Design and implementation of automobile sales management system

Rongmei Wang
Business School of China West Normal University, Nanchong 637002, China
wangrongmeinc@126.com

Abstract. Sales enterprise in management appears fragmented and incoherent customer information make enterprise management or relevant personnel cannot view all of the data and related information, customer information that results could not keep consistent and complete, use the computer to car sales information management, has the crafts incomparable advantages. Quick retrieval, convenient search, high reliability, large storage, good confidentiality, low cost. These advantages can greatly improve the efficiency of automobile sales management, but also make the enterprise can be scientific, standardized management, and the system USES advanced block encryption algorithm, so that the system has a very powerful data security performance, increase the accuracy of information analysis. As a sales management system, it can query, browse and store goods, which is of great significance to improve work efficiency. The system also has good flexibility and openness. Users can easily manage the various projects, change the current management content.

1. Introduction

With economic development, sino-us trade for automotive product purchase ability improved, cars are no longer a luxury, it is no longer primarily for official cars, people generally family can also buy up, automobile consumption quantity grows[1-2]. This leads to the prosperity of the auto market, enterprise production increase, various models emerge in endlessly, for China and the United States automobile trade sales management has brought certain difficulties. More importantly, the prosperity of the automobile market leads to more choices for consumers, so how to manage and maintain the relationship between consumers is very important for sino-us automobile trade[3-4].

The modernization of management work urgently needs the emergence of management information system, which is to meet the requirements of the complexity of management work[5-6]. Management information system is an interdisciplinary product, integrating management science, information science, system science, computer science and other sciences[7-8]. Management science and system science provide a guidance of systematic development and theoretical guidance, while information science and computer science are a means or method to realize this idea. Generally speaking, the management information system is mainly composed of computer hardware and software, including communication equipment, etc. If understood in a broad sense, including human factors and interaction and other links, the management information system can achieve information collection, processing, storage, transmission, use and other functions[9-10].

Due to the large number of vehicle brands operated by enterprises, there are many problems in the traditional manual management mode, such as the untimely update of automobile information. When...
the user purchases a car, due to the limitation of manual registration, the inventory in the library cannot be updated in time, which is inconvenient for customers to purchase and order. Unable to conduct accurate and timely sales staff business audit. Because it is a manual registration, so there are manual changes in the business to cover up the suspected, unable to accurately and quickly assess the performance of sales staff, sales staff resigned when the loss of a serious phenomenon; Management information is independent of each other, and backward market forecasting means and methods will affect enterprise decision-making. The imperfect command of market information and competition information will lose the good opportunity of competition. The advantage of the new system is to use the computer to complete a lot of work that was done by the staff manually, to achieve a reasonable and full use of existing resources, reduce work pressure; The adoption of the new system can realize the management function of the commodity sales information and data, which is convenient for the staff operation, optimize the enterprise management ability, enhance the enterprise efficiency and increase the competitiveness.

This paper is based on the sino-us automobile trade as the prototype of the sino-us automobile trade sales management sales management system design and implementation[11-12]. The original use of the system is based on C/S structure, on the functional design failed to cover the scope of business of automobile trade of China and the United States currently, and the original system for the construction of the lack of information interaction among departments, make although the system is part of a larger framework, but from the point of view of information sharing them but it is fragmented, share and transmit information not timely, and will reduce the efficiency of information, increase the cost of enterprise on collecting information, specifically for the sales work, messages cannot be Shared and is not conducive to enterprise's sales management, The organic combination of various business data cannot provide strong support for the development and decision-making of enterprises. Enterprise existing systems can be achieved only simple query statistics feature, both in terms of the amount of information sharing and information quality, are not able to meet the further development of the enterprise, especially in such an information is king s, simple query statistics cannot meet the demand of expansion of enterprise scale, consumer groups, more is not enough to achieve the function of huge amounts of data statistics and analysis, cannot satisfy the business enterprise from the vast amounts of information to analyze sales trends and the demand of marketing decisions.

2. System development environment
The design of this system is successfully developed under the Chinese version of Windows 10 operating system. In the development process, how to choose database management is an important issue, at present, more database products, each product has its own characteristics and scope of application, therefore, in the selection of the database, should consider the characteristics of the database application and scope of application, the system selected the database is ACCESS.

ACCESS is designed to provide the best performance for deploying and maintaining powerful, manageable, business-enabling Web sites that engage in business-to-business or business-to-customer transactions. When looking for a database to support your e-business solution, consider the following items: availability, performance, manageability, and price.

3. Feasibility analysis

3.1. Technical feasibility
This system USES VB6.0 as its foreground development tool, it has the powerful database development function and the rich table, the graph output function, the actual effect exquisite report form printing function, easy to read with the flexible language, the rapid friendly development interface and so on the characteristic. Using VB to develop database projects can accelerate and efficiently make database management projects. This system background USES the access database, which is a new type of interactive relational database management system, is an important member of Microsoft China and the United States automobile trade Office series of Office software. Access can build a database in the
simplest way, accept and convert data in multiple file formats, and easily extend and upgrade existing database systems.

3.2. Economic feasibility
With the expansion of enterprise scale, there are a variety of problems in sales, a variety of information and data increase; and increasingly complex, in the form of software management that is convenient for the management of staff, and reduce the workload, and clear specification, at a glance. At present, quite a number of small enterprises in China do not have a perfect inventory management system, which has poor management level and low operation efficiency. It is urgent to improve the modern management level, management quality and management efficiency. The operation of the new system will greatly reduce costs and improve economic benefits. Through the use of management software, enterprises can save a lot of unnecessary waste of time, more efficient to complete the work of sales, but also can have more time to deal with more other things.

3.3. Feasibility of operation
This system interface unified standard friendly generous, the operation is simple, each kind of operation accompanies the brief and comprehensive prompt message to enable the operator to be able to complete the required operation quickly.

3.4. Legal feasibility
This system does not violate relevant national laws and regulations. Based on commercial operation and logical overall operation thinking, it closely connects the sales contract, sales and delivery, payment settlement and historical data. Therefore, there is a legal guarantee that users can safely use.

4. Requirement analysis and design
A software system is composed of several parts that are interrelated and mutually restricted, and system requirement analysis is the most important stage of the whole system design and implementation. Demand analysis should clearly put forward what the system does, that is, demand analysis is to accurately answer the question of what the system must do, rather than how to do it. In-depth, detailed and correct system demand analysis is the basis of system design and implementation, otherwise the system development cost is heavy and irreparable. Demand analysis refers to the user's demand for the function, performance and behavior of the target system. In other words, the main task of requirements analysis is to clearly, accurately and in detail describe the functional requirements, data requirements, performance requirements and environmental requirements of the system, and give the system data flow chart and data dictionary. Here, we first give a textual description of the system business process, and then express the requirements specification.

4.1. Business process
Sino-us trade automobile sales management system is mainly responsible for the management of automobile sales, warehousing, automobile data, inquiry and summary. The core of its management is system management and inventory sales management, which are the data sources of automobile planned sales, inventory control and expected purchase and statistical analysis.

Register and check the vehicles in storage. Warehousing business includes procurement warehousing, customer exchange and sorting. In the vehicle data sheet of the database, the corresponding increase and storage of inventory are carried out according to the number of vehicles in storage.

Register outgoing vehicles. Vehicle outbound business includes sales outbound, return and replacement of sales vehicles, etc. The above outbound business must carry out the vehicle outbound registration work, fill out the outbound form, and reduce this type of vehicles in the vehicle data sheet of the database.

Enquiries on vehicle information. Users can inquire and replace vehicles according to their own needs, which makes the purchase more convenient. Managers can also inquire about the inventory and
recent sales. Can carry on the simple statistics to the vehicle according to the request. The staff can summarize the vehicles according to the warehousing list, date, suppliers and other major items, for the convenience of query and statistics. Users can be required to achieve the increase, delete, and modify and other operations.

4.2. Requirements specification

The sino-us trade automobile sales management system is specially based on the commercial operation, carries on the design to the enterprise in the sales management aspect question. The automobile sales management system of sino-us trade is based on commercial operation and logical overall operation thinking, closely connecting sales business, sales and delivery, payment settlement and historical data. In addition, advanced calculation and processing methods are used to make the system have very powerful data processing and comprehensive query statistical functions. Figure 1 shows the overall structure of the automobile sales management system of the United States.

![Overall structure of sino-us trade automobile sales management system](image)

Figure 1. Overall structure of sino-us trade automobile sales management system

The system basically meets the needs of sales management, to achieve the warehousing and sales information of all kinds of inquiries. Via message of the main form, users and administrators can put in storage of vehicles, sales, but the provisions of this system the authority, the operation of the users and administrators can do is not the same, for example: managers can directly by permission to add and delete user information, and users can query was carried out on the vehicle through the query conditions you want to look for information content. For example, the user can find the vehicle information of the day by entering the date to be queried in the query management. Six tables, including vehicle name, vehicle data, warehousing receipt and supplier name, are established in the database to make the system more perfect and conducive to management and query. Figure 2 shows the use case diagram of the automobile sales management system of sino-us trade, and figure 3 shows the automobile sales class diagram of sino-us trade.
This system can realize the commodity sales information and data management function, easy for staff operation, optimize enterprise management ability, enhance enterprise efficiency, increase competitiveness. Its development mainly includes the backstage database the establishment and development of front application program of two aspects, for the former requirement to establish data consistency and integrality, data security good database, as a result of the request processing information is not large, so use the Microsoft Access 2000, while for the latter request applications fully functional, easy to use and other characteristics, in view of the system development cycle short, using Visual Basic 6.0 as the front desk development tools. This system has a friendly user interface and powerful functions,
greatly reducing human resources and increasing the accuracy of information analysis. Figure 4 is the system development sequence diagram.

![Development sequence diagram of sino-us automobile trade sales management system](image)

**Figure 4. Development sequence diagram of sino-us automobile trade sales management system**

5. **Implementation of data encryption algorithm in sino-us automobile trade sales management system**

The objectives of the encryption algorithm applied in the sino-us automobile trade sales management system are as follows: to provide high-quality data protection and prevent unauthorized data leakage and undetected modification; It has a high complexity, which makes the cost of decoding exceed the possible benefits, and at the same time, it should be easy to understand and master. The security of cryptosystem should not depend on the security of algorithm, and its security is only based on the security of encryption key. Economical, efficient, and suitable for many different applications.

The encryption algorithm applied in the sino-us automobile trade sales management system is a block cipher algorithm with the block length of 64 bits and the key length of 56 bits. The length of the plaintext is the same as the length of the encrypted password, with no data compression or expansion. The algorithm of the encryption algorithm used in the sino-us automobile trade sales management system is completely open, and the security is completely dependent on the key.

Figure 5 is all the 16-wheel structure of the encryption algorithm applied in the sino-us automobile trade sales management system. The input can be plaintext or ciphertext, depending on whether the user is performing encryption or decryption operations. The only difference between encryption and decryption is that the 16 wheel key Ki on the right of the figure, \(1 \leq i \leq 16\) is used in the reverse order, and the encryption is \(K_1, K_2, \ldots, K_{16}\), decrypted as \(K_{16}, K_{15}, \ldots\) And \(K_1\). The subkeys are generated by the key extension algorithm.
Figure 5. The 16-round iterative process of encryption algorithm applied in the sino-us automobile trade sales management system

The encryption algorithm used in the sino-us automobile trade sales management system performs an initial replacement IP on the input 64-bit plaintext to scramble the original bit order. The data after permutation is divided into left and right 32-bit parts, the left side is denoted as L0, and the right side is denoted as R0. Carry out the transformation f under the round key control of R0, and the result is denoted as f(R0, K1), and then carry out bitwise XOR operation with L0, and the result is the 32-bit R1 of the right half of the next round of data. R0 is the left half of the next round of data, 32-bit L1. I'm going to do the same thing for L1 and R1 to get L2 and R2. Such a process is called round encryption, or round iteration. After 16 iterations, L16 and R16 were obtained. Finally, the inverse permutation of the initial permutation of (R16 L16) is performed to obtain the ciphertext.

Round operation can be expressed succinctly as follows:

\[ R_i = L_{i-1} \oplus f(R_{i-1}, K_i) \]
\[ L_i = R_{i-1}, i = 1, 2, ... 16 \]

The core problem of iterative process is the function of nonlinear f function, which is the main way to realize encryption chaos and diffusion in each round.

The cipher function \( f(R_{i-1}, K_i)(1 \leq i \leq 16) \) of each iteration process must be processed through three sub-processes (extended permutation, s-box replacement (compression), and p-box arrangement). Function f is to convert 32bit input into 32bit output, and the intermediate result of the operation is 48. The calculation of encryption function f is shown in figure 6.
Figure 6. Encryption function f calculation process

(1) Extended substitution

Expand permutation is called E function (Expand), which expands 32 bits to 48 bits and is a pure shift transform independent of the key. The structure diagram is shown in figure 7. The extended displacement is input by 32bit and divided into 8 groups with 4 bits in each group. After being extended by E function, it turns into 6 bits output in each group. If ai(l)(1 ≤ i ≤ 4,1 ≤ l ≤ 8)is each input corresponding to the selection group, and bj(l)(1 ≤ i ≤ 4,1 ≤ l ≤ 8)is each input of the expansion of the selection group, then the expansion formula is:

\[
\begin{align*}
    & b_1^{(l)} = a_4^{(l-1)}; b_2^{(l)} = a_1^{(l)}; b_3^{(l)} = a_2^{(l)}; \\
    & b_4^{(l)} = a_3^{(l)}; b_5^{(l)} = a_4^{(l)}; b_6^{(l)} = a_1^{(l)};
\end{align*}
\]

Figure 7. Extended displacement schematic

(2) Compression replacement (S-box selection)

The Substitution Substitution is the Substitution of the 48-bit genus input to 32 output via the correct Substitution Box of 8 S boxes.

(3) The ith S box is a 6-bit input and 4-bit output transformation. The rule of transformation is to take \{0,1,..., the 4 permutations on 15\}, that is, its 4 permutations are arranged into 4 rows, resulting in a 4*16 matrix. Suppose the input of S box is b0b1b2b3b4b5, and the output is the element of b0b5 row b1b2b3b4 column in the corresponding matrix. The p-box arrangement is also a Permutation. The 32-bit results obtained from the compression substitution are rearranged, and the transformed 32-bit results are the output of the password function f(r−1,Ki).
6. Conclusion
The development of automobile industry plays a very important role in promoting the economic development of our country. It is one of the pillar industries of our country. And as the world economy is more and more tend to be more integrated, and as the scope and type of customer demand continues to expand, the continuous development of science and technology, and continuously shortening product life cycle, the construction of sales management information system is to achieve the development of auto industry technical support, to improve automobile sales management level, improve the car industry market conversion is of great significance.

This article has analyzed the automobile sale management information system present situation, in the full analysis automobile sale management foundation, through the full elaboration to the system structure, the scale, the function and the software, the hardware disposition and so on carried on the design and the development. Automobile sales management information system is designed and realized, which can collect, store, transfer, process, display and analyze all kinds of information involved in automobile sales to realize data sharing, personnel collaboration and process optimization of automobile sales, and improve the overall benefit of automobile industry. Finally, a data encryption algorithm is designed to ensure the data security of the system, which plays a demonstration role for the informatization and intelligent construction of automobile sales management in China and the United States, and has a very broad space for promotion and application.

Acknowledgements
University-level merit-based fund project of an analysis on expansion of China's Export to United States, China West Normal University (Grant No. 463312)”and “Research start-up project of Intellectual property protection, FDI and economic growth, China West Normal University (Grant No. 412563).

References:
[1] Liang, Rao. Design and Implementation of the Automobile Network Marketing Management System[J]. Advanced Materials Research, 2014, 926-930:2546-2549.
[2] Grujic R , Grujic S , Durasinovic P , et al. Satisfaction Of The Employed In Food Businesses And Success Of Food Safety Management System Implementation[J]. Perspectives of Innovations, Economics and Business (PIEB), 2010, 05(2):38-41.
[3] Hatch L T , Fristrup K M . No barrier at the boundaries: implementing regional frameworks for noise management in protected natural areas[J]. Marine Ecology Progress, 2009, 395(6):223-244.
[4] Singer D J , Doerry N , Buckley M E . What Is Set-Based Design?[J]. Naval Engineers Journal, 2009, 121(4):31-43.
[5] Shah N , Ahmad A , Nazir B , et al. A cross-layer approach for partition detection at overlay layer for structured P2P in MANETs[J]. Peer-to-Peer Networking and Applications, 2016, 9(2):356-371.
[6] Bachman L D . Localism, Elitism, and Immobility: Elite Formation and Social Change in Post-Mao China[J]. World Politics, 1989, 42(1):64-94.
[7] Xiao J , Ju H. Market Equilibrium and the Environmental Effects of Tax Adjustments in China's Automobile Industry[J]. Review of Economics and Statistics, 2014, 96(2):306-317.
[8] Pilataxi J I, Robalino W M V, Garcia D C. Design and Implementation of a Driving Assistance System in a Car-like Robot When Fatigue in the User is Detected[J]. IEEE Latin America Transactions, 2016, 14(2):457-462.
[9] Tsang E W K. The implementation of technology transfer in Sino-foreign joint ventures[J]. International Journal of Technology Management, 1995, 10(7-8):757-766.
[10] Son H I. Design and implementation of decentralised supervisory control for manufacturing system automation[J]. International Journal of Computer Integrated Manufacturing, 2011, 24(3):242-256.
[11] Dowlatshahi S. A cost-benefit analysis for the design and implementation of reverse logistics
systems: case studies approach[J]. International Journal of Production Research, 2010, 48(5):1361-1380.
[12] Su-Ling L I, Liu J Y. Design and implementation of electro hydraulics servo control system of automobile leaf spring rolling mill[J]. Journal of Engineering Design, 2007, 14(1):44-47.
[13] Yeh T M, Lai H P. Evaluating the effectiveness of implementing quality management practices in the medical industry[J]. Journal of Nutrition Health & Aging, 2015, 19(1):102.