Research on time sharing rental model of new energy sharing vehicles based on big data technology

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Abstract. With the continuous advancement of Chinese automobile industry, China has become the world's largest automobile consumption market. At the same time, there are a lot of green development related issues such as energy consumption and environmental emissions. In recent years, with the continuous innovation and development of new energy vehicles and shared travel modes, the time-sharing lease mode of new energy vehicles has been rapidly popularized and developed. The new energy car rental mode not only makes travel more convenient and environmentally friendly, but also saves social and energy resources, becoming an important part of urban transportation, However, in the development process of time-sharing rental of new energy vehicles in cities, there are many problems, such as imperfect credit rating system, imperfect supporting resources, single business model and limited service area, which hinder and restrict the healthy development of time-sharing rental market of new energy vehicles. Big data as a new technology can better serve the time-sharing lease of new energy vehicles. By using the accumulated public data, valuable information can be mined out to solve the problems existing in the time-sharing lease of new energy vehicles. This paper analyzes the development scale and basic situation of urban new energy car rental market, finds out the main problems, then solves the main problems by using big data technology, and promotes the healthy development of urban new energy car rental industry.

1. Introduction
Scientific development is the requirement of the times. According to the statistics of the traffic administration of the Ministry of public security, in 2018, the number of motor vehicles had reached 327 million, including 240 million vehicles[1]. With the rapid increase of car ownership, the consumption of automobiles and diesel oil is increasing year by year, which further aggravates the tense situation of oil supply. It is very dangerous for China with high-speed development. The development of new energy vehicles can change or delay the demand for oil, while the development of new energy vehicle sharing and leasing business can better play the advantages of new energy technology and reduce energy consumption and automobile exhaust pollution.

2. Development status and characteristics of time sharing rental service mode for new energy sharing vehicles

2.1. Development status of time sharing rental service mode for new energy vehicles
Following the rapid development of "bike sharing", new energy sharing vehicles in cities are gradually laid out in various cities across the country. With the demands of urban traffic congestion alleviation,
carbon emission reduction and clean energy development, the domestic new energy vehicle rental market has a huge scale and market prospect.

The time-sharing lease is a system service platform based on unit time (minutes or hours), which uses positioning technology such as GPRS and Internet network to provide small and micro new energy vehicle rental services of self-service car reservation, return and cost settlement[2]. It is an improvement and innovation in the traditional car rental service and technical management mode.

In recent years, the key support of national policies, the rapid development of economy and society, the improvement of social civilization, the upgrading of consumption habits and the application of Internet of vehicles and big data technology have provided a broader market for the automobile time sharing rental industry. According to the relevant data survey, in 2017, the industry scale is about 1.82 billion RMB, in 2018, it is 3.65 billion RMB, and it is expected to reach the market scale of 11.79 billion RMB by 2020. At present, the time-sharing leasing mode of new energy vehicles can be roughly divided into two types:

- A borrow and X return mode (the same or different station can return the car after taking).
- Free float mode (pick-up and return at any public parking point within the designated service area).

Both modes have advantages and disadvantages, as shown in table 1:

| Table 1. Comparison of the two modes. |
|--------------------------------------|
| A borrow and X return mode           |
| Advantage                            |
| 1. Low operation cost, users complete charging by themselves |
| 2. The difficulty is low. It can be realized by configuring charging terminal and basic communication module in the vehicle |
| Disadvantage                         |
| 1. The user experience is general, and you need to go to the rental point before and after use |
| 2. In order to achieve convenience, the network density must be improved, and the cost of parking space and service point is expensive |
| Free float mode                      |
| Advantage                            |
| 1. The user experience is good. After use, park in the adjacent parking space |
| 2. The investment cost is low, and the public parking space and charging pile are separated to a certain extent |
| Disadvantage                         |
| 1. The vehicle is parked in a remote place, which requires a special service team to place the vehicle at the access point |
| 2. When the power is low, move to the user's nearest charging point. If the user does not follow the instructions, the battery may be exhausted and maintenance personnel are required to tow the vehicle |

2.2. Main features of time sharing rental service of new energy vehicles

2.2.1. Convenient and flexible vehicle retrieval. The time-sharing lease of new energy vehicles can realize self-service remote car retrieval and return. As long as there is a site nearby, it is convenient to scan codes and self-service car retrieval and return through mobile app or Internet, which not only saves manpower and material resources, but also makes the use more efficient and convenient. [3].

2.2.2. The time-sharing lease mode of new energy vehicles has high efficiency and intensive social resources. The time-sharing lease of new energy vehicles realizes one vehicle for many people, improves the turnover rate and utilization rate of vehicles, increases the profit of a single vehicle, reduces the investment cost of vehicles, reduces the capital pressure of enterprises, and increases the profit space.
2.2.3. The popularization and application of time-sharing lease of new energy vehicles reduce the number of private cars and the traffic burden. The widespread popularity of new energy sharing vehicles has updated the concept of consumers' renting, improved the user experience, provided a convenient mode for urban travel, reduced the personal willingness to purchase vehicles to a certain extent, effectively alleviated the continuous increase of car ownership, reduced traffic jams and eased parking difficulties.

3. Main problems in time sharing lease of new energy vehicles

3.1. The initial cost of business operation is high, while the short-term income is low
In the early stage of construction, enterprises need a lot of money for vehicle purchase and site purchase in the areas with high urban utilization rate. If the distribution density of the site is too thin, it increases the difficulty of returning vehicles in different places, reduces the user experience and delays the expansion of the user scale.

3.2. The development of the industry is greatly influenced by policy guidance and government behaviour, with strong uncertainty
In 2017, the Ministry of transport issued Guidance on promoting the healthy development of minibus rental, but the specific implementation opinions on the healthy development of the industry are lacking, so the policy is difficult to be implemented. The time sharing lease of new energy vehicles has been promoted in many cities, but the city has not developed systematic documents to support the time sharing lease of vehicles according to the current situation of the city.

3.3. Lack of uniform standards for time sharing leasing business of new energy vehicles
There is a lack of unified standard requirements in vehicle purchase requirements, vehicle operation specifications, parking station and site layout, basic charging equipment and other aspects involved in the time-sharing lease of new energy vehicles.

3.4. There are loopholes in the industry supervision of time-sharing leasing enterprises of new energy vehicles, and there are many challenges in risk management
The time-sharing leasing business mainly relies on the Internet and app terminals to borrow and return vehicles, which is prone to vehicle accidents, rent arrears, vehicle theft and rent fraud[4].

4. Use big data technology to solve the main problems
In recent years, the application of big data, cloud computing and other technical means has been continuously improved. The combination of new technology and time-sharing leasing business can better promote the healthy development of the industry.

4.1. Big data technology solves the initial development problems of the industry
The initial development of the time-sharing leasing enterprise needs to invest a large amount of money for the site setting and vehicle delivery. In order to attract users, time-sharing leasing should not only consider the scale of vehicles, but also control the number of stations. According to the data of local residents' travel, traffic conditions and vehicle idleness, the total amount of vehicles and the components of each station shall be arranged to reduce the cost of vehicle purchase and improve the utilization rate; meanwhile, the station layout shall be reasonably carried out according to the market demand and the cost of station purchase to accelerate the initial construction and increase the income.

4.2. Big data technology optimizes station and vehicle layout
In the layout of vehicles and stations, collect the data of customers' travel habits and return habits through big data, optimize the layout of vehicles and stations in time, save vehicle investment and adjust the density of stations, reduce idle vehicles, return vehicles in different places in real time, and
improve customer satisfaction[5]. At the same time, use big data to analyze the use of vehicles. Under the condition of scale control, appropriately raise the price of places where vehicles are frequently used and many people are waiting in line, appropriately reduce the price in low peak period and low peak month, implement step pricing, and improve the maximization of revenue.

4.3. Big data technology standardizes service standards, realizes enterprise resource integration among industries, and improves utilization rate

The time-sharing leasing business of new energy vehicles is mainly for customers to use the app for vehicle retrieval and service. However, the specific implementation standards need to be continuously improved and modified by using big data technology. For example, the use needs and user habits of local users may require different standards for different regions and ages. At the same time, specific standards need to be formulated. The standard should inform customers in advance in the form of big data, so as to achieve fairness, standardization and transparency. After the user experiences the vehicle, set up the evaluation survey content, and then analyze the data to realize the closed-loop control of the vehicle standard service.

4.4. Big data technology reduces enterprise management risk

At the beginning of customer application, establish a real user information file, directly connect with the management system of the public security department, and study and judge the credit status of the user through the driver's violation information, bad credit records, bank and insurance system data, sesame credit and other data. In use, through GPRS and network monitoring methods, real-time monitoring of vehicles, and timely handling of possible driving and use risks. After the vehicle is used, the user's use information shall be archived, and data feedback shall be conducted with credit institutions and public security departments to form a cooperative relationship and gather the strength of each institution to further reduce the risk.

5. Conclusion

The popularity of new energy vehicles reduces exhaust emissions, which can better solve environmental pollution and other problems. Time sharing lease is a form of shared vehicles, which can improve the use rate of vehicles, and reduce the traffic pressure. But as a new thing, in the process of development, it is facing pressure and challenges from all aspects. The healthy development of time sharing rental business of new energy vehicles needs more support. The government should play a leading role and cooperate with all departments to provide specific and reasonable policy support; enterprises also need to use big data, cloud computing and other technologies to improve management and service capabilities and provide better services; for users, they also need to set an example and reasonably regulate the return of vehicles.

References

[1] China Daily. (2019) Ministry of Public Security issued 240 million cars in 2018. https://baijiahao.baidu.com/s?id=1622708833658317326&wfr=spider&for=pc.
[2] Zhao, W.B., Niu, D.X. (2017) Research on the promotion strategy of time sharing rental of electric vehicles. Technology and Industry, 17,04:111–116.
[3] Wang, Y.F. (2019) Research on the characteristics of automobile products and consumer demand under the mode of shared travel. Cars and accessories, 2019,13:39-41.
[4] Liu, X., Dong, D.C. (2019) Analysis of time sharing lease behavior of electric vehicles based on Nested Logit. 47,01:47-55.
[5] Chen, Z.S., Zhao, J.W. (2019) Development strategy of car sharing travel for future smart city, 2019,21(03):114-121.