Research on The Application of Big Data in E-Commerce
Enterprise Supply Chain Cost Control

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Abstract. Big data technology obtains value information by collecting relevant data of e-commerce enterprises, strengthens the cost control of the enterprise supply chain, and adopts intelligent and digital analysis methods to enhance the core competitiveness of e-commerce enterprises. Based on the application of big data technology in e-commerce supply chain cost control, the paper analyses the current problems of e-commerce enterprise supply chain cost control, and proposes a solution to the problem by applying big data technology to reduce procurement costs.

Keywords: Big data, e-commerce, supply chain cost, cost control.

1. Introduction
With the continuous innovation of modern technology, big data technology is gradually improved and widely used in actual operations. In the cost control of the supply chain of small and medium e-commerce companies, scientific and effective cost control can effectively increase profits for small and medium e-commerce companies, and better enable them to develop scientifically and effectively. Nowadays, my country's small and medium-sized e-commerce companies are constantly developing and innovating following the development of society. In the profit of small and medium e-commerce, effective cost control of the supply chain can scientifically and effectively increase the profit of small and medium e-commerce. Therefore, in the continuous exploration and research of small and medium e-commerce, the scientific and reasonable use of big data technology can effectively control the cost at this stage, so that the technical innovation of small and medium e-commerce is sufficient for the development of my country's small and medium e-commerce [1]. Provides extremely favourable conditions, and at the same time, it also provides more development space for the development of big data technology. This article takes the application of big data technology in the supply chain cost control of small and medium e-commerce as an entry point, analyses the role of big data technology here, and provides references for the development of big data technology and the development of small and medium e-commerce.
2. Analysis of cost control issues

2.1. System lacks
Online purchase activities include consumers registering an account, setting a password, browsing. A large amount of consumer information is generated in each link, such as viewing goods and placing orders and payments. This information relates to the safety of users’ funds and needs to be guaranteed by e-commerce companies. However, the current level of information security protection of e-commerce companies is relatively low. There are no corresponding safeguards for information security, no access rights to data stored in cloud space, and no special network security supervision measures. Once the system is hacked or deliberately leaking user information from the inside for illegitimate benefits, users will lose their trust in the company, resulting in a large loss of customers.

The transportation of goods is a key link in the entire supply chain of e-commerce companies [2]. Most companies have not formulated a special cost accounting system for this link. Logistic costs are recorded in the production, sales and management processes, and only rough calculations can be made. This kind of cost accounting method does not reflect the true situation of the enterprise, and there is a large error, which is not conducive to the scientific cost and expense budget of the enterprise.

2.2. Ignore customer relationship maintenance
At present, with the development of e-commerce, there are a large number of substitutes for various products sold on online platforms. When the conditions are the same, consumers have the same purchase preference for the two substitutes for each other. Therefore, if e-commerce companies want to attract consumers more inclined to buy their own products, they need to be ingenious to enhance consumers’ awareness of their products and enhance users’ consumer experience by improving product quality or improving after-sales service. But at present, only a few e-commerce companies can realize this [3]. Most companies ignore the maintenance of customer relationships, resulting in restrictions on the expansion of their sales, unable to increase profit levels, and thus affecting corporate development.

2.3. Poor connectivity of supply chain links
E-commerce companies cannot form core competitiveness based on product characteristics and cannot sell suitable products in different markets. The implementation cost of their marketing plans is too high and the effect is not obvious. In order to save labour costs, many e-commerce companies arrange a small number of personnel in the procurement process, and sometimes even only arrange one staff member. This will lead to the lack of effective supervision of the procurement personnel to seek personal gains and fraudulent behaviours, which makes the company's procurement increased costs. The arrangement of logistics hubs and routes in many regions of my country is unreasonable. Sometimes due to the special location of transfer stations and destinations, repeated transportation will occur, causing transportation costs to increase again on the basis of higher transportation unit prices.

3. Internal supply chain cost control strategy based on big data
The organizational structure established by big data-based e-commerce companies for cost control mainly includes three main bodies: the first is the cost control committee, which is mainly responsible for setting cost control objectives from an overall perspective and selecting cost control plans; the second is each cost The responsibility centre is responsible for ensuring that the employees of each department perform their duties and supervise their work content; the third is the control entity at the execution level, responsible for implementing cost control during the business execution process, and forming specific feasible cost control Program. The organizational chart of cost control under big data is shown in Figure 1.
3.1. Cost control program based on big data

The cost control program based on big data mainly includes three parts: pre-prediction, in-process control, and post-analysis. The specific program is shown in Figure 2:

![Figure 2. Cost control process based on big data](image)

As shown in Figure 2, big data technology mainly includes data processing, big data processing, data centre, and big data platform. Among them, data processing is the pre-processing of the collected information, the process mainly includes screening, cleaning, integration and conversion [4]. Big data processing is the use of necessary processing tools to further analyse the pre-processed information. The processing tools mainly include Hadoop, HPCC and Storm.

3.2. Purchase cost control strategy

This article focuses on the analysis of the purchase cost control strategy based on big data from the two aspects of the purchase cost control and the cost control of the supplier in the early stage of the purchase and the cost control of the purchase process. The specific cost control measures are shown in Table 1:
Table 1. The strategy of using big data technology to control purchase cost

| Project                     | Measures                  | Big data technology used                      | Type of cost reduction                      |
|-----------------------------|---------------------------|-----------------------------------------------|--------------------------------------------|
| Cost control with suppliers | Build supplier database   | Storage, mining, analysis technology           | Transaction cost, information cost, commodity cost |
|                             | Automatic replenishment   | Predictive technology                          | Information cost, labour cost, transaction cost |
|                             | Real-time price adjustment| Supervision Technology                         | Information cost, commodity cost, labour cost |
|                             | Real-time evaluation and supervision | Supervision Technology | Labour costs |
| The procurement process itself | Procurement plan management | Analysis and prediction technology | Order cost, labour cost, transaction cost |
|                             | Procurement quality testing and feedback | Detection and identification technology | Labour costs |
|                             | Purchase cost analysis    | analytical skills                             | Labour costs                                |

We use big data technology to control the cost in the early stage of procurement mainly in two aspects: purchase cost and information cost. The control of purchase cost is mainly manifested in finding high-quality and low-cost suppliers through big data analysis technology, and avoiding the increase of purchase cost due to inaccurate supplier selection. Companies continue to enrich and enrich the supplier database through big data technology, and at the same time clean up the poor-quality suppliers in time to ensure the effectiveness of the entire database [5]. Through the establishment of the database, enterprises can quickly and accurately find high-quality suppliers and promote the reduction of information costs.

Open real-time price adjustment function. The process of using big data technology to implement price adjustment mainly includes the following four parts: First, the company needs to determine the standard product catalog and fully open it to all suppliers; second, the supplier adjusts the price of the product in vain according to the product catalog and product cost; third, the platform According to the prices provided by all suppliers, Baidong chooses the supplier with the lowest price to place an order. This step can not only effectively reduce the purchase cost of goods, but also reduce the information cost caused by incomplete inquiry. At the same time, because this process does not require human involvement, the entire process reduces transaction costs and labour costs. Finally, if the supplier receives the company's order, the entire procurement process will be completed smoothly; if the supplier does not receive the company's order, it means that there is no advantage in their price, and the supplier needs to further reduce the price of the product.

3.3. Measures to reduce inventory costs

Big data technology can not only store information about suppliers, but also store purchase records and browsing information of consumers. Through the analysis and calculation of these data, consumers’ purchasing preferences and products that consumers are more likely to purchase are obtained, shortening consumers the time required from the time an order is placed to the receipt of the product will increase consumers’ favour and trust in the e-commerce company. At the same time, according to the influence of supply and demand on prices, it is less expensive to purchase the products most likely to be purchased by consumers in advance than to purchase after consumers have made purchase instructions. Big data technology can automatically identify product information, and then classify products, which provides great convenience to the picking process, improves the
accuracy of the delivery and return links, and reduces consumers due to delivery errors the occurrence of decreased satisfaction. At the same time, the reasonable placement of goods through big data technology can maximize the use of warehouse space and reduce warehouse costs. Describe the inventory cost model as

\[ C_H = \int_0^Q h t^\alpha dq \]  \tag{1}

At this time, \( Q \) is the order quantity and \( q(t) \) are the inventory level at time \( t \) \((0 \leq t \leq 1)\). When \( \alpha \) and \( \beta \) are used as state parameters, the sensitivity of the demand rate to changes in the existing inventory level is measured. \( q(t) \) can be given by the following first-order nonlinear differential equation in the immediate state within the cycle time \( T \):

\[ \frac{dq(t)}{dt} = \theta q(t) = -D(q(t))^{\beta} \]  \tag{2}

3.4. Transportation cost

After the goods are packaged, they will be loaded into different transportation vehicles in turn. The radio frequency identification technology in the big data technology scans and uploads the information of the transportation vehicles to the system. The back-end personnel can grasp the driving and parking information of the transportation vehicles at any time, and feedback the information to Consumers, improve consumer satisfaction [6]. At the same time, real-time control of transportation vehicle information can deal with problems that occur during transportation in a timely manner, reducing risk costs. From the perspective of supply chain management, transportation cost has become an indispensable part of the total cost function. If the transportation cost is set as the fixed transportation cost \( C_f \) and the variable transportation cost \( C_v \), then there is \( C_T = C_f + C_v D \). When transportation is only related to distance, \( C_f \) and \( C_v \) can be set as a function of distance, that is, \( C_f = C_{s_f} + C_{d_f} d \) and \( C_v = C_{s_v} + C_{d_v} d \). At this time, \( C_{s_f} \) represents the fixed cost incurred in each transportation, and \( C_{d_f} \) represents the cost per unit of vehicle running one kilometer Cost, \( C_{s_v} \) represents the additional cost of transporting a single product, and \( C_{d_v} \) represents the marginal wear and running cost of each agricultural product per kilometer.

3.5. Sales cost control strategy

In the Internet age, companies can use big data technology to record and analyse potential customers’ search and view product types, functions, and features, and further understand potential customers’ concerns about similar products by analysing search keywords. And on the basis of the above analysis, the product purchase index is calculated, and the company arranges purchase or production according to the index level to meet market needs [7]. Taking mobile phone manufacturers as an example, big data technology can be used to store the number of browsing and favourites of different types of mobile phones by potential customers. The platform uses relevant data analysis to recommend the former mobile phones that are more concerned. The company recommends the former mobile phones as current Focus on marketing and actively stock up to meet customer needs. At the same time, through big data technology, potential customers can analyse the concerns of different types of mobile phones to determine whether customers are more concerned about the appearance or cost-effectiveness of mobile phones. Enterprises can rationally arrange purchases or production based on the analysis data.

The product marketing stage mainly uses big data technology to record, store and analyse information such as search content, stay time, shopping bias, comparison products, and final
purchased products, and then build customer behaviour models. Guided by customer behaviour models, adding keywords, dividing shopping personalities, dividing ethnic groups, and providing personalized services can effectively reduce labour costs and marketing costs. The specific cost control process is shown in Figure 3:

![Figure 3](image)

**Figure 3.** The cost control process of using big data technology in the marketing stage

4. Conclusions
In today's major enterprises are carrying out digital innovation, small and medium e-commerce companies should fully adapt to social changes and provide favourable conditions and corresponding technologies for the development of digitalization within the enterprise. Big data technology can better carry out effective digital innovation for small and medium-sized e-commerce companies, and use big data technology for effective data collection and processing, etc., can fully enable various departments to understand each other required data information, so that companies Development has been more strongly guaranteed. Big data technology provides a strong guarantee for the cost control of the supply chain of small and medium e-commerce, and also provides conditions for the stability and accuracy of cost control.

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