Research on classification management of car dealers in used car platform based on sd simulation model

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Abstract. In recent years, the used car e-commerce industry has risen rapidly, at present, the number of car dealers on the used car e-commerce platform is large and scattered, and car dealer management has become a mainstream issue. Based on this question, this article selects 40 car dealer data on the Y used car platform, and classifies them on the three dimensions of car dealers’ relative scale, integrity, and professionalism. Based on the classification results of car dealers, strategies are proposed, and system dynamics models of the relationship between each strategy and revenue are constructed respectively. Assign initial values or initial functions to each variable to obtain simulation results, and apply the simulation results to the differentiated management of car dealers’ classification. Targeted strategies and scopes for different types of car dealers are proposed, management goals for all types of car dealers in harsh environments are put forward, and it is suggested for the establishment of a dynamic tracking system based on the transaction process.

1. Introduction
The automobile industry has always played the role of a pillar industry in the national economy. Research data in the China Automobile Dealers association predicts that by 2020, my country’s used car transaction volume will reach 29.2 million. It has great potential for development. The used car transaction process still has a certain degree of complexity and risk under the current policy, technology and credit environment. In recent years, through the long-term efforts of industry professionals, various risks in used car transactions have been compressed to a controllable range. Unexpectedly, the outbreak of the new coronavirus in 2020 has brought new threats and challenges to the used car industry. At this time, as a used car trading platform, it is necessary to maintain the trust of users on the platform and the management of used car dealers has become the key to maintain survival.

The supplier of the used car platform is the car dealer (also known as the dealer). In recent years, there has been a dazzling array of researches on the electronic business platform and the management of suppliers by category. Research on used car e-commerce platforms mainly focuses on transaction mode, marketing mode and after-sales service [1-2]. Research on classification management is mainly used in supplier management of manufacturing companies [3-6]. Traditional supplier classification methods include ABC classification, matrix classification, etc. The policy constraints of the used car industry make these traditional methods ignore the particularity of their car dealer clusters in the application process. The current on-board management of used car platforms has (1) the selection and evaluation of car dealers are too subjective; (2) the lack of evaluation system for new car dealers; (3) the lack of classified management for the large number of car dealer clusters; (4) The incentive
mechanism of car dealers is not systematic; (5) Subjective evaluation has led to many problems such as the bullwhip effect, and there is great uncertainty in finding new car dealers to join. So based on these issues, this research uses a system dynamics simulation model to simulate the management strategies of different car dealers, Get the range of strategy application in different types of car dealers. Finally, based on the analysis results, a differentiated strategy and its application scope are proposed for the classification management of suppliers.

2. Construction of car dealer classification model of used car platform

According to the operation process of Y platform from the vehicle display to the successful transaction, based on the three dimensions of integrity, professionalism and car dealer scale, the average method, median method and expert survey method are used to determine the reference value, as shown in the table 1. Car dealers are divided into eight different groups, and their definitions are shown in table 2

Table 1. Classification of car dealers.

| Car dealer category               | Scale | Professionalism | Integrity |
|----------------------------------|-------|-----------------|-----------|
| Core large-scale car dealers     | >=15  | >=1.22          | >=0.96    |
| Core small-scale car dealers     | <15   | >=1.22          | >=0.96    |
| Risky large-scale car dealers    | >=15  | <1.22           | <0.96     |
| Risky small-scale car dealers    | <15   | <1.22           | <0.96     |
| Conventional large-scale car dealers | >=15  | <1.22           | >=0.96    |
| Conventional small-scale car dealers | <15   | <1.22           | >=0.96    |
| Potential large-scale car dealers | >=15  | >=1.22          | <0.96     |
| Potential small-scale car dealers | <15   | >=1.22          | <0.96     |

Table 2. Car dealer definition.

| Car dealer category               | Definition                                                                                                                                                                                                 |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Core large-scale car dealers     | This type of supplier occupies a large share of the transaction volume on the Y used car platform, and the supplier not only has a high degree of integrity, but also exceeds the average level of professionalism, and plays a core and main role in the business |
| Core small-scale car dealers     | This type of supplier has a relatively large share of the transaction volume on the Y used car platform, but compared to the core large-scale suppliers, its used car inventory accounts for a relatively small proportion, and its professionalism and integrity are higher than average level, only to be improved in its scale |
| Risky large-scale car dealers    | The inventory of such suppliers is relatively large, which will promote the development of the Y used car market to a certain extent, but their integrity and professionalism on the Y used car platform are low, and the transaction on the Y used car platform Bring greater instability |
| Risky small-scale car dealers    | Such suppliers have low integrity and professionalism on the Y used car platform, and the inventory is small, which brings greater instability to the Y used car platform transactions |
| Conventional large-scale car dealers | This type of supplier has a high degree of credibility on the Y used car platform, but is relatively low in professionalism and relatively large in inventory, forming a large scale. It will have a large market share in the future Y used car platform certain advantage |
| Conventional                     | This type of supplier has a high degree of credibility on the Y used car platform, but                                                                                                                                 |


small-scale car dealers
its professionalism is relatively low, the inventory is relatively small, and the transaction volume is relatively average, which has a small promotion effect on the future development of Y used car

Potential large-scale car dealers
This type of supplier has a high degree of professionalism in the Y used car platform, not high in credibility, but relatively large inventory, and has great development potential in the future Y used car platform transactions

Potential small-scale car dealers
This type of supplier has a high degree of professionalism in the Y used car platform, and the transaction volume is relatively large, but the integrity and inventory are not high, and they have certain development in the future Y used car platform transactions potential

Regarding the integrity of used car dealers, 33 higher-than-average dealers are core dealers and regular dealers, accounting for 82.5% of the total number of dealers; the 7 lower than average car dealers are risky and potential dealers, accounting for 17.5% of the total number of dealers. In terms of professionalism, above average are core car dealers and potential car dealers, totaling 20, accounting for 50% of the total number of car dealers; the remaining 20 car dealers are regular and risky car dealers. In terms of scale, there are 15 high-performance car dealers above average, accounting for 37.5% of all car dealers; 25 small-scale car dealers below average, accounting for 62.5% of all car dealers. The core car dealers are above average in terms of integrity and professionalism. Its transaction rate is 68.7%, ranking second, and the transaction amount with the platform relatively bigger. The transaction volume of core car dealers accounted for 51.5% of the total transaction volume, bringing greater profits to the platform, accounting for 44.18% of the total profit. The number of potential car dealers is relatively small, accounting for only 10% of the total number of car dealers, but the transaction volume of potential car dealers accounts for 32.34%, and the profit to the platform accounts for 39.97%. The number of risky car dealers and conventional car dealers accounted for 7.5% and 42.5% respectively, their trading volume accounted for 5% and 10.18%, respectively, and the profits brought to the platform accounted for 4.92% and 10.93% respectively.

3. SD simulation model analysis based on classification results

3.1. Construction of SD simulation model based on classification results
As shown in Table 3, first of all, according to various types of suppliers on the platform's trading volume, trading volume and revenue brought to the platform and other indicators to rank high and low, according to the sorting results and the classification of car dealers, set the parameters of the eight types of car dealers from 1-8 natural number eight.

| Car dealer category       | Parameter value | Professionalism       | Parameter value |
|---------------------------|-----------------|-----------------------|-----------------|
| Core large-scale car dealers | 8               | Conventional large-scale car dealers | 4              |
| Potential large-scale car dealers | 7             | Conventional small-scale car dealers | 3              |
| Core small-scale car dealers | 6               | Risky large-scale car dealers        | 2              |
| Potential small-scale car dealers | 5             | Risky small-scale car dealers         | 1              |

Take the construction of the system dynamics model of the strategy of benefit sharing to car dealers as an example. ①Determine the main variables of system dynamics through the focus of the game: platform profitability p, platform revenue π; ②R1 represents the rate of change of platform profit, km represents the platform's profit coefficient; ③Auxiliary variables and constants: platform profit before benefit sharing, platform basic profit, product price, cost of benefit sharing to the platform, sharing profits to car dealer's income, car dealer level, car dealer integrity, professionalism, car dealer
scale, nine auxiliary Variable or constant. The settings of each level variable, rate variable or auxiliary variable, etc. and their initial value or specific value or situation of the function are shown in table 4.

| Variables and description | Initial value/Function |
|---------------------------|------------------------|
| Platform profit rate of change R1 | (Platform revenue π - Platform revenue before profit) / Platform revenue π |
| Platform profit coefficient km | Car dealer level * 0.5 |
| Platform revenue before profit | Basic platform revenue |
| Basic platform revenue | EXP(0.3 * Product price)(Ten thousand yuan) |
| Product price | 10(Ten thousand yuan) |
| Profits to car dealers | Platform profitability * Platform revenue π |

Based on the analysis of the above-mentioned platform revenue π and the influencing factors of the degree of platform profitability, according to the correlation between various variables, the system dynamics model flow diagram shown in Figure 1 is constructed.

3.2. Analysis of SD simulation model based on classification results

This paper chooses Vensim PLE x32 software to carry out a detailed simulation analysis on the management strategy of Y used car platform car dealers. In this process, set the model parameters as follows: INITIAL TIME=0, FINAL TIME=24, TIME STEP=1, Units for Time: month. On this basis, a detailed summary and analysis of the influencing factors of each strategy and the influencing factors of platform revenue under each strategy. When each variable is the initial value, the car dealer level is 8. The analysis results at this time are as follows.

According to the transaction volume of the car dealers and the comprehensive ranking of the platform’s revenue, the eight types of car dealers’ levels are set to 1-8 eight natural numbers. From the simulation results, it can be found that when the platform transfers profits to the car dealers, the car dealer’s revenue increases significantly. The platform can attract more high-quality car dealers by concession to car dealers. Since the cost of platform concession is equal to the benefit of platform concession to car dealers, from a numerical point of view, the platform concession will bring more benefits to the platform than the cost caused by platform concession, and platform concession will have the greatest benefit to the core large-scale car dealers. When the Y used car platform faces the malicious competition market of the G platform, it can maintain the relationship with the core large-scale car dealers by improving the platform’s profit point. The range of benefits that can be provided is between 0-1.2.
4. Conclusions and suggestions

4.1. Differential management strategies of different types of car dealers

Propose differentiation strategies and their application scope for eight different types of car dealers, as shown in Table 5.

Table 5. Differential strategies of different types of car dealers.

| Car dealer category | Targets in a malicious competitive environment | Car dealer characteristics |
|---------------------|-----------------------------------------------|-----------------------------|
| Core large-scale car dealers | Vigorously maintain partnerships to prevent loss | The scale, integrity, and professionalism are above average, the transaction volume and revenue to the platform rank first, and the revenue created for the platform occupies a major position, accounting for 15% of the total number of car dealers |
| Core small-scale car dealers | Vigorously maintain partnerships to prevent loss | Integrity and professionalism are higher than average, and transaction volume and revenue to the platform rank third, accounting for a relatively large number, accounting for 25% of the total number of car dealers |
| Potential large-scale car dealers | Vigorously maintain partnerships while encouraging the improvement of integrity, while expanding the potential of the platform and the scale of large-scale car dealers | The scale and professionalism are higher than the average level, the transaction volume and revenue to the platform rank second, and the revenue created for the platform is relatively dominant, accounting for 5% of the total number of car dealers |
| Potential small-scale car dealers | Maintain partnerships, coordinate and encourage them to expand, while expanding the scale of potential small-scale car dealers | The degree of professionalism is higher than average, and the transaction volume and income rank fourth, accounting for 5% of the total number of car dealers |
| Conventional large-scale car dealers | Maintain partnerships while encouraging professionalism | The scale and credibility are higher than average, and the transaction volume and revenue to the platform are small, accounting for 12.5% of the total number of car dealers |

| Car dealer category | Management strategy |
|---------------------|---------------------|
| Core large-scale car dealers | For this type of large-scale car dealers, they are maintaining partnerships through platform degree of profit transfer. The platform concession range can be within 3.2% of the profit of a single product platform; at the same time, the display priority of some products of this type of car dealers on the platform can be improved, to top 6% |
| Core small-scale car dealers | The highest point of profitability for this type of car dealer is 2.6%; the main products of this type of car dealer are given priority for display, ranking in the top 10% of the total platform products; provide up to 47.5% of individual car source sellers for such car dealers |
| Potential large-scale car dealers | Aiming at such large-scale car dealers to maintain partnerships through the increasing degree of platform profit transfer. The degree of platform profit transfer range of the platform can be within 2.95% of the profit of a single product platform; At the same time, the display priority of some products of this type of car dealers on the platform |
Potential small-scale car dealers can be increased to the top 7.5%.

The highest degree of platform profit transfer for this type of car dealer is 2.3%; The main products of this type of car dealers are given priority for display, ranking in the top 15% of the total products on the platform; provide up to 32.5% of individual car source sellers for such car dealers.

For such car dealers to maintain partnerships through the increase in degree of platform profit transfer, The degree of platform profit transfer range of the platform can be within 2% of the profit of a single product platform; at the same time, it can increase the display priority of some products of this type of car dealers to the top 10%; provide up to 40% of individual car source sellers for such car dealers.

Conventional large-scale car dealers

For such car dealers to maintain partnerships through the increase in degree of platform profit transfer, the range of the platform can be within 2% of the profit of a single product platform, at the same time, it can increase the display priority of some products of this type of car dealers to the top 10%; provide up to 40% of individual car source sellers for such car dealers.

4.2. Establish a dynamic tracking evaluation system for the entire life cycle of used car dealers

At present, the Y used car platform has a relatively complete transaction process, during which an efficient product information tracking process is required. This process starts with the collection of vehicle source information, uploads the basic information of the car dealer of the vehicle sold and the vehicle detection information to the data system. The quality and progress data of the entire process of product launching, customer browsing, and customer ordering, including the departure and delivery of the vehicle, are all recorded and tracked, and the vehicle transaction status is continuously updated. Construct a dynamic tracking model according to the transaction process, as shown in Figure 3.

![Figure 3. Dynamic tracking model based on transaction flow.](image-url)

These data are not only used for the general inspection of the product transaction process, but also for the double inspection of the customer and the platform on the quality of the products provided by the car dealer to establish a complete transaction database. The establishment of the evaluation index system based on the data of the database mainly focuses on the three dimensions of the car dealer's scale, professionalism, and integrity, as well as the process of the used car transaction on the Y platform to build the car dealer's performance evaluation index. Refer to Figure 4 for details.
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