

Digital Intelligence Empowerment and Scenario Adaptation: A Study on the Integration Development Path of “AI+” Cross- Border Smart Retail E-Commerce for the ASEAN Market

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Abstract: Against the backdrop of “AI+” being elevated to a national strategic initiative and the accelerated restructuring of digital trade between China and ASEAN, cross-border smart retail e-commerce targeting the ASEAN market stands at a critical juncture of transitioning from “scale expansion” to “value creation.” Grounded in industrial integration theory and technology diffusion theory, this study systematically analyzes the enabling effects of “AI+” on cross-border smart retail e-commerce. It reveals the “technology–scenario” adaptation dilemma confronting Guangxi—as China’s frontier of opening-up to ASEAN—in the integrated application of AI technologies, specifically the structural tension between generic AI tools and the fragmented, multilingual, and low-trust consumer ecosystem of the ASEAN market. The findings indicate that the integrated development of cross-border smart retail e-commerce for the ASEAN market must transcend the logic of technological transplantation and shift toward a dual-drive model of “digital intelligence empowerment” and “scenario adaptation.” This study proposes a three-tier integration architecture comprising “technology middleware–scenario front-end–ecosystem network,” and explores a collaborative development pathway of “R&D in Beijing-Shanghai-Guangzhou, integration in Guangxi, and application in ASEAN,” thereby providing both theoretical underpinnings and practical guidance for Guangxi to establish itself as a benchmark for “AI+” cross-border e-commerce oriented toward ASEAN.

Keywords: AI+; Cross-Border E-Commerce; ASEAN Market; Smart Retail; Integrated Development

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1. Introduction

China and ASEAN are connected by mountains and rivers, bound by close people-to-people ties, and underpinned by a deep foundation of economic and trade cooperation. In recent years, with the full implementation of the Regional Comprehensive Economic Partnership (RCEP), the accelerated negotiation of the China–ASEAN Free Trade Area 3.0, and the continued deepening of international cooperation under the “Silk Road E-commerce” framework, bilateral digital trade has entered a historic phase of accelerated restructuring. In this process, cross-border e-commerce has emerged as the most dynamic growth pole in China–ASEAN economic and trade cooperation, demonstrating robust developmental momentum. In 2024, global cross-border e-commerce transaction volume exceeded USD 6.3 trillion, with China leading the world with an import–export volume of RMB 2.38 trillion. From January to August 2025, Guangxi’s cross-border e-commerce import–export volume reached RMB 30 billion, registering a year-on-year growth of over 110%, of which nearly 70% was attributable to ASEAN

countries. These figures not only reflect the institutional dividends arising from regional economic integration but also signal a paradigm shift in cross-border e-commerce from “scale expansion”—characterized by extensive growth—toward “value creation” through refined operations^[6].

Concurrently, next-generation digital technologies, particularly artificial intelligence, are profoundly reshaping the operational logic across industries. In 2024, “AI+” was incorporated for the first time into the Government Work Report, elevated to a national strategic initiative, marking a paradigm shift of AI technologies from laboratories to industrial deployment, and from general-purpose scenarios to sector-specific empowerment. Within the cross-border e-commerce domain, the deep penetration of AI technologies—encompassing intelligent product selection, personalized recommendation, automated customer service, intelligent warehousing and logistics, cross-border payment risk control, and AIGC-driven multilingual marketing—is systematically deconstructing and reorganizing traditional operational models: data-driven decision-making supersedes experiential judgment, algorithm-optimized processes replace linear operations, and intelligently generated content substitutes manual creation. This technological transformation offers revolutionary efficiency tools for cross-border e-commerce, which has long been constrained by the complex environment of “multiple languages, multiple cultures, and multiple regulatory regimes.”

However, the enabling effect of technology is not automatically realized; rather, its value conversion is critically contingent upon the degree of alignment between technological capabilities and application scenarios. Cross-border smart retail e-commerce targeting the ASEAN market confronts a distinctive “scenario complexity” in this regard: the ASEAN region comprises eleven countries with vastly disparate levels of economic development, diverse cultural and linguistic backgrounds, and heterogeneous digital infrastructure, giving rise to a highly fragmented e-commerce market. Southeast Asia encompasses over a dozen official languages and hundreds of dialects, and the development of digital corpora for these languages lags considerably, with the accuracy of mainstream AI tools in low-resource language scenarios falling significantly below that in major languages. Moreover, in contrast to the European and American markets—which rely heavily on platform-based credit scoring systems—Southeast Asian consumers’ purchasing decisions are profoundly influenced by social media and community-driven trust networks, exhibiting a distinctive “high-touch” consumption profile. This unique context raises a fundamental question: can generic AI tools be directly transplanted into the fragmented ASEAN market? How can the efficiency advantages of technology be converted into market trust and user loyalty? These questions remain insufficiently addressed in the existing literature.

A review of the extant scholarship reveals that academic inquiries into AI-empowered cross-border e-commerce predominantly focus on general-purpose application-level analyses, such as optimization of intelligent recommendation algorithms, enhancement of AIGC content generation efficiency, and intelligent logistics route planning, with limited attention devoted to the adaptation challenges specific to particular regional markets. More critically, few studies have systematically examined the deep integration mechanisms between “AI+” and cross-border smart retail e-commerce in the context of specific markets through the cross-cutting theoretical lenses of industrial integration theory and technology diffusion theory. As China’s frontier window for opening-up and cooperation with ASEAN, Guangxi not only bears the strategic mission of establishing itself as a benchmark for “AI+” cross-border e-commerce oriented toward ASEAN but also grapples with the practical challenge of implementing the collaborative development pathway of “R&D in Beijing-Shanghai-Guangzhou, integration in Guangxi, and application in ASEAN.” The 2025 ASEAN-oriented “AI+Cross-Border E-Commerce” Innovation Application Competition attracted 906 participating teams spanning 10 ASEAN countries, and the 2026 edition has been further upgraded and relaunched—these practical endeavors urgently call for systematic theoretical elucidation and directional guidance.

Against this backdrop, this study endeavors to construct a systematic analytical framework for the integrated development of “AI+” cross-border smart retail e-commerce. Drawing upon the dual perspectives of industrial integration theory and technology diffusion theory, it seeks to uncover the intrinsic mechanisms through which AI technologies empower cross-border e-commerce, systematically identify the contextual constraints and adaptation dilemmas specific to the ASEAN market, and consequently propose an integrated development pathway driven by the dual engines of “digital intelligence

empowerment” and “scenario adaptation.” The research aims to address three progressively nested core questions: First, through what dimensions—efficiency, experience, and boundary expansion—does “AI+” achieve industrial integration with cross-border smart retail e-commerce? Second, what “technology–scenario” structural tensions do generic AI solutions encounter in the fragmented ASEAN market? Third, how should Guangxi, as a regional distribution hub, construct the three-tier architecture of “technology middleware–scenario front-end–ecosystem network” to forge a distinctive development trajectory that differs from both technology-original and simple-transplantation models?

The significance of this study is twofold, encompassing both theoretical and practical dimensions. Theoretically, it extends industrial integration theory and technology diffusion theory into the research domain of cross-border e-commerce oriented toward specific regional markets, puts forth the dialectical proposition of “digital intelligence empowerment” versus “scenario adaptation,” and enriches the theoretical explanatory power of “AI+” industry applications. Practically, the findings will provide path references for Guangxi in building a highland for intelligent cross-border e-commerce development oriented toward ASEAN, lend theoretical support to the collaborative development model of “R&D in Beijing-Shanghai-Guangzhou, integration in Guangxi, and application in ASEAN,” and offer a transferable analytical framework for the cross-border application of AI technologies in similar emerging-market contexts. The remainder of this paper is structured as follows: Section 2 constructs the theoretical analytical framework for integrated development; Section 3 examines the developmental practices and challenges specific to the ASEAN market; Section 4 proposes the dual-drive integrated development pathway; and the final section presents conclusions and future research directions.

2. Problem Statement

Cross-border e-commerce has become the most dynamic growth pole in China–ASEAN economic and trade cooperation. In 2024, global cross-border e-commerce transaction volume exceeded USD 6.3 trillion, with China’s import–export volume reaching RMB 2.38 trillion, leading the world. From January to August 2025, Guangxi’s cross-border e-commerce import–export volume reached RMB 30 billion, a year-on-year increase of over 110%, with nearly 70% attributed to ASEAN countries. Behind these figures lies the superimposition of multiple policy dividends, including the advancement of the China–ASEAN Free Trade Area 3.0, the deepening of “Silk Road E-commerce” cooperation, and the realization of RCEP dividends.

Nevertheless, beneath the high growth trajectory lie structural challenges. Traditional cross-border e-commerce operational models are confronted with six major pain points: insufficient precision in product selection decision-making; the “cost–timeliness–controllability” trilemma in logistics systems; the dynamic game of platform rules; compound risks in payment systems; localization pitfalls in after-sales service; and the complexity of supply chain management^[5]. These pain points are further amplified in the ASEAN market context—a region comprising eleven countries with widely divergent levels of economic development, cultural and linguistic diversity, and uneven digital infrastructure, manifesting in a highly fragmented e-commerce landscape. Generation Z consumers’ elevated expectations for personalization and real-time interactive experiences render traditional manual operational models inadequate for meeting the nuanced demands of multilingual and multicultural environments^[4].

In this context, “AI+” offers transformative solutions for cross-border smart retail e-commerce. The deep application of AI technologies in intelligent product selection, personalized recommendation, automated customer service, intelligent warehousing and logistics, and cross-border payment risk control is fundamentally reshaping the operational logic of cross-border e-commerce. In 2025, Guangxi explicitly articulated the development pathway of “R&D in Beijing-Shanghai-Guangzhou, integration in Guangxi, and application in ASEAN,” promoting the penetration of AI across all industries. The launch of the 2026 ASEAN-oriented “AI+Cross-Border E-Commerce” Innovation Application Competition further advances the deep integration of AI technologies with real-world business scenarios in cross-border e-commerce.

However, existing research predominantly concentrates on generic applications of AI technologies in cross-border e-commerce, with limited attention directed toward the adaptation issues specific to particular regional markets. Can generic AI tools be directly transplanted to the ASEAN market? How can the efficiency advantages of technology be transformed into market trust and user loyalty? What role should Guangxi, as a regional distribution hub, play in the AI-empowered industry chain?

These questions remain to be systematically addressed. This study endeavors to construct an analytical framework for the integrated development of “AI+” cross-border smart retail e-commerce, unveiling the distinctive challenges and response pathways specific to the ASEAN market, thereby providing theoretical support for Guangxi’s pursuit of establishing itself as a highland for intelligent cross-border e-commerce oriented toward ASEAN.

3. Analytical Framework

3.1 The Enabling Mechanism of “AI+” from the Perspective of Industrial Integration

“AI+” does not denote a simple superposition of AI technologies and cross-border e-commerce; rather, it constitutes a deep industrial integration achieved through data-driven approaches, algorithmic optimization, and scenario adaptation. From the standpoint of industrial integration theory, the enabling mechanism of “AI+” manifests across three dimensions: first, efficiency restructuring—AI automates the processing of massive datasets, supplanting human judgment in product selection, pricing optimization, inventory management, and logistics routing, thereby significantly reducing operational costs and decision-making latency; second, experience enhancement—personalized recommendations based on user profiling, AIGC-generated multilingual marketing content, and 24/7 intelligent customer service fundamentally reconfigure the consumer experience chain from browsing to purchase; and third, boundary expansion—AI-enabled cross-lingual and cross-cultural adaptation capabilities empower small and medium-sized enterprises to penetrate diverse overseas markets at lower costs, dismantling the resource barriers traditionally inherent in international trade.

The core of this enabling logic resides in the closed-loop iteration of “data–algorithm–scenario.” User behavioral data, transaction data, and logistics data accumulated by cross-border e-commerce platforms constitute the foundational resources for AI model training; algorithms transform data into actionable operational decisions; and the complexity of scenarios reciprocally drives continuous algorithmic refinement. In this process, the abundance of data and the adaptive capacity of algorithms determine the upper bound of the enabling effect^[1].

3.2 The Distinctive Context and Adaptation Propositions Specific to the ASEAN Market

The ASEAN market presents pronounced “non-standardized” characteristics within the cross-border e-commerce context, posing challenges to the general technological logic of “AI+.”

First, market fragmentation and corpus resource scarcity. The ASEAN region encompasses over a dozen official languages and hundreds of dialects, necessitating multilingual processing of product information, user reviews, and customer service interactions. However, the development of digital corpora for Southeast Asian low-resource languages seriously lags behind, with the accuracy of mainstream AI translation tools in such scenarios falling substantially below that for major languages such as English, thereby constraining the deployment effectiveness of intelligent customer service and AIGC-driven marketing applications. The establishment of a “multilingual marketing” track in the 2026 competition precisely reflects the urgency of this pain point.

Second, the social embeddedness of trust mechanisms. In contrast to the European and American markets, which rely heavily on platform-based credit scoring systems, Southeast Asian consumers’ purchasing decisions are profoundly shaped by social media influence, KOL recommendations, and community-driven trust networks. Research indicates that the Chinese market exhibits a “high-tech-driven” model—relying on super-app ecosystems, virtual anchors, and algorithmically personalized recommendations—whereas Southeast Asia tends toward a “high-touch” model that emphasizes authenticity, community trust, and human intermediation. This implies that merely optimizing recommendation efficiency through AI algorithms may not effectively translate into higher conversion rates in the ASEAN market. Practical experience from Pingxiang, Guangxi, demonstrates that the “AI mass production + manual refinement” model needs to be integrated with localized elements such as Vietnamese streamers to achieve effective conversion.

Third, infrastructure disparities and technology adaptation costs. ASEAN countries exhibit considerable variation in digital infrastructure levels—Singapore’s e-commerce penetration and logistics efficiency approach those of developed nations, while digital payment and logistics networks in countries such as Myanmar and Laos remain under development. AI-enabled intelligent warehousing and dynamic route optimization solutions necessitate differentiated adaptation across varying infrastructural conditions, significantly increasing the complexity and marginal costs of technological deployment.

These distinctive contextual factors reveal a core proposition: “AI+” cross-border smart retail e-commerce oriented toward the ASEAN market cannot simply adhere to a “technology transplantation” strategy; rather, it must pursue an integration pathway of “scenario adaptation”—deeply coupling AI technological capabilities with the cultural, linguistic, institutional, and infrastructural conditions of the ASEAN market. This places new demands on Guangxi’s role as a regional distribution hub: not as an originator of AI technology innovation, but as a transformation hub for technology integration and scenario adaptation.

4. Developmental Practices and Dilemmas

4.1 Rapid Policy Deployment and Industrial Advancement

In recent years, Guangxi has intensively implemented policy initiatives surrounding “AI+” cross-border e-commerce oriented toward ASEAN. The 2025 ASEAN-oriented “AI+Cross-Border E-Commerce” Innovation Application Competition attracted 906 participating teams from 10 ASEAN countries, establishing itself as the largest-scale event in the China–ASEAN AI e-commerce domain. In the same year, the China–ASEAN Silk Road (Cross-Border) E-Commerce Open Cooperation Thematic Promotion Event released a series of research outputs, including the *2025 Southeast Asia Market AI-Empowered E-Commerce Development Trends Report* and the *Guangxi Silk Road E-Commerce Empowerment Handbook*, which systematically delineated the application value of AI across intelligent recommendation, customer service, supply chain logistics optimization, AIGC content generation, and precision marketing.

At the industrial level, AI application scenarios have expanded from discrete segments to full-chain integration. In intelligent product selection, AI systems, by integrating e-commerce platform transaction data, search trends, and user reviews, can predict hit products up to 45 days in advance. In intelligent logistics, dynamic routing algorithms based on real-time traffic data, customs clearance speed, and destination delivery networks can shorten order fulfillment cycles^[3]. In marketing, AIGC technologies have been deployed to generate multilingual product descriptions, intelligent layout designs, and live-streaming clips, substantially enhancing content production efficiency. The Pingxiang Cross-Border E-Commerce Industry Incubation Center has achieved normalized and scaled operations of AI-powered short-form video production, employing an “AI mass production + manual refinement” model that leverages intelligent editing and multilingual automatic translation and dubbing technologies.

4.2 The “Technology–Scenario” Adaptation Dilemma in Practice

Notwithstanding the rapid momentum of policy promotion and industrial application, “AI+” cross-border smart retail e-commerce oriented toward ASEAN continues to confront deep-seated constraints in practice^[9]. Existing research encapsulates the challenges of Guangxi’s cross-border e-commerce intelligent transformation as “four nodes and fourfold constraints”: market analysis intelligence faces dual constraints of data barriers and tool adaptation; marketing intelligence encounters collaborative difficulties arising from channel fragmentation and cultural differences; supply chain intelligence is constrained by infrastructure deficiencies and cross-border coordination bottlenecks; and customer service intelligence confronts multiple barriers of localization adaptation and compliance risks^[10].

The underlying source of these dilemmas resides in “technology–scenario” misalignment. Specifically:

The “last-mile” problem of data barriers. Although cross-border e-commerce platforms have accumulated massive transaction data, granular data specific to the ASEAN market—such as country-specific consumption preferences, holiday purchasing rhythms, and local competitive dynamics—are often held by local service providers, making them difficult for cross-border enterprises to access and integrate. AI-based product selection models trained on global data exhibit significantly diminished predictive accuracy when applied to specific ASEAN country markets.

The cultural adaptation bottleneck of AI-generated content. While AIGC tools can rapidly generate multilingual product copy and marketing materials, the output often lacks precise comprehension of local cultural taboos, aesthetic preferences, and consumer psychology. Automatically translated marketing copy may give rise to cultural misunderstandings due to semantic deviations, thereby undermining brand trust.

The fragmentation predicament of collaborative mechanisms. “AI+” empowerment requires multi-actor coordination among technology providers, e-commerce platforms, logistics service providers, payment institutions, and localization service

providers. However, data sharing and business collaboration among actors in the current ASEAN-oriented cross-border e-commerce ecosystem remain at a nascent stage, impeding the full-chain realization of AI's efficiency advantages.

5. Integrated Development Pathway: Dual-Drive Model of Digital Intelligence Empowerment and Scenario Adaptation

5.1 Technology Middleware: Building an ASEAN-Oriented AI Capability Foundation

The foremost task in overcoming the “technology–scenario” adaptation dilemma is to construct a dedicated AI capability foundation tailored to the ASEAN market, rather than simply applying generic technology solutions^[2].

Multilingual corpora and large-model adaptation. Guangxi, leveraging the China–ASEAN Artificial Intelligence Innovation and Cooperation Center, can collaborate with universities and technology enterprises to systematically build Southeast Asian low-resource language corpora for cross-border e-commerce scenarios, encompassing vertical-domain data such as product descriptions, user reviews, customer service dialogues, and marketing copy. On this basis, mainstream AI large language models can be fine-tuned and adapted to enhance semantic understanding and generation accuracy in low-resource language scenarios. The 2026 competition's encouragement of teams to develop AI applications around core areas such as multilingual marketing exemplifies practical exploration in this direction.

Cross-border data compliance and privacy-preserving computation. ASEAN countries exhibit divergent regulatory policies on cross-border data flows, imposing high compliance costs on enterprises. Privacy-preserving computation technologies such as federated learning and multi-party secure computation can be explored to enable AI models to perform joint training and inference using multi-source data without data exit, thereby reconciling data compliance with model effectiveness.

5.2 Scenario Front-End: Deepening Localized Operations in the ASEAN Market

The efficiency advantages of AI technologies need to be translated into commercial value through a deep understanding of local markets. The key to scenario adaptation lies in “human–machine collaboration”—leveraging AI for operational efficiency while entrusting cultural adaptation to local talent and partners.

A culturally adaptive content generation mechanism. Relying solely on AIGC tools for marketing content falls short of meeting the cultural sensitivities of the ASEAN market. A viable pathway is to establish a content production workflow of “AI generation + local review + cultural calibration”: AI rapidly produces initial drafts and multilingual versions, which are then reviewed and refined by operation teams familiar with local cultures, incorporating indigenous consumer psychology and cultural elements. Practice in Pingxiang demonstrates that the “Vietnamese streamer + Chinese team” model, combined with AI short-form video technology, has achieved effective conversion on the TikTok platform.

Digitalized construction of trust mechanisms. Addressing the “high-touch” trust characteristics of the ASEAN market, AI capabilities can be deeply integrated with social commerce and live-streaming commerce. AI-driven user profiling and interest matching can assist merchants in precisely identifying KOLs and community nodes, rather than supplanting interpersonal trust linkages. Practice at the China–ASEAN Cross-Border Streamer Incubation Base's Malaysia branch demonstrates that AI technologies, functioning as live-streaming assistants that monitor real-time broadcast metrics and provide strategic support to streamers, achieve technological empowerment rather than replacement.

5.3 Ecosystem Network: Collaborative Institutional Safeguards for Integrated Development

Integrated development necessitates transcending firm-level technology application to construct a collaborative ecosystem encompassing “technology–platform–service–policy.”

The collaborative division of “R&D in Beijing-Shanghai-Guangzhou, integration in Guangxi, and application in ASEAN.” This development pathway, already incorporated into Guangxi's policy framework, essentially represents the optimal allocation of technological capabilities and scenario-specific resources. Beijing-Shanghai-Guangzhou, as innovation hubs, possess advantages in foundational AI model research and cutting-edge technology development, while Guangxi should focus on scenario-specific integration—combining general AI capabilities with the specific demands, data resources, and localization services of the ASEAN market to develop replicable industry solutions for export to ASEAN. This division of labor logic demands that Guangxi cultivate system integration capabilities and industry knowledge accumulation mechanisms, rather than pursuing original breakthroughs in AI technology.

An industry–education integrated talent cultivation system. ASEAN-oriented “AI+”^[8] cross-border e-commerce requires interdisciplinary talent proficient in AI technology application as well as ASEAN market culture. The 2026 competition’s establishment of institutional and social tracks, soliciting projects from China and ASEAN countries, represents a significant initiative to promote industry–education integration through competition-based incentives. Future efforts should further streamline the talent development pathway of “university cultivation–enterprise practicum–startup incubation,” organically integrating AI application competence, ASEAN language and cultural literacy, and cross-border e-commerce operational skills.

Policy innovation and risk governance. ASEAN-oriented cross-border smart retail e-commerce implicates multiple policy issues including cross-border data flows, algorithmic governance, and consumer protection. Guangxi can pioneer the exploration of AI application regulatory sandbox mechanisms oriented toward ASEAN, testing new models and business formats of AI-empowered cross-border e-commerce within controlled environments before scaling up based on accumulated experience. Nanning has already introduced policy support providing up to RMB 1 million for dataset construction and up to RMB 2 million in “computing power vouchers” for model training to award-winning projects; however, the balancing mechanism between policy innovation and risk governance warrants further exploration. Evidence from Alibaba’s Forest Market further suggests that policy incentives for digital green transformation should be calibrated to consumer eco-consciousness: targeted subsidies can mitigate free riding and encourage green replacement when eco-consciousness is low to moderate, whereas excessive subsidies in highly eco-conscious markets may induce excessive price premiums and reduce consumer surplus and overall welfare^[11].

6. Conclusion

The integrated development of “AI+” cross-border smart retail e-commerce oriented toward the ASEAN market represents both a strategic choice for Guangxi to capitalize on regional cooperation opportunities and enhance industrial competitiveness, and a critical test case for assessing whether China’s AI industry can effectively “go global.” The analysis presented in this paper demonstrates that the enabling effect of AI technologies on cross-border e-commerce is not automatically realized, but rather depends on the degree of alignment between technological capabilities and the contextual specificities of the target market. The highly fragmented characteristics of the ASEAN market—in terms of linguistic and cultural diversity, consumption habits, trust mechanisms, and infrastructure—subject generic AI solutions to significant “scenario adaptation” dilemmas.

The key to resolving this dilemma lies in transitioning from a “technology-driven” approach to a dual-drive model of “digital intelligence empowerment and scenario adaptation”—continuously enhancing AI’s efficiency-enabling capabilities across product selection, recommendation, customer service, logistics, and other functions, while simultaneously deepening localized operations in the ASEAN market to embed technological applications within local cultural contexts, social relations, and institutional frameworks. As the frontier of opening-up to ASEAN, Guangxi should position itself as a “technology integration hub” and a “scenario adaptation center,” constructing the three-tier architecture of “technology middleware–scenario front-end–ecosystem network,” and forging a distinctive development trajectory that differs from both “technology-original” and “simple-transplantation” models.

Future research may explore the following directions: comparative analyses of AI application effectiveness across specific ASEAN countries, differentiated pathways of “AI+” empowerment for small and medium-sized cross-border e-commerce enterprises, and the interplay between AI technology applications and institutional issues such as data sovereignty and algorithmic governance. Exploration of these questions will provide a more robust theoretical foundation for the deep integration of “AI+” and cross-border e-commerce^[7].

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