



# Research on the Optimization of E-commerce Logistics Model with User Interest Tracking: A Case Study of Japan

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**Abstract.** The common e-commerce logistics mode is analyzed by SWOT analysis, including self-built logistics system mode, sharing logistics system mode with traditional business, outsourcing to third-party logistics mode, and logistics alliance mode which appears relatively late. This paper mainly analyzes the advantages and disadvantages of these four modes, and briefly analyzes the opportunities and threats faced by each mode. Secondly, the evaluation index of logistics mode selection is studied. Based on the idea of balanced scoring method, this paper analyzes and judges the logistics infrastructure, logistics service ability and logistics operation ability from multiple perspectives, and determines the index of logistics mode selection. Finally, the index weight is determined by fuzzy evaluation method and AHP.

**Keywords:** Traceability · User interest · E-commerce · Business logistics

## 1 Introduction

E-commerce is an indispensable means of modern computer processing. It is a new way of data information processing. It combines e-commerce with logistics and manages each other. It can greatly improve the efficiency of logistics services, meet the market demand of higher requirements, and also meet the needs of consumers [1]. In the process of entering the new social development of knowledge economy in the twenty-first century, it is necessary to improve the level of cross-border logistics management, and become the key plan for colleagues to implement. The cross-border e-commerce is closely related to the logistics industry in the designated economic circulation zone, and the two of them influence each other and cannot be separated. Based on the background of e-commerce development, this paper introduces the economic development status of logistics industry to professionals, and introduces some current trends of cross-border e-commerce logistics industry in Japan, providing basis for the future mainstream development of society [2].

In the mainstream B2C e-commerce model at this stage, logistics has become the key to competition [3]. However, the development of Japanese logistics industry is lagging behind, the logistics capacity is insufficient, the service level is not high, and the

degree of informatization is low. There is a big gap between the logistics requirements of e-commerce. By analyzing Japan's existing e-commerce logistics model, e-commerce companies can better understand the advantages and problems of various logistics models, and they can be scientific and reasonable when choosing logistics models, and use lower costs. Provide better service to customers.

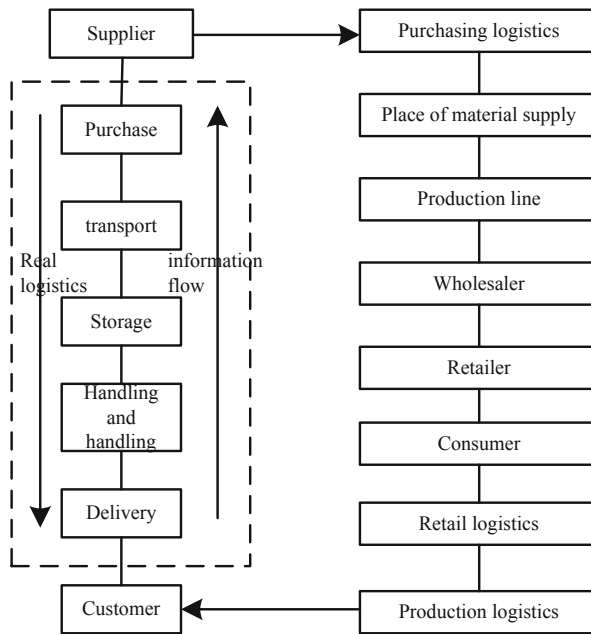
## **2 Investigation on the Development of E-Commerce Logistics in Japan**

Japan is an island country with long and narrow land. In 1950's development strategy, Japan put forward the idea of developing logistics and "maritime power", which is committed to developing a fast controlled and flexible logistics model. The Japanese government attaches great importance to the modernization of the transportation industry. At the same time, the storage is always regarded as the central link of the logistics [4]. It has supervised the establishment of a large-scale storage group, which has become the center of the logistics in Japan. In the process of economic recovery, Japan attaches great importance to learning the advanced skills and governance experience of the United States [5]. They inspected the transportation status of American factories, and formally introduced the concept of "logistics" into Japan after knowing the status of the overall factory plan and handling skills related to the transportation in the factory, such as the handling equipment, handling methods, stacking methods of inventory materials, etc. At the same time, with the strong support of Japan's economic development and the promotion of logistics demand, the application of logistics technology has received widespread attention. In addition, Japan also attaches great importance to the study and organization of logistics management [6]. Therefore, after entering the 1970s, Japan has been in the forefront of the world in the exploration of logistics skills and governance. Since the general development of e-commerce, Japan's good logistics foundation has formed strong support for its e-commerce business. The development of many large Japanese e-commerce companies is closely related to their good logistics foundation.

Compared with the traditional retail price, e-commerce has advantages. Most consumers are attracted by the high discount rate of e-commerce and choose to shop online. Therefore, e-commerce enterprises must complete the economic layout of logistics: on the one hand, reduce the circulation cost as far as possible, so that the total cost of online shopping is lower than the cost of shopping in stores, to attract consumers to patronize; On the other hand, it adds value to the distribution [7]. E-commerce logistics still has some problems, such as receiving goods, querying, returning goods and so on. There are two satisfactory ways to deliver the goods that consumers need: one is to send the goods to designated places, such as chain stores and other similar places. In Japan, goods are usually delivered to nearby convenience stores. The other is to send the goods to the user's mailbox or the unit and home [8]. This is the most convenient way for consumers to distribute, and it is also a common way adopted by many developed countries at present. E-commerce is usually delivered at a designated place, and the convenience of consumers to pick up goods is limited.

One of the characteristics of C2C mode of e-commerce is the "scatter" of "C". Not only are goods and consumers scattered, but also suppliers. Because for individual consumers, generally only one product needs to be mailed [9]. Even some small batches

of goods will be delivered to different destinations. Therefore, compared with the traditional business model, there is a huge waste in goods packaging and transportation. Logistics refers to the use of modern information technology and equipment, the goods from the place of supply to the place of receipt of accurate, timely, safe, quality and quantity, door-to-door reasonable service mode and advanced service process [10]. Logistics appears with the emergence of commodity production and develops with the development of commodity production, so logistics is an ancient traditional economic activity. Modern logistics refers to a new type of integrated management activity that integrates information, transportation, storage, inventory, loading and unloading, and packaging. Its task is to reduce the total cost of logistics as much as possible and provide the best service for customers [11]. Many Japanese experts and scholars believe that “modern” logistics is a process of transferring logistics from the supply place to the demand place with the most economic cost according to the needs of customers. It mainly includes transportation, storage, processing, packaging, loading and unloading, distribution and information processing. The basic activities included are shown in the figure.



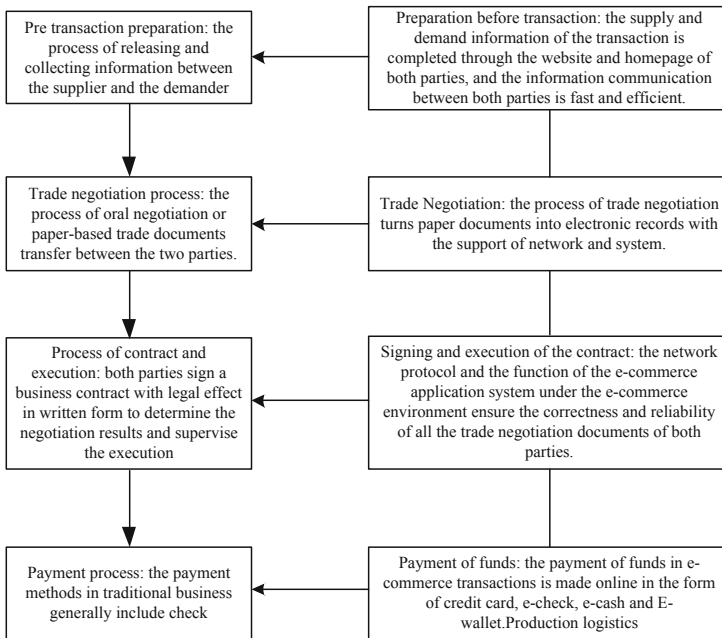
**Fig. 1.** Schematic diagram of e-commerce logistics

Through a large number of literature retrieval and analysis of retail e-commerce and logistics, on the basis of previous studies, this paper analyzes and studies the current logistics mode in Japan, and explores the selection of logistics distribution mode of retail e-commerce [12]. Firstly, the research scope of e-commerce logistics is defined. This paper analyzes the mode and advantages and disadvantages of e-commerce logistics in Japan, puts forward the evaluation method of e-commerce logistics mode selection, and finally puts forward the development suggestions for our country’s e-commerce

logistics. In the era of electronic service, the way of online business has changed a lot [13]. The traditional way is to find customers from the products, while the e-commerce business mode is to create different services to attract customers. After gathering a group of customers, we can develop the market from inside, see what the customers need, find sales opportunities here, and finally sell the products customers need. This process can be divided into the following three parts according to the internal management activities of the organization:

1. Transaction flow: refers to all documents and practical operation process of trade agreement.
2. Logistics: refers to the flow process of goods.
3. Capital flow: the flow of capital units (including banks) in a transaction.

Optimize the operation process of e-commerce logistics management, as shown in the figure:



**Fig. 2.** E-commerce logistics management process

In the process of e-commerce transaction, although the operation process of business practice is also divided into pre-transaction preparation, trade negotiation, contract signing and execution, capital payment and other links, the force and method used in the specific operation of the transaction is totally different from the traditional business force [14]. Compared with the traditional business model, e-commerce model has the following advantages:

- (1) Reduce transaction cost, transaction preparation time and negotiation time;
- (2) Can reduce enterprise inventory. Through the Internet market demand information can be transmitted among enterprises faster, so that the production enterprises can make faster decision-making and production, as well as timely supply of suppliers, so as to achieve the goal of reducing inventory.
- (3) Shorten the production cycle. E-commerce has changed the past self trust and closed phased cooperation mode into collaborative cooperation of information sharing, reducing the waiting time due to information closure.
- (4) Increased labor productivity. The cooperation between suppliers and distributors can automatically process the workflow through the network, which improves the efficiency.
- (5) Increase business opportunities and expand market scope. Online business can be carried out to traditional marketers and one! Advertising promotion can not reach the market scope, not limited by time and space.
- (6) Provide personalized service for customers. Customers can customize business, enterprises can provide recommendations, and provide customers with personalized information services.

### **3 E-commerce Logistics User Interest Tracking Model Optimization**

Completely independent logistics operation mode refers to the establishment of e-commerce enterprises' own logistics system in order to meet their own logistics needs. E-commerce enterprises invest in purchasing logistics facilities and equipment and allocating logistics services [15]. The independent organization manages the logistics business and selects the specific logistics operation and management methods. For the purpose of winning in the fierce e-commerce competition, many large websites in Japan try to use a third-party logistics mode, and then start to try the self-supporting logistics mode [16]. This is because most of the existing third-party logistics enterprises in Japan are unable to meet the needs of e-commerce in terms of internal management, information level and network level. Many large electronic enterprises have to start to build their own logistics system to strengthen their competitiveness [17]. Although self-built logistics needs sufficient funds as support, in order to gain competitive advantage, self-built logistics has become the first choice of many e-commerce websites. Based on this, users' interest information is tracked and recorded as follows:

As a new business model, e-commerce is the result of the development and application of Internet [18]. However, as a business activity, e-commerce transaction is inextricably linked with traditional transaction. Even in essence, there is no difference between e-commerce and traditional commerce. Through the realization of product sales, we can create profits for enterprises and create value for customers. Only in the way of transaction, the Internet as a medium for communication inquiry negotiations and other content. Therefore, e-commerce enterprises can also use the traditional commercial logistics system to carry out their own e-commerce logistics business [19]. While many shopping malls invest hundreds of millions of funds to expand their logistics systems, many large-scale e-commerce platforms are also actively following up and making efforts in

logistics. According to the customer requirements, the scheduling objectives include the completion time to meet the customer delivery time and the supplier resource yield. The specific calculation formula is as follows:

**Table 1.** User interest information of logistics distribution

	Traditional logistics	Electronic logistics
Business drivers	Material wealth	IT Technology
Scope of service	Logistics services (transportation, storage, packaging, loading and unloading, distribution, etc.)	Comprehensive logistics services, while providing a wider range of business, such as online front-end services
Means of communication	Fax, telephone, etc	Massive application of Internet and EDI technology
Storage	Concentrated distribution	Distributed and distributed centers are closer to customers
Packing	Batch packaging	Individual package, small package
Transport frequency	Low	High
Delivery speed	Slow	Fast
Delivery speed	Slow	Fast
Order	Less	Many

$$\begin{cases} \text{MAX} \sum_{g=1}^m z_g t_g^r, g = 1, 2, \dots, m \\ t_g^r \subseteq |t_{m+1} - t_0| \end{cases} \quad (1)$$

Where  $z_g$  represents the delivery deadline of the scheduling task;  $t_g^r$  represents the start time of the scheduling task;  $g$  represents the end time of the scheduling task;  $t_0$  represents the end time of the task;  $t_{m+1}$  represents the appointment time of the task on the resource. The specific algorithm is as follows:

$$\begin{cases} \text{MIN} |q_n - q_f| \\ n, f = 1, 2, \dots, m \\ n \neq f \end{cases} \quad (2)$$

In the formula:  $f$  represents the unit revenue coefficient of resource  $n$  when executing the scheduling task;  $q_n$  represents the execution time of scheduling task  $m$ ; e-commerce logistics requires that the logistics supply subject provide the required comprehensive logistics services to the internal logistics demand subject by effectively and reasonably organizing and using various resources within its logistics system in a certain period

of time. In order to measure and compare the capabilities of different logistics systems scientifically and objectively, this paper uses the idea of balanced scoring method for reference, and constructs the evaluation index system of e-commerce logistics from four dimensions: logistics infrastructure support capability, information system support capability, operation management capability and logistics service capability, as shown in the table.

**Table 2.** Evaluation indexes of business logistics

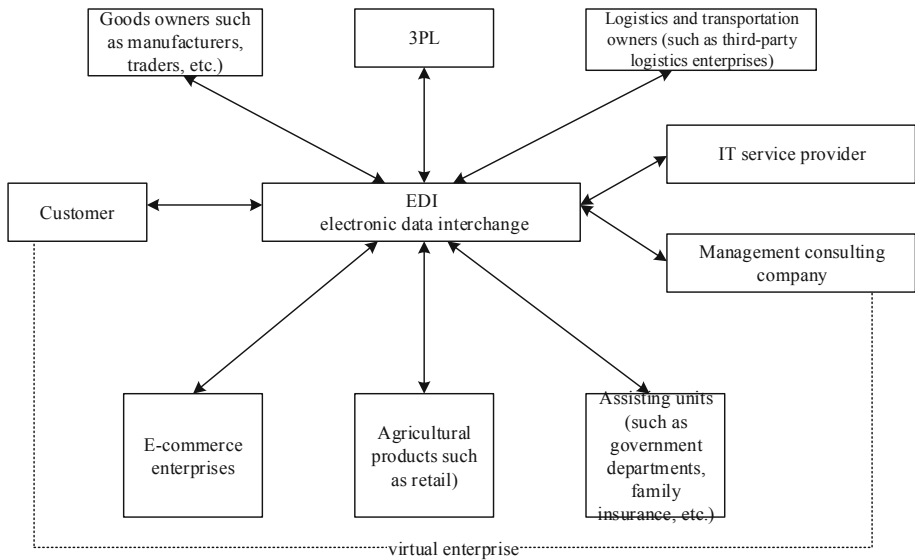
	Index category	Index explanation	Index name and code
E-commerce logistics index evaluation system	Logistics infrastructure support capacity	It reflects the basic ability of logistics service of the supplier	Utilization rate of storage equipment Utilization rate of transportation equipment Popularization rate of information equipment dot density Utilization rate of logistics infrastructure Per capita freight volume
	Information system capability	Reflect the application ability of modern information technology	Support capability of credit system Direct economic benefit evaluation Indirect economic benefit evaluation
	Operation and management capability	Reflect the operation ability of logistics management	Ratio of professional and technical personnel Logistics cost and profit rate Training cost per employee Market share
	Logistics service capacity	It reflects the demand of the demand side for the response ability of the supply side	Order response time Delivery delay rate Damage rate Delivery flexibility Delivery error rate Customer satisfaction

Further, starting from the logistics bottleneck problem in the development of e-commerce, this paper studies the effective method to solve the problem, which is to use modern information technology to realize the logistics electronation. On the basis of understanding the meaning and characteristics of e-Logistics, this paper analyzes the

current e-logistics mode and its development trend [20]. The emergence of e-commerce has changed the traditional business model and created value. The value source of e-commerce refers to the elements that can increase the total value created by e-commerce. The operation of e-commerce mainly includes four interrelated value sources: efficiency, complementarity, barrier and innovation. Based on the research of the value source of e-commerce, this paper describes the unique advantages of e-logistics system, including the realization of seamless links among systems, enterprises, capital flow, logistics and information flow, the realization of online tracking of goods sent out, and the real-time supervision and control of goods; Provide system integration service solutions for customers, combine the front-end service of customers with the back-end logistics business closely, evaluate the value of e-Logistics, analyze that e-logistics can not only realize the cost advantages of enterprises, but also meet the interests of consumers, so as to achieve win-win economic benefits, and finally put forward suggestions for the development and improvement of e-Logistics.

#### **4 Suggestions on the Optimization of E-commerce Logistics Mode**

Logistics information technology refers to the application of modern information technology in all aspects of logistics. It is one of the most important fields of logistics modernization, especially the application of rapid development of computer network technology makes logistics information technology reach a new level. Logistics information technology is an important symbol of logistics modernization, and also the fastest developing field in logistics technology. From the bar code system of data collection to the computer and Internet in the office automation system, all kinds of hardware and computer software such as terminal equipment are developing rapidly. At the same time, with the continuous development of logistics information technology, a series of new logistics concepts and new logistics management methods have emerged, which has promoted the reform of logistics. A complete logistics process includes the whole process of production of products by the manufacturer, transportation, storage, processing, distribution to users and consumers. It can be divided into the following aspects: first, the manufacturer packs the single products and concentrates multiple products in large packing boxes; second, through the transportation, wholesale and other bad links, larger packaging is usually needed in this link; finally, the products are circulated to consumers through the zero-sale link, and the products are usually restored to a single product in this link. People call the management of the above process supply chain logistics management. In the process of trade, the logistics process of goods from manufacturer to end-user is objective. For a long time, people have never taken the initiative, systematically and as a whole to consider, so they fail to play the overall advantages of the system. The supply chain logistics system is connected with many production enterprises, transportation industry, distribution industry and users, and changes with the change of demand and supply, so the system management must have enough flexibility and variability; The supply chain logistics system from production, distribution, sales to users is not an isolated behavior, but a link by link, mutual restriction and complementary. Therefore, it must be coordinated to play its maximum economic and social benefits. The EDI framework structure of e-commerce logistics is shown in Fig. 3.



**Fig. 3.** EDI framework structure of e-commerce logistics

Now let's look at an example of applying logistics EDI system. This model is a logistics model which is composed of goods sending owners, logistics transportation owners and goods receiving owners. The operation steps of this logistics model are as follows:

- (1) After receiving the order, the delivery owner shall make the delivery plan, and send the list and delivery schedule of the delivered goods to the logistics transportation owner and the receiving owner through EDI, so that the logistics transportation owner can make the vehicle deployment plan in advance and the receiving owner can make the goods acceptance plan.
- (2) According to the requirements of customer ordering and goods delivery plan, the owner of the goods shall issue the delivery order, sort and distribute the goods, print out the goods label of logistics barcode, and paste it on the goods packing box. Meanwhile, the owner of the goods shall send the type, quantity, packaging and other information of the goods to the owner of logistics transportation and receive the goods property allocation order through EDI.
- (3) When the owner of logistics transportation takes the goods from the owner of sending goods, the owner uses the on-board scanning readout to read the goods.

The logistics barcode of the label shall be checked with the previously received goods transportation data to confirm the delivery of goods.

- (4) The owner of logistics transportation shall sort out and pack the goods in the logistics center, make a delivery list and send the delivery information to the receiving owner through EDI. At the same time of goods delivery, the goods tracking management is carried out, and after the goods are delivered to the receiving owner, the delivery business information and freight request information are sent to the shipping owner through EDI.
- (5) When the goods arrive, the receiving owner shall read the logistics barcode of the goods label with the scanning readout instrument, check and confirm with the previously received goods transportation data, issue the receiving invoice and put the goods into storage. At the same time, EDI is used to send the receiving confirmation information to the logistics transportation owner and the goods delivery owner.

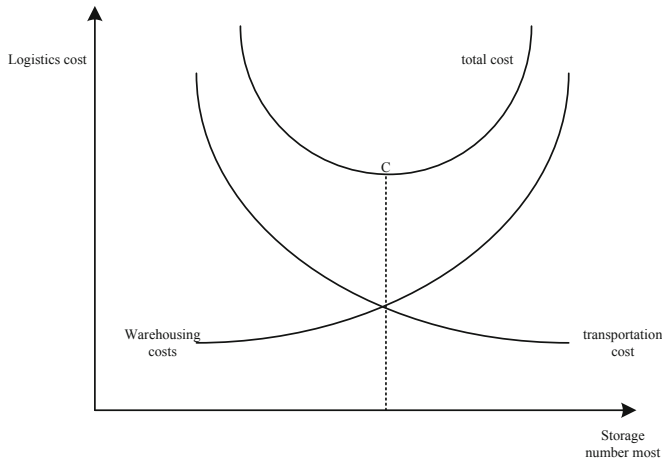
There are two main situations of self-supporting logistics in e-commerce enterprises: one is BtoB e-commerce website operated by traditional large-scale manufacturing enterprises or wholesale enterprises. Because it has established initial scale marketing network and logistics distribution system in its long-term traditional business, it can meet the logistics matching under the conditions of e-commerce only by improving and improving it Delivery requirements; Second, e-commerce companies with strong financial strength and large business scale can establish a smooth and efficient logistics system to meet business needs and provide comprehensive logistics services to other logistics service demanders (such as other e-commerce companies) when the third-party logistics cannot meet their cost control objectives and customer service requirements We should make full use of its logistics resources to achieve scale efficiency.

## 5 Empirical Analysis

In order to verify the effectiveness of the proposed e-commerce logistics model optimization research method, a verification experiment is carried out. The experimental data comes from the MySQL database, and the total amount of data is 10 GB. In the model of logistics cost, there is a law of two rate reverse, that is, there is a relationship between the items of logistics cost. The decrease of one item cost will lead to the increase of another item cost. Considering that transportation and warehousing are two main parts of logistics cost, we can use a simplified model to represent logistics cost, as shown in the figure.

C \* in the figure represents the lowest total cost. In consideration of reducing the number of warehouses, although the storage cost can be reduced, the transportation distance will become longer and the number of transportations will increase, resulting in the increase of transportation cost. If the increase of transportation cost exceeds the decrease of storage cost, the total logistics cost will increase instead, so the measures to reduce the number of warehouses is meaningless. When choosing and designing the logistics system, we must test the total cost of the system. Firstly, we should consider the strategic position of logistics in the enterprise, secondly, we should consider the ability level of logistics, finally, we should evaluate the total cost of logistics and choose the logistics system with the lowest cost. The third-party logistics has changed the traditional enterprise logistics mode, freed the enterprise from the shackles of “big and

all” and “small and all”, and enabled the enterprise to enhance its core competitiveness and maintain the advantages of market competition from the strategic height. However, any enterprise must consider its operation cost and opportunity cost when deciding. What is the economic value of 3PL operation. Let’s take inventory as an example to analyze 3PL’s economic value. For general production enterprises, inventory related cost is an important part of logistics cost, which consists of ordering cost and storage cost, and these two kinds of costs are also a kind of relationship between the two, as shown in the figure.



**Fig. 4.** Test results of simplified logistics cost model

In Fig. 5, represents the lowest inventory cost. According to the theory of consumer surplus value, we can know the relationship between total value B, price corpse and cost C. Under the condition of market economy, the demanders of logistics activities can automatically control the same kind of services with different prices and quality, and hope to obtain the maximum profit surplus (B-P). From the perspective of service providers, they should expand their profit space (P-C) as much as possible, and do not want the demanders to get more surplus. Therefore, under the effect of competition, the surplus of demander will become a constant, that is,  $B-P = s$  (constant). It has been proved that the most remarkable feature of using e-commerce and Internet technology to complete the coordination, control and management of the whole logistics process is the integration of various software technologies and logistics services. It can make seamless links among systems, enterprises, capital flow, logistics and information flow, and this link has the function of foresight at the same time. It can provide a transparent visibility function between upstream and downstream enterprises, and help enterprises to control and manage the inventory to the maximum extent.

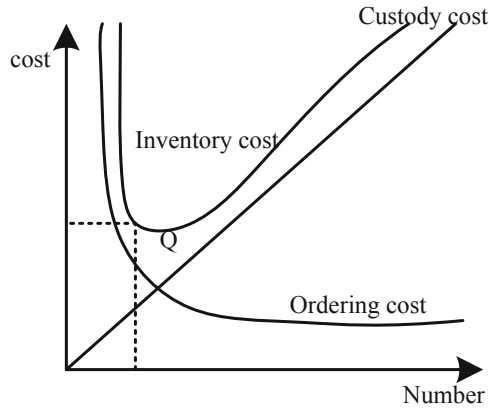


Fig. 5. Logistics trade cost test results

## 6 Conclusion

Due to the rapid development of e-commerce in recent years, logistics, which is the basis of tangible commodity business activities, has not only become an obstacle to e-commerce, but also a key factor for the smooth progress and development of e-commerce. How to establish an efficient and low-cost operation the logistics system to ensure the smooth development of e-commerce has become the focus of attention. This article is based on this situation to study the problem of electronic logistics in Japan. Through the development of electronic logistics, the organizational structure of the current logistics system can be reformed; through standardized and orderly electronic logistics procedures, logistics can enter a benign track that makes full use of existing resources, reduces logistics costs, and improves logistics operation efficiency. Therefore, the proposed optimization method can improve e-commerce logistics transportation performance in all aspects.

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