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Supply Chain Innovation in the Catering Industry: An Assessment of the Cost-Effectiveness and Sustainability of the Central Kitchen Model

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Abstract: With the trend of mechanization in the catering industry, the demand for scale, industrialization and standardization of the catering supply chain has increased. As an emerging catering supply chain model, the central kitchen has great potential to meet the demand for mechanization. Central kitchens are an effective way to solve the catering industry's problems in scaling up operations. However, in practice, many issues still need to be researched and explored in the central kitchen based on the enterprise perspective in the context of the Chinese catering industry. This paper collects and analyzes data from China's restaurant industry and Shuhai's business data to determine whether central kitchens positively impact supply chain management and performance improvement in the context of China's restaurant industry. It is found that the central kitchen model effectively reduces supply chain costs, ensures product quality and improves supply chain synergy and integration, which is a theoretical guide and practical revelation for the supply chain decision-making of catering enterprises and the model design of supply chain service enterprises.

Keywords: Supply Chain Innovation, Catering Industry, Central Kitchen Model

1. Introduction

With the continuous development of China's food and beverage industry, the mechanization of food and beverage brands as well as the improvement of supply chain management level, the innovation of supply chain model to reduce cost and improve efficiency has become the focus of attention in the industry [1, 2]. According to the China Chain Restaurant Industry Report 2022 (data released by China Chain Store Association (CCFA) and China Renaissance), small and medium-sized restaurant chains are experiencing rapid growth, and the trend of chainization in the restaurant industry continues to grow. Some scholars and business reports believe that the trend of chainization in China's restaurant industry will continue [3].

However, China's catering supply chain faces challenges such as information asymmetry, excessive length and low management awareness, which result in a short life span and a high elimination rate of catering enterprises. The main reason is the mismatch between the fast growth of the industry and the capabilities of its back-end supply chain. As a result, the catering industry's standardization, scale and industrialization have made corresponding demands on the supply chain [4].

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Martin Christopher, a British supply chain management scientist, once pointed out that Competition among enterprises in the 21st century extends to competition among supply chains. Companies like KFC and McDonald’s have built their supply chain systems in the restaurant industry. Supply chain service providers like Sysco have proven the value of supply chain model innovation. However, there is still a lack of systematic and detailed analysis of China's catering industry's emerging "central kitchen" model and the in-depth exploration of its representative enterprises. Therefore, the purpose of this paper is to conduct an in-depth study on the current situation and problems of the supply chain in China’s catering industry, as well as the analysis and evaluation of the "Central Kitchen Model" based on the data of China’s catering industry business reports and the data of Shuhai’s supply chain companies [5].

China’s catering industry is growing rapidly. According to the 2023 China F&B Industry Ecology White Paper, the total revenue of China’s F&B industry reached 4.4 trillion RMB in 2022, a 6.3% decrease from the previous year. Still, in the first two months of 2023, it reached 842.9 billion RMB, a 9.2% increase. The number of registered restaurant enterprises increased by 24.9% from January to November 2021, with a net increase of registered businesses reaching 2,163,000 entrepreneurs entering the industry. Small and medium-sized restaurant chain brands experienced significant growth in store count in 2021. Brands with fewer than 100 stores had a 23.0% increase, while those with 11-100 and 5001-10000 stores had 16.8% and 16.0% increases, respectively. The chainization rates of all types of F&B categories increased year-on-year due to improvements in store management, brand management, and development in the restaurant supply chain. Leading examples include MiXueBingCheng, with over 10,000 stores each. Wallace and JueWeiYaBo, having over 15,000 stores each, and ZhengxinJiPai, boasting 20,000 stores. These trends indicate that China’s catering industry is moving towards standardization and large-scale development.

2. Analysis of the Problem

2.1. Geographical Information Asymmetry

China is a vast country with significant information asymmetry across regions, mainly in the 2 aspects of raw material procurement cost control, product quality management and integrated management of stores in different regions, which is manifested in the taste and price differences of dishes in different regions, which contradicts the background of restaurant brand chainization.

2.2. Long Supply Chains and Intermediate Costs Resulting from the Distribution Process

The catering supply chain consists of multiple steps, including planting/farming, food processing, logistics, warehousing, sales, distribution and terminal stores. Upstream agricultural products are characterized by cyclical volatility and price fluctuations, and there is limited synergy between upstream and downstream due to information asymmetry. For a long time, many dispersed farmers and small and medium-sized suppliers have made up the major proportion of the entire supply chain, and the limited scale of the supply chain has resulted in an excessively long and non-transparent farm-to-table supply chain, which restricts further development of the supply chain.

2.3. Insufficient Awareness of Supply Chain Management

In the current catering market, small and medium-sized catering enterprises still dominate and need more awareness of supply chain management. Many catering companies need help with management problems in procurement, quality control, and logistics during expansion, leading to rising costs and declining customer experience. The key to this problem is that caterers need to ensure a standardized supply of ingredients from the supply chain source, which sets higher demands on the ability to

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control the supply chain. The supply chain management level has yet to keep pace with the scale of the catering industry.

3. Supply Chain Model Analysis and Evaluation

3.1. Central Kitchen and Operation Model

A central kitchen is a processing and distribution center with independent food production sites, facilities and equipment capable of centralized processing and production of semi-finished and finished food products and distributing them to food retail units. The central kitchen's main production and processing functions include centralized procurement of raw materials, standardized production, unified inspection and packaging, frozen food and raw materials storage, and distribution and processing information related to production, production and distribution.

The concept of Central Kitchen has been proposed in the United States, Japan and other countries for decades, and also has a more mature mode of operation [6]. China’s central kitchen development started relatively late, and there are still problems such as backward production technology, low levels of automation, and ineffective management mode. At the same time, there is also a lack of unified health standards, industry policies and regulations, which need further improvement.

The main players in the produce-to-table food restaurant supply chain are farms, agents, food processors, wholesalers, retailers and end restaurants. In the traditional supply chain model, farms produce agricultural products, agents buy agricultural products in bulk from farms or individual farmers, which are sold to food processors for primary or complete processing, and the semi-finished or finished products made by the food processors are sold to different wholesalers depending on the geographic location, who in turn sell the products to retailers in each region, and finally to the end restaurants. China Chain Restaurant Industry Report 2021, published by the China Chain Store Association (CCFA) and China Renaissance, shows a 2%-30% markup at each step, with complex supply links and high transaction costs. Under the central kitchen model, the central kitchen directly purchases from farms or individual farmers or builds its production bases to produce the required agricultural products, which are then pre-processed, cooked and packaged to make the final products, which are delivered to the stores in each region through its own cold-chain logistics network or cooperation with third-party logistics service providers.

3.2. Motivating Factor

3.2.1. Policy Incentives

In 2019, the National Development and Reform Commission and 25 other departments jointly issued the ’Opinions on Promoting the High-Quality Development of Logistics and Facilitating the Formation of a Strong Domestic Market,’ which proposes the development of a new model of ’Central Kitchen + Cold Chain Distribution,’ creating new opportunities for the development of central kitchens and cold chains. In 2020, Guangdong Province included central kitchens in its ten strategic pillar industry clusters; Lanzhou City in Gansu Province also identified six central kitchen pilot construction projects; Anhui Province promoted new forms of business and consumption and accelerated the promotion of a new service model of central Kitchen + Cold Chain Distribution of Food Ingredients’ for agricultural products1. Many local governments believe that introducing central kitchens is a practice of combining supply chain and digital technology, enhancing the level of intelligent, intensive and standardized production of the regional modern service industry, expanding the scale of the catering industry, cultivating new business models, and promoting the transformation and upgrading of the industrial structure and the high-quality development of the economy.

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3.2.2. Catering Channelization Trend + Small and Medium-Sized Business Needs

Under the trend of restaurant mechanization in China, the demand for cost reduction and efficiency improvement in restaurant stores has prompted them to improve their supply chain management. Currently, most of China's central kitchens are self-built by restaurant giants (61.4%), and many serve specific social groups such as colleges and universities and the government (20.3%). 50.3 percent of companies have fewer than 50 stores and lack capital and supply chain management capabilities. The central kitchen model meets restaurant chains' cost reduction and efficiency improvement needs, especially small and medium-sized ones that do not have enough capital and supply chain management capabilities to support their expansion.

3.2.3. Logistics Infrastructure Development

Cold chain logistics is a professional logistics that utilizes temperature control, preservation and other technological processes and facilities such as cold storage, refrigerated trucks and refrigerated containers to ensure that cold chain products are always under the specified temperature in the whole process of preliminary processing, storage, transportation, circulation and processing, sales and distribution. The central kitchen model relies on the rapid development of cold chain logistics in China, which provides a solid foundation for the centralized processing and distribution of food products.

3.3. Advantages of the Model

3.3.1. Scale Processes to Reduce Costs at All Steps of the Chain

The central kitchen model reduces procurement costs by centralizing the purchase of agricultural products and shortening the markup link in the catering supply chain1. In addition, large-scale processing of raw materials can also improve the full utilization of raw materials and reduce the consumption of water, electricity, gas and other energy, as well as labor costs [7]. Large-scale centralized distribution of finished products also helps to reduce the logistics costs that would otherwise be incurred by small, multiple, order-based ordering. According to most scholars, costs in the catering industry mainly include raw materials, labor and rent, with raw material costs accounting for 35%-40% of revenue, labor costs accounting for about 15%-20%, and rent costs accounting for 10%-15%. In addition, external factors such as takeaway platform fees, energy costs and related taxes account for around 15-20%. Cost reduction can be categorized into both fixed and variable costs. The central kitchen model reduces the space requirements of the store, which can reduce rental costs or convert excess space into dining areas to reduce rental expenses further. At the same time, simplifying complex processes can significantly reduce labor costs and improve meal delivery efficiency and table turnover. It is worth noting that the upstream cost of prepared dishes usually accounts for more than 90% of the total cost of the product [8].

3.3.2. Standardized Process to Ensure Product Quality

The central kitchen model standardizes all aspects of food processing and production by unifying the procurement, handling, and processing of food raw materials. Standardization has been achieved in all aspects, from purchasing, pre-processing, processing, storage, transportation, and reheating, avoiding the irregularity of manual operation and ensuring the stability of the product's quality, taste, color, and flavor in different regional stores. At the same time, according to food processing requirements, it follows HACCR, GMP and other production standards to ensure the hygiene supervision of the product production process, thus ensuring food safety [9].

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3.3.3. Industry Chain Optimization and Integration

The central kitchen model covers the entire process from production to consumption, involving various industries such as planting, farming, food processing, freezing and preservation, and cold chain transportation. Many catering enterprises are exploring new modes of “central kitchen + other industries”, cooperating and developing with raw material bases, logistics companies and catering brands, and promoting the development of related industries. Some catering supply chain enterprises have established solid cooperation with downstream catering brands, which helps the supply chain enterprises share market information, improve the synergy of the supply chain, and thus increase the profits of the supply chain members [10].

4. Case Study

The predecessor of Shuhai is the catering supply chain subsidiary of Haidilao, which started to operate independently in 2007, providing Haidilao with an overall supply chain system that includes centralized procurement, centralized central kitchen processing, unified quality control, and interconnection of logistics systems. According to the annual report of Haidilao for the year 2022, the transaction amount arising from the " Restarted Shu Hai Agreement " for the year ended December 31, 2022, amounted to RMB2,096,482,000, which is one of the largest suppliers of Haidilao.In 2014, Shuhai Supply Chain was formally established to provide one-stop, complete food supply chain solutions such as ingredient procurement, warehouse hosting, and information services for chain companies and retailers. It provides services for over 2,000 restaurant chain brands such as 7-11, Tai Er, Meng Zi Yuan, etc. Shuhai Supply Chain integrates many supply chain businesses, including cold chain logistics, service platforms and central kitchens.

Regarding procurement, Shuhai has built some of its vegetable bases. Shuhai Supply Chain has developed standards for supplier selection and started strategic partnerships with vegetable bases and other ingredient suppliers to produce according to Shuhai’s standards. At the national level, Shuhai covers the centralized procurement of all categories through the use of national direct procurement plus regional joint procurement. At the regional level, Shuhai aggregates the order resources to take advantage of scale advantages and establishes partnerships with nearby production bases and suppliers to deliver and distribute goods in the area, creating a new national and regional supply pattern.

At the warehouse and distribution end, up to now, Shuhai has more than 40 warehousing and distribution logistics centers and 9 production and processing centers across the country, with a total area of more than 400,000 square meters and the daily throughput of the self-built logistics and distribution centers is more than 900 tons, and assembled more than 2,000 cold-chain logistics trucks, with a total capacity of 2,000 refrigerated and ambient trucks to build a nationwide whole process cold-chain logistics system, and make timely deliveries to downstream stores of the catering enterprises.

On the production side, Shuhai Supply Chain has food processing centers nationwide and four innovative R&D centers in Beijing, Shanghai, Dongguan and Wuhan. The main products are Chinese semi-finished products, including Chinese marinated condiments, semi-finished products, Chinese sauces, marinades, and frozen dishes. Shuhai Supply Chain has more than 50,000 SKUs at present. Shuhai Supply Chain carries out standardized processing and new product development through its food processing center according to the demands of downstream catering stores. It reduces the average cost of catering enterprises by up to 30% through self-built intelligent cooking equipment under the central kitchen model.

On the sales side, Shuhai Supply Chain has signed cooperation agreements with catering companies such as Haidilao, 7-11, supermarket retailers such as He Ma, and many enterprises and

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institutions such as CCTV and Huawei. The downstream users place orders to procure commodities through Shuhai's B2B service platform. In marketing, to show the scene of the restaurant cooking methods, Shuhai in Shanghai and other large cities promote innovative experience centers so that customers can have an immersive experience and exchange restaurant design-specific ideas, prompting the restaurant enterprises and Shuhai as soon as possible to reach a cooperation intention.

Regarding supply chain informatization, in 2021, Shuhai will replace the original ERP, outsourced WMS, and ordering systems with its self-developed platform. At present, in the whole business chain of Shuhai, the import and export inventory management, procurement management SRM, customer service CRM, customer ordering Saas, its own WMS, and TMS system are all based on one development platform, which realizes the online and visualization of the business process.

5. Future Directions

5.1. Provision of value-added services

Providing value-added services: Third-party catering supply chain service providers under the central kitchen model are more closely connected to downstream stores, with more stable cooperation and higher information transfer and sharing1. Given small and medium-sized chain restaurant brands' high elimination rate and limited supply chain management capabilities, central kitchens can provide consulting services such as menu optimization and recipe development based on store sales data, enhancing customer loyalty and retention.

5.2. Explore new sales channels.

China's takeout industry has grown rapidly due to the cultivation of Chinese restaurant consumers' online ordering habits during the pandemic. Still, the ensuing difficult-to-regulate and widespread food safety issues are a potential impediment to the industry's further development. While the model of standardized food delivery from the central kitchen is a potential solution to food safety issues, most of the current third-party catering supply chain is mainly targeted at enterprises (to B), and the cooperation with existing Internet catering platforms such as Hungry, Meituan to develop to C sales may be a new growth point for the industry.

5.3. Whole-chain Intelligent Logistics

Shuhai and other central kitchen enterprises have already realized online business, established SaaS full-link digital solutions covering production, procurement, orders, warehousing, logistics and other links, and strengthened the control of the whole process of supply and demand and the full-link tracking of orders5. Central kitchen enterprises play a role in linking upstream and downstream in China's catering supply chain. Leading enterprises have strong bargaining power and more stable cooperation with upstream agricultural suppliers and downstream catering brands, which helps to break the boundaries of the enterprise through information exchange and combine information sharing with enabling technologies such as IoT, blockchain, etc., to make the whole chain more intelligent, and further enhance the supply chain synergy and management.

6. Conclusion

This study finds that the Shuhai Supply Chain utilizes the central kitchen model to reduce operating costs and improve profitability, customer service quality and supply chain management. The "central kitchen" model has a positive impact on reducing costs in each link, ensuring the stability of product quality and supply chain synergy and integration. The results of this study will facilitate F&B industry players and managers to understand better the "central kitchen" model and related service providers and thus be more likely to make decisions conducive to improving supply chain management. Finally, due to the current development status of the "central kitchen" model and the data that can be collected, the construction of informatization and intelligence in the whole chain can not get evidence-based results, which can be used to conduct in-depth research on this topic.

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