Research on Omni-Channel Supply Chain Structure Based on BOPS Mode

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Abstract: With the rapid development of Chinese economy, the urbanization process is accelerating and the number of urban population is increasing. In this context, the omnichannel supply chain is a new circulation mode emerged at the historic moment, its development speed is amazing. Under the mode of omni-channel supply chain management, the urban integrated pipeline corridor industry, logistics industry and finance have shown a rapid growth trend and become an important factor to promote the urban economic development. However, there are still many problems in supply chain management in the process of supply-side structural reform. For example, low efficiency of infrastructure construction, high logistics cost and lack of omni-channel service quality lead to low efficiency of supply chain structure, which also affects urban economic development and residents' consumption level.

Keywords: BOPS mode, Omni-channel, Supply chain structure.

1 INTRODUCTION

With the development of the world economy, people's demand for material life and spiritual culture has been increasing, the mode of omni-channel supply chain management has become an indispensable part of enterprise operations, studying BOPS mode under the current environment is of great significance. In the omni-channel mode, studying the relationship between BOPS and the supply chain structure of logistics enterprises can effectively reduce the traditional operation cost and management risk. By analyzing the problems faced by the docking of traditional commercial operation mode and modern logistics industry, it can be found that: On the one hand, disadvantages such as large investment in infrastructure construction and long cycle limit the transformation of traditional domestic retail industry to modernization[1]. On the other hand, from the perspective of the government, it proposes to introduce competition mechanism into the supply chain, improve the level of omni-channel management and service efficiency, so as to promote the strategic theoretical basis of enterprise development. At the same time, this will help solve the problems in the process of docking Chinese traditional mode of operation and modern logistics industry and improve the competitiveness of enterprises.

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2 RESEARCH ON SUPPLY CHAIN DECISION-MAKING UNDER DIFFERENT CHANNEL STRATEGIES

2.1 Problem Description

Omnichannel means that in the process of supply chain management, enterprises, consumers and retailers cooperate to sell their own products to end users. Theoretically speaking, it is a management mode in which suppliers, manufacturers and distributors jointly complete value-added and after-sales service activities to achieve social and economic benefits. This is the concrete application of the concept of "omnichannel" in the field of logistics, but in practice, there are still problems such as unreasonable supply chain structure and low operating efficiency. At present, the main reasons for the slow development of Chinese traditional retail industry are: the lack of core technical strength; On the other hand, due to the lack of large-scale production, it is unable to form large-scale operation advantages and long-term profitability, which leads to a disadvantageous position in market competition, this is difficult to achieve a sustainable virtuous cycle.

Consider the secondary supply chain composed of traditional retailers and manufacturers, and assume that there are two modes: dual channel and omnnel: (1) Dual channel refers to the supply chain formed by retailers and manufacturers through franchising, that is, retailers establish contact with wholesale and retail enterprises through the construction of wholesalers, channel agents, sales agents and other modes[2]. (2) Omnichannel means not only retailers' physical stores and manufacturers' online direct selling channels, but also the online direct selling channels established with e-commerce, that is, retailers establish contact with wholesale and retail enterprises by establishing physical stores and sales agents of wholesale and retail enterprises. Retailers build sales agents and other models to form supply chains with them. As can be seen from the above description, the channel structure under dual-channel and all-channel (i.e. channel under BOPS mode) is shown in Figure 1:

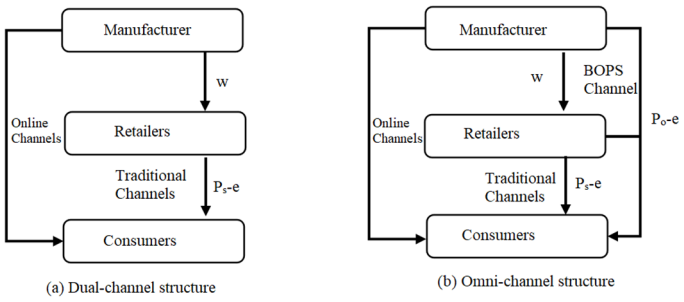

Figure 1. Dual-channel and all-channel channel structure

In a dual-channel supply chain structure, the retailer first purchases the product from the manufacturer at the wholesale price w, and then the retailer ships the product to the retailer. Then the retailer decides the offline retail price of the product ps to sell the product and provides the service value e for consumers in the physical store[3]. It also provides logistics support for the final sales process and ensures the integrity of the product supply chain. Therefore, how to coordinate the relationship between retailers and wholesalers, distributors and consumers is a

topic that must be faced to realize the value maximization of dual channels. In this mode, manufacturers, distributors and third-party logistics enterprises constitute an important part of the whole omnichannel system structure. The optimization of the supply chain structure is the key to maximize the omnichannel value and improve the overall efficiency and economic benefits of the whole system. Market demand depends on the selling price and the service value of consumers. Therefore, under the dual-channel supply chain structure, the demands of traditional channels and online direct selling channels are respectively shown in formula (1) and (2) :

$$D_s = (1-\lambda)a - (p_s - e) + \theta p_0 \tag{1}$$

$$D_o = \lambda a - p_0 + \theta(p_s - e) \tag{2}$$

In addition to the above dual-channel supply chain structure, in order to comply with the integration trend of online and offline channels, assuming that manufacturers and retailers cooperate to provide BOPS channels, this paper studies the omnchannel composed of manufacturers and retailers cooperate to provide BOOTC products under the traditional supply chain[4]. Based on the analysis, the optimization scheme of the all-channel supply structure based on the BOPS mode is obtained. By analyzing the comparison between the traditional supply chain and the online and offline channels, this paper concludes that the optimization of the all-channel supply structure plays an important role in improving the overall operating efficiency and reducing the logistics cost. Research shows that 45% of consumers who use BOPS channels purchase additional products during in-store pickup, while those purchased in retail stores are composed of online and offline channels; Consumers can collect goods from merchants by means of online payment. Secondly, retailers differ from traditional supply chains because of information sharing and service demand differences between online and stores, which make it difficult to effectively connect them [5]. Therefore, more and more retailers are willing to adopt the BOPS strategy. In the case of considering BOPS channels, the demand function model of the omnichannel structure is constructed as shown in formula (3), (4) and (5) :

$$D_s^b = (1-\lambda)a - (p_s - e) + \theta p_0 \tag{3}$$

$$D_o^b = m(\lambda+\delta)a - p_0 + \theta(p_s - e) \tag{4}$$

$$D_b^b = (1-m)(\lambda+\delta)a - (p_s - e) + \theta(p_s - e) \tag{5}$$

2.2 Optimal Decision Making Under Centralized Supply Chain

The optimal decision under the centralized supply chain means that the supplier bears the cost of the overall structure of the supply chain and shares the risk through third-party logistics enterprises or financial institutions according to customers' new requirements on the performance, quality and service of the goods under the condition of ensuring timely supply and

demand. It can reduce the overall demand level of both parties and improve customer satisfaction and service quality[6]. Under the centralized supply chain structure, the traditional retail channel and the online channel are managed by a central decision maker. The analysis of the dual channel and omnichannel models is as follows:

Model analysis without BOPS channels: Based on the description of dual-channel demand, related concepts of supply chain management and omnichannel are analyzed. From the perspective of demand side, combined with the BOPS model of the coordination mechanism between channels, operational efficiency and other influencing factors, the conclusion is drawn: with the intensification of market competition and the reduction of industry access threshold, the profit space of enterprises will be compressed; On the other hand, the change of consumer consumption habits leads to the increase of retail terminal diversion. In the case of centralized decision-making, the profit of the central decision maker operating the dual-channel supply chain is expressed as Formula (6) :

$$\pi_c = p_s[(1-\lambda)a-(p_s-e)+\theta p_o]+p_o[\lambda a-p_o+\theta(p_s-e)]-\frac{\beta e^2}{2} \tag{6}$$

In the case of centralized decision making, the profit of the central decision maker consists of two parts: one is the profit of selling products in traditional physical stores, and the other is the profit of franchise sales. Central decision makers play an important role in supply chain management, whose main function is to analyze and optimize the whole system structure, which can effectively control and supervise the overall operation mode[7].

Model analysis with BOPS channels: In the practice of omnichannel retail, BOPS strategy greatly improves the convenience of consumers to buy products and the flexibility of order fulfillment, which improves the overall efficiency of the supply chain and provides consumers with more high-quality and convenient shopping experience, thus improving the omnichannel service quality. In the case of centralized decision-making, the study of omnichane supply chain structure is conducive to improving the enterprise's own resource allocation and market competitiveness, and promoting industrial upgrading. Combined with the demand function of the omnichane supply chain, the profit function of the central decision maker under the omnichane supply chain can be obtained as shown in Formula (7) :

$$\pi_c^b = p_s[(1-\lambda)a-(p_s-e)+\theta p_o]+p_o[(\lambda+\delta)a+2(\theta p_s-p_o-\theta e)+e]-\frac{\beta e^2}{2} \tag{7}$$

2.3 Balanced Decision Making in Decentralized Supply Chain

In the decentralized mode, the retailer's decision-making power is mainly in the hands of the supplier, so it needs to be supervised and managed. When a retailer makes a purchase decision, the supply chain system will formulate corresponding strategies according to different demands, which leads to adverse selection problems due to consumer dispersion, information asymmetry and other reasons. On the other hand, it may also lead to the failure of the manufacturer to obtain sufficient product supply, resulting in increased costs and even a loss operation situation.

Meanwhile, the scattered distribution of consumers makes it difficult for the enterprise to centrally control the type and quantity of goods. Therefore, supervision and management should be carried out to achieve the goal of reducing risks and improving profits[8].

Model analysis of non-BOSP channel: The model of BOSP channel is established under the traditional distribution model, and enterprises need to settle the related expenses involved in the process of product production to sales. This enables decision-makers to have a certain understanding of their regional market environment. Therefore, in order to solve this problem, we must first determine a reasonable and feasible scheme; Secondly, it is necessary to formulate corresponding strategies and measures according to consumer demand preferences in different regions. Finally, considering the cost factor and combining with the actual situation to make the most suitable distribution channel selection, so as to reduce the cost of decision makers and improve the profit margin. Therefore, under the set and distributed supply chain, the profit of the retailer operating the dual-channel supply chain is expressed as formula (8) :

$$\pi_s = (p_s - w)[(1-\lambda)a - (p_s - e) + \theta p_o] - \frac{\beta e^2}{2} \tag{8}$$

Under the centralized distributed supply chain, the profit of the central decision maker consists of two parts: one is the profit of selling products in traditional physical stores, and the other is the profit of franchise sales [9]. Central decision maker plays an important role in supply chain management. Its main function is to analyze and optimize the whole system structure, and it can effectively control and supervise the overall operation mode.

Model analysis when there are BOPS channels: Nowadays, consumers' purchasing methods are gradually changing to multi-channel, mobile and fragmented, and the consumption process is becoming simpler and more transparent. Therefore, the development of enterprises faces great challenges. In such a complex competitive environment, it is necessary to make appropriate adjustments in order to remain invincible, and the equilibrium strategy means to achieve the overall optimal through the interaction between different types and scale factors. Decision makers need to constantly revise strategic selection methods according to market changes, and make timely responses to meet consumer demand and improve customer satisfaction and loyalty. Therefore, the profit function of omnichannel supply chain in decentralized decision-making is expressed as Formula (9) :

$$\begin{aligned} \pi_m^b = {} & p_o[(\lambda+\delta)ma - p_o + \theta(p_s - e)] + \\ & w[(1+\delta)a - (\lambda+\delta)ma + (\theta-1)(p_s + p_o) + (2-\theta)e] \end{aligned} \tag{9}$$

3 OMNICHANNEL SUPPLY CHAIN STRUCTURE BASED ON BOPS MODE

3.1 Construction of Omnichannel Supply Chain Structure

Omnichannel supply chain structure refers to the vertical connection between suppliers and final consumers, and its core is to build a system composed of manufacturers, distributors and

retailers. Through the establishment of the supply chain management organization to ensure that the enterprise in the whole operation process to the market changes in time, and through the supply chain management to achieve rapid response to the market demand, so as to ensure the quality of products and service level. The omnichannel supply chain model in BOPS mode is shown in Figure 2:

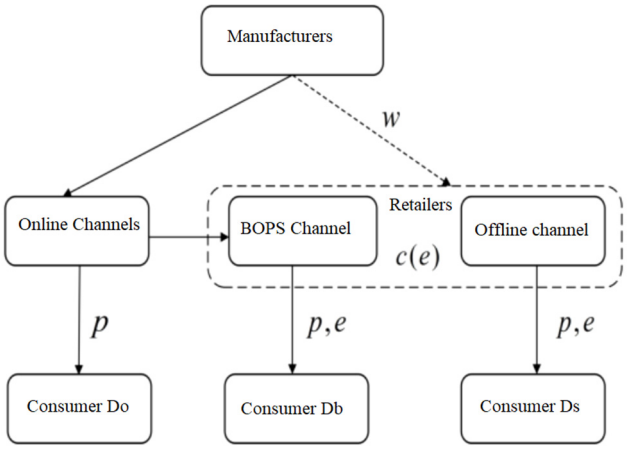

Figure 2. Omnichannel supply chain model under BOPS mode

In the practice of omnichannel retail, the integration of online and offline channels not only needs to overcome many technical bottlenecks, but also needs good cooperation and collaboration among supply chain members. Under the BOPS mode, the effective integration of online and offline channels is conducive to making up for the defects of the traditional supply chain management mode, such as low efficiency, high cost and long cycle. On the one hand, BOPS increases the sales and service cost of offline retail stores and also increases the sales profit of online channels. On the other hand, for offline retail stores, cooperation with online platforms can enable them to obtain more professional and systematic services. At the same time, in terms of BOPS sales integration, enterprises have adopted two strategies in practice, including the offline channel and the online channel. However, due to the high supply chain management cost of the online platform and the limitation of the offline channel, enterprises are faced with great difficulties in the operation process.

3.2 BOPS Sales are Credited to Online Channels

Omni-channel management based on channel structure refers to the income and expenditure generated from a supply chain and gradually refined to other links and processes in the whole value chain. The inclusion of BOPS sales into online channels means that all the profits of BOPS consumer orders belong to manufacturers, and the benefits of consumers through channels are obtained by manufacturers. Supply chain structure will directly determine the value creation ability and efficiency. At this time, the manufacturer's profit optimization is expressed as Formula (10) :

$$\max_{w} \pi_m^{D1} = wD_s + p(D_b + D_o) = w(\lambda_1 a + e - p) + p[(1-\lambda_1)a + e - 2p] \quad (10)$$

When BOPS sales volume is included in online channels, it brings huge economic benefits to the current society. At the same time, it also increases the government's investment in infrastructure construction and improves the overall competitiveness of the city[10].

3.3 BOPS Sales are Booked into Offline Channels

After studying the omnichannel supply chain structure, it is found that it is mainly operated through online sales mode. Offline channel refers to that retailers directly purchase products from manufacturers and charge consumers fees when purchasing goods or services from wholesalers. However, there are huge differences between traditional retail enterprises and e-commerce: on the one hand, they have different places of operation, on the other hand, there are obvious differences - the limitations of the point market and the terminal market, so the online sales model to a large extent limits the cost and risk sharing of business exchanges between the main operators of the channel. In the omnichannel practice, in order to improve the service enthusiasm of offline retailers, improve customer satisfaction, and promote the healthy development of online retail enterprises, this paper studies the omnichannel supply chain structure under the BOPS mode, analyzes the coordinated decision of the omnichannel supply chain when BOPS sales volume is included in the offline channel, and the profit optimization problem of the manufacturer is shown in Formula (11) :

$$\max_{w} \pi_m^{D2} = w(D_s + D_b) + pD_o = w[(\lambda_1 + \lambda_2)a + 2e - 2p] + p[(1 - \lambda_1 - \lambda_2)a - p] \quad (11)$$

When BOPS sales are included in offline channels, its advantage is that it can improve the efficiency of the supply chain, reduce operating costs, and increase the channel supply capacity to a certain extent.

4 CONCLUSION

In summary, with the development of social economy and improvement of people's living standards in our country, the concept of omni-channel supply chain is widely applied in all walks of life, and the theory study and practice exploration of supply chain management model also gradually increase. Our country carries on an active response under the field of omni-channel, which is of great significance for promoting the development of the society. However, at present, domestic academic circles have few researches on the omnichannel logistics structure under the BOPS mode, and most of them focus on its management and control in traditional urban construction, while the research on omnichannel supply chain management of urban infrastructure is still in its infancy. Based on this, this paper studies the omnichannel supply chain structure under the BOPS mode, hoping to provide some references for related fields.

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