Original Research Article

Cross-border electronic commerce and its impact on traditional trade patterns

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Abstract: Cross-border e-commerce is reshaping international trade by enhancing efficiency and transparency through technologies such as big data, recommendation algorithms, and blockchain. This paper analyzes its business models and technical foundations, and uses data to show its impact on trade processes, costs, supply chains, and intermediary services. It concludes with strategic recommendations to support its high-quality development amid evolving policies and technologies.

Keywords: Cross-border e-commerce; International trade; Big data

1. Introduction

With the rapid advancement of economic globalisation and information technology, cross-border e-commerce is reshaping global trade at an unprecedented pace. Unlike traditional international trade, which depends on intermediaries, complex customs procedures, and lengthy transaction cycles, cross-border e-commerce leverages computer technologies to enable real-time information exchange, automated transactions, and efficient payments. This allows enterprises to directly reach global consumers, significantly lowering costs and improving responsiveness. Powered by AI, big data, and blockchain, e-commerce platforms excel in precision marketing, intelligent recommendations, and logistics tracking, accelerating the shift from offline to online and from centralised to decentralised trade models. Meanwhile, traditional trade is increasingly challenged in structure, efficiency, customer acquisition, and risk management.

2. Technical basis and platform models of cross-border e-commerce

2.1. Main Business models of cross-border e-commerce

The development of cross-border e-commerce has given rise to a variety of business models, mainly including B2B (Business-to-Business), B2C (Business-to-Consumer), C2C (Consumer-to-Consumer), and DTC (Direct-to-Consumer), which has been emerging in recent years. The B2B mode, represented by platforms such as Alibaba.com and Made-in-China, emphasises wholesale of bulk commodities and inter-enterprise cooperation, and is the mode with the largest transaction volume at present; the B2C mode, such as Amazon, AliExpress and Shopee, is more oriented to the end-consumers, highlighting the user experience and quality of service, and is suitable for direct sales between brands and retailers.

Table 1. Comparison of major cross-border e-commerce business models.

Model Type	Representative Platforms	Target Users
B2B	Alibaba.com, Made-in-China	Business ↔ Business
B2C	Amazon, AliExpress, Shopee	Business → Consumer
C2C	eBay	Consumer ↔ Consumer
DTC	Independent sites (e.g., Shopify)	Brand → Consumer
S2B2C	Weidian, Pinduoduo, TikTok Shops	Platform + small merchants → Consumer

2.2. Cross-border e-commerce platform architecture analysis

Cross-border e-commerce platforms typically adopt a front-end and back-end separation architecture to support efficient user interaction and complex data processing. The front-end, developed with HTML and frameworks like Vue or React, handles product browsing, ordering, and payments. The back-end, built with technologies such as Java, Python, or Node.js, manages product data, orders, inventory, and logistics. To support global transactions, platforms integrate multi-language modules, multi-currency payments, and tax calculation tools. For data storage and retrieval, MySQL or MongoDB is often combined with Elasticsearch to support product searches and user profiling.

Table 2. Key components of cross-border e-commerce platform architecture.

Architecture Layer	Key Functions	Major Technologies/Tools
User Interface Layer (Frontend)	Product browsing, order placement, payment, multilingual support	HTML, CSS, JavaScript, Vue, React
Business Logic Layer (Backend)	User authentication, product management, order processing, payment flows	Java, Python, Node.js, Spring Boot
API Service Layer	Integration with payment, logistics, tax systems	RESTful API, GraphQL, Webhooks
Data Management Layer	Storage and retrieval of user, order, and product data	MySQL, MongoDB, Redis, Elasticsearch
Algorithm Support Layer	Recommendation systems, user profiling, targeted marketing	Big data platforms (Hadoop/Spark), AI algorithms
System Support Layer	Scalability, load balancing, security, disaster recovery	Cloud platforms (AWS, Alibaba Cloud), Kubernetes, Docker

2.3. Core computer technology applications: big data, recommendation algorithms and blockchain

Cross-border e-commerce platforms use big data to analyze user behavior and optimize inventory. Technologies like Hadoop, Spark, and Flink support real-time data processing, while recommendation algorithms improve personalization and conversion. Blockchain enhances security and trust in areas like product traceability and payments. These technologies boost user experience, efficiency, and risk control.

Table 3. Core computer technologies applied in cross-border e-commerce platforms.

Technology Category	Key Technologies/Tools
Big Data Processing	Hadoop, Spark, Flink
User Profiling & Analysis	Data modeling, geographic analysis, behavior analysis
Recommendation Algorithms	Collaborative filtering, matrix factorization, deep learning
Blockchain	Public/private chain platforms, smart contracts
Real-Time Computing	Kafka, Flink, Storm
Security Control	Encryption algorithms, identity authentication, access control

2.4. Data-driven user behavior and precise marketing strategy

Cross-border e-commerce platforms analyze user data—such as browsing, search, and purchase behavior—to segment users and implement targeted marketing. Using AI and machine learning, platforms tailor promotions, optimize campaigns through A/B testing, and deliver personalized ads to improve ROI. Churn prediction models help retain users, while post-sale feedback supports service refinement. This data-driven approach enhances user engagement and boosts platform competitiveness.

3. The impact of cross-border e-commerce on the traditional international trade model

3.1. Trade process reconstruction and enhanced information symmetry

Cross-border e-commerce streamlines trade by enabling direct buyer-seller interaction, eliminating intermediaries, and reducing transaction time from weeks to minutes. Real-time data updates, credit ratings, and automated tools improve transparency and information symmetry. This shift transforms trade into a platform-based, data-driven, and instant model.

3.2. Change in cost structure and transaction efficiency

The rise of cross-border e-commerce has significantly changed the cost structure and transaction efficiency of international trade. In traditional trade, enterprises need to invest a lot of costs for exhibition, overseas market development, channel construction and manual operation, resulting in high marketing and operating costs. Under the cross-border e-commerce model, enterprises can make low-cost global exposure through the platform, reduce intermediate links and fixed expenses, and realise 'asset-light' operation.

3.3. Transformation of supply chain response mechanism and order processing

Cross-border e-commerce enables a shift from manual, slow supply chains to fast, flexible, data-driven models. Platforms use ERP and API systems for automated order handling, while big data helps forecast demand. MES integration supports personalized production, and smart logistics, including overseas warehouses, improve global delivery. This transformation shortens delivery times and boosts supply chain adaptability.

3.4. Impact on traditional foreign trade intermediaries, customs brokerage and payment models

Cross-border e-commerce reduces reliance on traditional intermediaries by enabling direct buyer-seller interaction. It simplifies customs clearance through digital systems and speeds up payment with third-party platforms like PayPal and PingPong. Technologies such as blockchain and smart contracts further improve efficiency and compliance. As a result, traditional service models face disruption and must adapt or be phased out.

4. Conclusion

Cross-border e-commerce is rapidly transforming traditional trade through technologies like big data, recommendation algorithms, and blockchain. It enhances efficiency, reduces costs, and empowers SMEs to compete globally. As AI, cloud computing, and IoT advance, the model will grow more intelligent and integrated. Enterprises and policymakers must adapt to ensure sustainable development and deeper global connectivity.

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