvements and economic gains for businesses.

Yaiprasert & Hidayanto, (2023), used ensemble machine learning techniques to improve digital marketing strategies in the food delivery sector. The research applied artificial intelligence to analyze data coming from customers in terms of their preference and behavior prediction. Methodologically, the combination of decision trees, naïve Bayes, and the nearest neighbor algorithm showed a high accuracy of prediction. The results show that integrating AI-driven models increases marketing efficiency by automating tasks such as customer segmentation and content optimization, which aligns marketing strategies with customer needs. This demonstrates the transformative potential of AI in e-commerce and digital marketing.

Hindarto, (2023), discussed the transformative effects experienced in business dynamics brought about by the integration of e-commerce, underlining the integration of advanced technologies like artificial intelligence in enhancing operations and digital marketing strategies. AI helps in optimizing sales strategies, managing customer data in a better way, and providing personalized marketing campaigns that influence consumer preferences. It allows organizations to analyze customer information and understand purchasing behavior in order to drive sales in the competitive e-commerce market. Further, AI simplifies the procedures of transactions and enhances customer experiences, making customers more loyal and satisfied.

Tang et al., (2023), examined the use of artificial intelligence in improving inventory forecasting in cross-border e-commerce. They find that AI methodologies, particularly Extreme Gradient Boosting (XGBoost), outperform traditional inventory forecasting methods in terms of accuracy and practical efficiency. With this technological improvement, companies can regulate their inventory, reduce waste, and coordinate marketing strategies to fit consumer preferences. The findings of the study substantiate the Logistics 4.0 movement and call for e-commerce enterprises to implement advanced technological innovation in order to maintain competitiveness in the fast-changing marketplace.

Wang et al., (2023), appraised the Technology Acceptance Model for the role of Artificial Intelligence in e-commerce and digital marketing. It flags how AI has transformed online shopping through better customer engagement, personalization of experiences, and facilitation of business processes. Technologies such as chatbots and recommendation systems enhance efficiency, reduce search times, and predict market demands. The role of AI in improving service quality and competitiveness also lies in catering to evolving customer preferences, especially during the COVID-19 pandemic.

Hicham et al., (2023), discussed the critical role that artificial intelligence plays in e-commerce and digital marketing, specifically its ability to analyze consumer behavior, enhance customer experiences, and improve marketing strategies. The ability of AI to process large amounts of data enables it to target more precisely and create tailored campaigns. Additionally, the integration

of AI technologies like predictive analytics, chatbots, and automated content generation increases the efficiency of marketing activities. It also, however, discusses some data privacy problems and other ethical issues involving human supervision and strict adherence to the data protection laws.

Alqurashi et al., (2023), the role played by Artificial Intelligence in augmenting e-commerce and digital marketing. It demonstrates its ability in increasing personalized content marketing; a study of 485 participants confirmed that using AI increased customer engagement and satisfaction. The use of artificial intelligence in data analysis has allowed organizations to understand consumer preferences, predict behaviors, and design tailored marketing strategies-thereby providing them with a competitive advantage. This manuscript highlights the importance of strategic integration of AI channels and resource allocation to AI capabilities in improving marketing strategies in the digital landscape.

Udayana et al., (2024), examined the impact of digital marketing and e-commerce on the performance and sustainability of small and medium enterprises (SMEs) in Indonesia. The findings indicated that both approaches notably enhanced marketing efficacy and the sustainability of businesses. E-commerce emerged as a vital component in facilitating communication and marketing efforts, with the cost-effectiveness and quantifiable effects of digital marketing strategies being apparent. Furthermore, the research proposed that artificial intelligence could bolster e-commerce by allowing for personalized marketing, enhancing customer interaction, and streamlining inventory management, thereby assisting small and medium-sized enterprises in their endeavors towards digital transformation.

#### **4. DISCUSSION AND COMPARISON**

A thorough review of the literature examining the impact that artificial intelligence has on e-commerce and digital marketing identified some of the major themes relating to opportunities and challenges of adopting AI technologies. A big finding from the research was that artificial intelligence can greatly contribute to improved customer experiences and satisfaction. Much of the research has put a strong emphasis on how AI-enabled customer relationship management and personalized marketing strategies are likely to bring increased engagement and satisfaction

**Table 1. Summary of the literature review on details**

#	Study	Focus Area	Key AI Techniques	Findings	Advantages	Disadvantages	Ethical Considerations
1	Singh, (2021)	AI transforming e-commerce	Machine learning, CRM optimization	Enhanced operational efficiency and marketing precision.	Improved satisfaction, better logistics	Data misuse	Balancing benefits and risks in AI applications
2	Sohaib et al., (2022)	Social media marketing activities (SMMAs) in China's e-commerce	Tailored marketing, data analytics	Efficient SMMAs enhance relationship quality, boosting loyalty and repurchase intentions.	Improved consumer loyalty, better business performance	Dependence on technology, data accuracy challenges	Privacy concerns, responsible AI deployment
3	Singh et al., (2024)	Online shopping assistants	NLP, AI recommendation systems	Enhanced interactions and acceptance of AI-driven assistants.	Tailored recommendations, better customer trust	Data sensitivity issues	Trust, ease of use, and privacy concerns
4	Reddy et al., (2024)	AI in personalization	AI-driven algorithms	Improved engagement and real-time marketing relevance.	Higher conversion rates, consumer loyalty	Privacy issues	Ethical balance in personalization practices
5	Goriparthi, (2020)	Personalized e-commerce recommendations	Collaborative filtering, content-based filtering	AI-enhanced systems outperform traditional methods, increasing accuracy and engagement.	Improved user engagement, higher conversion rates	Potential data misuse	Data privacy, algorithmic bias
6	Khrais, (2020)	AI in e-commerce and digital marketing	Explainable AI (XAI)	XAI builds transparency, improving customer trust while enabling hyper-personalized strategies.	Increased trust, personalized marketing	Job displacement	Transparency in decision-making processes
7	Mahapatra et al., (2022)	AI impact on customer	Personalized recommendations	Improved targeting and customer	Effective marketing strategies, seamless	Requires substantial data	Ethical data collection and

#	Study	Focus Area	Key AI Techniques	Findings	Advantages	Disadvantages	Ethical Considerations
		behavior		satisfaction on platforms like Amazon and Flipkart.	shopping	infrastructure	usage
8	Putha et al., (2024)	AI-driven personalization in e-commerce	Collaborative filtering, content-based methods	AI improves recommendations and enhances customer satisfaction.	Measurable improvements in business performance	Algorithmic bias	Data privacy, ethical AI deployment
9	Cao, (2021)	AI in customer service and store design	Intelligent robots, recommendation engines	Streamlined shopping experiences and enhanced engagement.	Operational efficiency, dynamic pricing	Resource-intensive	Managing algorithmic fairness
10	Rusthollkarhu et al., (2022)	B2B customer journey management	AI tools for journey phases	Enhanced decision-making and efficiency in B2B marketing.	Automation, actionable insights	Skill gap for AI tools implementation	Ethical use in human-AI collaboration
11	Tolstoy et al., (2022)	SME online marketing capabilities	Ambidextrous marketing	Highlighted the role of tech for engagement and process optimization.	Competitive advantage, process refinement	Technological dependency	Need for continuous skill upgrading
12	Chen et al., (2022)	AI in firm performance	AI management, decision-making	Enhanced customer service and operational efficiency.	Competitive advantage, market trend prediction	High dependency on AI technologies	Data protection, fair AI management practices
13	Sabharwal et al., (2022)	AI and digital advertising	Real-time data analysis	Improved customer acquisition and engagement.	Profitability, quick market adaptation	Risk of over-targeting consumers	Privacy concerns, ethical marketing
14	Andrzejak, (2023)	AI in Polish e-commerce	Machine learning, NLP	Improved efficiency and competitive advantages for businesses.	Cost reduction, intelligent automation	Skilled workforce requirement	Customer interaction and bias management
15	Yaiprasert & Hidayanto, (2023)	AI in food delivery marketing strategies	Ensemble machine learning	High accuracy in customer predictions, better segmentation.	Efficient marketing campaigns, improved engagement	Resource-intensive	Ethical AI deployment, privacy concerns

#	Study	Focus Area	Key AI Techniques	Findings	Advantages	Disadvantages	Ethical Considerations
16	Hindarto, (2023)	E-commerce optimization	Personalized marketing campaigns	Effective targeting, improved sales growth.	Enhanced loyalty, simplified processes	Transaction process dependencies	Adherence to privacy regulations
17	Tang et al., (2023)	AI in inventory forecasting	XGBoost	Improved inventory accuracy, reduced waste.	Efficient logistics, alignment with consumer demand	Over-reliance on AI	Transparency in AI-driven strategies
18	Wang et al., (2023)	AI and consumer behavior	Chatbots, recommendation systems	Enhanced efficiency and consumer engagement.	Better shopping experience, reduced search times	Ethical dilemmas in AI usage	Data handling and consumer trust issues
19	Hicham et al., (2023)	AI in consumer behavior and marketing	Predictive analytics, chatbots	Improved targeting and marketing efficiency.	Real-time campaign adjustments	Algorithmic fairness issues	Regulation compliance, human oversight in AI
20	Alqurashi et al., (2023)	AI in personalized content marketing	Data analysis, AI-driven prediction	Improved engagement, satisfaction, and competitive advantage.	Enhanced strategies, deeper consumer insights	Investment in AI technologies	Ethical AI use, trust-building
21	Udayana et al., (2024)	Digital marketing for SMEs	Not specified explicitly	Positive impact on marketing and sustainability	Affordable, impactful strategies	Limited focus on AI implications	Inferred role of AI in e-commerce

rates. Similarly, other studies proved the positive impact artificial intelligence has on customer engagement by way of tailor-made content marketing. Personalization was one of the recurring themes, demonstrating the effectiveness of artificial intelligence in delivering personalized shopping experiences and relevant content to customers. This ability to personalize interactions has been instrumental in improving conversion rates and fostering customer loyalty. Another important finding related to the application of artificial intelligence in improving operational efficiency. Various studies showed that AI methods, including Extreme Gradient Boosting (XGBoost), outperformed traditional inventory forecasting methods, which helped improve inventory management and reduce waste. Similarly, improvement in operational efficiency by analyzing real-time data and quickly adapting to market demands was illustrated. However, the integration of artificial intelligence is also associated with various challenges, mostly related to data privacy and ethical concerns. Several research studies have raised these challenges and urged ethical practices in AI and the strictest adherence to data protection rules. What is more, the risks of algorithmic bias and the need for explainable artificial intelligence were underlined-referring to the necessity of transparency and human oversight in decision-making supported by AI. It also underlined the requirement of professional IT staff and challenges in AI-driven systems. The review pointed out that effective human-AI collaboration could be a way to maximize the benefits of AI technologies in e-commerce and digital marketing. In general, these papers outline that AI is the transformative force in the digital landscape, enabling sweeping competitive advantages to be realized by way of enhanced customer experiences, personalized marketing, and operational efficiencies. They also emphasize the critical need to address ethical and privacy concerns to ensure responsible and sustainable AI integration.

## **5. EXTRACTED STATISTICS**

The discussed focus areas in the studies have identified several aspects of AI in e-commerce and related fields. The most frequently quoted one is personal recommendations: 10 references emphasize the use of AI in tailoring shopping experiences for each individual consumer. Digital marketing strategies, at 9 mentions, also center on the integration of AI into campaign optimization and targeted marketing. Customer

engagement was mentioned 8 times, with a focus on the role of AI in improving interaction and retention. Conversion rates, in 6 studies, looked at how AI helps to increase sales, while ethical considerations-also 6 in number-looked at data privacy, algorithmic bias, and the ethical use of AI. Customer satisfaction, mentioned 5 times, focused on how the experiences of users are enhanced through personalized and efficient services. AI in relation to inventory management was discussed in 3 mentions, though less frequently. Explainable AI and dynamic pricing, each mentioned twice, referred to the transparency of decision-making processes and market-driven pricing strategies, respectively. Business sustainability, also mentioned twice, looked at how AI could support sustainable practices for SMEs. Other topics, each mentioned once, included AI's role in B2B marketing management, cross-border e-commerce, and online shopping assistants (OSAs), as seen in Fig. 1.

The most common AI techniques applied in all these applications are Collaborative Filtering and Content-Based Filtering, each being mentioned six times, as they are very well known for producing personalized recommendations. Hybrid Models, mentioned three times, improve the accuracy of recommendation by combining different techniques. Machine Learning, with its five mentions, is a generic category covering a large number of models for analyzing data and automating tasks. Predictive Analytics, mentioned three times, is applied to the forecast of consumer behavior and new trends. Natural Language Processing (NLP), also three, makes it possible for chatbots and virtual assistants to understand and quickly reply to user queries. And finally, Specialized Models, such as XGBoost, Decision Trees, Naïve Bayes, Nearest Neighbor, and ensemble methods were each mentioned once in specific use cases like inventory management and optimization in digital marketing, as shown in Fig. 2.

A literature review of different studies showed very important findings about the role that AI has played in e-commerce and digital marketing. The enhanced customer experience and satisfaction due to AI are cited in numerous studies, with nine such instances. Improved marketing strategies are also frequently noted, again, nine times. The ones referring to increased customer engagement appear seven times, and personalization appears in eight instances. Anticipating consumer behavior was a key

finding in six independent studies, with data privacy and ethical concerns flagged in seven instances. Operational efficiency was improved in five research studies, with trust and transparency mentioned in four. Competitive advantage was another important benefit, recorded four times. AI-driven recommendation systems and real-time solutions were each mentioned twice, while customer data management was mentioned three times. One

time, there were mentions of improved inventory management and efficacy in marketing, along with business sustainability; twice, there were mentions of addressing algorithmic bias and problems with skilled IT workers and systems. This summary shows the transformative potential in e-commerce and digital marketing through AI, but most importantly, it underlines how imperative it is to address issues regarding ethics and privacy, as shown in Fig. 3.



Fig. 1. Statistical representation about the focus areas

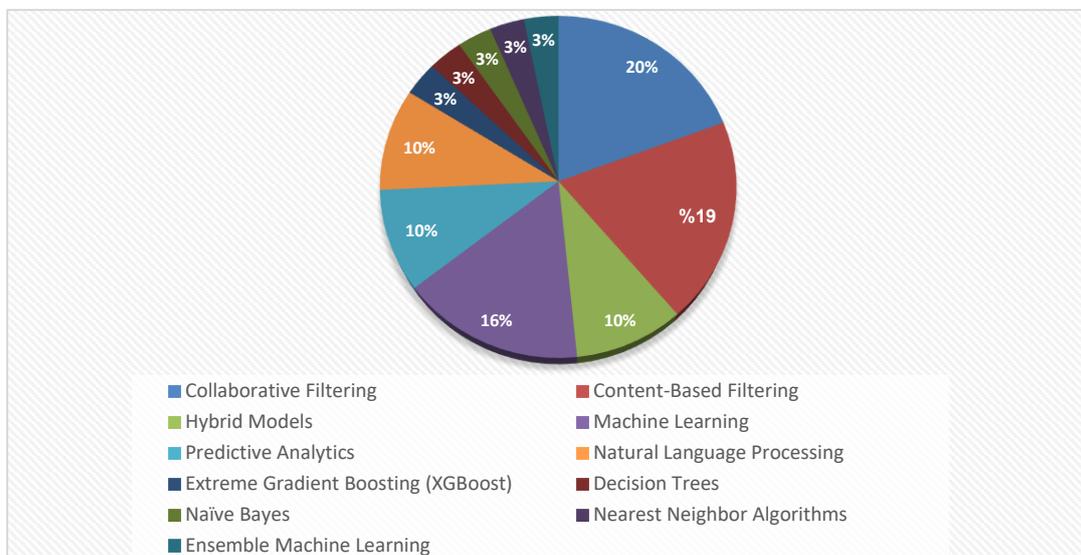
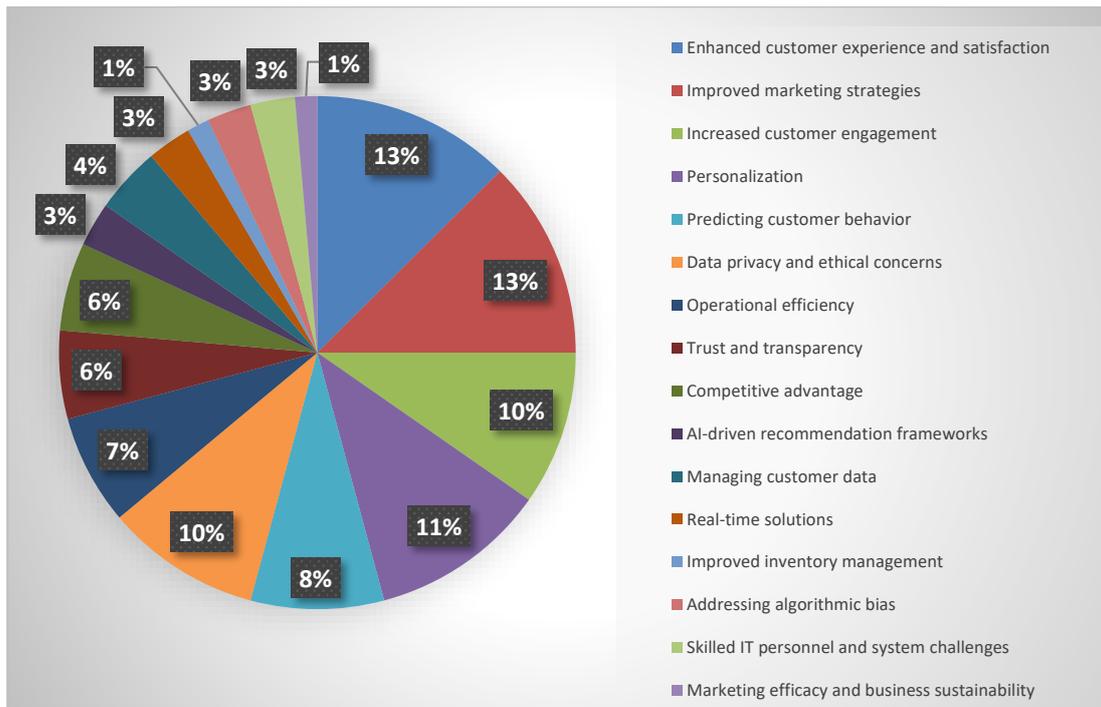
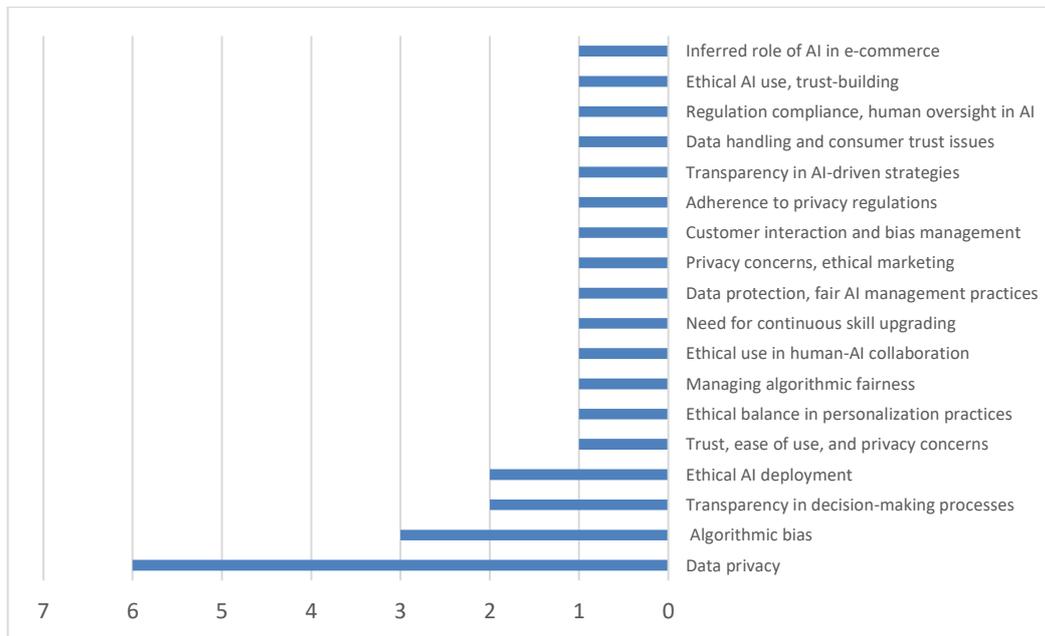


Fig. 2. Statistical representation about the AI techniques used



**Fig. 3. Statistical representation about the frequency for key findings**



**Fig. 4. Statistical representation about the frequency for ethical considerations**

Ethical issues in most studies point to some important themes. The most frequently noted is data privacy, which appears in six studies. This underlines the critical importance of protecting consumer information in AI-driven e-commerce and digital marketing applications. Another crucial issue is algorithmic bias, pointed out in

three studies, indicating that fairness and impartiality in AI algorithms are needed in order not to incur undesired discriminations. There are two references to transparency in decision-making processes and two allusions to the ethical deployment of AI, through which transparent and intelligible AI mechanisms are

needed. Other concerns related to trust, ease of use, ethical collection of data, managing algorithmic fairness, and using human-AI collaboration ethically appear less frequent but are always important. Ensuring the compliance with privacy regulations and improvement in data protection and management methodologies, dealing with issues of customer engagement and bias, and maintaining transparency in AI-driven approaches is fundamentally important in gaining consumer trust and for the sustainable business operation. The diverse ethical implications show that it is multi-dimensional and intricate in integrating AI into e-commerce and digital marketing; hence, there is a need for a balanced approach that considers both the benefits and possible risks, as shown in Fig. 4.

## 6. RECOMMENDATION

- Investment in e-CRM systems and advanced payment solutions is crucial for improved management of customer data and enabling more personalized marketing strategies.
- Businesses can use social media platforms to interact with their target audience and build their brand.
- AI-driven analytics helps in predicting customer needs and preferences, ensuring a seamless shopping experience.
- Building customer trust faces challenges related to data privacy and scalability.
- Integration of AI in marketing strategies contributes to precise targeting of advertisements and messaging, increasing customer engagement and conversion rates.
- Emerging technologies such as voice assistants enable new avenues for interacting with customers.
- Responsible AI implementation requires ethical AI practices and collaboration with providers.
- Addressing cultural imbalances and considering AI's ethical implications can help create more inclusive marketing strategies.

## 7. CONCLUSION

Artificial intelligence has a huge, transformative impact on e-commerce and digital marketing, bringing about great opportunities to innovate these sectors by optimizing operational efficiencies, enriching customer experiences, and

forecasting market trends. The pandemic has placed in evidence the need for companies to adopt digital marketing strategies, using AI in overcoming challenges and ensuring strength in the future. It enables big data analytics, driven by AI, to optimize customer journeys and drive personalized marketing campaigns, addressing data privacy and scalability issues in the process to bring about substantive business growth. E-commerce operations and marketing strategies still have a lot of catching up to do in terms of integration of AI; on the other hand, research in this regard and interdisciplinary collaboration continue to unfold fully. With the commitment to ethical practice, investment in AI education, and embracing state-of-the-art technologies like voice assistants, organizations can possibly create more inclusive, efficient, and innovative marketing strategies. Future research should also delve deeper into the impact of AI on consumer behavior and the dynamic digital landscape, which will allow businesses to maintain competitiveness and a customer-centric approach. The adoption of AI-driven strategies will empower organizations to cultivate enduring customer relationships, attain sustainable growth, and respond effectively to swiftly evolving market dynamics.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

- Abdulrazaq, M. B., Mahmood, M. R., Zeebaree, S. R. M., Abdulwahab, M. H., Zebari, R. R., & Sallow, A. B. (2021). An analytical appraisal for supervised classifiers' performance on facial expression recognition based on Relief-F feature selection. *Journal of Physics: Conference Series*, 1804(1), 012055. <https://doi.org/10.1088/1742-6596/1804/1/012055>
- Alqurashi, D. R., Alkhaffaf, M., Daoud, M. K., Al-Gasawneh, J. A., & Alghizzawi, M. (2023). Exploring the impact of artificial intelligence

- in personalized content marketing: A contemporary digital marketing. *Migration Letters*, 20(S8), 548–560. Available at <https://migrationletters.com/index.php/ml/article/view/4630>
- Amelia, A., Hendrian, S., Solikhah, M., Kholipah, S. A., & Fahrezi, R. B. (2023). Analyze the role of social media in increasing customer loyalty in Shopee's digital e-commerce business. *Journal of Indonesian Social Technology*, 4(8), 941–948. <https://doi.org/10.59141/jist.v4i8.667>
- Andrzejak, E. G. (2023). AI-powered digital transformation: Tools, benefits, and challenges for marketers—case study of LPP. *Procedia Computer Science*, 219, 397–404. <https://doi.org/10.1016/j.procs.2023.01.305>
- Antczak, B. O. (2024). The influence of digital marketing and social media marketing on consumer buying behavior. *Journal of Modern Science*, 56(2), 310–335. <https://doi.org/10.13166/jms/189429>
- Apriani, A., Sani, I., Kurniawati, L., Prayoga, R., & Panggabean, H. L. (2024). The role of artificial intelligence (AI) and its benefits in digital marketing strategy. *East Asian Journal of Multidisciplinary Research*, 3(1), 319–332. Available: <https://journal.formosapublisher.org/index.php/eajmr>
- Armaya, R. E. A., Abdulrahman, L. M., Abdulkareem, N. M., & Salih, A. A. (2023). Web-based efficiency of distributed systems and IoT on functionality of smart city applications. *Journal of Smart Internet of Things*, 2023(2), 142–161. <https://doi.org/10.2478/jsiot-2023-0017>
- Attar, R. W., Almusharraf, A., Alfawaz, A., & Hajli, N. (2022). New trends in e-commerce research: Linking social commerce and sharing commerce: A systematic literature review. *Sustainability*, 14(23), 16024. <https://doi.org/10.3390/su142316024>
- Bawack, R. E., Wamba, S. F., Carillo, K. D. A., & Akter, S. (2022). Artificial intelligence in e-commerce: A bibliometric study and literature review. <https://doi.org/10.1007/s12525-022-00537-z>
- Cao, Y. (2021). Artificial intelligence-based plant environment detection in coastal areas and B2C e-commerce network marketing. *Arabian Journal of Geosciences*, 14(11), 73–52. <https://doi.org/10.1007/s12517-021-07352-4>
- Chen, D., Esperança, J. P., & Wang, S. (2022). The impact of artificial intelligence on firm performance: An application of the resource-based view to e-commerce firms. *Frontiers in Psychology*, 13(April), 884830. <https://doi.org/10.3389/fpsyg.2022.884830>
- Cordes, D. L., & Marinova, D. (n.d.). Systematic literature review of the role of e-commerce in providing .pdf.
- Goriparthi, R. G. (2020). AI-enhanced big data analytics for personalized e-commerce recommendations. *Journal of AI Technologies*, 1(2), 246–261.
- Haji, S. H., Al-zebari, A., Sengur, A., Fattah, S., & Mahdi, N. (2023). Document clustering in the age of big data: Incorporating semantic information for improved results. *Journal of Applied Science and Technology Trends*, 4(01), 34–53. <https://doi.org/10.38094/jastt401143>
- Haleem, A., Javaid, M., Qadri, M. A., Singh, R. P., & Suman, R. (2022). Artificial intelligence (AI) applications for marketing: A literature-based study. *International Journal of Intelligent Networks*, 3(August), 119–132. <https://doi.org/10.1016/j.ijin.2022.08.005>
- Hicham, N., Nassera, H., & Karim, S. (2023). Strategic framework for leveraging artificial intelligence in future marketing decision-making. *Journal of Intelligent Management and Decision*, 2(3), 139–150. <https://doi.org/10.56578/jimd020304>
- Hindarto, D. (2023). The role of e-commerce in increasing sales using unified modeling language. *International Journal of Software Engineering and Computer Science*, 3(2), 120–129. <https://doi.org/10.35870/ijsecs.v3i2.1503>
- Issa, J., Abdulrahman, L., et al. (2024). AI-powered sustainability management in enterprise systems based on cloud and web technology: Integrating IoT data for environmental impact reduction. *ResearchGate*. Available at [https://www.researchgate.net/profile/Teba-Mohammed-Ghazi-Sami/publication/382306224\\_AI-powered\\_Sustainability\\_Management\\_in\\_Enterprise\\_Systems\\_based\\_on\\_Cloud\\_and\\_Web\\_Technology\\_Integrating\\_IoT\\_Data\\_for\\_Environmental\\_Impact\\_Reduction/link/s/669797158dca9f44](https://www.researchgate.net/profile/Teba-Mohammed-Ghazi-Sami/publication/382306224_AI-powered_Sustainability_Management_in_Enterprise_Systems_based_on_Cloud_and_Web_Technology_Integrating_IoT_Data_for_Environmental_Impact_Reduction/link/s/669797158dca9f44)
- Khrais, L. T. (2020). Role of artificial intelligence in shaping consumer demand in e-commerce. *Futures in Internet*, 12(12), 1–14. <https://doi.org/10.3390/fi12120226>

- Kyaw, K. S., Tepsongkroh, P., & Thongkamkaew, C. (2022). Business intelligent framework using sentiment analysis for smart digital marketing in the e-commerce era. *Tourism Industry Department, Didyasarin International College, Hatyai Business School, Hatyai University*, 16(3), 1–23.
- Limna, P., Siripipatthanakul, S., Jaipong, P., Sitthipon, T., & Auttawechasakoon, P. (2022). A review of digital marketing and service marketing during the COVID-19 and the digital economy. *Advances in Knowledge and Executive*, 1(5), 4. Available: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4177509](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4177509)
- Mahapatra, D. M., Patra, S. K., & Baral, S. K. (2022). Unleashing the potential of artificial intelligence (AI) in customer journey of cognitive marketing and consciousness intention in e-commerce websites. *Proceedings of the 2nd International Conference on Sustainability and Equity*, 2, 44–51. <https://doi.org/10.2991/ahsseh.k.220105.006>
- Majedkan, N. A., Idrees, B. A., Ahmed, O. M., Haji, L. M., & Dino, H. I. (2020). Queuing theory model of expected waiting time for fast diagnosis of COVID-19: A case study. In *Proceedings of the 3rd International Conference on Advanced Science and Engineering (ICOASE 2020)*, 127–132. <https://doi.org/10.1109/ICOASE51841.2020.9436601>
- Mariani, M. M., Perez-Vega, R., & Wirtz, J. (2022). AI in marketing, consumer research and psychology: A systematic literature review and research agenda. *Psychology & Marketing*, 39(4), 755–776. <https://doi.org/10.1002/mar.21619>
- Nalla, N., Reddy, V. M., & Lead, E. (2024). AI-driven big data analytics for enhanced customer journeys: A new paradigm in e-commerce, 1(2), 719–740.
- Purnomo, Y. J. (2023). Digital marketing strategy to increase sales conversion on e-commerce platforms. *Journal of Contemporary Administration and Management*, 1(2), 54–62. <https://doi.org/10.61100/adman.v1i2.23>
- Putha, S., Researcher, I., & Developer, S. S. (2024). AI-driven personalization in e-commerce: Enhancing customer experience and sales through advanced data analytics, 1(1), 225–270.
- Qurtubi, G. A., Yudhistira, M. A., Febrianti, I. P., Rachmadewi, I., & Purnomo, H. (2022). The role of e-commerce: A systematic literature review. *International Journal of Interactive Mobile Technologies*, 16(13), 118–129. <https://doi.org/10.3991/ijim.v16i13.30611>
- Rathore, D. B. (2023). Digital transformation 4.0: Integration of artificial intelligence & metaverse in marketing. *Eduzone International Peer Reviewed Academic Multidisciplinary Journal*, 12(01), 42–48. <https://doi.org/10.56614/eiprmj.v12i1y23.248>
- Reddy, M., Nalla, L. N., & Lead, E. (2024). Personalization in e-commerce marketing: Leveraging big data for tailored consumer engagement, 1, 691–725.
- Rustholkarhu, S., Toukola, S., Aarikka-Stenroos, L., & Mahlamäki, T. (2022). Managing B2B customer journeys in digital era: Four management activities with artificial intelligence-empowered tools. *Industrial Marketing Management*, 104(May), 241–257. <https://doi.org/10.1016/j.indmarman.2022.04.014>
- Sabharwal, D., Sood, R. S., & Verma, M. (2022). Studying the relationship between artificial intelligence and digital advertising in marketing strategy. *Journal of Content, Community and Communication*, 16(8), 118–126. <https://doi.org/10.31620/JCCC.12.22/10>
- Sakhvidi, M. Z., & Saadat, R. (2024). A study of artificial intelligence and e-commerce economy. *International Journal of Industrial Engineering and Operations Research*, 6, 139–158. Available: <http://ijieor.ir>
- Saputra, R., Nasution, M. I. P., & Dharma, B. (2023). The impact of using AI Chat GPT on marketing effectiveness: A case study on Instagram marketing. *Indonesian Journal of Economics and Management*, 3(3), 603–617. <https://doi.org/10.35313/ijem.v3i3.4936>
- Singh, C., Dash, M. K., Sahu, R., & Kumar, A. (2024). Investigating the acceptance intentions of online shopping assistants in e-commerce interactions: Mediating role of trust and effects of consumer demographics. *Heliyon*, 10(3), e25031. <https://doi.org/10.1016/j.heliyon.2024.e25031>
- Singh, R. (2021). A study of artificial intelligence and e-commerce ecosystem – A customer's perspective. *International*

- Journal of Research in Engineering Science and Management*, 4(2), 78–87. Available: <https://journal.ijresm.com/index.php/ijresm/article/view/507>
- Sohaib, M., Safeer, A. A., & Majeed, A. (2022). Role of social media marketing activities in China's e-commerce industry: A stimulus organism response theory context. *Frontiers in Psychology*, 13(August), 1–16. <https://doi.org/10.3389/fpsyg.2022.941058>
- Tang, Y. M., Chau, K. Y., Lau, Y. Y., & Zheng, Z. (2023). Data-intensive inventory forecasting with artificial intelligence models for cross-border e-commerce service automation. *Applied Sciences*, 13(5), 3051. <https://doi.org/10.3390/app13053051>
- Tolstoy, D., Nordman, E. R., & Vu, U. (2022). The indirect effect of online marketing capabilities on the international performance of e-commerce SMEs. *International Business Review*, 31(3), 101946. <https://doi.org/10.1016/j.ibusrev.2021.101946>
- Udayana, A. A. G. B., et al. (2024). Investigating the role of e-commerce application and digital marketing implementation on the financial and sustainability performance: An empirical study on Indonesian SMEs. *International Journal of Data Networks and Science*, 8(1), 167–178. <https://doi.org/10.5267/j.ijdns.2023.10.007>
- Verma, S., Sharma, R., Deb, S., & Maitra, D. (2021). Artificial intelligence in marketing: Systematic review and future research direction. *International Journal of Information Management Data Insights*, 1(1), 100002. <https://doi.org/10.1016/j.ijime.2020.100002>
- Vidhya, V. (2023). The intersection of AI and consumer behavior: Predictive models in modern marketing. *Remit. Review*, 8(4), 2410–2424. Available: <https://remittancesreview.com/menu-script/index.php/remittances/article/view/907>
- Vlačić, B., Corbo, L., Costa e Silva, S., & Dabić, M. (2021). The evolving role of artificial intelligence in marketing: A review and research agenda. *Journal of Business Research*, 128(March 2020), 187–203. <https://doi.org/10.1016/j.jbusres.2021.01.055>
- Wang, C., et al. (2023). An empirical evaluation of technology acceptance model for artificial intelligence in e-commerce. *Heliyon*, 9(8), e18349. <https://doi.org/10.1016/j.heliyon.2023.e18349>
- Yaiprasert, C., & Hidayanto, A. N. (2023). AI-driven ensemble three machine learning to enhance digital marketing strategies in the food delivery business. *Intelligent Systems with Applications*, 18(April), 200235. <https://doi.org/10.1016/j.iswa.2023.200235>
- Yasin, H. M. (2025). Pneumonia and COVID-19 classification and detection based on convolutional neural network: A review. *Journal*, 18(1), 174–183.
- Ziakis, C., & Vlachopoulou, M. (2023). Artificial intelligence in digital marketing: Insights from a comprehensive review. *Information*, 14(12), 1–30. <https://doi.org/10.3390/info14120664>

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