Design of Automobile Rapid Maintenance Based on Digital Maintenance Assistant System

Cong Luo$^{1,*}$

$^1$Automotive Department, Boertala Vocational and Technical College, China, 833400

*Corresponding author e-mail: congluo@betltc.edu.cn

Abstract. In recent years, with the rapid growth of China's automobile ownership, the profit proportion of automobile aftermarket in the automobile industry is increasing day by day, and the automobile service industry is gradually growing in the development of China's national economy. The current automobile maintenance management software is not good and bad, most of these management software in order to meet the common possible user needs and lead to the same software function, lack of consideration for the management system of small and medium-sized enterprises, and there are certain defects in generality. At the recent 2020 China Automobile Supply Chain Conference, Wu Wei, director of the Machinery Department of the Industrial Development Department of the national development and Reform Commission, said that the production and sales volume of the automobile market had achieved a year-on-year growth for six consecutive months. If this momentum can continue in the fourth quarter, the total production and sales volume by the end of this year is expected to be close to the level of last year. Automobile fast repair refers to the activities of automobile maintenance and minor repair, but not vehicle repair, automobile assembly repair and secondary maintenance. The service scope is locked in 120 fast repair and maintenance items that can be completed within 2 hours. At present, the total number of motor vehicles in our country is huge, and the number of maintenance enterprises can not meet the demand of maintenance, so the potential of automobile fast repair market is unlimited. As the main business of fast repair industry, automobile fast repair is paid more and more attention by people. The application of digital management mode and maintenance cases creates good conditions for the development of fast repair enterprises, and makes it possible for fast repair enterprises to adopt reasonable maintenance methods. This paper focuses on the chaos in maintenance management, on the basis of the research and analysis of automobile maintenance management system and digital management concept, taking customer demand as the starting point, this paper designs a digital automobile maintenance auxiliary system specially for automobile fast repair enterprises to assist managers in maintenance management, so as to achieve the purpose of standardized management business "fast and reasonable" maintenance, and improve customer satisfaction.

Keywords: Maintenance Management, Digital Management, Auto Repair, Process Standardization
1. Research background
In recent years, chaos has emerged in the field of automobile maintenance and management. Some people in the industry say that the current automobile market is in a state of depression as a whole, and the survival pressure of 4S stores is relatively high, which also encourages some dealers to make the above or similar behaviors for profit. Due to the profit and benefit relationship between manufacturers and dealers, such behaviors have become difficult to manage. For the damage of parts to defraud maintenance costs, false maintenance and excessive sales promotion and similar problems, because most of the shop owners do concealment, high professionalism and unequal information, it is difficult for car owners to find their own rights and interests infringed. Even if they do, it is difficult to obtain evidence, let alone maintain their rights and interests. All these are related to the continuous development of the automobile industry in all aspects in recent years. According to the statistics of the automobile market in the developed countries, the profit proportion of the automobile after-sales service market can reach 60% - 70% of the total profit of the automobile industry, while the proportion of the after-sales market in China is only about 40%. The profit distribution of its mature automobile market is shown in the figure below[1].

![Figure 1. Profit distribution of mature automobile market.](image)

2. Overall framework design
SQL, structured query language as the basis of query theory. It is a relational database language with strong versatility and strong function[2]. The overall framework of automobile rapid maintenance based on DMAS can be divided into three layers: interaction layer, operation layer and data layer[3].

◆ In the interaction layer, users input their own requests through this step, and feed back the problems to the users themselves after the analysis by the machine. This is also known as human-computer interaction[4-5].

◆ The operation layer, the controller passes the user input request to the model. Different views are selected according to the business logic and judged by the industry database storage.

◆ The data layer is used to judge the business logic and store the results. Provide guarantee for the
follow-up management and control.

3. Digital management system
In order to meet the needs of the market economy under the new situation, it has become an inevitable trend to break the traditional management mode, adopt advanced management means and improve the scientific management level of enterprises. In order to keep pace with the development of the times, the application of digital maintenance management system is of great significance. Digital management is mainly based on the development of computer and network technology, the use of the most advanced management concepts, the development of information technology applied to the field of management, oriented to development, production preparation, manufacturing, sales, service recovery and other product life cycle process. To realize the integration of advanced management concept and the latest digital technology, to digitize the automobile maintenance management, it is necessary to establish a database. The basic information of the maintenance, staff and vehicle is shown in the table below[6].

| Table 1. Customer basic information table. |
|------------------------------------------|
| Customer number | Int |
| Name | char |
| Gender | char |
| Number | char |
| License plate number | char |
| Model | char |
| Place of work | char |
| Mailbox | char |

Input by the system administrator in advance to facilitate later selection. Including the functions of customers, vehicles, repair items, staff add, query, modify, delete. The design of database is the key and difficult point of the system development. The most important thing is to ensure the integrity of database design and the security of operation. In addition, about the physical structure design of database, there should be role information table, user information table, customer basic information table, maintenance project information table. In addition, it is also necessary to analyze the maintenance case information table, reservation record information table, estimated power of attorney information table, maintenance project information table of estimation power of attorney, spare parts information table of estimated power of attorney, and pricing information table. This system can realize the unified management of vehicle maintenance, and can conveniently input, query, modify, delete and exit the maintenance information.

4. Detailed design of the system

4.1. Design of the main page of the system
The main page of the system should divide the function templates clearly. In order to facilitate the users to operate, the distribution of the templates should be reasonable, easy to understand, and strive to be concise and easy to operate. Through the communication with users and the information obtained in the demand analysis stage, the total function and target of the system are obtained. The interface of the system should be simple and generous, and the framework structure should be clear, so that the work amount of relevant staff can be greatly reduced when using the system; According to the user's request, the system should set the relevant authority and control the operation authority, so as to prevent the irrelevant personnel from using the system and viewing and modifying the relatively confidential data; For the data needed by daily operation, such as vehicle information, customer information, supplier information, vehicle repair information, etc., can be input, modified, deleted, and can carry out a variety of query conditions; the system should have good operation efficiency, so as to quickly enter the relevant data. Each function module can be arranged according to the process
sequence according to the maintenance auxiliary management process. Then users log in to the system according to their own roles, quickly find the parts they need to operate, and make maintenance appointment. The maintenance appointment interface includes the query of reservation information and the management of maintenance appointment. The management of maintenance appointment includes appointment creation, appointment editing and appointment deletion. These parts can meet the needs of customers to a certain extent and lay a foundation for improving customer satisfaction. The development of this system makes it convenient for automobile maintenance plant to track the registration work, accessories, working hours and settlement of each vehicle to be repaired, which is helpful to the standardized management, scientific statistics and quick query of information, and improves the work efficiency and management quality of automobile maintenance enterprises.

4.2. System login process
The login module is the security door of the system. The system realizes user login through user name and password, and judges the user's authority. The page of login module mainly includes login interface and login failure interface. Login process: 1) the user opens the login interface; 2) input the user information; 3) verify the user information to the system; 4) enter the system after the verification; 5) otherwise, the user fails to pass the verification and returns the wrong login information.

5. Conclusion
In the process of design and implementation of Digital Maintenance Assistant System of automobile rapid repair industry, the specific process management can be completed with the help of corresponding modules, which provides convenience for further maintenance work.

References
[1] Wang Guangkei Automotive after sales marketing Guangzhou: Sun Yat sen University Press [M] (2011).
[2] Wang Shan,Sa Shixuan. Introduction to Database System [M] (2007.11).
[3] Li Ya,Fan Lilin,Sun Linfu Design and implementation of automobile after sale management system based on B / S mode [G] (2006).
[4] Robert Powell,Richard Weeks. C# and . NET Framework Beijing: People's Posts&Tel ecom Press [M]. (2002).
[5] Lin Lin. design and implementation of automobile maintenance management system Chengdu: University of Electronic Science and technology [D]. 2003.
[6] Zhao Ming. Research on automobile fault diagnosis expert system based on case-based reasoning. Changsha: Central South University, [D] (2003).