

# Application of JIT Ordering Method in LIFAN Automobile Supply Chain

Jialiang Zhu

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**Abstract:**

*Abstract: Lifan Motor Company has suffered a major bankruptcy crisis in recent years, and despite its recent acquisition by Geely Group and bankruptcy restructuring, the company's performance has been poor. After studying the relevant literature and analyzing the company's financial reports in recent years, it was found that Lifan's product sales were low but its production capacity was always high, which led to many cars being produced and then stalled and unsold. This paper addresses this problem by proposing a JIT ordering method under a push-pull combination supply chain and investigating the feasibility of applying it in Lifan's supply chain.*

**Keywords:** Lifan, push-pull combination supply chain, JIT ordering

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## I. Introduction

### 1.1 Background and significance of the study

After more than 100 years of development, the global automobile industry has now entered a mature period of stable development, and automobile production and sales have become one of the important indicators to measure the economy of each country. As a rising star, China's auto industry has been the first in the world in terms of production and sales for ten consecutive years, and the first in the world in terms of production and sales of new energy vehicles for four consecutive years. However, China's car ownership per 1,000 people is far below the level of developed countries, and the automotive industry still has a lot of room for development. Costs in the automotive industry are not incurred in machining, assembly, etc. More than 90% of the time is spent in the distribution of automotive parts, which is a non-beneficial time-consuming process that makes automotive manufacturing much less efficient and increases production costs. Ultimately, these costs will be paid for by consumers. In recent years, due to the global economic downturn, the international situation is changing, regional economic instability and other international factors, as well as domestic consumer demand is increasingly weak, passenger car products, low domestic market acceptance, similar enterprises, such as the pressure of competition and other internal factors, China's auto market is under greater downward pressure, all kinds of small and medium-sized auto enterprises is even worse. In particular, the gasoline car market in recent years under the impact of new energy car companies sales continue to decline, especially some of the old domestic cars, the market shrinkage is very serious.

### 1.2 Significance of the study

The purpose of this course design assignment is to optimize the ordering method in the supply chain link of Lifan Industrial (Group) Co. It has significant socio-economic benefits and practical significance.

## II. Lifan's current situation and problems

### 2.1 Status of Lifan

Lifan has been actively pursuing the country's "Go Global" policy since 2013, and has placed great emphasis on overseas development and maintenance, winning the title of "Most Popular Foreign Car" in Russia for many years in a row. In 2015, Lifan launched its new energy car sharing platform "Panda Car", which has quickly become a leader in the domestic new energy car industry. However, in 2016 Lifan was pointed out to be in violation of applying for central government grants in 2015, and after it was exposed Lifan was disqualified from the 2016 central government grant pre-allocation and executed a fine. Over time its development struggled. On July 26, 2019, Lifan released an announcement showing that the undisclosed cumulative occurrence involving litigation (arbitration) in the last 12 months amounted to 1.423 billion yuan. early August 2019, a person with knowledge of the matter broke the news to relevant media that there is currently a great conflict between Lifan passenger cars and some of its suppliers. For the conflict between Lifan passenger cars and some suppliers, Lifan's secretary of the board of directors, Guo Jianfeng, explained that the so-called problem of suppliers' payment for goods is due to a dispute over the quality of individual suppliers' products not

meeting the standards.

## 2.2 Analysis of the necessity of Lifan's replacement order program

### 2.2.1 Supply Chain Management

By checking Lifan Group's official website (<http://www.lifan.com/>) we found that Lifan prefers to use bidding when selecting auto parts suppliers. Although bidding can select suppliers in a wider range, for some of the more specialized parts solutions, it can lead to a longer production time for the product as there are fewer potential bidding companies qualified to undertake the task. During the production process, Lifan did not assemble and produce cars according to actual customer demand, but instead misjudged the market demand and produced a large number of cars in advance. Although this minimized production costs, it led to a large inventory backlog at Lifan.

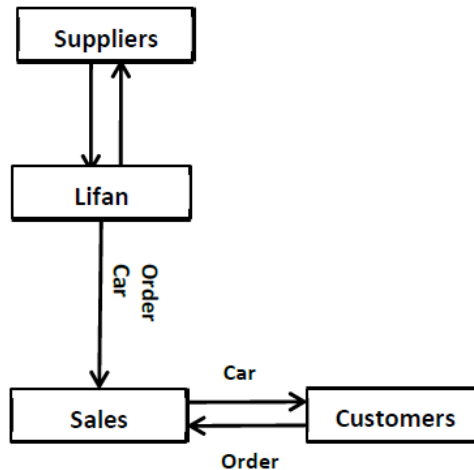


Figure 2-2-1 The current push supply chain flow chart used by Lifan Motors

### 2.2.2 Sales

According to the sales flash report released by Lifan, Lifan Motors sold only 197 traditional passenger cars and 231 new energy vehicles in a month, continuing a precipitous decline under an already rather low market share. As a result of low sales, Lifan's vehicle production had to come to a near standstill. Production of conventional passenger cars and new energy vehicles was only 281 and 218 units. It was because of the wrong prediction of the changes in market demand, the production and sales of vehicles could not open up the situation, and Lifan's already difficult financial and debt problems became more serious. In order to get out of the predicament, Lifan had to start by changing the ordering scheme, changing the car production scheme, changing the sales scheme, using the new production and sales model to achieve profitability, and solving the capital and debt way.

| Product Name            |                            | Production (car/unit) |   |                      |   | Sales (units/units) |   |                      |   |
|-------------------------|----------------------------|-----------------------|---|----------------------|---|---------------------|---|----------------------|---|
|                         |                            | This month Quantity   | This month Year-on-year increase/decrease | This year Cumulative | Total for the year Year-on-year increase/decrease | This month Quantity | This month Year-on-year increase/decrease | This year Cumulative | Total for the year Year-on-year increase/decrease |
| Ride Use Car            | Traditional Passenger Cars | 281                   | -95.67%                                   | 17485                | -73.40%   | 197                 | -96.87%                                   | 21633                | -68.94%   |
|                         | New Energy Cars            | 218                   | -85.05%                                   | 1466                 | -73.64%   | 231                 | -78.87%                                   | 1675                 | -66.12%   |
| Motorcycles             |                            | 49856                 | -30.17%                                   | 395167               | -15.81%   | 55386               | -19.85%                                   | 405410               | -13.62%   |
| Motorcycles Engine      |                            | 98638                 | -18.04%                                   | 825220               | -29.14%   | 70288               | -20.66%                                   | 520849               | -34.52%   |
| General Gasoline engine |                            | 32800                 | -6.19%                                    | 232220               | -17.27%   | 24580               | -33.58%                                   | 210377               | -27.44%   |

Figure 2-2-2 Production and sales data of Lifan Industrial (Group) Co

### III. Application study of JIT ordering scheme of push first and pull second

#### 3.1 Overview of JIT ordering and push-pull combination supply chain

##### 3.1.1 JITordering

Just in time (JIT) production method refers to the production of the required products in the required quantity, in order to achieve the ideal state of zero inventory, no defects, and low cost, and to pursue the production and management of no inventory and complete elimination of waste, i.e., "the parts arrive exactly in the required quantity when they are needed." The JIT production method uses an advanced information transfer system to enable the immediate transfer and sharing of production demand information from the OEM to the supplier, who organizes the production of parts according to the OEM's model input order, sequencing, and JIT supply until the assembly line is directly assembled and executed according to the supply order, thus realizing the purpose of zero inventory management in the OEM [4].

##### 3.1.2 Advantages and disadvantages of JITordering

JIT supply has many advantages, including reducing the number of internal material storage, the demand for warehouse space is not high, saving money and reducing costs; timely delivery, shorten the supply process time consuming; reduce the labor intensity of the assembly work, improve the efficiency of labor; promote a good relationship with suppliers to provide assurance of the quality of purchased parts, and procurement costs can be reduced. But it is undeniable that JIT supply also has many drawbacks, its shortcomings are summarized as follows: to ensure the good and normal operation of JIT supply, you must need a strong information system to support the establishment of efficient communication; because of excessive demand changes will lead to a serious shortage of JIT supply capacity or excess, so it can not adapt to larger-scale changes in demand; JIT supply requires a high level of Supplier management level, including the ability to deal with various types of unexpected situations, the ability to solve all kinds of failures in a timely manner, skilled in product information and its processes, etc. [5]. It can be seen that JIT supply is not all good and no harm, it has advantages and disadvantages, in the specific implementation of JIT supply period, should be combined with the actual situation of the enterprise, a clear analysis of the advantages and disadvantages,

scientific and reasonable implementation of JIT supply [5].

### 3.1.3 Push-pull combination supply chain

In a push-pull supply chain, the upstream uses push operations to replenish inventory in the supply chain based on long-term forecasts, while the downstream uses pull operations to respond to real customer demand. The key is to determine the demarcation point between push and pull, which determines how to forecast demand. In the production chain, due to the relatively low uncertainty of demand, long lead time, the importance of scale effect, the complexity of the supply chain structure, the need to plan the supply chain, and the importance of resource allocation, as well as the company's focus on cost minimization, it is more appropriate to use the push strategy to forecast demand based on historical data. When it comes to real customer demand, uncertainty is high, lead time is shortened, service level becomes the dominant factor, and in order to increase flexibility and responsiveness, pull strategy is used to respond directly to the demand orders from the retailers [8]. Push production not only shortens the delivery cycle, but also makes full use of the capacity. The risk of push production is that what if the demand is gone, or does not come on time? Therefore, "push" has to become "pull" at a certain point, i.e., pulled by customer orders, in order to control the risk of inventory backlog [9].

## 3.2 Ordering options

### 3.2.1 JIT ordering under push-pull supply chain solution

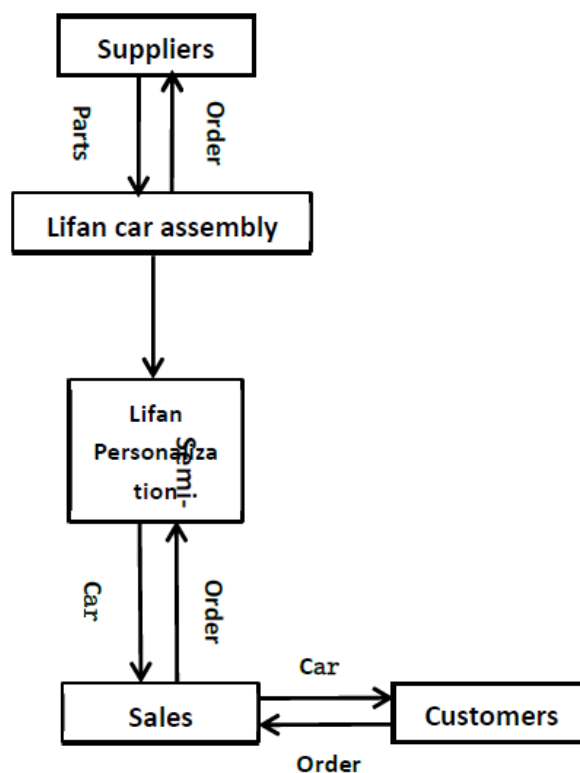


Figure 3-2-1-1 JIT ordering flow chart under push-pull supply chain

The JIT ordering method under the push-pull supply chain is recommended for Lifan's overall supply chain. As Lifan Auto's defaulted funds to suppliers this time is due to the fluctuation of the internal and external economic environment this year, resulting in the sudden cooling of the auto market, as well as the inaccurate forecast of downstream demand and resulting in excessive orders from suppliers, making a shortfall in capital flow. Therefore, the Just In Time ordering method can be used in the solution selection, in which the information of each consumer's demand is integrated over a period of time and ordered from the supplier, then manufactured and customized, and finally delivered to the consumer.

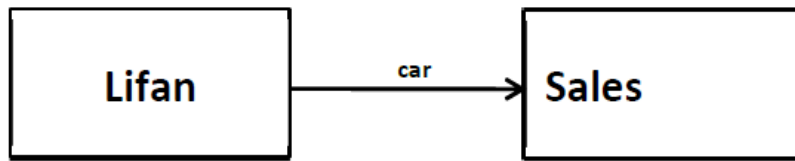


Figure 3-2-1-2 Partial push supply chain flow chart

For some customers who urgently need to get the current car, Lifan can choose to produce part of the whole car in small quantities, so that the customer can get the whole car directly from the agent seller's stock quickly to meet the demand. For Lifan Motor Company internally, Lifan Motor needs to recreate a JIT ordering model for auto parts to meet the above overall supply chain requirements and to improve the efficiency of the supply chain. Figure 3-2-1-3 shows the JIT ordering model of Lifan Motor Company under the proposed JIT supply chain mentioned above.

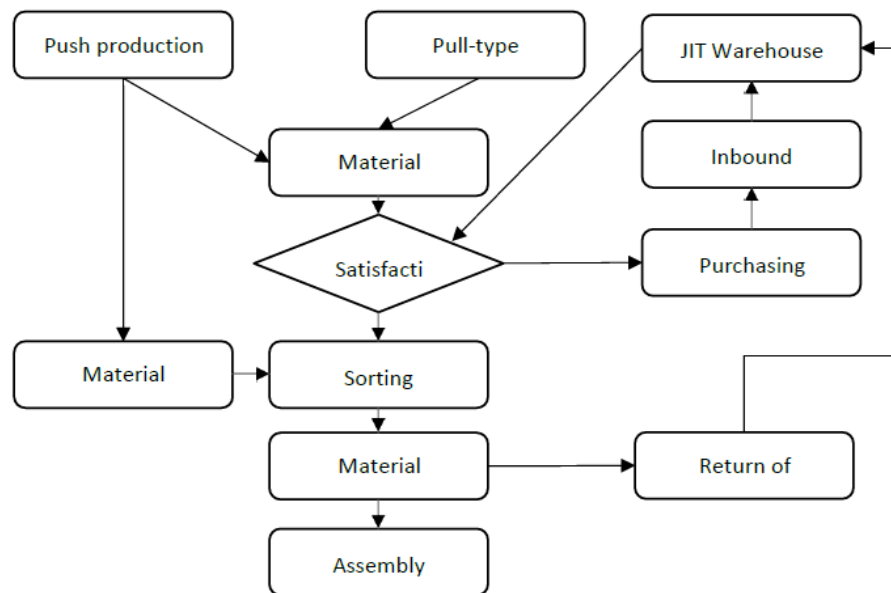


Figure 3-2-1-3 JIT ordering model of Lifan Motor Company

### 3.2.2 Advantages of the orderingscheme

- 1.Unlike the simple pull supply chain, the response speed of this ordering scheme can meet the demand of consumers with current car delivery and avoid the loss of customers.
- 2.Unlike a simple push supply chain, Lifan reduces dependence on downstream consumer demand forecasts and reduces the risk associated with market changes.
- 3.Avoid mass production of existing cars, reduce the generation of inventory cars that both consumers and manufacturers do not like, as a way to reduce costs.

### 3.3 FeasibilityAnalysis

#### 3.3.1 Technicalfeasibility

The system required for this JIT solution is not a very complex one, and many other car companies are working on or making the system, so the solution is technically possible.

#### 3.3.2 Organizationalfeasibility

Although Lifan Group is suffering from debt risk, as a large group, it has considerable experience in program implementation, rational organization and selection of personnel, so the program can be realized in terms of

organizational feasibility.

### 3.3.3 Economic feasibility

The program has very good economic benefits, taking into account not only the needs of ordinary consumers, but also those who urgently need a car, achieving full coverage of the consumer base. It also allows the customer service level and reputation to be improved. The push-pull JIT ordering scheme will prevent Lifan from being over-ordered, as in this case, due to inaccurate demand forecasts or market fluctuations. So the solution is economically feasible.

### 3.3.4 Other possible difficulties

- For some special parts, it may not just be as simple as filling in the information online, special parts may need to be inspected and tested on site, which still requires some time and labor cost for offline negotiation, and it is very difficult to completely select suppliers online. Lifan Auto can have the ordering department set up a special team to screen out a few suppliers with good scores, and then conduct offline negotiations to minimize offline costs.
- The Just In Time strategy requires a high level of delivery from the supplier. If the supplier's logistics capability is not strong it can lead to a long delivery period, resulting in a lower level of customer service and a worse reputation, leading to more serious consequences. So Lifan must select the best quality and suitable supplier according to its own situation in the process of choosing suppliers.
- Some of the best suppliers may not see Lifan's bids on the web. If Lifan doesn't look for suppliers on its own, it may cause an increase in opportunity cost. If Lifan Auto goes looking for suppliers on its own, it will result in higher labor and time costs. Lifan could solve this problem by increasing the publicity of the supplier search and investing more in advertising.

## 3.4 Cost model under JIT ordering scheme

This paper makes a simple cost model for the JIT ordering process under the push-pull combination proposed to Lifan Motors, and the total annual cost can be derived by substituting the real data into the model.

The model is aimed at minimizing the total annual cost, which includes annual inventory cost  $C_1$ , annual ordering cost  $C_2$  and annual transportation cost  $C_3$ . The model is designed to minimize the total annual cost of ownership.

$$\min C = \min(C_1 + C_2 + C_3)$$

$$\text{Of which inventory costs are } C_1 = \sum_{i=1}^I (D_1^i + D_2^i) H / 2$$

$$\text{The cost of ordering is } C_2 = \sum_{i=1}^I DK / (D_1^i + D_2^i)$$

$$\text{Shipping costs are } C_3 = \sum_{i=1}^I DS / (D_1^i + D_2^i)$$

Where  $I$  is the number of parts required for the whole year, and  $D^i$  is the number of parts required for the daily push production schedule for the  $i$ th ordering period of the year, and  $D_1^i$  is the number of parts required to fulfill all pull orders in the  $i$ th order period of the year, and  $H$  is the inventory holding cost, and  $DK$  is the cost of a single order, and  $DS$  is the single shipment cost.

Since the JIT scheme under the push-pull supply chain has different lengths of each ordering period and different order quantities, it has more flexible characteristics than the pure push ordering scheme, and the inventory cost under the JIT ordering scheme is lower than that of the pure push ordering scheme, and the total cost is more advantageous.

## IV. Summary

The predicament that Lifan encountered was caused by both internal and external reasons.

**External factors:** The peak of car purchases brought by the economic market rebound and the lowering of financial thresholds since 2017, bumped up against the volatile internal and external economic environment in 2019, making domestic car companies highly competitive, with Lifan's market share being taken by other car companies with better and more rational production models.

**Internal factors:** During the production process, Lifan did not assemble and produce cars according to the actual demand, but misestimated the market demand and made a large number of advance production, which made a large inventory backlog. In the auto industry, which is under increased competitive pressure, it had to face problems such as selling fewer cars and making smaller profits. With the increase in production but not the expected sales, and the single order program, Lifan's capital flow became quite difficult.

With the growth of the national economy, the domestic auto market is still expanding rapidly. If Lifan can change its supply chain management ordering mode, invest some capital and use information technology to establish a new push-pull JIT ordering system, it will be beneficial for Lifan's future development.

Due to the lack of personal experience and time constraints, this paper still has many flaws and the

theoretical study may be disconnected from the practical part. This example study was made with as much information and data as possible.

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