Intelligent Application of Automobile Financial Service in Artificial Intelligence Era

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Abstract. In order to ensure the safety of financing collateral, financial institutions usually entrust third-party logistics companies to supervise the financing vehicles in stores, and the supervision cost is borne by the dealers. However, in recent years, with the increase of labor cost, the pressure on dealers' income is increasing; and there are frequent cases of third-party supervisors and dealers colluding to sell financing vehicles without permission, It causes the loss of financial institutions' pledge and the increase of bad debts; Orion supervises the company's huge compensation liability risk. How to find a more economical and effective financing vehicle management and control mode to avoid personnel risk is a subject that needs in-depth discussion for financial institutions, major automobile manufacturers and dealers. This paper proposes the application of intelligent supervision mode, the use of Internet of things technology, with the help of OBD equipment, certificate key electronic supervision box, combined with the system database, to build a supply chain financial platform, realize the intelligent, real-time identification, positioning, tracking and management of vehicles, ensure 24-hour continuous monitoring, timely warning of abnormal state, alleviate regulatory loopholes, reduce the number of people For the reason of vehicle loss, theft, transfer sales and other risks. Through the questionnaire survey of three stores, more than 98% of the staff are satisfied with the intelligent supervision mode.

Keywords: Auto Finance, Intelligent Supervision, Risk Management and Control, Intelligent Application

1. Introduction
With its long supply chain and better economic pull effect, the automobile industry has become the pillar industry in China's manufacturing industry and occupies a pivotal position in China's national economy. Due to its historical position in the development process of China's automobile industry, our province has always been an important core in the overall layout of China's automobile industry. The rapid development of its automobile and parts industry has made great contributions to China's economy and the economy of the whole province [1].

After years of development, the automobile industry in our province has developed into an automobile industry cluster with China First Automobile Group Co., Ltd. as the core enterprise, including the R & D, manufacturing and trade of complete vehicles, various special purpose vehicles...
and auto parts, and the all-round development of cars, trucks, heavy vehicles, light vehicles and mini cars. With the aggravation of international competition, the overall competitiveness of our province's automobile industry has weakened, but it still cannot change our province's position in the international and domestic automobile market. Thanks to the rapid development of the automobile industry in our province, the financial market of the automobile industry in our province is constantly enriched, the types of financial institutions participating in the financing of the regional automobile industry are increasing, and the financing means are becoming more and more diversified. However, due to the immature development of the regional financial market, the high "pyramid" structure of the Regional Automobile Industry and the decline of the business prosperity of automobile parts enterprises, the financing means of the automobile industry in our province is relatively single, and the financing products are relatively scarce. At the same time, the financing resources of the industry are highly concentrated in FAW Group, not only the financing methods are more than other parts enterprises, but also the financing costs are far lower than those of non-group parts enterprises and downstream auto dealers. The problems of financing difficulty and expensive financing of relevant enterprises in the auto industry in our province are still reflected in varying degrees. With the rapid growth of the number of car sales, the demand for dealers' capital adequacy is also higher. However, the dealers have invested a lot of money in the early period of building a shop. Taking a joint venture brand intermediate car dealer as an example, the investment in building a shop is about 30 million yuan. Moreover, most of the dealers operate on leased sites. As small and medium-sized enterprises, there are not many physical assets and poor data in investment period statements, so it is difficult to obtain bank financing support. Therefore, how to ensure that the downstream dealers have sufficient funds to ensure the channel expansion and market share expansion of the brand is a problem faced by all automobile manufacturers. All automobile manufacturers have joined hands with financial institutions to launch a supply chain financial support system based on inventory vehicle pledge for downstream dealers, that is, the inventory financing support system for automobile dealers. It solves the problem of difficult and expensive financing for dealers, and enables automobile manufacturers to expand sales channels and expand production scale more widely. The first is the rise of regulatory costs: with the decline of dealers' profits in recent years, their income and profit pressure are increasing. However, the labor cost of supervision is increasing year by year. At present, the supervision cost of a single store is about 5000-6000 yuan / month, which is a great burden for dealers. Secondly, it is difficult to prevent and control the moral hazard of supervision and increase the management cost of automobile manufacturers: in recent years, the risk events of dealers' fund misappropriation occur frequently, especially the third-party in store supervisors collude with dealers to sell financing vehicles without permission, resulting in the loss of financial institutions' collateral, the inability to recover loans, the increase of bad debts and the huge compensation responsibility of supervision companies. And once there is a risk, it will cause the bank's bad evaluation of the brand credit of the automobile manufacturer, and then affect the financing environment of the brand dealer network, and cause adverse impact on the manufacturer's supply chain financial system, and increase the management cost [2].

Based on the above two problems existing in the current third party logistics supervision, how to solve the regulatory burden of dealers and avoid the risk of pledge loss of financial institutions is the common concern of all parties in the supply chain financing chain. The significance of this paper is to reduce the burden of operating costs of dealers and optimize the regulatory efficiency of financial institutions and logistics supervision companies.

2. Related Concepts

2.1. Basic Principles of Supply Chain

When supply chain finance solves the financing problem of each link of the supply chain, it does not start from the individual, but from the whole process of upstream and downstream business
From the perspective of core enterprises: according to Michael Lamoureux, supply chain finance is to optimize the source and cost of purchase and sales funds in the upstream and downstream chain with core enterprises as the center. The optimization process is reflected in the integration of logistics, information flow and capital flow in the supply chain, and the capital cost analysis and operation cost management of the business data involved, which is completed by various financial tools [3].

From the perspective of commercial banks: according to Wang Chan's point of view, financial institutions grasp all the upstream and downstream enterprises of a certain industry, focus on the core manufacturers, expand the whole industry credit, consider the relevant enterprises in the supply chain as a whole, and design personalized financial services for the relevant enterprises in the supply chain according to the transaction order formed in the business process and the characteristics of the industry. The industry provides corresponding financial support, including various kinds of rich financial products and characteristic service modes[4].

From the perspective of logistics service providers: Aberdee believes that the core of supply chain finance is to pay attention to the embedded supply chain financing and settlement costs, and construct the optimization scheme of the supply chain cost process. Through the effective connection of logistics and information flow, the upstream and downstream of the supply chain and financial enterprises are combined together.

2.2. Basic Theory of Automobile Supply Chain Finance

(1) Business classification
Automobile supply chain finance business can be divided into two kinds in the actual business operation. One is for the terminal consumer market. This paper does not discuss the consumer finance business of customer car purchase. One is for the whole vehicle purchase market, the financial business of the downstream dealer purchase link, that is, the dealer inventory financing business discussed in this paper [5].

(2) Auto Supply Chain Finance - Analysis of dealer inventory financing business
Major automobile manufacturers regard automobile dealers as the vanguard of automobile sales. The operation of vanguard is closely related to the business performance of various automobile brands and the future market development. As a small and medium-sized auto dealer, in order to ensure the basic survival and development or continuous business expansion, it may inevitably encounter difficulties financial constraints. The main reason is that in the early stage of the establishment of auto dealers, investors have to invest a huge amount of money to build stores or pay operating margin to auto manufacturers, resulting in the shortage of cash flow of dealer investors. In addition, dealers need to purchase complete vehicles from automobile manufacturers on a regular basis, and pay for the purchase funds in the form of cash, bank acceptance bills, working capital loans, etc. Daily working capital to ensure that dealers can continue to operate as an important prerequisite. Therefore, if the dealer investors cannot provide high financial support, or lack of financing capacity, it will restrict its future development [6].

2.3. Auto Supply Chain Finance - Dealer Inventory Financing Business Model
(1) Prepayment financing mode
Most of the auto dealers are small and medium-sized enterprises, and they rely on the brand authorization and commission support of the upstream manufacturers, so their negotiation ability is weak compared with the auto manufacturers. Automobile sales industry is capital intensive industry, dealers need to prepare a high amount of daily working capital. Financial institutions take this opportunity to carry out special inventory financing for dealers. Prepayment financing mode, as the name suggests, dealers can receive goods only after payment, which solves the problem of insufficient purchasing funds in the ordering process. Nuclear. The process is that the automobile dealers obtain credit from financial institutions, pay a certain proportion of deposit to financial institutions when they actually purchase, and the financial institutions lend money and pay it in full to the manufacturers.
After receiving the purchase funds, the automobile manufacturers transport the financing vehicles to the dealers according to the order or the purchase and sale contract. After receiving the financing vehicles, the dealers pledge them to the financial institutions, and the financial institutions entrust the third party logistics enterprises to supervise the corresponding financing vehicles. The expected risk of the loan when the seller fails to fulfill the repayment obligation [7].

(2) Financing mode of automobile certificate pledge

The financing mode of automobile certificate pledge is signed by automobile manufacturers, dealers and financial institutions. Financial institutions provide financing support for dealers relying on the brand reputation of manufacturers. At the same time, it can entrust the vehicle manufacturer to deliver the vehicle to the third-party financial institution for repayment according to the agreement of the general financial institution. After the vehicle is sold, the dealer shall repay to the financial institution and redeem the corresponding vehicle certificate [8].

(3) Credit mode of chattel mortgage

Auto dealers pledge their legally owned vehicles without property rights disputes to financial institutions. Financial institutions entrust logistics companies to keep the vehicles, and dealers apply for credit financing accordingly, which is called chattel mortgage credit mode. Automobile dealers can replace vehicles according to the inventory situation (idle inventory can replace the sold pledged vehicles)[9].

2.4. Related Formulas

Stream processing [10]:

\[ Y_t = c + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{j=1}^{q} \beta_j X_{t-j} + \mu_t \]  

(1)

The causality between the two needs to be further analyzed by Granger, and the standard deviation and coefficient of variation are used to measure the difference

\[ S_i = \left[ \sum_{t=1}^{N} (Y_{t+i} - Y_t)^2 \right]^{\frac{1}{2}} \]  

(2)

\[ V_i = \frac{S_i}{Y_t} \]  

(3)

3. Intelligent Scheme of Automobile Financial Service in the Era of Artificial Intelligence

3.1. Architecture Research

Core enterprises hope to optimize the capital cost in the supply chain, while financial institutions and logistics companies hope to share vehicle data intelligently through the Internet of things technology, so as to achieve the goal of reasonable control of project risk. After in-depth discussion with cooperative financial institutions and long-term logistics companies, enterprise a plans to introduce OBD intelligent supervision and electronic supervision box to avoid various risks under the current supervision mode. The overall structure is as follows:

(1) Overall structure

According to the requirements of dynamic, intelligent and shared supervision of vehicles and certificates, the overall architecture of perception layer, cloud platform and application layer is built based on the theory of Internet of things platform to realize the functions of data acquisition, information early warning and electronic fence. We need to establish web services to realize the management of vehicles, dealers, banks and equipment through mobile app and office network.

(2) Perception layer system architecture
The mode of civil air defense (store supervision) + technical defense (vehicle shield electronic supervision equipment and certificate electronic supervision box) is adopted to improve the supervision efficiency through vehicle shield equipment and certificate electronic supervision box. The traditional manual inventory and safe storage of certificate keys are switched to the operation mode of OBD real-time positioning inventory and certificate safe key / fingerprint self collection.

3.2. 4s Store Intelligent Control Mode Construction and Business Process Design

(1) The third party logistics company's vehicle management and control system synchronizes the dealer information and branch store information to the vehicle shield platform. After the system configuration is completed, the vehicle in and out of the warehouse and inventory operation is carried out on the intelligent management and control platform.

(2) Financing vehicle warehousing management.

4. Scheme Test and Analysis

4.1. Sales Statistics of the Enterprise

![Car sales of enterprise A](image.png)

**Figure 1.** Enterprise a auto sales chart

At the beginning of its establishment, enterprise a was headquartered in Beijing, and its branches were set up in East China (Shanghai) and South China (Guangzhou), with about 300 employees and an annual sales performance of about 70000 sets. After more than ten years of development, enterprise a has nearly 800 employees, which are distributed in Beijing headquarters, seven branches in East China, South China, North China, northwest, southwest, central China and northeast, and six parts business centers. Up to 2018, the development of small cars sold by enterprise a since its establishment has covered small cars, medium cars and small s cars_ : UV, medium and large SUV, medium business bus and other nearly 10 models, the product line is increasingly rich. The channel network of 4S stores developed by enterprise a is distributed in more than four tier cities with about 600 stores and county-level branches with about 200 stores, which basically covers large, medium and small cities and towns across the country, realizing network penetration. Through convenient and complete sales and after-sales service network, enterprise a has provided practical guarantee for the overall quality of brand a automobiles.

4.2. Branch Sales Statistics
Figure 2. Sales and profit statistics

Table 1. Enterprise a dealer income

| Years | Dealer proceeds/10000 yuan |
|-------|--------------------------|
| 2008  | 597                      |
| 2009  | 888                      |
| 2010  | 761                      |
| 2011  | 665                      |
| 2012  | 178                      |
| 2013  | 146                      |
| 2014  | 34                       |
| 2015  | 56                       |
| 2016  | 237                      |
| 2017  | 339                      |

The supervision cost of a single branch is about 3000-4000 yuan / month, which is a higher cost compared with the average monthly sales of 20 units of a single branch. And the branch staff need to transfer vehicles between the head office and the supervision staff of the third party logistics company, so the process is cumbersome and the efficiency is low. It affects the vehicle sales efficiency of the branch, and increases the time and management cost for the staff of the branch to and from the head office.

Since 2012, the competition in the automobile industry has become increasingly fierce, the profit margin of new car sales has been diluted, and even losses have occurred, and the income of dealers has declined year by year. However, the human resource cost of supervision has increased year by year. At present, the supervision cost of single store has increased from 4500 yuan / month to about 6000 yuan / month, which is a relatively high operating expense for dealers.

4.3. Statistical Investigation

4.4. Advantage Analysis of Intelligent Management and Control Mode

(1) It effectively avoids the credit risk and operational risk of the third party logistics company regulators and dealers.

It solves the most concerned problem of financial institutions and automobile manufacturers: "where is the car? Where is the certificate?". In the past, under the supervision operation, the information can only be obtained through the manual submission of the logistics staff; while the vehicle information can be located in real time through 0bd, which solves the problem of where the car
is, and solves the problem of where the certificate is through the daily inventory of the certificate electronic safe deposit box. Financial institutions, third-party logistics regulators and dealers can view the status of financing vehicles in real time through Chedun platform; vehicles can be located in real time through Chedun OBD electronic supervision equipment; financial institutions and third-party logistics regulators can conduct inventory verification in real time through the system, so as to improve the efficiency of vehicle inventory management of dealers and branches; electronic safe deposit box of certificate is introduced, and dealers can redeem certificates The certificate and key can be collected by the electronic key extraction code to avoid the long-term meaningless waiting for the release of the certificate. The real-time transmission of system data can effectively prevent the dealers from colluding with the third-party supervisors to falsely report the storage and delivery of the pledged goods. Through the platform of the pledge supervision system, the logistics, capital flow and information flow of the pledged goods can be matched and controlled in real time, avoiding the moral hazard and operational error risk of manual processing.

(2) Reduce the cost of dealer supervision

At present, the in store supervision fee is about 6000 yuan / month. Under the intelligent control scheme, the monthly supervision fee of dealers can be reduced to 4000 yuan / month, a decrease of 33%. Each dealer can save 24000 yuan of supervision fee every year. According to the statistics of 500 dealers currently under supervision in enterprise a, the accumulated supervision fee of L, 2 million yuan can be saved every year, which can be fully converted into dealer income. According to the average sales volume of 15 sets / month, the monthly supervision fee is only 375 yuan. Compared with the current supervision fee of 4000 yuan / month, the monthly supervision fee can be saved by 3625 yuan. According to the statistics of 100 branches supervised by enterprise each year, the accumulated supervision fee can be saved by 4.35 million yuan. It has made a great contribution to the improvement of branch revenue. Moreover, with more manufacturers and dealers introducing intelligent management and control, after the scale effect, a supervisor can use the shop inspection mode to supervise multiple dealers within a certain range, and the supervision cost will decrease year by year. Compared with the labor cost of in store supervision, the cost of system and equipment will continue to decrease every year as the technology matures. The supervision fee paid by dealers will not increase with the increase of labor cost, but will decrease year by year with the progress of technology.

| Table 2. Smart control model store survey |
|------------------------------------------|
| **A of stores** | **B of stores** | **C of stores** |
| Satisfaction of Intelligent Control Mode | 43 | 24 | 49 |
| Degree of interest in the mode | 42 | 13 | 56 |
| Is it helpful to management and control | 39 | 11 | 84 |

5. Summary

With the gradual sinking of automobile sales market, the market space share of the first and second tier cities is shrinking, and the market space potential of the third, fourth and fifth tier cities is huge. The major automobile manufacturers are laying out the network of small and micro dealers or branches in cities below the third tier, providing good financing services for these dealers, and laying the corresponding vehicle pledge management and control mode with compliance, high efficiency and more competitive cost, which are the topics that the major automobile manufacturers are seriously thinking about. Through the introduction of intelligent management and control mode, the inventory financing business of branch stores can be promoted without obstacles, which is conducive to the
leverage effect of branch stores, prying more funds into sales and service operation, and making contributions for auto manufacturers in this huge potential market. The introduction of intelligent vehicle management and control mode is also conducive to financial institutions and automobile manufacturers to implement fine differentiated management of dealers’ inventory financing business, and enrich multi-level management of collateral through different vehicle management and control modes. There are many automobile brands in the domestic market, and there are nearly 30000 dealers in its network. The financing needs and actual risk bearing capacity of each brand, different region and different scale dealers are different. Automobile manufacturers and financial institutions can implement differentiated pledge hierarchical supervision and management for different dealers, which can not only effectively control the financing risk, but also meet the personalized business needs of dealers in different regions and sizes.

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