

Optimizing Warehousing Strategies for Retail Food Live Streaming on Supply Chain Cost: A Case Study of TikTok

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Abstract. The outbreak has indeed left a significant impact on the traditional offline sales model. However, it has simultaneously catalyzed the flourishing growth of the e-commerce live-streaming industry. Consumers have progressively adapted to this novel online shopping mode, signifying a paradigm shift in retail dynamics. Therefore, this paper studies the cost problem under different strategic choices of logistics and warehousing for retail food from the perspective of a platform system and analyzes the after-sale cost of a two-level retail food supply chain consisting of a manufacturer and an e-commerce platform by combining data and theory. This study further analyzes the optimal decision problem for e-commerce cloud warehousing, traditional warehousing systems and a combination of e-commerce cloud warehousing and traditional warehousing systems. This study not only enhances our understanding of the profound shifts in the retail food sector but also equips e-commerce platforms with concrete theoretical insights and practical references to bolster their supply chain cost management strategies in a post-outbreak era characterized by evolving consumer preferences and dynamic market conditions.

Keywords: E-commerce, Retail Food, Cost Management, Online Shopping.

1. Introduction

The epidemic outbreak impacted the offline sales model. Still, it also promoted the prosperous development of e-commerce live banding business, and consumers gradually adapted to the new online purchase mode [1]. Research on supply chain cost mainly focuses on business synergy, information technology, financial performance evaluation, etc. It needs to include the problem of logistics and warehousing strategy selection to study supply chain cost from the perspective of the platform system [2-4]. In this regard, this paper researches and investigates the cost problem under different strategy choices of logistics and warehousing of retail food under the platform supply chain mode from the perspective of platform system, analyses the two-level retail food supply chain composed of manufacturers and e-commerce platforms by combining data with theory, analyses after-sale costs, and further compares and analyses the optimal decision-making problem under the three conditions of e-commerce cloud warehousing, traditional warehousing system, and combination of e-commerce cloud warehousing and traditional warehousing system. The optimal decision-making problem. This paper's research helps provide theoretical inspiration and reference for e-commerce platforms to strengthen supply chain cost management.

2. Literature Review

Zhou et al. found that the non-exclusive referral model should be used when the referral fee and referral cost are low or high, and exclusive referral is chosen only when the referral fee or cost coefficient is low [5]. Zhang et al. proposed that fresh produce suppliers and e-commerce platforms can maximize profits in direct sales and online resale models, respectively [6]. Huang analyzed the optimal decisions of suppliers and platforms, assuming that the return rate is related to product quality and the return rate is not related to product quality [7]. Liu studied and analyzed the supply chain quality cost model under information discontinuity using the relevant methods of grey system theory

[8]. Xiao et al. pointed out that cost-sharing choices are largely influenced by the efficiency of data usage of supply chain members [9]. Rodríguez B et al. investigated pricing and assortment decisions in a manufacturer's sales through independent retailers and a direct channel supply chain in the presence of inventory costs [10]. Tian et al. found that the order fulfillment cost and the upstream competitive intensity interaction affect the choice of the mediator's optimal model [11].

This paper constructs a two-level retail food supply chain game model consisting of producers and e-commerce platforms from the perspective of a platform system to address the costs of logistics, warehousing and promotion of retail food under the supply chain model. Further, it compares and analyses the optimal decision-making problem under the three conditions of e-commerce cloud warehousing, traditional warehousing system and the combination of e-commerce cloud warehousing and traditional warehousing system.

3. Supply Chain Cost Issues with Live Streaming of Retail Food Strips

3.1. The Development of TikTok

In the United States, lipstick is widely recognized as a cheap luxury product, and even in an economic downturn, people still retain a strong desire to consume, so cheap lipstick becomes the target of choice. This is known as the "lipstick effect". The cheap non-essential items of Shake Shack's "9 yuan 9 car" have also pressured most consumers in our country during the economic recession.

According to the official data of TikTok e-commerce in 2023, TikTok has over 600 million daily active users, millions of e-commerce authors, and more than 100 billion average monthly content interactions. In the past year, TikTok's e-commerce GMV has increased by 80% year-on-year, the volume of commodity card orders has increased by 180% year-on-year, the volume of search orders has increased by 202% year-on-year, the number of monthly active users has increased by 54% year-on-year, and it has adopted the way of online and offline linkage to extend its services [Data from TikTok Ecommerce]. Jieyin has become the mainstay of many short video platforms and even a national short video app.

3.2. Shake Shack Supply Chain Operating Model

The supply chain between suppliers and consumers can be divided into two categories depending on the warehousing model: cloud warehousing on behalf of the delivery and self-built warehouses direct delivery.

The cloud warehouse mode refers to the manufacturers putting the goods into the third-party cloud warehouse in advance through the system and the TikTok platform docking. After the consumer orders, the merchants will push the order to the cloud warehouse, and the cloud warehouse will carry out the commodity sorting, express delivery and logistics after-sales service. Self-built warehouse direct mode refers to the manufacturers putting the goods into the TikTok platform's warehouse, and after consumers place orders, the platform will unify the shipment.

The advantages of the cloud warehouse on behalf of the sender include saving energy, which allows you to put more energy into the core business, and saving costs, as the third-party cloud warehouse has a more professional warehousing system, management, and facilities. It also reduces management's difficulty by transforming internal management activities into external contractual relations shifting management responsibilities from internal to external legal responsibility, which is conducive to simplifying the management work.

Disadvantages: Because of the relatively low threshold of the starting point of the cloud warehouse on behalf of the shipment service, the service efficiency and quality of each storage company are mixed, so be careful to choose. For example, the equipment and management of fire, theft and moisture prevention, shipment accuracy, and handling returns and exchanges could be higher. E-commerce companies' goods are placed in the warehouse of a third-party cloud warehouse. If the storage company's operation has problems, this will undoubtedly affect the business development of

e-commerce. So before choosing to cooperate, you need to choose a third-party cloud warehouse with stable development and a good reputation for cooperation.

Advantages of self-built warehouse direct shipping include the ability to control warehousing to a greater extent, the flexibility to layout based on product characteristics, and the potential for long-term usage to reduce warehousing costs.

Disadvantages: High cost of buying and renting land in the early stage; Fixed capacity and cost make part of the enterprise's capital occupied for a long period with high investment risk; Poor flexibility in the location and structure of the warehouse. If the enterprise can only use its warehouse, it will lose the flexibility of strategic optimization of site selection due to quantity constraints; the size of the market, the location of the market and customer preferences change if the enterprise can not adapt to such changes in the warehouse structure and services, the enterprise will lose many business opportunities.

3.3. Analysis of Shake Shack Supply Chain Cost Issues

3.3.1 TikTok Platform Warehousing Cost Decisions

Warehousing costs have been in focus as an important issue in the platform's supply chain. According to TikTok's annual report, TikTok's sales (GMV) reached 1.41 trillion yuan in 2022, an increase of 76% year-on-year, behind the huge sales issued a challenge to TikTok's logistics and warehousing capacity [Data from Securities Times].

TikTok platform's sales model helps it not take the initiative to bear the supplier's goods warehousing in the collection of transport links. TikTok platform in the direction of retail food selected "TikTok cloud warehouse". Cloud warehouse is a new logistics and warehousing system relying on storage facilities to circulate goods. The cloud warehouse is more flexible and less costly than traditional warehousing. The TikTok platform can adjust the storage area in advance according to the off-peak season, sales data forecasts, and the development of promotional activities to rationalize storage costs and effectively reduce operating costs. Previously, TikTok initiated the supply chain cloud warehouse project. Through resource synergy with several head courier companies, it has operated more than 45 warehouses in several first-tier and core cities, with a national warehouse layout of more than 1.5 million square feet [Data from Battle of the Fast Warehouses].

After independent research on the pricing of Jingtang Cloud Warehouse, a month of regional retail food warehousing and logistics costs were simulated through a 1,000-square-metre warehouse to compare the difference between the cost of self-built warehouses and cloud warehouses in first-tier cities. The data was selected from the monthly sales volume of regional retail food, about 20,000 units. The comparison is shown in Table 1.

Table 1. Comparison of monthly costs of self-built warehouses and cloud warehouses (retail food)

Self-built warehouse 1000m2		Cloud Warehouse 1000m2	
storage charges 2/m2/day	About \$60,000	storage charges 0.5/m2/day	About \$15,000
labour cost (10 persons)	About \$70,000	Treasury operating expenses (\$1.2/unit)	About \$24,000
Warehouse equipment (infrastructure + software)	About \$50,000	postage and packing fee (\$2/unit)	About \$40,000
Various miscellaneous expenses such as utilities (Electricity \$0.80/kWh, water \$4.41/tonne)	About \$20,000	insurance premium (2 per cent/year)	About \$200.
(grand) total	About \$200,000	(grand) total	About \$80,000

According to Table 1, it can be visualized that cloud warehousing can significantly reduce input costs. At the same time, considering the price discounts for warehousing through telephone inquiry, it can give about a 5% discount under guaranteed freight order volume and long-term cooperation.

The TikTok platform uses regional warehousing in managing and operating its cloud warehouses, which means that the cloud warehouses support merchants in choosing a warehouse close to them and can guarantee 24-hour merchandise collection. This helps the TikTok platform cover major economic regions and respond quickly to regional demand. The TikTok platform also draws on the extreme fulfillment concept implemented by SF Express to ensure worry-free delivery and storage of goods through a single cloud warehouse with a peak daily delivery of more than 300,000 pieces and a storage capacity of more than one million pieces.

As a result, the TikTok platform prefers to utilize the low investment of cloud warehouses for low-cost purposes in its warehousing decisions. Merchants can store retail food products in the cloud warehouse in advance and send food products to all parts of the country more quickly and conveniently to improve customers' logistics service level. This is a good trade-off for the basic principle of "the inverse of logistics cost and logistics service level" in logistics strategy, which can bring better service experience to customers while reducing cost.

3.3.2 TikTok Platform Logistics Cost Decision

TikTok Cloud Warehouse Delivery. While suggesting retail food merchants to use cloud warehouses, the TikTok platform is also targeting the large order volume and small number of individual orders of retail food products, which not only helps retailers to solve the courier fee troubles but also improves the delivery speed and service quality of the TikTok platform. According to Table 1, Cloud Warehouse's delivery fee of RMB 2 per order is quite attractive to retailers, and the decision also helps the TikTok platform ensure the quality of its own platform's logistics services while achieving long-term cooperation with food retailers.

Outsourcing of logistics for the TikTok platform. The Shake Shack platform gives full play to the advantages of huge demand and cargo flow, through which it obtains price discounts in warehousing and logistics cooperation. TikTok platform, considering the Yuantong logistics in the country, has implemented the transformation and expansion plan of nearly 30 collection centers, and in the collection centers and city distribution center layout to complete the automated sorting equipment, nearly 40 sets of new network trunk transport vehicles 600, significantly improve the modernization and intelligence level of the center [Data from Shanghai Express Industry Association]. In 2022, the "Double 11" shopping festival and China Communication and Yuantong respectively reached cooperation to cope with the huge number of orders. At the same time, the two logistics companies also set up special logistics customer service, implemented the Spring Festival non-closing plan and gave preferential subsidies of up to RMB 0.2 per order, which helped the TikTok platform greatly reduce logistics and workforce costs.

The official data of TikTok shows that the end delivery service problems account for more than 50% of the courier complaints and returns for courier reasons. The problem of end-of-line delivery can directly affect the user's shopping experience. It will further affect the users repurchase, hurting merchants and users. TikTok platform has recently launched the "shunting package" service, and merchants can order for free. At the same time, the merchants' product detail page bill of lading page will show the "shunting package" label display. Marked "shunting package" goods will be shunting express and delivered to consumers to provide door-to-door service. The essence of the logistics decision to cooperate with SF is to pry the "sub-brand lever", a way to borrow another "asset" to strengthen their brand image. Shunfeng Logistics represents stability, speed and safety in the public's mind, and customers' willingness to choose TikTok's platform is greatly increased. This decision helped TikTok solve the logistics fulfillment problem and build brand trust with customers, exchanging high-quality logistics services for more orders.

3.3.3 After-sales costs

The current retail food after-sales costs are mainly from customer service and returns, in the retail food returns, due to the opening of almost impossible problem returns, resulting in returns-related costs accounted for the after-sales not very big, so some merchants are more inclined to cloud warehouse warehousing, which will save management resources. Cloud warehouse logistics speed is superior, and the return rate is almost identical. The return cost station cost total percentage ratio is small, which means that cloud warehouse after-sales costs in the return cost can be effectively controlled.

Secondly, the customer service cost of TikTok is in line with other platform e-commerce companies. Taking online office outsourcing, the cost is relatively unaffected by decision-making. However, the customer's return and exchange are the most influential in TikTok after-sales cost.

The general platform returns to involve a central warehouse. The central warehouse is an e-commerce platform warehousing logistics link in the core of a module, usually distributed in the provincial capitals and other first-class cities, close to the origin or suppliers, one end of the chain through the base or wholesale market, one end of the chain through the market end. Its main role is to concentrate all the goods in the region to the warehouse and then sort and ship according to the commodity category.

However, because the jittery e-commerce to the storage and logistics end of the cut has just begun, it will face some problems: orders for goods first need to be sent to the jittery distribution of warehouses in Guangdong to identify the quality, authenticity, complete the identification of the jittery side of the shipment, usually later than their own time through the courier company shipment of three to four days.

Unlike Jingdong, Alibaba, and TikTok, the e-commerce warehouse distribution type is limited and needs its own logistics and distribution system. A businessman who has used the TikTok e-commerce warehouse said that TikTok e-commerce at this stage of the centralized delivery model could even be described as "anti-humanity", a batch of Zhejiang goods to be sent to the warehouse in Guangzhou for identification, additional identification and warehouse management fees, freight costs need to be borne by the businessman. Once three or four days cannot be done, it will produce a return and need to be returned to Zhejiang.

Although the cost of returns does not account for a large proportion of retail food, it is still an issue to be considered, from which it can be seen that TikTok's return system needs to be changed and that it can be used in conjunction with e-commerce cloud warehouses, outsourcing warehouses, and using a mature information technology platform supply chain to combine merchants, warehouses, and customers to reduce costs.

4. Findings

4.1. Cost issues

Firstly, the development status and operation mode of the Jitterbit platform. The Jitterbit platform is currently in full development momentum and new operation mode. Platform supply chain costs, jittery platform live with goods retail food, publicity and after-sales costs accounted for part of the investment, and after-sales use of cloud warehouse will lead to a "difficult to return" problem. Regarding e-commerce warehousing and logistics costs, Shake Enterprise has taken full advantage of its huge demand and flow of goods, which has led to price discounts in warehousing and logistics cooperation. However, its recent warehousing reform has led to bad results, so it is not realistic to re-establish the logistics system. This study suggests that the platform system in major cities establishes a central logistics warehouse, with the cloud warehouse to assist in ensuring the lowest cost.

4.2. Shortcomings and subsequent improvements

Given the shortcomings of the current study, limited by the research time and other issues, this study hopes to use mathematical models to transform qualitative research into quantitative research in the subsequent study and construct the cost model of Shake Shack retail food after deformation by drawing on the profit function of cold chain fresh agricultural products. Data due to the existing summary data is very scarce. Using the form of independent research, selected the data of about 30 samples of TikTok head retail food through the cost model and prediction model to analyze an in-depth discussion of the supply chain of the TikTok platform cost issues.

5. Conclusion

This study examines the cost of retail food products in a supply chain model under different logistics and warehousing strategy choices from a platform system perspective. This paper investigates post-sale costs by analyzing data and the theory of a two-tier retail food supply chain consisting of a manufacturer and an e-commerce platform. Further, it compares and analyzes the optimal decision-making problem under three conditions: e-commerce cloud warehousing, traditional warehousing system, and a combination of e-commerce cloud warehousing and traditional warehousing systems. It is found that e-commerce cloud warehousing has significant advantages in cost reduction. In addition, this paper analyzes the logistics cost decision and after-sale cost of the TikTok platform and suggests improvements to reduce costs and improve service quality. Future research can use mathematical models to transform qualitative research into quantitative research to explore the cost problem of the supply chain of the TikTok platform in depth.

Authors Contribution

All the authors contributed equally, and their names were listed alphabetically.

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