

Enhancing Agile Responsiveness in Flexible Supply Chains: A Case Study of Automobile Companies

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Abstract: As the leading industry in China's current development, the automobile industry is seeking international development under the background of globalization. In order to gain a competitive advantage, the management model of the flexible supply chain is introduced to quickly adapt to market changes and improve the agile responsiveness of the supply chain. This paper first gives an overview of the research, introduces the development status faced by automobile companies, and explains the basic concepts of flexible supply chains. Then the research content is expanded, and a multi-angle analysis is adopted. From the front end to the back end of the supply chain, the four links of the procurement system and supplier management, production system and design development, inventory system and logistics efficiency, and the role of the audit system in the supply chain are analyzed and studied to improve the agile responsiveness of the flexible supply chain of automobile companies. Finally, for the four links, the multi-point supply strategy, "three-ization" strategy, digital strategy and strategy to improve audit transparency are summarized. In the future, automobile companies will also use a variety of strategies to improve the agile responsiveness of the flexible supply chain to adapt to the ever-changing market and new challenges.

Keywords: Supply chain, Flexibility, Agile responsiveness, Automobile companies.

1. Introduction

As the leading industry in China's current development, the automobile industry has begun to transform from an incremental stage to a stock stage after the production and sales volume of the domestic automobile market reached its peak in 2017 [1]. Against the backdrop of globalization and increasingly fierce domestic market competition, my country's automobile companies have begun to expand overseas markets on a large scale and seek international development. In order to gain a competitive advantage, the supply chain needs to change with market changes and quickly produce products that meet customer needs [2].

As an advanced supply chain management model, the flexible supply chain can quickly adapt to market changes and improve agile responsiveness by flexibly adjusting each link of the supply chain. The core feature of the flexible supply chain is the ability to quickly and economically deal with the uncertainty of the environment or caused by the environment in the production and operation activities of enterprises. It is generally composed of three capabilities: buffering, adaptation and

innovation. Buffering capacity refers to the setting of a certain amount of inventory, production capacity, or other resource reserves in the supply chain to cope with the uncertainty caused by demand fluctuations or supply interruptions; Adaptability refers to the ability of the supply chain to make corresponding adjustments to adapt to environmental changes without changing its basic characteristics when the environment changes; Innovation capability refers to the ability of the supply chain to adopt new behaviors and new initiatives to influence the external environment and change internal conditions.

This research is based on the characteristics of a flexible supply chain, the thesis adopts multi-angle analysis, from the front end to the back end of the supply chain, in a logical order, divided into four links: procurement system and supplier management, production system and design development, inventory system and logistics efficiency, and the role of audit system on the supply chain, and studies the strategies to improve agile responsiveness in each link.

2. Strategies to Enhance Agile Responsiveness in Automobile Supply Chains

The thesis analyzes and studies the strategies to improve the agile responsiveness of the flexible supply chain of automobile companies from four aspects: procurement system and supplier management, production system and design development, inventory system and logistics efficiency, and the role of the audit system in the supply chain.

2.1. Procurement system and supplier management

The procurement system of automobile enterprises is complex and dynamic and has high requirements for the stability of the supply chain. It involves long chains, multiple levels, and complex collaborative relationships. With the advancement of globalization and the expansion of overseas markets, market demand is also constantly changing. The procurement system of automobile enterprises needs to have the ability to respond quickly to market changes and be able to quickly adjust procurement plans to adapt to market demand. In the procurement system of automobile enterprises, automobile enterprises have extremely high requirements for the quality of parts and components. Any quality problems may affect the performance and safety of the entire vehicle, so it is necessary to ensure the stability of the supply chain and the quality of parts and components[3].

Automotive companies can adopt a multi-point supply strategy to improve the agility and responsiveness of the supply chain.

The multi-point supply strategy can reduce the dependence of automobile companies on a single supplier, and confirm the first, second and third suppliers according to the supply ratio from high to low. Although this increases the complexity of management and requires more effort in multi-point verification procedures, quality control and R&D management, it can effectively disperse risks and ensure the agile responsiveness of the supply chain.

Enterprises can track the performance of suppliers through the quality and production departments, and dynamically adjust the ratio of first, second, and third suppliers based on the performance evaluation results. Dynamic adjustment enables enterprises to continuously optimize the supplier resource pool while resisting risks and improving the overall response speed of the supply chain. The introduction of market competition mechanisms by enterprises can also promote competition among suppliers, help optimize procurement costs, and enhance the bargaining power of automobile companies, providing more room for enterprises to strive for more favorable prices and better procurement conditions.

The multi-point supply strategy can also help companies deal with potential supply disruptions. Companies establish redundant supply resources, and based on consolidating existing suppliers, they continue to expand more supply channels. When faced with the risk of material supply disruptions,

companies can quickly switch material sources to ensure the agile responsiveness of the supply chain [4].

2.2. Production system and design development

The automotive industry production system is a complex system that usually adopts large-scale production methods to achieve cost-effectiveness and high efficiency. The production line is highly dependent on automation technology, including robots, automated assembly lines and intelligent control systems. The production of automobiles relies on complex supply chain management, involving many suppliers and parts, and requires high integration and coordination. Automakers often adopt lean production principles to reduce waste, improve production efficiency and respond to market changes. As consumers' demand for personalized cars increases, the automobile production system also increasingly requires customized production strategies.

In order to improve the agility and responsiveness of the supply chain, automobile companies need to shift from mass production to mass customization, mainly adopting the "three-ization" strategy, namely standardization, modularization, and platformization, to reduce the complexity of products [5].

Through the standardization of auto parts, enterprises can reduce the number of parts types, reduce design complexity, reduce material management costs, and create economies of scale. Parts standardization can standardize every link in the production of auto parts, from the selection of raw materials, and the specification of production processes to the inspection of finished products, to ensure that each production process is traceable, effectively improve product quality, and reduce the defective rate. Modular production design allows each work group on the production line to focus on the manufacturing of different modules, speed up the overall production speed, and improve production efficiency. Flexible assembly and interchangeability between modules facilitate meeting the personalized needs of customers. The after-sales maintenance process is also more simplified. Only the faulty module needs to be replaced, and there is no need to repair the entire car, saving time and cost. Platformization can realize the commonality of parts between different products. By applying some fixed parts combinations on the same platform, different models on the same platform have similar structures and configurations, which greatly facilitates product design, development, and production [6].

The "three-in-one" strategy can flexibly respond to customer needs, efficiently customize in a short period, reduce development costs, shorten development cycles, and effectively improve the agility of the automotive company supply chain.

2.3. Inventory system and logistics efficiency

Auto companies need to store and manage a large number of auto parts and complete vehicles, which requires a large warehouse area and the ability to conveniently store and allocate different types of auto parts. Auto parts are dependent on each other, and the inventory system needs to be precisely controlled to ensure the safety and integrity of parts and complete vehicles, and to be delivered to the production line in a timely manner. The automotive logistics system includes highly centralized production, long-distance transportation of finished products, and a large amount of after-sales parts logistics, which requires dedicated transportation and loading and unloading equipment. This process requires timely regulation by automobile companies.

Therefore, automobile companies usually adopt digital strategies to optimize inventory systems and logistics efficiency.

To ensure that managers can understand inventory dynamics and avoid inventory backlogs and shortages, automobile companies use digital management, using machines to scan goods barcodes or

Radio Frequency Identification (RFID) tags to automatically record goods in and out of the warehouse, integrate data sets, and analyze and generate detailed inventory reports[7]. Inventory reports include inventory turnover rate, sales analysis, slow-selling product analysis, etc., which can provide data support for enterprises to optimize inventory management strategies and improve the agility and responsiveness of the enterprise supply chain. The automobile enterprise inventory system can also be integrated with other enterprise management systems such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) to achieve data sharing and business process collaboration. The inventory system can set different user permissions according to the needs of different departments and positions to ensure data security and operational standardization. Users can select different conditions to quickly query the required inventory information and improve the work efficiency of the inventory system. For companies with multiple warehouses, establishing a digital inventory system and uniformly managing the inventory status of multiple warehouses can achieve the optimal allocation of resources. Inventory data between different warehouses can be shared in real time to facilitate scheduling and management[8].

In terms of logistics systems, automobile companies are also increasingly integrating advanced digital technologies, such as Global Positioning System (GPS) tracking, the Internet of Things, and big data analysis, to improve logistics efficiency, reduce costs, and enhance transparency in the supply chain. By establishing a complete logistics information management system and providing logistics information query services, customers can keep abreast of automobile transportation conditions at any time. It can also plan transportation routes based on multiple parameters such as the type, quantity, transportation distance, and user requirements of the goods, and automatically generate the optimal transportation route to ensure that the goods arrive at their destination quickly, safely, and accurately. The use of a digital logistics system can track and monitor the location, driving speed, and fleet size of the vehicle in real time. When an emergency occurs, automobile companies can take effective measures to solve the problem promptly [9].

2.4. The role of audit systems in supply chains

Audit systems, as an important part of internal control, are usually used for independent inspection and evaluation of a company's finances and operations. However, as the complexity of the corporate operating environment increases, the role of the audit system has gradually expanded to supply chain management. A supply chain audit is a process of comprehensively reviewing the supply chain to ensure that it complies with the company's standards and regulations, identify potential risks and take corrective measures. It includes but is not limited to credit assessment of suppliers, contract audits, material procurement, inventory management, transportation processes, compliance checks, etc [10].

Auditing can ensure the flexibility and responsiveness of supply chain links through comprehensive monitoring and evaluation of the supply chain. The following are several specific aspects of auditing to improve the agility and responsiveness of the supply chain:

Improve risk management capabilities: By identifying potential risks in the supply chain through auditing (such as the financial health of suppliers, price fluctuations of raw materials, etc.), companies can take measures in advance, such as diversifying supplier selection or adopting hedging strategies, thereby improving the stability and resilience of the supply chain.

Optimize decision support: Through big data audit analysis, companies can gain in-depth insights into each link of the supply chain, helping decision makers make more accurate supply chain adjustments and respond to changes in market demand on time.

Cost control and efficiency improvement: By regularly auditing each link of the supply chain, companies can find inefficient links in the process, thereby optimizing the supply chain structure and reducing operating costs. At the same time, the audit system can also help companies identify the

laws of price fluctuations and effectively avoid the risk of cost fluctuations caused by changes in supplier prices.

Ensure compliance: With the advancement of globalization, cross-border supply chain operations have become the norm. The audit system can ensure that each link of the supply chain complies with national or regional regulatory requirements by standardizing the selection and management of suppliers, avoiding supply chain disruptions or reputation losses caused by violations of compliance requirements.

Improve transparency and information flow: The audit system can help automobile companies build a transparent information flow system, monitor various activities of the supply chain in real time, and support information sharing and circulation in all links. This is crucial for quickly responding to changes in market demand and adjusting production and inventory plans.

The role of the audit system in a flexible supply chain cannot be ignored. It not only helps companies improve the transparency and compliance of the supply chain, but also effectively identifies and controls risks in the supply chain, and improves the responsiveness and agility of the overall supply chain. Especially in the automotive industry, complex supply chain networks and time-sensitive production processes require companies to ensure the efficiency and flexibility of the supply chain through precise auditing and monitoring. By optimizing the audit system, automobile companies can better respond to market fluctuations and changes in demand, and improve their competitiveness and market share.

2.5. Future Outlook

In summary, automobile companies can adopt a multi-point supply strategy to optimize procurement systems and supplier management, implement the "three-ization" strategy to improve the efficiency of production systems and design development, promote digitalization strategies to strengthen monitoring of inventory systems and logistics efficiency, and strengthen audit intensity in the supply chain through strategies to increase audit transparency.

In the future, automobile companies can also build smart factories to improve production efficiency, use lean production to reduce losses and waste, introduce new technologies and new suppliers, and increase the relevance of collaborative cooperation. They can use these methods and strategies in combination to improve the agility and responsiveness of the automobile companies' flexible supply chains.

3. Conclusion

The automotive supply chain is a complex and large system. With the expansion of the market, the agile responsiveness of its supply chain will also be affected by more unstable factors. This article proposes strategies to improve the agile responsiveness of the automotive enterprise's flexible supply chain in four aspects: procurement system and supplier management, production system and design development, inventory system and logistics efficiency, and audit system acting on the supply chain. A multi-point supply strategy is proposed for procurement system and supplier management, a "three-ization" strategy is proposed for production system and design development, a digital strategy is proposed for inventory system and logistics efficiency, and a strategy to improve audit transparency is proposed for the supply chain as a whole.

In the future, automobile companies will also use a combination of strategies such as operational transformation, industrial restructuring, technological development, and carbon footprint management to improve the agility of the supply chain and adapt to the ever-changing market and new challenges.

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