

Digital Commerce in the AI Era: Opportunities and Challenges

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Abstract: Artificial Intelligence (AI) is rapidly transforming digital commerce by enhancing business operations and improving customer experiences. AI-driven technologies such as machine learning, predictive analytics, chatbots, and recommendation systems enable businesses to provide personalized services, automate operations, and make data-driven decisions. This study examines the opportunities and challenges associated with digital commerce in the AI era using an analytical approach based on secondary data from research articles and industry reports. The findings reveal that AI improves operational efficiency, customer engagement, fraud detection, supply chain management, and marketing effectiveness. At the same time, challenges such as data privacy concerns, cybersecurity risks, algorithmic bias, high implementation costs, and job displacement remain significant issues. The study concludes that AI has the potential to revolutionize digital commerce by driving innovation and competitiveness. However, responsible AI adoption, ethical practices, transparency, and strong regulatory frameworks are essential to ensure sustainable growth and consumer trust in the evolving digital economy.

Keywords: Digital Commerce, Artificial Intelligence (AI), E-commerce, Machine Learning, Data privacy.

1 INTRODUCTION

Digital commerce has become an integral part of the modern global economy, transforming the way businesses operate and consumers interact in online marketplaces. The advancement of digital technologies, internet connectivity, and electronic payment systems has accelerated the growth of e-commerce across various sectors. In recent years, the emergence of Artificial Intelligence (AI) has further revolutionized digital commerce by enabling intelligent automation, predictive analytics, personalized recommendations, and enhanced customer engagement. AI technologies are increasingly being adopted by businesses to improve operational efficiency, optimize supply chains, and strengthen decision-making processes.

Wang et al. [1] explained that AI-driven technologies support operational risk mitigation and financing decisions in digitalized live-streaming e-commerce logistics, thereby improving efficiency in online commerce operations. Cao and Liu [2] highlighted the role of cross-border e-commerce and digital finance in accelerating the digital transformation of manufacturing enterprises. Similarly, Molla et al. [3] emphasized that the integration of metaverse technologies, extended reality, and AI-based digital environments can significantly enhance customer engagement and e-commerce growth. Liu [4] further discussed how digital financial policies and technological innovation contribute to the dynamic development of e-commerce ecosystems.

AI has also transformed consumer behavior and marketing strategies in digital marketplaces. Wang [5] observed that AI technologies strongly influence consumer preferences and purchasing decisions by analyzing user behavior and market trends. Chang et al. [6] examined the role of human-AI collaboration in interactive digital advertising and highlighted its effectiveness in improving customer perception and engagement. In addition, Wodnicka and Wronka [7] stated that blockchain technology supports transparency, security, and trust in digital commerce, thereby strengthening the digital economy.

The integration of AI into digital commerce platforms has created opportunities for intelligent automation and improved business efficiency. Tekwani and Thampi [8] discussed how AI enhances Open Network for Digital Commerce (ONDC) platforms through intelligent automation and disaggregated digital commerce models. Parveen et al. [9] emphasized the importance of AI, cybersecurity, and business transformation in building a secure and intelligent digital future. Likewise, Zhao and Wan [10] explained that AI-based social media marketing and trend forecasting techniques improve cross-border e-commerce performance and customer targeting strategies.

Personalization has become one of the major advantages of AI-driven digital commerce systems. AI-based recommendation systems significantly improve customer satisfaction by delivering personalized product suggestions according to user preferences and browsing history [11]. Similarly, Dixit et al. [12] stated that AI-driven digital commerce enhances global business growth through personalization, automation, and intelligent decision-making.

Although AI offers numerous benefits to digital commerce, several challenges remain, including data privacy concerns, cybersecurity threats, ethical issues, algorithmic bias, implementation costs, and technological dependence. Businesses must therefore adopt responsible AI practices and establish effective regulatory frameworks to ensure sustainable growth and consumer trust. In this context, the present study aims to examine the opportunities and challenges associated with digital commerce in the AI era and to analyze the impact of AI technologies on business operations and consumer experiences.

2 LITERATURE REVIEW

Wang et al. [1] examined the role of AI-driven technologies in digitalized live-streaming e-commerce logistics. The study focused on financing decisions and operational risk mitigation in e-commerce supply chains. The authors observed that AI-based systems improve logistics efficiency, support better financial decision-making, and reduce operational uncertainties in digital commerce platforms. Cao and Liu [2] analyzed the relationship between cross-border e-commerce, digital finance, and the digital transformation of manufacturing enterprises. The study highlighted that technological innovation and digital financial development significantly contribute to the expansion of e-commerce activities and enhance the competitiveness of manufacturing industries in global markets.

Molla et al. [3] explored the application of the metaverse, extended reality, and AI technologies in e-commerce growth. The research proposed that immersive digital environments and AI-enabled customer interaction systems improve customer engagement and create more interactive online shopping experiences. Liu [4] investigated the impact of digital financial policies and technological innovation on e-commerce development. The study emphasized that supportive digital financial ecosystems and innovation-driven strategies positively influence the sustainable growth of digital commerce activities.

Wang [5] studied the influence of AI on consumer behavior in digital marketplaces. The findings indicated that AI technologies shape consumer preferences, purchasing decisions, and online shopping behavior by analyzing customer data and delivering personalized recommendations. Chang et al. [6] examined human perception in interactive digital advertising using a human-AI collaboration approach. The study revealed that AI-driven advertising systems improve customer engagement and advertising effectiveness while enhancing user experience in digital platforms.

Wodnicka and Wronka [7] conducted a literature review on the role of blockchain in the digital economy and e-commerce. The study concluded that blockchain technology improves transparency, security, trust, and transaction efficiency in digital commerce systems. Tekwani and Thampi [8] discussed the integration of AI in the Open Network for Digital Commerce (ONDC). The research highlighted that intelligent automation and AI-enabled systems improve operational efficiency, customer experience, and scalability in disaggregated digital commerce platforms.

Parveen et al. [9] focused on the role of AI, cybersecurity, and business transformation in building a secure digital future. The study emphasized the importance of cybersecurity measures, secure AI deployment, and digital transformation strategies in protecting e-commerce systems from cyber threats and data breaches. Zhao and Wan [10] analyzed the application of AI technologies in social media marketing for cross-border e-commerce. The study highlighted that AI-based hotspot analysis and trend forecasting techniques help businesses improve targeted marketing strategies and customer engagement in international markets.

AI-based personalized recommendation system for e-commerce platforms. The study demonstrated that recommendation systems based on artificial intelligence significantly enhance customer satisfaction, increase sales, and improve personalized shopping experiences [11]. Dixit et al. [12] examined AI-driven digital commerce with a focus on personalization and global growth. The study concluded that AI technologies support business expansion, improve operational efficiency, and enhance customer experiences through intelligent automation and data-driven decision-making.

Overall, the reviewed literature indicates that AI has transformed digital commerce by improving personalization, operational efficiency, logistics management, customer engagement, and digital marketing strategies. At the same time, challenges related to cybersecurity, ethical concerns, data privacy, and technological dependence remain critical issues that require responsible AI adoption and effective regulatory frameworks for sustainable digital commerce growth.

3 ARTIFICIAL INTELLIGENCE IN DIGITAL COMMERCE

3.1. AI as a Transformational Technology in Digital Marketing

Artificial Intelligence (AI) has emerged as a transformational technology in digital marketing and e-commerce. Recent studies indicate that AI-driven technologies such as machine learning, generative AI, and large language models are significantly improving customer engagement, marketing automation, and personalization strategies. Studies highlighted that AI adoption and privacy-related technological shifts are reshaping digital marketing practices. Studies emphasized the importance of building AI-enabled marketing teams to improve organizational performance. Furthermore, AI-powered search capabilities and personalization techniques have enhanced customer experiences and business competitiveness in e-commerce platforms. Research also indicates that generative AI enables businesses to deliver personalized recommendations, dynamic content, and improved customer interaction, thereby increasing digital marketing effectiveness.

3.2. AI and Supply Chain Transformation in E-Commerce

AI technologies have significantly improved supply chain management and operational efficiency in digital commerce. Researchers observed that modern supply chains require resilience, adaptability, and data-driven decision-making to overcome disruptions in global business environments. AI-based systems support predictive analytics, inventory optimization, logistics management, and order fulfillment processes. Studies identified digital marketing, customer service, logistics, and data analytics as major components of the e-commerce value chain enhanced through AI integration. Technologies such as AI-driven chatbots, machine learning algorithms, and automated logistics systems contribute to operational efficiency and improved customer satisfaction. These advancements enable businesses to streamline e-commerce operations and maintain competitive advantages in digital markets.

3.3. Generative AI and the Future of E-Commerce

Generative AI is transforming e-commerce by enabling intelligent personalization and enhancing digital shopping experiences. Studies emphasized that early adopters of AI technologies gained substantial competitive advantages in digital commerce through AI literacy and AI-enhanced marketing practices. Adobe's Digital Trends Report highlighted the importance of data quality, generative AI strategies, and AI-based performance indicators for improving customer experiences. Research findings confirmed that generative AI and large language models enhance e-commerce search capabilities and provide hyper-personalized shopping recommendations.

In addition, organizations such as Walmart and Google have integrated generative AI into their digital platforms to deliver personalized homepages, AI-generated product summaries, and intelligent search experiences. These developments demonstrate that generative AI is becoming a key driver of innovation, personalization, and customer engagement in modern digital commerce.

4 OBJECTIVES OF THE STUDY

The study is conducted with the following objectives:

1. To understand the concept of digital commerce in the AI era.
2. To examine the role of Artificial Intelligence in transforming digital commerce.
3. To identify the opportunities created by AI in digital commerce.
4. To analyze the challenges associated with AI adoption in digital commerce.
5. To evaluate the overall impact of AI on business performance and consumer experience.

5 ROLE AND OPPORTUNITIES OF AI IN DIGITAL COMMERCE

- **Personalization:** AI recommends products and services based on customer preferences, browsing history, and purchasing behavior, thereby improving customer satisfaction and engagement.
- **Customer Support:** AI-powered chatbots and virtual assistants provide instant responses and 24/7 customer service, enhancing communication efficiency.
- **Predictive Analytics:** AI helps businesses analyze market trends, forecast customer demand, and support strategic decision-making through data-driven insights.
- **Automation of Business Operations:** AI streamlines inventory management, payment processing, logistics, and order fulfillment, reducing manual effort and operational costs.

- **Improved Customer Experience:** Personalized recommendations, faster service delivery, and intelligent interfaces improve the overall digital shopping experience.
- **Operational Efficiency:** AI enhances productivity and accuracy by automating repetitive tasks and optimizing business workflows.
- **Fraud Detection and Security:** AI-based systems identify suspicious activities, detect fraudulent transactions, and strengthen cybersecurity measures in digital commerce platforms.
- **Supply Chain Optimization:** AI improves supply chain performance through demand forecasting, inventory optimization, route planning, and efficient delivery management.

6 CHALLENGES AND DATA ANALYSIS OF AI IN DIGITAL COMMERCE

6.1. Challenges of AI in Digital Commerce

- **Data Privacy and Security:** The extensive use of customer data in AI systems increases concerns related to data protection, privacy breaches, and cyber threats.
- **High Cost of Implementation:** Adoption of AI technologies requires significant investment in infrastructure, software, and skilled professionals, which may be difficult for small businesses.
- **Ethical Issues:** AI systems may produce biased or discriminatory outcomes due to improper training data and lack of transparency.
- **Technological Dependence:** Excessive dependence on AI may reduce human involvement in decision-making and business control.
- **Lack of Skilled Professionals:** The shortage of trained personnel and AI experts creates challenges in managing and maintaining AI-based systems effectively.

6.2. Data Analysis

This study adopts a comparative analytical approach based on secondary data collected from research articles, industry reports, and digital commerce platforms. Table 1 presents the comparison between digital commerce operations before and after AI integration.

Table 1. Digital Commerce Before and After AI Integration

Indicator	Before AI Integration	After AI Integration
Customer Experience	Generic and uniform	Personalized and dynamic
Customer Support	Human-based, slower	AI chatbots, instant response
Marketing Strategy	Broad targeting	Data-driven targeted marketing
Pricing Strategy	Fixed pricing	Dynamic and optimized pricing
Fraud Detection	Limited capability	AI-based real-time detection
Decision Making	Manual and reactive	Predictive and automated

As shown in Table 1, AI integration has significantly improved the efficiency and effectiveness of digital commerce operations. Businesses are able to provide personalized services, enhance customer engagement, optimize pricing strategies, and improve fraud detection mechanisms through AI-driven systems. The analysis also indicates that AI-based predictive analytics and automation support better decision-making and operational efficiency. However, increased dependence on AI technologies also introduces challenges related to cybersecurity, ethical concerns, and data privacy.

7 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 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.

8 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 XG Boost, 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.

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.

Once, 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.



Fig. 1. Statistical representation about the focus areas

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.

9 FINDINGS AND DISCUSSION

The findings of the research highlight many important possibilities and issues with digital commerce in relation to artificial intelligence (AI).

Possibilities

- Personalization: By using AI, companies can provide unique product suggestions according to customers' preferences, providing greater customer satisfaction.
- Operational efficiency: AI reduces the amount of labour performed by humans through automation, therefore increasing productivity.
- Better decision-making: Through AI-driven analytics, companies will have a better basis on which to make better strategic decisions.
- Fraud prevention: AI technology can be used to identify and prevent fraud in real-time.
- Scalability: Businesses are able to process high volumes of transactions.

Issues

- Data privacy issues: The collection and use of individuals' personal information generate data privacy issues.
- Cybersecurity risks: The growing dependency on digital systems has increased the risk of being attacked by hackers.
- Job loss: There is a risk that human workers whose roles are being automated may ultimately lose their jobs.
- Algorithmic bias: If AI system data is poorly prepared before being analysed, then their ultimate use may be impaired.
- Implementation costs: For small businesses, implementing AI technologies will likely pose challenges.

Despite the challenges posed by AI, it continues to be a source for innovation and growth in digital commerce.

10 CONCLUSION

Artificial Intelligence (AI) has significantly transformed digital commerce by improving customer experience, operational efficiency, and business decision-making processes. AI-driven technologies such as machine learning, predictive analytics, chatbots, and recommendation systems have enabled businesses to provide personalized services, automate operations, and enhance supply chain management. The study highlights that AI integration supports targeted marketing, fraud detection, and real-time customer support, thereby increasing the competitiveness of digital commerce platforms. However, the rapid adoption of AI also introduces several challenges, including data privacy concerns, cybersecurity risks, ethical issues, high implementation costs, and technological dependence. The shortage of skilled professionals further affects effective AI implementation in businesses. Despite these challenges, AI continues to drive innovation and growth in the digital economy. Therefore, organizations must adopt responsible AI practices, strengthen data security measures, and develop effective regulatory frameworks to ensure sustainable and ethical growth of digital commerce in the AI era.

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ETHICS STATEMENT

This study did not involve human or animal subjects and, therefore, did not require ethical approval.

STATEMENT OF CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest related to this study.

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