Proceedings of ICMRED 2026 Symposium: The Future of Work: Strategy, Workforce Transformation, and Organizational Renewal
DOI: 10.54254/2754-1169/2026.LD31608

The Elasticity Optimization of Cross-border E-commerce Supply Chain: A Case Study Based on JD.com

Siyu Li[1], Fan Xiong[2*]

[1]*College of Economics and Management, Tianjin University of Science and Technology, Tianjin, China*

[2]*SILC Business School, Shanghai University, Shanghai, China*

**Corresponding Author. Email: Fan.Xiong@student.uts.edu.au*

Abstract. Under the backdrop of the corss-border e-commerce becoming a new motivation of the foreign trade growth, in order to save the issue of insufficient supply chain flexibility, the bottlenecks of the operational efficiency, and digital of JD's com's cross-border e-commerce sector, this study conducts a systematic case analysis of JD .com's cross-border e-commerce supply chain was based on supply chain resilience and the development of bottlenecks. This research sorts out the supply chain resilience advantages of JD.com, the layout of the "bonded warehouse + oversea warehouse" and the disadvantages of insufficient warehouse coverage, inaccurate risk prediction and insufficient data sharing. The paper deeply analyze the core causes of the lagged supply chain efficiency response, weak risk resistance resilience, and the problem of compatibility between technology and mode. The study finds that the insufficient cooperation between technology and processes, the lack of ecological resource integration, and the lag in organizational design are the root causes of the problems. Beside, this study indicate the optimization mechanism of supply chain resilience for cross-border e-commerce, and provides practical references for JD.com and similar companies to improve supply chain resilience through AI integration, ecological cooperation, and organizational adaptation.

Keywords: Cross-border E-commerce, supply chain resilience, JD'com, AI technology, digital transformation.

1. Introduction

In recent years, cross-border e-commerce has developed rapidly by leveraging the advantages of digitalization and globalization, becoming the core driving force for global foreign trade growth. The rapid growth of its transaction volume has opened up low-cost overseas channels for small and medium-sized enterprises, optimized the allocation of global trade resources, and promoted the coordinated upgrading of supporting industries such as logistics, payment, and warehousing. However, cross-border e-commerce also faces multiple risks, including at the international level, policy fluctuations caused by trade protectionism, disruptions in logistics due to geopolitical conflicts, and paralysis of supply chain nodes due to extreme weather, among other external interference factors. At the industry level, problems such as unstable cross-border logistics

DOI: 10.54254/2754-1169/2026.LD31608

timeliness, tight overseas warehouse resources, and scattered supplier management are prominent. The COVID-19 pandemic has further exposed the insufficient resilience of the global supply chain against shocks.

As the leading cross-border e-commerce company in China, JD.com has built a smart supply chain system supported by artificial intelligence, big data and the Internet of Things, achieving partial intelligence in order processing, logistics distribution and other links. However, the construction of supply chain flexibility is still restricted. From an external perspective, its cross-border business covers many countries around the world, and it needs to deal with policy changes in different markets, logistics barriers and natural disturbances. Internally, the uneven coverage of overseas warehousing areas, the scarcity of resources in some emerging markets, the single supply sources of core category suppliers with no alternative solutions, and the high risk of product delays all increase the potential risks of supply chain disruptions.

Existing research on supply chain resilience mainly focuses on traditional manufacturing or general e-commerce fields, while systematic case studies on cross-border e-commerce scenarios are scarce. This study takes JD's cross-border e-commerce as a case, combines literature analysis, industry data sorting and enterprise operation practice tracking, and uses the "redundancy - flexibility - collaboration" ternary perspective of supply chain resilience and the application logic of smart supply chain technology to explore the internal mechanism of supply chain elasticity optimization. The research objective is to verify the effective paths for optimizing the resilience of cross-border e-commerce supply chains, break down the barriers between theory and practice, enrich the scenario-based research results on supply chain resilience, and provide practical references for other cross-border e-commerce enterprises to enhance their risk resistance capabilities.

2. Layout, advantages and bottlenecks of JD.com's cross-border supply chain

2.1. Layout scope and operation mode

JD.com's cross-border e-commerce business's core business carriers is JD Worldwide and JD International, which covers more than 200 countries and regions. It mainly focused on high-quality product such as 3C electronics, household appliances, and beauty products, forming competitive differences and owning its own competitive advantages [1]. The aspects of supply chain infrastructure construction, JD.com draws on the multi-node warehousing and dedicated line transportation solutions in global supply chain network design, as well as the integer programming idea of freight hub integration, thus developing its own supply chain system featuring "bonded warehouses + overseas warehouses" coupled with cross-border dedicated line transportation [1]. At present, JD.com has established over 130 warehousing nodes in 23 countries, which pairing with multiple cross-border dedicated transportation routes, constructing a supply chain system from overseas production areas to domestic consumers, and achieving the efficient circulation of cross-border commodities. In addition, JD.com's platform adopts an operation mode combining self-operation and semi-hosting. The self-operated business mainly ensures quality control and delivery efficiency of core product categories, and the semi-hosting model expands category coverage by empowering high-quality merchants, enabling flexible responses to fluctuations in market demand [2].

DOI: 10.54254/2754-1169/2026.LD31608

2.2. Resilience advantages and core competitiveness of the existing supply chain

The advantages of JD.com's cross-border supply chain are reflected in multi-dimensional collaborative cooperation [3]. The aspects of inventory reserves, the large-scale overseas warehousing layout and multi-route transportation network create sufficient logistics redundancy. Even facing the confronted with emergencies like local logistics disruptions, the continuity and accuracy of on-time delivery can be guaranteed through route switching and warehouse deployment [1]. Meanwhile, in terms of flexibility and agility, JD.com's platform through advanced analytics technologies as the core driving force of its cross-border supply chain. It integrates cutting-edge technologies such as big data, artificial intelligence, machine learning, and operations research optimization to conduct in-depth improvements on all links of the supply chain. JD.com applies advanced analytics technologies to analyze massive order data, optimize supply chain processes, improve operational efficiency, and enhance the flexibility, agility, and risk resistance of the supply chain. In addition, JD.com promotes the sustainable development of the entire supply chain ecosystem by sharing its research findings, data, and supply chain capabilities with partners [2]. In terms of adaptability, JD.com's cross-border supply chain faced with the issue of tariff policy adjustments. It needs to adjust and respond to policy changes such as tariffs and trade agreements through supply chain design, and optimize production layout and product processes by utilizing trade rules to reduce the impact of policy fluctuations on JD Logistics [1]. The aspects of cooperation capabilities, JD.com has established deeply collaborative relationships with high-quality global suppliers, customs authorities of various countries, and international logistics providers, which can simplify supply chain links and shorten the commodity circulation cycle. JD.com's core competitiveness lies in its long-standing commitment to delivery services and a rigorous genuine product traceability system. The sharp surge in JD.com's orders in 2025 is a recognition and endorsement of its supply chain system.

2.3. Problems and development bottlenecks of the existing supply chain

Despite the significant advantages of JD.com's current supply chain, there are still some issues that need to be saved. Firstly, JD.com's overseas warehousing layout is not comprehensive enough. Insufficient coverage in some remote areas and emerging markets directly leads to longer delivery times for users, which undermines JD.com's service experience [1]. Secondly, the over-concentration of core commodity suppliers which resulted in insufficient risk resistance capacity, an incomplete range of product categories, and reduced revenue. In addition, in the customs clearance process, the application of digital transformation is inadequate, and some procedures rely on traditional manual operations, which lead to inconsistent customs clearance efficiency and even occasional cargo detention, thereby affecting the overall fulfillment cycle [4]. Finally, there are problems and bottlenecks in risk management and logistics optimization. At present, the existing risk early-warning systems insufficient predictive capabilities for external uncertainties, such as international logistics fluctuations, geographical factors, weather conditions, and policy changes, these caused it impossible to take preventive measures in advance. This places extremely high demands on the supply chain's adaptability. Moreover, there is still room for optimization in the traffic distribution of some warehousing nodes and logistics route planning [3]. These problems not only restrict the further market expansion of JD.com's cross-border e-commerce business, but also reduce the long-term stability of JD.com's cross-border supply chain.

DOI: 10.54254/2754-1169/2026.LD31608

3. Core challenges and deep-seated problems faced by supply chain management

The linear operation process and experience-driven decision-making model of the traditional supply chain are the core problems that restrict its efficiency improvement and response speed optimization. These issues run through the entire chain from demand forecasting, inventory allocation to logistics operations. The core contradiction lies in the insufficient deep adaptation between technology and supply chain operation, which makes the traditional model unable to cope with dynamic and collaborative demands in complex market environments.

At the levels of demand forecasting and resource allocation, traditional supply chains lacking the integration of technologies such as artificial intelligence have significant shortcomings. Pan et al.'s research using JD Logistics as a case pointed out that the accuracy of demand forecasting without integrating AI technology was low, and the planning of warehouses and transportation routes showed rigidity, ultimately leading to the dilemma of both inventory shortages and surpluses [5]. Wu et al. found in the research on the location selection of e-commerce logistics hubs that the traditional supply chain hub layout lacked the support of machine learning algorithms and was difficult to achieve the optimal allocation of cross-regional logistics resources, directly resulting in a significant decline in cross-regional logistics efficiency [6].

The delay in information transmission and insufficient coordination among various links further exacerbated the efficiency loss of the supply chain. The root cause of this problem lies in the disconnection between technology application and process adaptation. Gardner et al.'s empirical study of 262 American hospitals confirmed that when technology and processes did not achieve deep adaptation, the operational redundancy of the supply chain would significantly increase [4]. Only by combining high IT adoption rates with prudent technology application could the performance of the supply chain's time-sensitive sensitivity show a significant positive correlation (path coefficient 0.151, $p = 0.051$). Duana's research on JD also showed that even if enterprises introduced intelligent warehousing equipment, due to poor data quality and an imperfect management system, there were still problems of poor information transmission between upstream and downstream, ultimately affecting the logistics delivery efficiency in some regions [7]. These studies collectively indicate that if the application of technology lacks supporting process optimization and data management, it is difficult to achieve its value, and instead, it will exacerbate the coordination barriers in each link of the supply chain.

3.1. Insufficient supply chain resilience and weak ability to cope with uncertainties

3.1.1. Essence of the problem

The supply chain risk resistance system has structural flaws and is unable to withstand external shocks such as natural disasters, policy changes, and geopolitical conflicts. Under sudden disturbances, it is prone to node paralysis and process interruption, and cannot quickly resume normal operations.

3.1.2. Causes

From an external perspective, the deepening of global division of labor has increased the dependence of supply chain nodes. Any disturbance in any link may trigger a "domino effect". Extreme weather, trade protectionism, and changes in regional policies have led to a significant increase in the frequency and intensity of external shocks [2].

DOI: 10.54254/2754-1169/2026.LD31608

From the perspective of internal capabilities, the risk perception and prediction capabilities are insufficient. Han et al.'s empirical research shows that enterprises that have not deployed artificial intelligence technology lack real-time risk monitoring and early warning systems [3]. The capacity for resource reallocation and substitution is lacking. The traditional centralized layout and single sourcing model make it difficult to quickly switch supply channels. The data fragmentation of Duana leads to a significant lag in supply chain disruption warnings. The absence of an ecological collaboration mechanism [6]. Daymond et al. pointed out that there is a lack of resource integration and risk-sharing mechanisms among supply chain entities, and they respond in isolation when shocks occur [2].

3.1.3. Risk impact

Insufficient supply chain resilience can lead to short-term operational disruptions, economic losses and damage to long-term competitiveness. Han et al. data shows that enterprises that have not deployed artificial intelligence technology have an average supply chain recovery period of 28 days after natural disasters, which is 47% longer than that of enterprises empowered by artificial intelligence (based on the 19-day recovery period of AI-empowered enterprises), and the revenue loss accounts for 8% to 12% of the annual total revenue [3]. Jd.com restored supply within 15 days through artificial intelligence risk early warning and resource reallocation, and controlled revenue loss within 3% [3,8].

The impact of changes in domestic lockdown policies was also significant. During the COVID-19 pandemic, Duana mentioned that in some regions of JD.com, data fragmentation affected material allocation, and later achieved stable supply of key materials through ecological collaboration [7,8].

3.2. Challenges of technology integration and model adaptation in digital transformation

The digital transformation of enterprise supply chains is confronted with the dual challenges of superficial application of technology and insufficient adaptability of models, which leads to a disconnection between transformation investment and actual results.

The problem of superficial application of technology is prominent. Duana found that the blockchain traceability system and drone delivery equipment of some business lines of JD.com lack connection with core processes such as inventory management and order processing, and the technological investment has not been transformed into actual efficiency improvement [7]. Hu et al. confirmed that the data analysis of most enterprises still remains at the descriptive level and is difficult to be effectively transformed into actionable decisions [9].

Insufficient adaptability of the model further restricts the effectiveness of the transformation. The research indicates that the dual constraints of external policy uncertainty and the lack of internal organizational design lead to a significantly lower efficiency of new technology implementation in small and medium-sized enterprises compared to large enterprises [10]. The research shows that the institutional distance among supply chain partners leads to inconsistent application standards of digital tools, making it difficult to form a synergy effect [11].

The imbalance between regional layout and digital technology adaptation has exacerbated the predicament. Cohen and Lee indicated that the global production and warehousing layout of some enterprises, due to the failure to effectively integrate digital technologies, is difficult to achieve cross-regional resource coordination, and the advantages of supply chain flexibility have not been fully exerted [1]. The machine learning optimization scheme proposed by Wu et al. has its effect compromised due to the lack of adaptation to regional policies and logistics infrastructure [6]. Mansouri et al. found that integer programming models need to be deeply integrated with regional logistics resources and customs policies; otherwise, it is difficult to achieve the expected integration effect [12].

These problems have led the digital transformation of the supply chain into a predicament of "high input and low output", failing to be effectively transformed into core competitiveness. Instead, it has increased operational complexity and cost burden.

4. Suggestions

4.1. Deepening the integration and application of supply chain and AI technology

4.1.1. Application of AI technology in supply chain risk prediction

AI can help enterprises resist external shocks such as natural disasters by improving the production flexibility of the labor force, optimize supply chain coordination, and enhance supply chain resilience. In addition, AI can play a role in cognitive tasks and supply chain management, accurately predict supply chain disruption risks (such as the impact of raw material arrival delays), and formulate response plans in advance [3].

4.1.2. Application of AI in inventory optimization

Through an intelligent inventory allocation system and the application of operations research optimization algorithms, dynamic inventory allocation across global warehousing nodes can be realized, achieving the goal of "stocking goods nearby and transferring inventory across warehouses" and reducing the risks of stock outs and overstocking [9].

4.1.3. AI for site selection of e-commerce supply chain traffic hubs

Machine learning-driven location model for traffic hubs is proposed. Through data analysis, the distribution of warehousing nodes and traffic allocation are optimized to improve the operational efficiency of the supply chain network, providing corresponding technical support for the layout of "bonded warehouses + overseas warehouses" and the planning of dedicated logistics lines for cross-border e-commerce [7].

4.2. Optimizing cross-border warehousing layout and logistics routes

For warehousing optimization, the multi-node warehousing and dedicated line transportation mode can be adopted. Warehousing site selection should be carried out in combination with the optimization of trade agreements and tariff policies, promoting the nearby layout of suppliers, support just-in-time (JIT) production, and reduce cross-border logistics costs [1]. By applying machine learning-based demand forecasting models, the inventory allocation of cross-border warehouses can be optimized by region and category, realizing "stocking goods nearby and transferring inventory across warehouses" to match the demand intensity of different markets [9].

For logistics routes, alternative logistics routes can be developed by leveraging infrastructure investments (such as the "Belt and Road" railways) to avoid the long cycle and risks of traditional maritime transportation. Through product modularization and disassembly, the tariff costs of

DOI: 10.54254/2754-1169/2026.LD31608

finished products can be reduced and the efficiency of cross-border logistics routes can be optimized [1].

4.3. Constructing a cross-border supply chain ecosystem collaboration and resource coexistence mechanism

4.3.1. Facility collaboration to enhance information flow

Attempting to build a four-in-one cross-border infrastructure network integrating "land, sea, air, and cyberspace", which integrates logistics channels such as railways, shipping, highways, and aviation. Meanwhile, the construction of new digital infrastructure such as 5G, industrial internet, and cross-border payment systems should be strengthened to realize the flow of personnel, goods, information, and data [4].

4.3.2. Technology collaboration to achieve information sharing

A cross-border supply chain visualization platform can be built by using technologies such as the Internet of Things IOT, big data, and AI to solve the problem of information asymmetry. For example, the IOT can monitor the transportation status of cross-border goods in real time, improving logistics transparency [9].

4.3.3. Sharing logistics and warehousing resources to reduce costs

Integrate logistics methods such as shipping and air transportation to provide "end-to-end logistics solutions"; dynamically allocate inventory (overseas warehouses, bonded warehouses, domestic warehouses) based on big data analysis to achieve "stocking goods nearby and transferring inventory across warehouses" [6]. Logistics resources can be operated in a collaborative manner, promoting joint transportation and shared warehousing among logistics enterprises to share transportation and warehousing costs; a logistics information sharing mechanism was established to track the status of goods in real time and optimize logistics routes [9].

4.4. Improving the operation mode of digital transformation

The operation mode of digital transformation should cover the whole process of "making strategic objectives—reconstructing businesses—laying a solid technical foundation—allocating resources—ensuring governance—iterating and implementing", avoiding technology stacking or superficial transformation and ensure that digitalization penetrates the entire supply chain [4]. The digital operation mode needs to go beyond the goal of "cost reduction and efficiency improvement", continuously explore new value growth points, and build a sustainable profit model [12].

5. Conclusion

This study takes the cross-border e-commerce supply chain of JD as the research object. Based on the perspective of supply chain resilience, combined with the "redundancy - flexibility - collaboration" triadic framework and the application logic of intelligent supply chain technology, it explores the elastic optimization path. The research findings show that JD has formed core advantages such as a combination of bonded warehouses and overseas warehouses, multi-dimensional collaborative cooperation, and technology empowerment, and has built a cross-border

DOI: 10.54254/2754-1169/2026.LD31608

supply chain system covering more than 200 countries and regions. However, it still faces problems such as incomplete coverage of overseas warehouses, excessive concentration of core suppliers, insufficient digital application of customs clearance, and weak risk prediction capabilities. The root causes of these problems lie in insufficient coordination of technology and processes, insufficient integration of ecosystem resources, and lagging organizational design, which in turn lead to low supply chain response efficiency and weak resilience to uncertainty. In response to these problems, this study proposes four optimization suggestions, including deepening the integration application of AI technology in risk prediction, inventory optimization, and hub location selection, optimizing the cross-border warehouse layout and logistics routes, leveraging multiple infrastructure to expand alternative channels, and building a four-in-one supply chain ecological collaborative mechanism of "land, sea, air, and network", strengthening resource sharing and information communication.

From a theoretical perspective, this study fills the gap in systematic case studies of supply chain resilience in the cross-border e-commerce scenario and enriches the scenario-based research results of supply chain resilience. Practically, it provides an operational reference solution for JD and similar cross-border e-commerce enterprises to enhance their supply chain's ability to resist risks and cope with global market fluctuations. This study has certain limitations, focusing only on the single case of JD, and the generalizability of the research conclusions needs to be further verified. In the future, the sample range can be expanded to include small and medium-sized cross-border e-commerce platforms, and in-depth exploration can be conducted on the impact of regional policy differences and emerging technologies such as blockchain on the optimization of supply chain resilience, to enhance the comprehensiveness and applicability of the research conclusions.

Authors contribution

All the authors contributed equally and their names were listed in alphabetical order.

References

[1] Cohen, M. A., & Lee, H. L. (2019). Designing the right global supply chain network. Journal of Manufacturing and Operations Management, 31(2), 81-104.

[2] Daymond, J., Maguire, S., Knight, E., & Rumyantseva, M. (2022). Managing ecosystem emergence and evolution: Strategies for ecosystem architects. Strategic Management Journal, 44(1), 1-27.

[3] Han, M., Shen, H., Wu, J., & Zhang, X. (2024). Artificial intelligence and firm resilience: Evidence from firm performance under natural disaster shocks. Information Systems Research, 35(1), 293-316.

[4] Gardner, J. W., Boyer, K. K., & Ward, P. T. (2017). Achieving time-sensitive organizational performance through mindful use of technologies and routines. Organization Science, 28(3), 540-558.

[5] Pan, Y., Wang, X., & Ye, Q. (2024). Enhancing supply chain management through artificial intelligence: A case study of JD Logistics. Proceedings of Innovative Strategies in Microeconomic Business Management - ICEMGD 2024, 109, 116-121.

[6] Wu, T., Chen, W., Cordeau, J.-F., & Jans, R. (2025). Machine learning-empowered Benders decomposition for flow hub location in e-commerce. INFORMS Journal on Computing.

[7] Duana, Z. (2024). Research on the supply chain optimization approach of JD's transformation into a digital ecosystem retailer. Proceedings of the 3rd International Conference on Financial Technology and Business Analysis, 138, 187-194.

[8] Shen, Z. M., & Sun, Y. (2023). Strengthening supply chain resilience during COVID-19: A case study of JD.com. Journal of Operations Management, 69(3), 359–383.

[9] Hu, H., Qi, Y., Lee, H. L., Shen, Z. J., Liu, C., Zhu, W., & Kang, N. (2024). Supercharged by advanced analytics: JD.com attains agility, resilience, and shared value across its supply chain. INFORMS Journal on Applied Analytics, 54(1), 54-70.

[10] Bucheli, M., Ciravegna, L., & Sáenz, L. F. (2023). The octopus that shrank: A historical analysis of how multinationals address policy and contractual uncertainty in a global value chain. Strategic Management Journal,

DOI: 10.54254/2754-1169/2026.LD31608

44(13), 3289–3323.

[11] Dong, M. C., Fang, Y., & Straub, D. W. (2017). The impact of institutional distance on the joint performance of collaborating firms: The role of adaptive interorganizational systems. Information Systems Research, 28(2), 309–331.

[12] Mansouri, B., Abdallah, R., Tamvada, S., Hassini, E., Bellino, B., & Khelil, K. (2025). Freight gateway consolidation for Purolator International using integer programming. INFORMS Journal on Applied Analytics, 55(3), 263-278.