Innovation in Supply Chain Collaborative Management for Chain Supermarkets in the New Retail Context

Zengneng Xing

Hainan Vocational University of Science and Technology, Haikou 571126, Hainan, China

Abstract: New retail is driving chain supermarkets to transition toward omnichannel integration and rapid consumer demand responsiveness. Traditional supply chain collaboration models in industrial and commercial enterprises struggle to meet new operational requirements due to information delays and superficial coordination. Through systematic research on pain points in conventional collaboration models and innovative pathways under new retail, this paper reveals that establishing a data-driven demand-production coordination system, an omnichannel fulfillment logistics coordination system, and a consumer-driven product-service coordination system can break down information barriers between industrial and commercial entities. This approach enhances overall supply chain responsiveness and value creation capabilities, providing actionable practical directions for supply chain collaboration management in chain supermarkets.

***Keywords*:** new retail; supermarket chain; industrial and commercial enterprises; supply chain; collaborative management

1. Introduction

With the popularization of the new retail concept, chain supermarkets are no longer confined to offline sales but need to take into account new scenarios such as immediate delivery of online orders and personalized satisfaction of consumer demands. This places higher demands on the supply chain collaboration between upstream manufacturing enterprises and supermarkets. However, the traditional collaborative model mostly remains at the basic level of "supermarkets placing orders and enterprises supplying goods", lacking in-depth information sharing and full-chain linkage, which often leads to problems such as inventory overstock, delayed order fulfillment, and disconnection between goods and consumer demand. Against this backdrop, exploring innovative practices of supply chain collaborative management suitable for new retail has become a key for chain supermarkets and upstream enterprises to achieve a win-win situation and enhance market competitiveness, which holds significant practical value.

2. Supply Chain Collaborative Management Model for Traditional chain Supermarkets and industrial and commercial Enterprises

2.1 Basic supply and marketing collaborative model

Centered on short-term purchase and sales contracts, chain supermarkets form a "demand-supply" basic linkage with upstream manufacturing enterprises. Supermarkets formulate purchasing plans based on the sales data of their stores and place orders with enterprises. Manufacturing enterprises organize production and distribution based on orders, and both parties ensure supply through simple information exchange. This model is easy to operate and suitable for medium and small-scale cooperation, but the depth of collaboration is limited. It is prone to lead to inventory overstock or shortage in supermarkets due to deviations in demand forecasting. Moreover, production enterprises lack market dynamic perception and have insufficient response flexibility.

2.2 Inventory co-management collaborative model

Adopt the Supplier Managed Inventory (VMI) mechanism to drive both industry and commerce to shift from "passive supply" to "active collaboration". Chain supermarkets open real-time sales and inventory data to core manufacturing enterprises. Enterprises independently formulate replenishment plans based on these data, which are implemented after being reviewed by the supermarkets [1]. Clarify the responsibility for stockouts and inventory turnover requirements through agreements, and establish a corresponding reward and punishment mechanism. This model can reduce the risk of inventory redundancy and stockouts, but it has higher requirements for the security and timeliness of data sharing.

2.3 Value-co-creation collaborative model

Guided by long-term strategic cooperation, achieve full-chain collaboration from procurement to sales. The industry

and commerce parties jointly established a category management team to conduct market research and develop customized products together. Production enterprises participate in supermarket promotion planning and adjust production capacity according to the rhythm of the activities. Both parties share the benefits of cost savings and jointly establish a risk-sharing mechanism. This model can deeply explore market value, but it requires both parties to break down interest barriers and establish a highly trusting cooperative relationship [2].

3. Innovative Paths for Supply Chain Collaborative Management of Industrial and Commercial Enterprises in Chain Supermarkets under the Background of New Retail

3.1 Data-driven demand forecasting and production collaboration path

The industry and commerce parties should first jointly establish a data task force to clarify the scope of data collection. Chain supermarkets need to provide real-time sales data from offline store POS machines, online mall order data, and member consumption behavior data. Manufacturing enterprises need to synchronize production capacity data. Unify the data standards. For example, the coding of commodity SKU adopts the 18-bit coding rule agreed upon by both parties. The format of sales volume data is unified as "yyyy-MM-ddHH:mm:ss- commodity code - sales volume", and deploy data cleaning tools to automatically eliminate outliers to ensure data quality. The Time Series Prediction Model (LSTM) was selected to process the sales data. The historical sales data of the recent 12 months was used as the training set, and the initial model was constructed in combination with feature variables such as holidays and promotional activities. After the model outputs the daily sales prediction results of the subcategories, the error rate needs to be calculated by comparing the "predicted value - actual value". When the error rate exceeds 10%, the model will be automatically retrained and the weights of the feature variables will be adjusted [3]. Introduce consortium chain technology to build a data sharing network, and set up three types of nodes: chain supermarkets, manufacturing enterprises, and third-party auditing institutions. After each piece of data is uploaded, it must be verified and approved by the third-party nodes before it can be uploaded to the chain to ensure that the data cannot be tampered with. The production scheduling system of the manufacturing enterprise is connected to the prediction model through the API interface. When the predicted sales volume exceeds the current production capacity by 15%, the system automatically sends a production capacity warning to the production manager and generates alternative production scheduling plans at the same time. The supermarket end can view the production scheduling progress of manufacturing enterprises in real time, avoiding supply and demand mismatches caused by information gaps.

3.2 The path of fulfillment and logistics collaboration through the integration of all channels

Both the industry and commerce parties first conduct regional demand research: by analyzing the density of offline stores and the heat map of online orders, they determine the number and location of the forward warehouses, and the shared warehouses are located in the regional center. The inventory allocation is configured as "core products account for 60%, regular products account for 30%, and long-tail products account for 10%". Deploy a warehouse management system (WMS) to achieve real-time synchronization of inventory data among the forward warehouse, shared warehouse, and production enterprise warehouse. When the inventory of a certain commodity in the current warehouse drops below the safety line, the system automatically sends a replenishment request to the shared warehouse. Develop standardized API interfaces: The order system of chain supermarkets will push order information in real time to the inventory system of production enterprises and third-party logistics platforms. After the inventory system of the manufacturing enterprise confirms the shipment, it will send the logistics tracking number back to the supermarket order system. The logistics platform synchronously updates the transportation status to the visual boards of both parties. The Kanban design should include core information such as "order source - product location - estimated delivery time", support filtering and querying by order number and region, and set up abnormal warning . Production enterprises reserve 15% to 20% of flexible production capacity to cope with demand fluctuations such as promotions and sudden orders, and sign emergency supply agreements with raw material suppliers. The logistics end adopts ant colony algorithm to optimize the delivery route, comprehensively considering the delivery distance, traffic congestion and order concentration, to shorten the delivery time. At the same time, an emergency response plan should be formulated. When the logistics capacity in a certain area is insufficient, the backup logistics vehicles in the surrounding areas should be automatically dispatched to ensure the efficiency of contract fulfillment.

3.3 The collaborative path of goods and services driven by reverse consumption

Chain supermarkets conduct stratified research relying on the membership system, send targeted questionnaires to high-frequency members, and store sales assistants record consumers' immediate feedback by scanning codes. The

online mall sets up a "Preference Voting" module on the product detail page. The collected data is classified through the clustering algorithm (K-means); For instance, the demand for snack foods can be classified into three categories: "low sugar and healthy", "portable small packaging", and "high cost performance". The sample size and growth trend of each category of demand should be marked to form a demand analysis report. Both the industry and commerce parties hold a joint development meeting based on the demand report to determine the core parameters of the customized products. The manufacturing enterprise provides a sample production plan, while the supermarket formulates a trial sales plan. During the trial sale period, sales volume, repurchase rate and user reviews will be monitored in real time. When the sales volume on the 15th day of the trial sale fails to meet expectations, both parties will jointly adjust the parameters. After the trial sales meet the standards, the production enterprise initiates mass production, and the supermarket simultaneously formulates a full-channel promotion plan . Analyze the sales rate of goods on a weekly basis. When the sales rate of a certain product is lower than 30% for two consecutive weeks (sales rate = number of sold SKUs/total number of SKUs), immediately initiate slow-moving sales handling. The manufacturing enterprise should stop the production of this product, and the supermarket should carry out "combination promotions". When the sales rate of a certain product exceeds 80% for four consecutive weeks, the production capacity is locked in advance. Promote green collaboration, jointly select degradable packaging, and optimize the transportation loading rate through packing algorithms; Monthly statistics on the green synergy effect will serve as the basis for subsequent optimization.

4. Conclusion

This study has identified the shortcomings of traditional chain supermarket industrial and commercial enterprises in supply chain collaboration, such as insufficient information sharing leading to supply and demand mismatch, imperfect omni-channel fulfillment system affecting distribution efficiency, and difficulty in reverse transmission of consumer demand to the production end. It also addresses the issue of information lag through data-driven collaboration and enhances distribution timeliness through omni-channel fulfillment collaboration. Consumption reverse drives collaboration to achieve precise product development.

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