

TECHNOLOGICAL ADVANCEMENTS AS KEY DRIVERS IN THE TRANSFORMATION OF MODERN E-COMMERCE ECOSYSTEMS

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ABSTRACT

This systematic literature review explores the transformative role of technology in shaping modern e-commerce, emphasizing its impact on business models, consumer behavior, and regulatory environments. Drawing from 31 peer-reviewed journal articles published between 2020 and 2025, the study identifies key technological innovations—including artificial intelligence, big data analytics, blockchain, mobile computing, and Internet of Things—that are redefining digital commerce ecosystems. The review employs bibliometric analysis and thematic synthesis to map research trends and extract interpretive insights. Findings indicate a shift toward agile, personalized, and secure e-commerce platforms supported by integrated technological infrastructures. However, challenges such as cybersecurity risks, regulatory gaps, and the global digital divide persist. The paper underscores the need for adaptive regulation, ethical AI deployment, and inclusive digital infrastructure. By synthesizing diverse scholarly contributions, the review offers a coherent understanding of how technological advancements are reshaping e-commerce and provides actionable recommendations for researchers, policymakers, and practitioners navigating this evolving digital landscape.

Keywords: *artificial intelligence, blockchain, consumer behavior, digital transformation, e-commerce*

1. INTRODUCTION

The evolution of e-commerce as a technological replacement for traditional markets has triggered a transformative shift in the global business landscape. The pervasive influence of digital technology, from cross-border payment systems to real-time data sharing, has not only altered how consumers interact with businesses but also how businesses structure their operations. E-commerce has emerged as a critical domain of technological advancement, largely driven by innovations such as big data analytics, blockchain technology, artificial intelligence, and mobile computing (S. Liu et al., 2025). These developments transcend geographical boundaries, reduce transaction costs, and enhance overall customer experience, marking a departure from the limitations of traditional market infrastructures.

Big data analytics, in particular, plays a pivotal role in optimizing business strategies, enabling firms to forecast demand, personalize offerings, and fine-tune operations. The application of these analytics in cross-border contexts has allowed businesses to enter and navigate new markets with reduced risk and enhanced adaptability (S. Liu et al., 2025). Blockchain technology, meanwhile, has begun to establish itself as a key enabler of secure online transactions, ensuring transparency and transactional integrity. The rise of quantum digital payment protocols promises even more robust advancements in security and efficiency, underscoring the relentless pace of technological progress in this domain (S. Liu et al., 2025).

As businesses adapt to this rapidly evolving landscape, traditional market players are increasingly compelled to incorporate digital frameworks to remain viable. One such adaptation is seen in the adoption of enterprise architecture methodologies such as TOGAF, which supports the digital transformation of legacy systems (Irawan et al., 2024). This shift is further reflected in the growing prevalence of the S2B2C (supplier-to-business-to-consumer) model, which requires integrated digital ecosystems for seamless information sharing, inventory tracking, and customer engagement (Li & Gong, 2025). Companies are also leveraging sentiment analysis and personalized recommendation systems to better align with consumer preferences, thus enhancing the shopping experience and fostering brand loyalty (Gao & Li, 2022).

In this context, the concept of digital transformation has transcended being a mere strategic choice to becoming an operational imperative. Businesses that fail to digitize risk obsolescence, especially when faced with volatile or uncertain environments. Several studies emphasize how digital infrastructures contribute to business continuity, resilience, and adaptability in challenging conditions (Shveda et al., 2024). This reorientation toward technology-driven models signals a broader transformation across industries, wherein digital readiness and technological innovation are key determinants of competitiveness and sustainability.

Consumer behavior, too, has evolved in tandem with these technological advancements. E-commerce platforms offer unprecedented levels of convenience, variety, and personalization, reshaping how consumers discover, evaluate, and purchase products (Ji et al., 2022). However, this evolution is not without its complications. For example, the online clothing sector continues to face barriers stemming from the inability to replicate physical interactions with products. Consumers often experience dissatisfaction due to sizing issues, texture uncertainty, and return complications (Z. Liu & Luo, 2022). Despite such sector-specific challenges, the general trajectory of consumer behavior in the e-commerce landscape is characterized by a growing preference for digital engagement and personalized services.

Simultaneously, the increasing reliance on digital platforms raises important concerns about consumer protection and regulatory oversight. In regions where legal frameworks are slow to evolve alongside technology, consumers may be exposed to higher risks of exploitation, fraud, and privacy breaches (Padalka et al., 2021). The need for comprehensive and adaptive regulatory mechanisms has therefore become more urgent, particularly as new technologies introduce novel ethical and operational challenges. Mobile applications and their acceptance by users are also shaping this evolving landscape, offering

greater responsiveness, customer service efficiency, and retail innovation (Khrais & Alghamdi, 2021).

The expansion of e-commerce, while promising in many respects, introduces a suite of challenges and emergent trends that must be rigorously examined. Among the most pressing of these are cybersecurity threats and digital fraud. As digital infrastructures expand, so too do the attack surfaces vulnerable to exploitation. Researchers have underscored the critical need for fraud detection systems that utilize machine learning and big data analytics to identify and mitigate risks in real time (Byrapu Reddy et al., 2024; X. Liu et al., 2022). These systems are not only essential for safeguarding transactions but also for maintaining consumer trust in digital marketplaces.

Furthermore, the global digital divide presents a significant barrier to equitable participation in the e-commerce economy. Disparities in information and communication technology (ICT) access, infrastructure, and digital literacy continue to widen the gap between technologically advanced and under-resourced enterprises. This imbalance affects competitive equity and limits the benefits of e-commerce to a select group of global players (Jaković et al., 2021). The integration of the Internet of Things (IoT) into marketing strategies and the automation of logistics via intelligent robotics offer exciting opportunities, yet they also underscore the uneven capacity for adoption across different business contexts (Yin & He, 2022; You & S, 2022).

The significance of these technological transformations and their implications for global commerce necessitate a systematic review of the existing body of research. Although a growing number of studies have investigated various aspects of e-commerce, there remains a lack of comprehensive synthesis that addresses the multifaceted nature of technological innovation in this field. This systematic literature review aims to fill that gap by critically evaluating recent scholarly contributions, identifying overarching trends, and highlighting key challenges and opportunities in the digital transformation of commerce (Nuraini et al., 2024; Rolando et al., 2024; Rolando & Sunara, 2024; Rolando & Yen, 2024; Tanuwijaya et al., 2024).

The central problem addressed in this review is the fragmented understanding of how technological innovation is shaping e-commerce across different dimensions, including business models, consumer behavior, regulatory frameworks, and competitive dynamics. While individual studies offer valuable insights, a more integrated approach is required to grasp the full spectrum of implications and inform both academic inquiry and practical applications (Ingriana, Chondro, et al., 2024; Ingriana, Gianina Prajitno, et al., 2024; Karaniya Wigayha et al., 2024; Mulyono et al., 2024; Rolando & Ingriana, 2024).

This review is justified by the need to provide a structured, evidence-based account of current knowledge in the field. It seeks to consolidate diverse perspectives, methodologies, and findings to present a coherent narrative about the technological evolution of e-commerce. By doing so, it contributes to a clearer understanding of the field's trajectory and supports future research agendas and policy formulations.

The specific objectives of this review are to: (1) identify key technological trends influencing e-commerce; (2) examine how these trends affect business models, consumer behavior, and market structures; (3) evaluate the main challenges and limitations associated with digital transformation in commerce; and (4) propose directions for future research and practical implementation. The primary research questions guiding this review include: What

are the dominant technological innovations impacting e-commerce? How are these innovations transforming traditional business practices and consumer interactions? What challenges emerge from these transformations, and how can they be addressed?

The scope of this review is limited to peer-reviewed journal articles published between 2020 and 2025, sourced from the Scopus database. This temporal range captures recent advancements and ensures relevance to current debates. The review focuses on global perspectives to reflect the transnational nature of e-commerce and includes studies across different industries and technological domains. However, the review excludes grey literature, conference proceedings, and non-English sources to maintain methodological rigor and consistency.

The potential significance of this review lies in its ability to inform both scholarly discourse and practical decision-making. By synthesizing current knowledge and identifying gaps, the review supports a more nuanced understanding of digital transformation in commerce. It highlights the importance of interdisciplinary approaches, encompassing technology, business strategy, consumer psychology, and regulatory studies. Moreover, it provides actionable insights for policymakers, business leaders, and technology developers seeking to navigate the complexities of the digital marketplace.

This paper is structured according to the IMRAD format, beginning with this introduction that outlines the context, problem, objectives, scope, and significance of the study. The methods section describes the systematic review protocol, including database selection, inclusion and exclusion criteria, and data analysis techniques. The results section presents the key findings organized by thematic categories, while the discussion interprets these findings in light of existing literature and theoretical frameworks. The paper concludes with a summary of contributions, limitations, and suggestions for future research.

In sum, this systematic literature review seeks to provide a comprehensive and integrative account of how technological innovation is redefining e-commerce. It endeavors to bridge theoretical and practical domains, offering a roadmap for understanding and navigating the evolving digital commerce landscape.

2. RESEARCH METHOD

This systematic literature review followed rigorous protocols established under the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 framework. This section outlines the systematic steps taken to ensure a transparent, replicable, and academically robust approach in synthesizing the current body of research on consumer boycotts.

2.1 Search Strategy

The literature search was conducted exclusively through the Scopus database, chosen for its comprehensive indexing of peer-reviewed academic journals in the domains of social sciences, business, and management. To reflect recent developments in consumer activism, the search was restricted to publications from 2020 to 2025. Search terms were constructed to capture key thematic intersections, including “consumer boycott,” “consumer activism,” and “brand avoidance,” combined with “business performance,” “financial impact,” or “sales,” and further intersected with “brand reputation,” “brand trust,” or “corporate response.” These terms were applied to article titles, abstracts, and keywords, and truncation symbols were used to ensure variation coverage. Filters limited the results to English-language journal articles published within the designated time frame. The search initially

identified 2,417 records. After applying date filters, 813 articles remained. A multi-step screening process based on PRISMA guidelines was then undertaken.

2.2 Inclusion and Exclusion Criteria

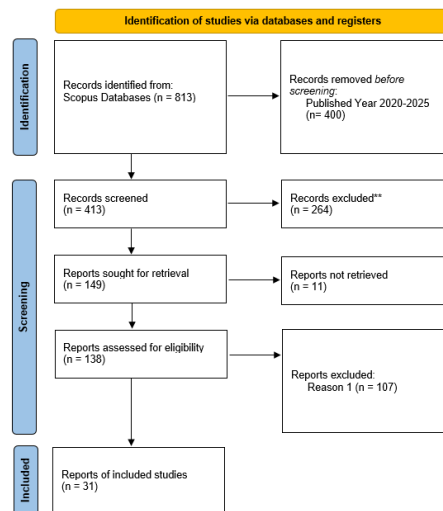
To refine the article pool, a set of inclusion and exclusion criteria was systematically applied. Studies were included if they were published between 2020 and 2025, written in English, accessible via open access, and published in peer-reviewed journals within the fields of business, management, or social sciences. Only empirical research designs—qualitative, quantitative, or mixed methods—were considered. Conversely, articles were excluded if they were published outside the target years, in languages other than English, or were non-journal sources such as conference papers, book chapters, or editorials. Additionally, studies that were subscription-based, unrelated to the target academic domains, or purely theoretical without data were also excluded. This filtering yielded 61 articles. After full-text screening focused on psychological and sociocultural drivers, brand reputation, and digital amplification mechanisms, a final selection of 31 studies was retained for in-depth analysis. Table 1 below summarizes the detailed inclusion and exclusion criteria used during the article selection process.

Table 1. Inclusion and Exclusion

Criteria	Inclusion	Exclusion
Publication Year	2020–2025	Before 2020 or after 2025
Language	English	Non-English publications
Article Type	Peer-reviewed journal articles	Conference papers, book chapters, editorials
Access Type	Open access	Subscription-based or restricted articles
Subject Area	Business, Management, Social Sciences	Articles outside these domains
Methodology	Empirical (qualitative, quantitative, mixed)	Theoretical or conceptual without data

2.3 PRISMA Flow Diagram

To enhance transparency, the literature selection process is illustrated in Figure 1, a PRISMA flow diagram that outlines the number of records identified, screened, excluded, and ultimately included in the review. This diagram reflects the progression from 813 records after date filtering to the final 31 studies analyzed.

**Figure 1.** PRISMA SLR: “Technology”, “Modern”, AND “e-commerce”**Source:** Authors’ own work

2.4 Data Extraction

Data from the selected studies were extracted using a standardized template in Microsoft Excel. Key elements recorded included article metadata (author, year, journal), research methodology (design, sampling, data collection), thematic focus (consumer motivation, brand response, and role of digital media), and each study’s main findings, limitations, and contextual considerations. To ensure reliability, the extraction was carried out independently by two reviewers. Any inconsistencies were discussed and resolved collaboratively, involving a third reviewer when needed.

2.5 Quality Assessment

To assess the methodological rigor of the included studies, an adapted checklist was used. For qualitative research, the Critical Appraisal Skills Programme (CASP) framework was applied, while quantitative studies were assessed based on the clarity of objectives, appropriateness of the research design, validity of data, analytical coherence, and transparency of reported findings. Studies that did not meet the required quality threshold were excluded from the final synthesis.

2.6 Bibliometric and VOSviewer Analysis

To explore patterns and trends in the research landscape on consumer boycotts, a bibliometric analysis was conducted using VOSviewer software. This analysis included keyword co-occurrence to reveal dominant research themes, co-citation mapping to identify foundational literature, and bibliographic coupling to uncover relationships among recent studies based on shared references. Thematic clusters emerged, highlighting areas such as boycott motivation, digital activism, corporate response strategies, financial consequences, and cultural influences. These clusters provided the analytical foundation for the subsequent thematic synthesis.

2.7 Synthesis Method

A thematic synthesis approach was adopted to integrate the findings from the included studies. This involved three stages. First, open coding was used to generate initial

categories from the extracted data. These categories were then refined into broader descriptive themes through axial coding. Finally, these themes were analyzed in light of the research objectives to produce interpretive insights. The themes were ultimately organized around four dimensions central to the research: the motivational drivers behind consumer boycotts, corporate response mechanisms, reputational impacts, and the influence of digital platforms in the mobilization and spread of boycott movements.

3. RESULTS AND DISCUSSION

3.1 Bibliometric Analysis of E-Commerce and Technology Literature

3.1.1 Keyword Co-Occurrence Network

To understand thematic structures within the literature, a bibliometric analysis was conducted using VOSviewer software. The network visualization (Figure 1) highlights co-occurring keywords from selected publications in the Scopus database (2020–2025). The resulting clusters illustrate how technological innovation in e-commerce has been explored across multiple research dimensions.

Red Cluster focuses on digital strategy and organizational transformation, marked by keywords such as *company*, *author*, *content*, and *marketing*. Blue Cluster centers around logistics and operational efficiency, with keywords like *trade*, *logistic*, *seller*, and *experimental result*. Green Cluster captures consumer behavior themes, including *convenience*, *relationship*, *online shopping*, and *efficiency*. Yellow Cluster emphasizes analytical and methodological contributions with terms such as *big data*, *paper*, and *basis*.

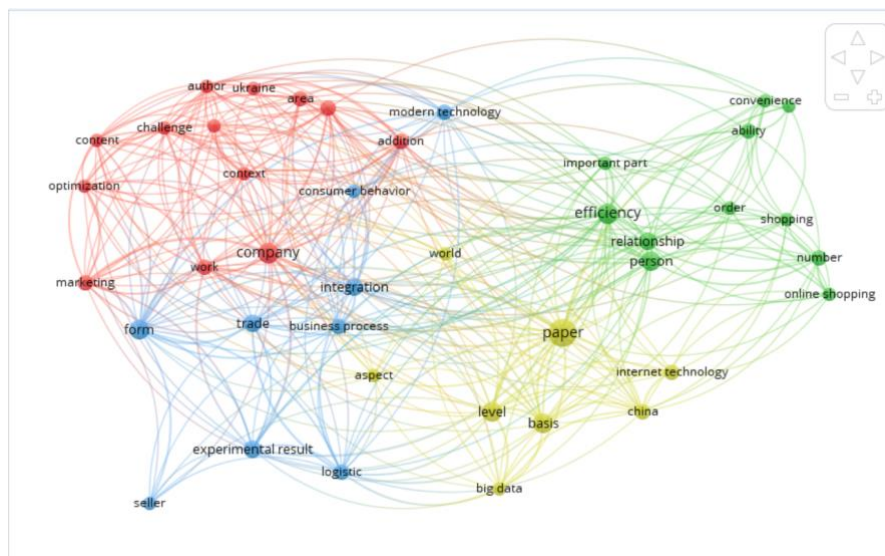


Figure 2. VOSviewer Network Visualization Here

This visualization demonstrates the interdisciplinary nature of technological applications in e-commerce, with connections bridging business strategy, operations, and user behavior.

3.1.2 Temporal Evolution of Research Focus

The overlay visualization (Figure 2) provides a chronological mapping of publication trends, using color gradients from blue (earlier research) to yellow (more recent). Early studies (2021–2022) largely addressed technological infrastructure and company-level

digital adoption. Recent studies (2023–2025) reflect a thematic shift toward user experience, customer satisfaction, and digital platform optimization.

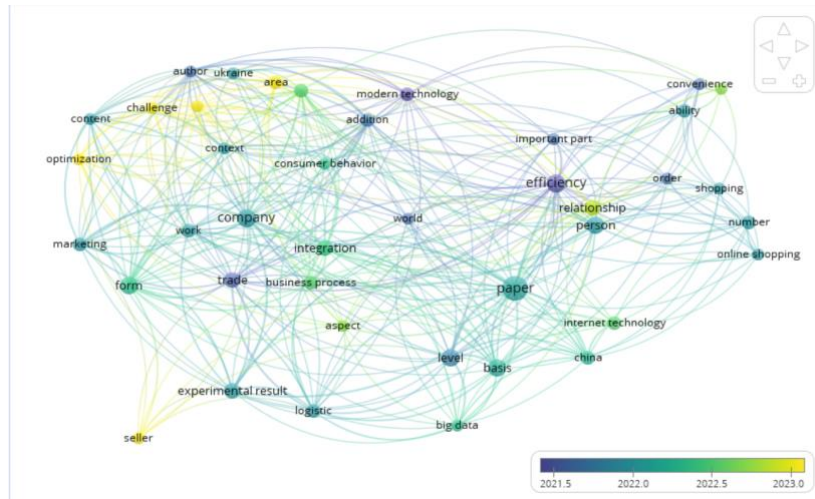


Figure 3. VOSviewer Overlay Visualization Here

This temporal insight suggests a growing academic interest in personalization, ethical data use, and adaptive business models as e-commerce ecosystems mature.

3.2 Thematic Findings from Systematic Literature Review

3.2.1 Technology-Driven Business Transformation

Modern e-commerce business models are increasingly shaped by technologies such as artificial intelligence, blockchain, and cloud computing. These innovations facilitate: Real-time decision-making and data sharing, Secure digital transactions through blockchain, Agile system restructuring using enterprise architecture frameworks like TOGAF. Research emphasizes that organizations adopting integrated technological ecosystems improve resilience, reduce operational friction, and remain competitive in volatile markets.

3.2.2 Consumer Behavior and Digital Engagement

A core theme in the literature is the evolution of consumer behavior in response to digital capabilities: Big data and AI enable hyper-personalization and predictive recommendations, Sentiment analysis tools help businesses capture shifting customer moods, Consumers now prioritize convenience, trust, and value alignment in digital environments. Nonetheless, challenges remain in replicating physical touchpoints, especially in product categories like fashion where size, texture, and fit affect satisfaction.

3.2.3 Emerging Digital Ecosystems and Business Models

Technological innovation has enabled new frameworks such as the S2B2C (Supplier-to-Business-to-Consumer) model, which streamlines supply chains and supports scalable operations. Studies indicate: Increased adoption of mobile platforms, Enhanced customer tracking and engagement tools, Integration of IoT and robotics in fulfilment. The literature points to a future of seamless omnichannel experiences where front-end personalization is supported by back-end automation.

3.3 Challenges and Implications of Technological Innovation

3.3.1 Security and Fraud in Digital Commerce

The rise of digital marketplaces brings heightened cybersecurity risks. Key insights include: Machine learning-based fraud detection is critical for real-time threat mitigation,

Consumers are increasingly aware of data privacy, prompting regulatory interventions, Secure infrastructure enhances trust and adoption. Several authors advocate for international standards in digital transaction security, especially in cross-border e-commerce.

3.3.2 Regulatory Gaps and Ethical Considerations

The pace of technological advancement has outstripped the evolution of legal frameworks in many regions. Literature highlights: A need for adaptive, tech-neutral regulation, Protection against exploitation, misinformation, and unethical data use, Emphasis on ethical AI and algorithmic transparency. Studies urge governments and businesses to collaborate in developing policy guidelines that balance innovation with accountability.

3.3.3 Inclusivity and Infrastructure Disparities

Finally, digital inequality remains a pressing concern: ICT access varies widely between regions, limiting digital participation, SMEs in developing economies face adoption challenges due to cost and knowledge gaps, Government and institutional support is crucial for equitable digital transformation. The global digital divide has implications not only for market access but also for long-term socioeconomic development.

4. CONCLUSION

This systematic literature review has examined how technological innovation is reshaping modern e-commerce across multiple dimensions. The analysis reveals that advancements in digital infrastructure—such as artificial intelligence, big data analytics, blockchain, and mobile technologies—have enabled transformative shifts in business operations, consumer engagement, and market strategies. These technologies are not only enhancing efficiency and personalization but also redefining traditional business models through new frameworks like the S2B2C model and integrated digital ecosystems.

The thematic synthesis identified three core transformations: (1) digital transformation of business models driven by operational agility and strategic integration; (2) evolving consumer behaviors emphasizing convenience, personalization, and trust; and (3) emergent challenges surrounding cybersecurity, ethical AI use, and global digital inequality. Bibliometric analysis further supported these findings by highlighting the evolution of research focus from foundational technological integration to more nuanced themes of digital engagement and regulatory gaps.

However, this transformation is not without its limitations. The review highlighted critical challenges such as data security risks, uneven access to technological resources, and lagging regulatory frameworks. These challenges underscore the importance of developing adaptive, inclusive, and ethically sound approaches to e-commerce implementation, especially in regions facing infrastructural and digital literacy barriers.

In practical terms, this study contributes to academic and industry discourse by providing an integrated perspective on the drivers and implications of digital transformation in e-commerce. For policymakers and business leaders, the insights from this review suggest the need to prioritize investment in secure, accessible digital infrastructure while ensuring that innovation aligns with consumer rights and social equity.

For future research, studies could explore longitudinal effects of digital transformation across various industry sectors, assess consumer trust dynamics in relation to emerging technologies, and examine cross-cultural variations in digital adoption. Furthermore, interdisciplinary collaboration among technologists, economists, and

sociologists will be crucial to address the socio-technical complexities of modern digital commerce.

In conclusion, technology is not merely a tool in e-commerce—it is the architecture upon which the future of commerce is being built. Understanding its current trajectories and challenges is essential for fostering an inclusive, efficient, and resilient global digital marketplace.

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