

Analysis on the Supply Chain Cost Control of PDD Under the Background of Big Data

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Abstract: With the continuous growth of the national economy and the continuous breakthroughs in Internet technology, a new era of big data has come. Although China's e-commerce industry started late, it has seen rapid development. In recent years, it has gradually become an important driving force for China's economic development. In e-commerce, the application of big data lies in mining useful data information for analysis, to reasonably predict the future market, reduce costs, and maximize profits. In modern enterprises, effective supply chain management is a source of profit that can not be ignored. It can produce great profit benefits, which is almost the most important for current e-commerce enterprises. At the same time, the Internet and informatization of supply chain operation is convenient for enterprises to analyze the cost of each link of the supply chain in combination with big data and make favorable decisions. This paper uses supply chain cost control theories, takes PDD as the research object, analyzes the current situation of its supply chain cost control from all links, finds existing problems. Then relevant thoughts & suggestions in the big data context are put forward, including sharing data info, maintaining supplier relationship, using user portraits for consumption stimulation and rational marketing cost planning, eliminating the "copycat" impression and maintaining customer relations, absorbing management talents and rationally allocating personnel for better cost control and profit improvement.

Keywords. Big data, electronic commerce, Cost control, Supply chain, PDD

1. Preface

1.1. Research Background

Since 2019, COVID-19 has affected China and the global economy. This reduction led to decreased household incomes, lower consumer confidence, and slower market consumption growth. Repeated epidemics also dampened work enthusiasm and ability, restricted the supply side, and triggered anti-globalization sentiments and supply chain issues. It had a profound impact on China's economic market and posed challenges to various industries.[1]

China's e-commerce emerged in the 1990s, growing rapidly in recent years. In 2023, its transaction volume increased to 46.83 trillion yuan.² Affected by consumer

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² Data source: Statistical Bulletin of the People's Republic of China on National Economic and Social Development in 2023.

confidence, it faces a crisis and opportunities. Enterprises need to seize the chance and formulate the right strategy. For any enterprise, effective cost management is the key to improving efficiency and achieving sustainable development. Supply chain cost control is a top priority, but the current methods are not advanced enough. In the era of big data, it is a trend to combine it with e-commerce supply chain cost management.

1.2. Review

- Relevant research on big data technology

Meiyan Du (2022) proposed that the continuous development of communication and computer network technologies has led to the pervasive integration of information technology in all aspects of people's lives.[1] Rogers, R. (2024) thought data management can benefit food manufacturers in the efficiency of their day-to-day operation, while also extending capabilities into the highest levels of company and brand strategy.[3] Zhi Haidan (2023) proposed the future prospect of big data in enterprise management is impressive, running through the whole operation process, but it needs a professional information team for support and guarantee.[4]

- Related research of supply chain cost control

Li Junhua (2022) believes cost management from supply chain perspective helps enterprises ensure production plan accuracy, optimize procurement and sales.[5] Song Chunyan (2023) emphasizes tobacco commercial enterprises need to improve the cost management process in procurement, production, sales, and logistics, and promote deep integration with cost control as per supply chain requirements.[6]

- Relevant research on big data and supply chain cost control

Xianfeng Zhu (2024) proposed the risk management system of e-commerce supply chain based on big data technology has good risk prediction and risk management effects.[7] Ye Tian (2023) believed B2C e-commerce enterprises should explore supply chain cost control based on actual conditions and use big data tech to optimize procurement, sales, warehousing, logistics, info security and supplier cooperation.[8]

In conclusion, China has some research on big data and supply chain cost control, but few on its application, especially in the e-commerce industry. This paper integrates them, identifies problems, and analyzes solutions in the big data context.

2. Overview of E-commerce Supply Chain Cost Control in Big Data Context

2.1. Introduction of big data background

Nowadays, info circulation is getting faster, giving rise to big data. McKinsey defines big data as a broad data set with large scale, fast flow, diverse types and low value density. Enterprises must apply data info to adapt to high-growth info, seize big data opportunities and enhance optimization ability. Main big data techs include data preprocessing, mining, cloud computing platform and scalable storage system.

The key to big data app is "useful" for e-commerce. It reflects in marketing, prediction, fault analysis and promotion. But it also brings info leakage problems, posing risks. If not handled well, it brings challenges to customer relationship maintenance.[9]

2.2. The implication of supply chain cost

In this article, the in-cycle costs associated with a firm's supply chain, including procurement, production, and sales costs, are considered supply chain costs. The cost can be categorized into internal and external. Internal includes the costs of departments during production and turnover; external is the cost from collaboration with suppliers, retailers, and consumers.

The supply chain cost involves many enterprises. If information isn't effectively circulated and shared, it causes cost transparency deficiency and lowers control efficiency. This paper starts from the cost composition of each link and analyzes cost control approaches.

2.3. The impact of big data background on supply chain cost control

Big data is closer to people's lives. Our lives and modern enterprises' business rely on it. Supply chain cost control is no exception. The main effect it brings is synergistic effect.

The synergistic effect refers to the scenario where, when groups are combined rationally, they can produce a greater effect than if they were operating independently. In supply chain cost control, it refers to the complementary information advantages between upstream and downstream enterprises to provide better services. In the big data era, upstream enterprises can obtain consumer information to optimize production capacity. Downstream sellers can grasp the market precisely, use data to increase profits.

The big data era influences supply chain cost control. Refined control and other demands offer a new orientation. Enhancing cooperation and fulfilling needs is crucial. E-commerce enterprises can make it more effective if they adapt.

3. PDD Supply Chain Cost Control Case in Big Data Context

3.1. Industry background

Since its inception in 1990, China's e-commerce industry has made great strides, developing into a comprehensive system that includes domestic, overseas, and cross-border transactions. Especially in the past two decades, it has transformed from nothing to something and from a spark to a common consumption mode.

China's e-commerce is closer to the core of the economy. The transaction scale of e-commerce in China is continuously expanding due to the popularity of electronic equipment and the improvement of living standards. In 2023, it was approximately 46.83 trillion yuan, an increase of about 11.00% compared with 2022, related industries are accelerating, further promoting economic development.

After years of development, leading e-commerce enterprises have built their own "ecosystem". The connection between platforms and merchants has become closer, with big data resources emerging as a key factor. The growth and reusability of data provide conditions for sustainable development, like user profiling and precision marketing, and forecasting market changes.

In brief, people's living standards are rising, and their recognition of e-commerce is increasing. The big data environment offers favorable conditions for e-commerce, and its prospects will be brighter.

3.2. Basic situation of PDD

PDD is a C2M group-purchasing social e-commerce platform founded in September 2015. Users can download the software via mobile devices, form groups through social media, and buy goods at lower prices. With its novel social e-commerce thinking, it has created a distinctive concept and attracted many customers.

In the early stages, PDD attracted small merchants, tapped into emerging markets using WeChat, and gained a substantial user base with its unique model. Through user engagement and promotions, it experienced rapid growth by late 2015 with over 12 million users without traditional advertising expenses. In 2019, its active users reached 687 million, and coverage is rising. By the end of 2020, its active users reached 788.4 million, making it the largest e-commerce platform in China with an annual transaction volume of 1,667.6 billion yuan, a 66% increase from 2019.³

Low-priced products had a good effect in the early stage but had problems later, and the low-end impression remains. The group mode and subsidy method are easy to imitate, and the competition hasn't improved. To gain the biggest advantage, PDD needs to start with supply chain management.

3.3. Analysis of PDD supply chain cost composition

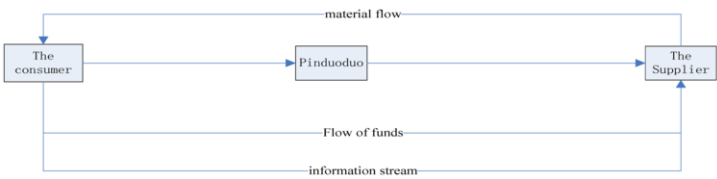


Figure 1. Schematic diagram of PDD's supply chain

Analysis of PDD's supply chain system reveals that consumers are the starting point. Market demand info comes from them and is conveyed to suppliers via the platform. The supply chain's operation depends on meeting consumer requirements and diverse demands. Supply chain optimization and upgrading is an issue to be resolved, and effective cost control will make supply chain management more effective.

As an e-commerce enterprise providing an online shopping platform, PDD's supply chain costs can be roughly divided into internal and external costs.

PDD's internal costs include management cost, research and development cost, and marketing cost, etc. The marketing cost is for attracting users to download, buy and order, and for publicity. The management cost is for internal payment and management. The research and development cost are for enhancing the user experience and fighting counterfeits or optimizing the page.

External costs are from an enterprise's external supply chain, including service and transaction costs. Service cost is for user returns, exchanges, and compensation.

³ Data source: Collated according to Wande database

Transaction cost is for the collaboration between the supplier and PDD, like getting real-time market info and costs of decision-making, supervision, breach of contract, and execution.[10]

3.4. Current situation of PDD's supply chain cost control

Table 1. Annual revenue and of Pinduoduo 2019-2023⁴

	2019	2020	2021	2022	2023
Gross revenue	30.142 billion yuan	59.492 billion yuan	93.95 billion yuan	130.558 billion yuan	247.639 billion yuan
Purchase cost	6.339 billion yuan	19.79 billion yuan	31.718 billion yuan	31.462 billion yuan	91.724 billion yuan
Marketing, sales, management fees	28.471 billionyuan	42.702 billion yuan	46.342 billion yuan	58.309 billion yuan	86.264 billion yuan
Research and development fees	3.87 billion yuan	6.892 billion yuan	8.993 billion yuan	10.385 billion yuan	10.392 billion yuan

Analysis of PDD's annual report shows costs of each part have risen. Research and development, marketing, and sales management expenses have increased significantly. Over five years, sales and management expenses have risen by over 20 billion yuan, and research and development expenses by about 7 billion yuan.

- Analysis of current situation of PDD's internal supply chain cost control

To compete, PDD has exclusive titles and sponsorships in popular TV programs like "Extreme Challenge" and the 2021 Spring Festival Gala, incurring high marketing costs. To tackle counterfeit goods, it spends a lot on R&D to restore reputation. However, considering the user growth rate, such high marketing and R&D costs are disproportionate, and the allocation lacks scientific basis.

According to survey data, over time, PDD users have gradually saturated. The user growth rate dropped rapidly from 71.02% to -1.48% in six years, and active users increased slowly. High marketing costs and poor growth show that its customer acquisition cost is no longer as good as in the early stage.

- Analysis of current situation of PDD's external supply chain cost control

Low-price quality control has worsened PDD's reputation, like "cut the blade" for rewards, which gets criticized. Consumers often don't get promised rewards, leaving a negative impression of false publicity and low credibility. These dampen consumption enthusiasm and increase service costs.

On the other hand, the negative impression also causes concerns for suppliers. It's hard to have a fixed, long-term cooperation, increasing transaction cost, which is bad for long-term development.

⁴ Data source: According to Pinduoduo Annual report.

4. Problems of PDD Supply Chain Cost Control in Big Data Context

4.1. *Marketing direction incorrect, marketing cost control inefficient*

Marketing cost is a big part of PDD's costs. It mainly includes publicity, design and promotion costs. PDD invested heavily in sponsoring TV programs, but the publicity's effect did not match the investment, and the user growth rate did not increase. Its marketing cost control was inefficient, failing to address key problems. With popularity growth, the marketing cost should be redirected to enhance user experience and reputation for a good word-of-mouth effect.

In the marketing process, the Marketing Department's management staff failed to use user feedback, develop a clear direction and determine accurate objectives, resulting in PDD's overall marketing investment.

4.2. *Low research and development cost control effect*

PDD has spent a lot on R&D to address counterfeits and improve the user experience. Its R&D costs rose from 3.87 billion yuan in 2019 to 10.392 billion yuan in 2023 but failed to restore users' perception.

For PDD, "shanzhai" gives users a poor experience. "Shanzhai" refers to counterfeit, fake products or behavior, characterized by imitation strong, low cost, quality, intellectual property, reliable quality, but also meets the requirements of spectrum. PDD fails to supervise product authenticity. The Black Cat report shows PDD received over 30,000 complaints but gave a low response rate. This indicates the R&D expenses are poorly managed.

4.3. *Neglect to maintain the user-side relationship, service cost control is not in place*

Low prices stimulate purchases but ignore the shopping experience, especially in after-sales. Unsatisfactory after-sales deepens the negative impression, increases costs and causes user loss. Complaint statistics show in 2023, the number of complaints against it was 845,621, ranking third, and the response volume was low. This indicates its after-sales service lags behind, and the service cost control is insufficient.

4.4. *Unreasonable management cost and lack of management talents*

PDD's management costs include administrative expenses, management salaries and education funds. To address the predicament, it recruited highly paid talents, increasing the cost. The proportion of employees shows management personnel are only 7% and basic platform operation personnel are about 28%, indicating redundancy for PDD. High management salaries don't solve issues, and redundant basic staff don't add value, resulting in poor cost allocation and intangible costs. Due to the late development of the domestic e-commerce industry, professional management talents are scarce. PDD has a low proportion of such professionals and needs to attract them.

5. Suggestions for PDD Supply Chain Cost Control in Big Data Context

In summary, PDD has issues in cost control in marketing, R&D, management, and service supply chain: Incorrect marketing orientation lowers efficiency; Unsatisfactory R&D input effect; Low proportion of management talents; Poor customer relationship and service cost control. Considering the big data trend, suggestions are proposed to enhance its supply chain cost control.

5.1. *Sharing data, information transparently and maintaining supplier relationships*

PDD has many suppliers with inconsistent product quality. Long-term cooperation with outstanding ones is beneficial for cost control. It needs to screen suitable ones based on evaluation criteria by professionals. Suppliers can be evaluated from multiple aspects to select the best. Then, PDD should share information transparently with suppliers, establish and refine the sharing system. Through long-term collaboration and close information sharing, they can achieve a win-win and minimize the supply chain cost.

5.2. *User portraits stimulate consumption and reasonably plan marketing costs*

JD uses the data technology industry according to different levels of users to customize marketing plan, improving the conversion rate. Alibaba focuses on content marketing, such as "shopping" plate, attracts many brand merchants and talent to participate in, they bring free or low-cost traffic import. It reduces the platform dependence on traditional advertising channels, saving marketing expenses.

Currently, PDD's user base is nearly saturated. The marketing focus should shift from visibility investment to platform construction and user experience. Many users have accounts but rarely purchase, indicating the current marketing approach is wrong. The platform should be optimized to identify low-spending users through data analysis, create personas, and promote the required products. Design tasks or provide discounts to stimulate their consumption.

5.3. *Eliminate the impression of "copycat" and maintain customer relations*

Alibaba strengthens after-sales services to make users feel at ease during the shopping process. This makes users more willing to shop on the platform, and customer retention rate is further improved. The value of JD brand increases users' trust in JD, reduces users' sensitivity to price, and improves customer retention.

Users are the most crucial element of PDD's supply chain. To maintain a good relationship with them, PDD must foster the "customer is God" notion. It's essential to solve the problems of counterfeit and inferior products and the service attitude, enhance the customer service system, and improve the low-end perception.

Before product sale, assess goods with a high poor rating rate on the data tracking platform, understand the situation, supervise improvement, remove counterfeit links. After the product is sold, efficient settlement of after-sales complaints saves costs, earns trust, and improves the platform's impression. Service cost is correlated with the goods return rate. The service cost is related to the return rate of goods. To reduce it, PDD should improve the after-sales level and subdivide the return conditions to prevent malicious return and avoid unnecessary costs.

In the current big data era, personal information is at risk and consumers are concerned. So, PDD should enhance user information protection, safeguard privacy, establish a security system to protect rights and improve the user experience.

5.4. Absorb management talents and allocate personnel reasonably

In conclusion, supply chain cost optimization needs outstanding management personnel. PDD has the lowest proportion of them. To stay competitive, it can select and train internal candidates or recruit more professionals and enhance incentives.

PDD has too many unnecessary basic staff in the supply chain, resulting in low-cost performance. The assessment system should be improved, efficiency enhanced, outstanding staff rewarded, and layoffs made if necessary. A training system can be set up to optimize employees' knowledge and quality, train talents and reduce brain drain.

6. Research conclusion and enlightenment

Nowadays, big data technology is maturing. E-commerce has advantages in its application. PDD has developed rapidly with its model but has rising costs and ineffective control. Based on data and user experience analysis, its problems include irrational marketing costs, unsatisfactory R&D cost input, shortage of management talents and service cost issues. By integrating data technology approaches in various links, the solutions are: At the marketing level, focus on combating counterfeiting and build user relationships. In management personnel allocation, increase the proportion of administrator and promote talents. Regarding supporting services, foster the "customer is God" concept, handle user problems and reduce return rate and service costs.

This paper endeavors to integrate big data technology with e-commerce supply chain cost control to expand the depth of the supply chain direction in cost control and ultimately promote the upgrading of the consumption structure, economic development and prosperity, as well as the improvement of people's quality of life. In the big data era, not using big data technology reasonably means falling behind. E-commerce enterprises are suitable for using it. If they grasp the opportunity to improve based on their conditions, they will achieve great results.

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