Business Models and Marketing Strategies in Cross-border E-commerce in the Age of Artificial Intelligence

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Abstract. Digital economy development and breakthrough in artificial intelligence have introduced radical shifts to the cross-border e-commerce. The current paper will discuss the ways in which the cross-border e-commerce industry is transforming its business models and marketing strategies due to the introduction of AI technologies. It investigates the literature and case study to analyze the role of the AI in optimizing supply chain operations through intelligent product selection, the activities of digitalizing the platform models to greater variety, and enhancing digital services such as AI customer service and VR/AR shopping experiences. It further discusses how the marketing strategies are changing including AI-generated portraits of users, dynamic pricing, automated content creation, and intelligent attribution modeling. Moreover, this paper suggests some strategic proposals to develop in the future, with special emphasis on the development of mature algorithm systems, changes in product-based operation to brand-based one, and the introduction of blockchain technology to detect the traceability of commodities or proactive reaction to the supervision of data security and privacy. The research results show that AI is not only a technical tool but also a core driving force for innovation, efficiency improvement and personalized development in cross-border e-commerce. It urges enterprises to adopt comprehensive, intelligent and ethically standardized development strategies to achieve sustainable growth in the global market.

Keywords: Cross-border E-commerce; Artificial Intelligence; Business Model; Marketing Strategy; Digital Economy.

1 Introduction

Cross-border e-commerce has become an important part of international trade, breaking geographical restrictions and linking global consumers with diversified markets [1]. The rapid development of the digital economy has further promoted this process, forming a fiercely competitive and constantly evolving market environment, which has posed severe challenges to the traditional operation mode of cross-border e-commerce. At present, the deep integration of artificial intelligence is promoting a new round of major changes in cross-border e-commerce, promoting its development from simple cross-border digital trade to an intelligent and data-driven industrial ecosystem. AI technologies such as machine learning, natural language processing and generative AI

© The Author(s) 2026
L. C. Yoong (ed.), *Proceedings of the 2026 2nd International Conference on Financial Innovation and Marketing Management (FIMM 2026)*, Advances in Economics, Business and Management Research 408,
https://doi.org/10.2991/978-94-6239-801-6_105

have been gradually applied to the whole value chain of cross-border e-commerce, ranging from back-end supply chain management to front-end consumer interaction. This technological integration not only brings unprecedented operational efficiency, personalized service and scalable development space, but also puts forward new requirements and challenges for enterprise operation and strategic decision-making.

The core issue addressed in this paper is to systematically clarify how AI fundamentally changes the operation and strategic framework of cross-border e-commerce. Although existing studies have explored single dimensions such as user portrait construction, a unified analytical framework that systematically integrates relevant research results is still insufficient [2]. Therefore, this study explores how AI is changing business models and marketing in cross-border e-commerce, and what opportunities and challenges companies face in the digital economy.

This research mainly achieves three objectives. Firstly, it analyzes the evolution of cross-border e-commerce business models driven by AI, focusing on supply chain intelligence, platform model diversification and digital service innovation. Secondly, it explores the transformation of marketing strategies under the empowerment of AI, including user insight acquisition, content intelligent production and marketing effect optimization. Thirdly, based on the above analysis, it puts forward operable strategic suggestions and development prospects, and responds to the risks brought by AI application, especially data security and ethical issues [3].

2 The Cross-border E-commerce Business Models in the Era of Artificial Intelligence

Previously, cross-border e-commerce models were predominantly meant to address the geographical divide but today it has developed to become an intricate technology driven ecosystem. The AI would be the central nervous system in this evolution as it enables efficiency, transparency, and value generation in the main areas of operation.

2.1 Intelligent Supply Chain and Product Selection through AI: Active Prediction not Passive Response

Any successful cross-border e-commerce enterprise is anchored on a strong supply chain. Supply chains in the past were mainly reactive in nature, in that operations began once orders had been received. This frequently resulted in backlogs, delays or missed market.

The old system of product selection was dependent on intuition and past sales. As an example, a seller may anticipate a good demand of a particular dress in the U. S. due to the previous years statistics and only to realize that by the time one stock came in, the consumer taste altered [4]. It was a sluggish subjective process that was risky by nature.

However, with AI, this has completely changed the picture. According to studies by Li and Zheng, the utilization of digital technologies in e-commerce across borders is highly curbing the risk of supply chains [1]. Previously, the risks could only be

determined after the fact, such as the creation of miscalculated products that are piling up in the warehouses. Now AI allows conducting real-time analysis of vast datasets on various channels. For example, AI Tools could potentially notice a spike in the popularity of"heated eyelash curlers"on TikTok in South Korea and notified sellers to stock inventory ASAP and enter the market before its popularity hits its peak. Essentially, AI has turned supply chains into more of a reactive system to the dynamic in the market to a more proactive approach at predicting the changes in consumer demand.

2.2 Models of Diversified Platforms and Channel Integration

The cross-border e-commerce channel strategies are being transformed by the AI. Previously, there were sellers who concentrated on a single platform, including Amazon. But nowadays, the consumers are scattered over a variety of touch-points-some make the purchases already on the TikTok, others purchase the products during the live-streaming sessions, and many of them are comparing the prices on Google and make a purchase on Amazon. Eliminating the use of multiple channels is denying the company access to a large market share.

The AI allows businesses to work and collaborate on different platforms at the same time without operational mayhem. In the case of traditional e-commerce communities like Amazon and Shopee, a robot will be able to maximize product titles and price to advance the level of search in multiple national markets.

Additionally, AI-based real-time translation is a good solution to language issue. As a case in point, it uses polite honorifics in addressing Thai audiences and uses a more casual and more conversational voice when talking to U. S. consumers. As Ding, Huang, and Zhang discovered, AI translation services not only allow translating between two languages but also take into account the tone and style to adapt to local cultural norms [4].

Also, in the case of social commerce websites like TikTok Shop and Instagram Shopping, AI can recycle long-form video into numerous short clips, create subtitles in other languages, and distribute such custom-made messages to target consumers in individual countries.

2.3 Services digitalization and Customer Experience

Use of AI has enhanced the customer service in cross-border e-commerce in a very fast manner. Unlike in the past when customer support would be very labor intensive using human labor, AI has rendered services to be more intelligent, responsive and personalized.

Language barriers and time-zone differences are one of the biggest barriers to e-commerce between countries. As an example, in case a consumer in America experiences an issue with a late night order, Chinese customer service teams are usually offline. In the traditional modes, when making inquiries through email it could take over 24 hours to receive an answer.

Currently, even more merchants have used the AI chat-bots and virtual assistants. The systems are 24/7 multi-lingual as well as capable of answering frequent questions concerning logistics, returns, and product-related matters. Considering the following example, a customer in France who has ordered a bag and wonders whether it can be delivered when he/she is away in Paris before the valentine day can get instantaneous response depending on the real-time logistics information. A machine-assisted system of inquiries can contribute to answer thousands of questions at the same time, which is much higher than that of human team of inquiries.

Moreover, most online shopping sites, including Dewu, a Chinese application, have implemented VR and AR technologies, which allow one to get a virtual try-on experience. Previously, most consumers could not physically touch and feel products, thus they did not know their size or fit, and their appearance. This ambiguity usually resulted in a slowing of purchases and the high turnover rates. Yin came up with a new solution that utilized VR to make products more unique [5]. With the help of virtual reality, the consumer can see how the clothes may look in other colors and/or put on shoes or be able to virtually put furniture in a living room to determine how much space they are going to fit in them. Such experience helps a lot in minimizing anxiety in the process of making a purchase decision.

2.4 Smart Logistics and Open Processes

AI is transforming logistics, which is a key element of cross border e-commerce in fundamental ways. AI is useful to optimize route planning and schedule the delivery, predict possible delays due to bad weather, customs clearance, or any other unforeseen disturbances.

Trustworthy logistic systems merely offer general estimated time frames, e.g. 3 to 5 working days. Intended to contrast with this, AI, through the incorporation of real-time data, can produce extremely accurate prediction of the delivery within a day, e.g., delivery within 2 pm to 4 pm tomorrow. As pointed out in the research of Qi, Q., Jiao, Y, etc. This transparency is also an essential element of the value-added service mechanism of logistics in the present day. Interfaces with AI will enable customers to receive real-time information on the shipment location and estimated delivery time [6].

Another use of AI is optimization of local logistics data to facilitate the better use of warehouses and inventory in international markets, which can be used to fulfill orders faster and at cheaper. It is of particular significance in optimization with respect to price volatility which exists in the processes of global supply chain.

3 Artificial Intelligence-based Marketing Approaches Analysis

Marketing sphere is the industry, where the effect of AI change is most important as it enables the policies of the mass market campaign to shift to very personal, dynamic and measurable analytics.

3.1 Purified User Profiling and Interactive Integrity

The core of medical e-commerce marketing in the present generation is based on artificial intelligence-generated profiles of users. Artificial intelligence creates elaborate user profiles based on their browsing history, their buying behavior, the way they use social media and even the way they interact with the device like moving the mouse.

Currently, a trend among numerous e-commerce organizations is the approach to use a hybrid marketing model of AI-fuelled user profiling and VR technology. An example is when a consumer already owns a pair of blue jeans the AI system will reflect on the data of the body and style preference. In case the user does not find a top he likes in virtual tools, the system will automatically recommend: This top will go well with people's jeans. Is it okay to give people a preview of the entire appearance? The VR system is then used to create an imaginary image of the coordinated outfit in real time.

Malik and Goyal researched on an advanced area, quantum-AI-based dynamic user profiling that can handle exponentially greater datasets [2]. This kind of technology does not only predict immediate consumer demands but also the future desires. This profound insight is what facilitates a set of fundamental marketing activities, namely customized suggestions of products. The approval of performance enhanced through recommendation algorithms can have enormous accuracy as described by Su, X., Lei, etc. which endorse cross-selling and up-selling performance [7]. Dynamic pricing, predictive analytics are also supported by AI systems.

On the one hand, they dynamically change prices based on the demand on the market, the price of competitors, the browsing history of the user, and the likelihood of the purchase, which will help businesses to maximize the level of revenue and the chances of conversion. AI, in its turn, can predict the needs of customers by tracking behavioral patterns. An example of this is that when users fall under the category of consumable products then the system can be used to estimate when users are likely to repurchase it thus triggering immediacy and personalized marketing messages, attracting clients before the client actively comes up with a search.

3.2 Computer Generated Contents and Interactive Interactions

Generative AI is transforming the model of content production of cross-border e-commerce radically. Previously, sellers wishing to penetrate ten national markets were forced to recruit local copywriters, create video variations in local regions, and develop local visuals. Small and medium sized enterprises had great hindrances of such high costs.

AIGC has successfully over-bypassed this bottleneck. Using the same set of original materials, AI will be able to create localized variations of the products to fit different markets by modifying not only language but also color choices, cultural references and storyline. Xingchen etc. outline this trend in terms of being a creativity-driven growth, stating that AIGC provides a tremendous potential of multi-channel marketing [8].The essence of AIGC to the e-commerce across the border in this research can be broken down into three dimensions.

To start with, it is scalable content production. Conventional content creation was heavily based on manual content and in most cases it would take a day to be able to complete a piece of copy. Conversely, AIGC allows it to be effectively produced on a large scale and make thousands of copies in minutes. Bian, Cai and Mao have observed that this feature saves considerable time and cost input making the small and medium sellers undertake large-scale marketing campaigns locally [9].

Secondly, optimization and dynamic testing. AI will be able to come up with several copies of advertising text, run them in parallel on low-traffic groups, and automatically determine the highest-performing content within a limited timeframe. The speedy trial and error process helps in the constant repetition and refinement of marketing plans.

Thirdly, individualism in the interactive situations. The use of automated content is not unlimited to advertisements but also to improve the engagement of users. Indicatively, AI is capable of creating customized video ads in real time depending on the record of the users, and this delivers a video that is nearly related to products the user has recently searched.

Notwithstanding, there are challenges that come with opportunities. Bian, Cai and Mao cautioned about the possibility of AI generated content undermining brand consistency and creating cultural sensitivity problems [9].

Expressions appropriate in the Middle East may lead to negative effects in European markets. The real competitive advantage lies not in the quantity of AI-generated content, but in the ability to guide AI to respect cultural boundaries and maintain consistent brand positioning across markets.

From this perspective, future winners will not be enterprises with the highest content output, but those capable of balancing speed and quality, scale and accuracy. The ability to generate content that is both efficient and culturally appropriate will become the core competitiveness in the AIGC era.

3.3 Intelligent Attribution and Dynamic Optimization

One of the challenges that have been experienced over time in marketing cross-border e-commerce is very fragmented consumer experience, most of which cuts across borders and on a multitude of platforms. A customer can find a product through TikTok, compare the prices on Google, consult during a live stream, make the purchase on Amazon. The classic attribution models would only attribute the final click channel, which would heavily underestimate and create misjudgments concerning the initial channel which could include the social media and the content of KOLs [10].

Multi-touch attribution models that are based on AI can eliminate this problem. Using cross platform user identities and device fingerprint, AI systems can recreate the full consumer journey of their original awareness to the ultimate purchase, and award conversion credit according to what the touch-point actually contributed.

This is especially an important capability to multisite and international businesses that conduct operations in numerous platforms and locations. It assists sellers in determining exactly, what country, channel, creative form and advertising budget will actually lead towards sustainable growth.

4 Strategic Recommendations and Future Outlook

To thrive in the current AI-driven landscape, cross-border e-commerce enterprises must adopt forward-looking and integrated strategies that balance technological application with ethical and sustainable practices.

4.1 Development of Mature AI Algorithms and Marketing Modes

The use of AI in e-commerce across countries has passed the stage of the first studies, and the ongoing optimization will become the main focus of future competitive advantage. Businesses should also improve their algorithms not to rely on descriptive analytics, which is used to comprehend past data, but predictive and prescriptive analytics that can be used to forecast and make strategic decisions in the future.

Marketing models based on AI must possess the ability to make decisions that are independent and multifaceted. Indicatively, social media trends in various countries can be tracked at the same time using the algorithms, it can predict that a certain type of dress is going to be fashionable in Japan over the summer in three months' time and also automatically create an inventory suggestions and matching marketing strategies. This system can also dynamically redistribute advertising resources in Amazon, Tik Tok, and individual websites, which can redirect resources previously used in search advertising to short-video advertising platforms in the situation of viral content discovery [11].

Now, Qi, Q, Jiao, Y, etc. underline the fact that value-added services on the basis of optimized models represent one of the sources of competitiveness [6]. This in the marketing environment would mean that AI should not evolve into a mere automated tool, but rather a strategic partner. Such systems must take into account inventory levels, fluctuations in exchange rates and cultural differences in a region to come up with solutions that are globally optimal as opposed to merely modifying the prices and putting up adverts. Companies that have developed intelligent marketing systems will have a long term competitive advantage in the global environment in the future.

4.2 Strategic Change Product Selling to Brand Building

AI usage has highly enhanced efficiency of sales in cross-border e-commerce, but it also has potential dangers. Overreliance on algorithmic modification of short term conversion rates usually results in intense rivalry on the costs and homogeneousness of products that erode brand value in the long term. The brand advantage is not achieved through the functionality of the product, but rather through the special emotional relationship and recognition that is created among consumers.

The actual worth of AI in brand building is that it would enable business firms to gain deeper insights into what is beyond transaction data. The records of purchases may indicate what is purchased, yet, it does not mean what kind of motivations people have and why they recommend a brand. The AI aids businesses in the real-time interpretation of emotional predisposition within the user review, and the innuendo capabilities within

search behaviour to comprehend the emotions of consumers in their attitude and cultural receptiveness to a brand.

At the strategic level, companies ought to alter the priorities of AI applications based on optimising the single transactions towards long-term relationships with customers.

4.3 Prioritizing Risk Management and Regulatory Compliance

The wide application of AI improves operational efficiency but also brings new risk challenges. Wang etc. note that the digital economy increases security risks and requires stricter regulatory responses. For cross-border e-commerce enterprises, compliance has become a necessary strategic task rather than an optional choice [3].

Data sovereignty conflicts have become common in global operations. Enterprises that conduct business in Europe, Southeast Asia and North America need to comply with the General Data Protection Regulation (GDPR), data localization requirements and relevant laws in different regions. AI systems process a large amount of user data, and any violation may result in fines or market exit. Enterprises must integrate privacy protection into the basic design of AI systems, so that data collection, storage and processing meet regulatory requirements from the beginning.

Algorithmic bias may bring potential harm to brand image. In practice, some pricing systems automatically set higher prices in specific regions, which disproportionately affects certain groups. Although such results are not intentional, they reflect structural bias in training data. Once exposed, this unfairness will seriously damage brand reputation. Regular algorithmic fairness reviews have become a necessary part of risk control.

The development of AI-generated content (AIGC) also brings legal uncertainty. Issues such as copyright ownership, infringement responsibility and false publicity involved in automatically generated descriptions and copy are not clearly defined in national laws. Enterprises should take the initiative to formulate internal ethical norms and review mechanisms to avoid related risks. As Wang etc. emphasize, adapting to the complex legal and ethical environment is crucial for long-term sustainable development [3].

Risk management does not limit development, but clarifies stable development boundaries. Clearer compliance and ethical boundaries help AI play a greater role. Enterprises that regard compliance as a strategic investment rather than an additional cost will achieve more stable and long-term development in global competition.

5 Conclusion

This paper considers the radical effects of artificial intelligence (AI) in cross-border e-commerce business model and marketing strategies. Experimental evidence supports the fact that AIs have turned into one of the fundamental facilitating technologies and transformed the logic of functioning of the global industry.

AI in the operations are used to optimize supply chain decisions with automated product selection, facilitate omnichannel models, increase customer experience with

VR applications, and boost the supply chain transparency. It has been applied in marketing to provide personalized interaction with users dynamically through user profiling, at scale through AIGC, and optimization of strategies based on the data.

Such innovations are pointers that cross-border e-commerce is becoming smart and part of an immersive environment. The adoption of AI and blockchain can also increase the level of consumer trust, but the problems of data security, adherency to regulations, and the ethical use of AI persist.

The research concludes that those organizations that will achieve success in the long run are the ones that will approach AI as a strategic initiative. The enterprises must not only utilize these technologies to reduce expenditures and increase short term sales, but also develop sustainable and trusted brands and co-create value with the global consumers. The move to the intelligent global partners as opposed to the digital intermediaries is a major strategic challenge and opportunities of the digital economy.

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