

Research Article

Applications of the Small and Medium Enterprise Management System Using the Clustering Algorithm

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The traditional small and medium enterprise management system has a low efficiency of operation and management. A small and medium enterprise management system based on a clustering algorithm is designed in this paper to address this problem. In the proposed algorithm, the management system architecture is planned. The overall framework of the management system is designed based on the architecture theory. The management module is set up to realize the design of the management system. The system operation data management storage mode is set up to shorten the staff management and execution process. A multiunit management module is used to realize the management, operation, and propaganda management of enterprise expenditure. The effectiveness of the designed system is tested using simulation-based experiments to simulate the management and operation mode of the medium- and small-sized enterprise. Experimental results show that the efficiency of the designed management system is about 34% higher than that of the traditional management method, and the operation is stable.

1. Introduction

Small- and medium-sized enterprises (SMEs) are now widely distributed and inexpensive all over the world. According to statistics, 99% of the country's total number is small and medium enterprises, and 40% of the total profits and taxes and 60% of the industrial output value are created by small and medium enterprises [1]. The SME of China provides about 75% of the job opportunities to the Chinese people. With the rapid development trend of mobile Internet in recent years, more and more employees are more willing to use mobile terminal applications for word processing and business interaction, which improves the efficiency of enterprise management and service. From the current situation of the application of software systems in China, it is known that the proportion of management systems in large enterprises is more than 95%, but the proportion of small and medium enterprises using this kind of enterprise management system is less than 5% [2]. Through analysis and investigation, it is found that one of the main reasons is that small and medium enterprises have limited funds and a weak information foundation.

Based on external factors, the current model of economic operation has been altered by the growing popularity of the global economy and computer network technology [2]. It is impossible to gain a competitive advantage if a company does not follow the current growth trend and continues to operate in the traditional management model. As a result, SMEs must use advanced CRM principles and technologies to improve their business processes to improve their ability to resist risks and achieve long-term growth. The SME's internal staff quality is inconsistent, and mobility is frequent. Changes in employee jobs are likely to result in customer loss if the customer is not successfully managed. The stable old customer is the primary source of revenue for SMEs. The customer's loyalty must be maintained at all costs [3].

In addition, compared with large enterprises, small and medium enterprises have a strong demand for personalized development and are not suitable for complex and solid management systems, which is another reason [4]. In long-term development, small and medium enterprises have not realized that information management can bring great convenience for managers and employees and can also bring considerable profits to the development of enterprises. The

management system on the current market has insufficient individualized development and an incomplete functional module for small and medium enterprises [5]. With the rapid development of information technology and the “Internet plus” thought, an enterprise management system in small and medium enterprise management plays an increasingly important role. Due to the limited resources of small and medium enterprises, the level of informatization is lagging. Therefore, using technology innovation to enhance the efficiency of small and medium enterprises has become a research hotspot [6]. Therefore, a management system suitable for small and medium enterprises requires good flexibility, and business development performance to meet the specific needs of different enterprises is the primary focus of research [7]. It is necessary to propose and realize a new small and medium enterprise management system that integrates the core business function, advanced technology method, and data mining algorithm. It helps the small and medium enterprises to introduce a convenient and efficient management system at a low cost and assist enterprise decision-making [8].

2. Design of the Small and Medium Enterprise Management System Based on Clustering Algorithm

In this section, we will discuss various aspects of the proposed design. The details are given in the following subsection.

2.1. Design of Management System Architecture Based on Clustering Algorithm. The main basis of the small and medium enterprise management system design is cluster analysis, also called group analysis. It is a multivariate statistical analysis method for categorizing samples or indicators based on the theory of “birds of a feather flock together” [9]. There is no model for reference or follow-up by clustering analysis, i.e., a large number of data samples are classified according to their respective characteristics without prior knowledge. For the k -means algorithm, $X = \{x_1, x_2, \dots, x_n\}$ with n data objects is divided into k different classes [10]. In this algorithm, k different initial cluster centers are selected in n data. Then each data object is divided into the nearest class from the k initial cluster centers, thus forming k different initial cluster distribution. After each class division, the class center point is calculated according to certain rules. Suppose the calculated class center is different from the class center point mentioned above. In that case, the above data will be allocated again. By using the above principle, iterations are repeated until the last class center no longer changes, the function converges, and the algorithm terminates. The principle is shown in Figure 1 ($n = 10, k = 2$) [8]. The specific principle of graph 1K, which means clustering algorithm, is shown in Figure 1.

However, the k -means algorithm has the problem that the fixed weight is lacking flexibility. For this problem, an ideal evaluation index is introduced. Taking the difference or

distance between ideal and practical scheme as objective function, the optimal weight value is obtained by constructing Lagrange function. When calculating Euclidean distance in the iteration process, the modified weight value is assigned to the attribute. The algorithm can automatically identify the importance of different attributes according to the set of data objects. It can truly feedback the importance of different attributes for clustering [11]. First, an attribute evaluation matrix is needed to be built. According to the input data object set X , the dataset contains M data. All the data contain n attributes. The expression form of the cluster object is given by

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}. \quad (1)$$

In practical applications, the dimension of each attribute is different. In order to prevent the subsequent clustering effect, we need to eliminate the influence of dimension on different attributes and make the data of target objects comparable to calculate the contribution of each attribute to the overall clustering [12]. Therefore, the above attribute evaluation matrix is normalized according to the attribute dimension. The data is mapped to the interval $[0, 1]$. In this paper, the usual method of linear function normalization is used, given by

$$R_{ij} = \frac{x_{ij} - \min x_{in}}{\max x_{in} - \min x_{in}}, \quad (2)$$

where $\max x_{in}$ and $\min x_{in}$ are the maximum and minimum values of different attributes in the original dataset and R_{ij} is the attribute evaluation matrix after normalization. The attribute indexes of cumulative sales volume, price discount rate, and employee size are better with the larger target value for supplier data. The delivery time and return rate are better with the smaller target value [9]. Therefore, the normalized attribute matrix is processed again, and the larger the target value, the better. The attribute evaluation matrix R_{ij} is further constructed as a standardized attribute evaluation matrix, R_{ij}^* , $0 < R_{ij}^* \leq 1$. If it is 1, it is regarded as the ideal attribute evaluation scheme, expressed as

$$R_D = \begin{bmatrix} 1 & 1 & \cdots & 1 \\ 1 & 1 & \cdots & 1 \\ \vdots & \vdots & \ddots & \vdots \\ 1 & 1 & \cdots & 1 \end{bmatrix}. \quad (3)$$

When the actual scheme approaches the ideal attribute evaluation scheme, it is the optimal state [13].

Assume ideal attribute evaluation scheme is P_d , which is obtained with the vector product of the attribute weight vector set and the matrix R_D , expressed as

$$P_d = \sum_{j=1}^w \omega_j R_D, \quad (4)$$

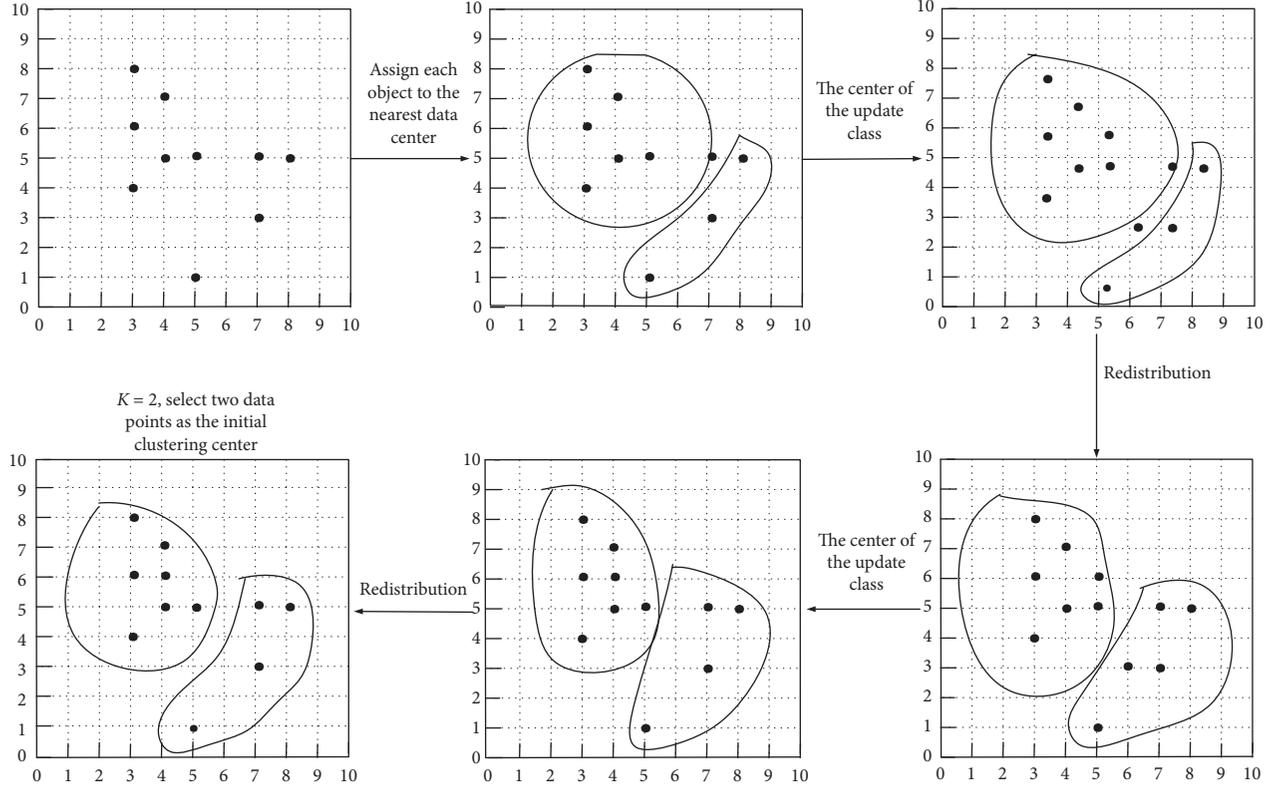


FIGURE 1: The specific principle of graph 1K, which means clustering algorithm.

where w_j is the weight of different attributes. The actual attribute evaluation scheme is denoted as P_f , which is obtained with the vector product of attribute weight vector set and normalized attribute evaluation matrix Q_{ij} , expressed as

$$P_f = \sum_{j=1}^w \omega_j R_{ij}^*, \quad (5)$$

where w_j is the weight of different attributes, $i = 1, 2, 3, \dots, m$. By using equations (4) and (5), the generalized distance between the actual attribute evaluation scheme and the ideal attribute evaluation scheme can be obtained; that is, the distance between the data object point in the actual scheme and the data object point in the ideal scheme expressed as

$$d_i = P_d - P_f = \sum_{j=1}^n \omega_j R_{Dj} - \sum_{j=1}^n \omega_j R_{ij}^*. \quad (6)$$

Let the constructed generalized distance d_i be the objective function. The smaller the objective function is, the closer the actual attribute evaluation scheme is to the ideal scheme. As the ideal scheme is unknown, it is necessary to solve an optimal solution under certain constraints [14]. To solve this problem, the Lagrange multiplier method is introduced. According to the definition and principle of the Lagrange multiplier method, the optimal weight value w_j^* can be obtained by calculation under certain constraint conditions, which makes w_j close to the ideal weight of each attribute [15].

First, the Lagrangian function is to be constructed. The multiobjective optimization decision problem is simplified into a single-objective optimization decision-making problem. Then by using the standard adaptive method proposed in the literature, according to the constraints of the Lagrange multiplier method under $w_j > 0$ and $\prod_{j=1}^n \omega_j = 1$, the optimal attribute weight value w_j^* is finally obtained to minimize the objective function d_i . The Lagrangian function is constructed by using [16].

$$L = \sum_{i=1}^m d_j - \lambda \left(\prod_{j=1}^n \omega_j - 1 \right). \quad (7)$$

After expansion, it is obtained as

$$L = \sum_{i=1}^m \sum_{j=1}^n \omega_j Q_{ij} - \lambda \left(\prod_{j=1}^n \omega_j - 1 \right), \quad (8)$$

where $Q_{ij} = 1 - R_{ij}^*$ and λ is the coefficient. Let the first-order partial derivative of L to w_j be equal to 0, expressed as

$$\frac{\partial L}{\partial \omega_j} \left[\sum_{i=1}^m \sum_{j=1}^n \omega_j Q_{ij} - \lambda \left(\prod_{j=1}^n \omega_j - 1 \right) \right] = 0. \quad (9)$$

Then according to equation (9) and the constraint $\prod_{j=1}^n \omega_j = 1$, the expression of w_j and λ is given by

$$\begin{cases} \omega_j = \frac{\lambda}{\sum_{i=1}^m Q_{ij}}, \\ \lambda = \left[\prod_{j=1}^n \left(\sum_{i=1}^m Q_{ij} \right) \right]^{(1/n)}. \end{cases} \quad (10)$$

According to equation (10), w_j is obtained, that is, the optimal value of the attribute weight w_j^* , which is expressed as

$$\omega_j^* = \frac{\left[\prod_{j=1}^n \sum_{i=1}^m Q_{ij} \right]^{(1/n)}}{\sum_{i=1}^m Q_{ij}}, \quad (11)$$

where $Q_{ij} = 1 - R_{ij}^*$, R_{ij}^* is the normalized attribute evaluation matrix.

2.2. Design of the Management System Framework.

According to the above theory, the system framework is designed. In order to facilitate the use of small and medium enterprises, the design is based on the use of mobile phone terminals [17, 18]. At present, the mobile terminal-based enterprise management system is concentrated on the native application of mobile phones. User experience is poor, the mobile phone runs slowly, and the development cost is high. In order to facilitate the rapid development and management of the system and realize a genuinely lightweight application system, a new JFinal rapid development framework is adopted in the system [19]. The framework is based on Java language, and its core design objectives are less code, easy learning, rapid development, powerful functions, lightweight, and ease of expansion. From JSP + Servlet to the SSH framework, heavyweight frameworks require too many complex system configurations, high code redundancy, and low development efficiency (Zhu Nian, 2017) [20]. Compared to the traditional SSH framework, the JFinal new framework has many advantages, such as exquisite framework design, high development efficiency, support for hot deployment model, support for SQL statements, and support for common open-source framework and multiple views. [21]. The comparison is shown in Table 1.

From Table 2, it can be seen that SSH traditional framework has high development cost, high technical requirements, and long development cycle and is more suitable for a large-scale project. The JFinal framework is more lightweight and flexible and of less cost, and it is more suitable for small- and medium-sized projects. Therefore, the new JFinal technology framework support system is adopted. The JFinal framework is composed of two parts: logical structure and spatial structure. The overall structure is shown in Figure 2.

The logical architecture is based on the MVC design pattern, including client requests, client response, request interceptors, request processors, and action processors. With the complexity of the business promotion, the processing layer can be integrated into more systems for decoupling, which helps to find errors in the development process. The spatial architecture uses the microkernel

omnidirectional extension architecture, consisting of five parts: the request handler, the interceptor, the controller, the render layer, and the plugin. Each part is implemented through the interface, which has strong expansibility, flexible application, and easy use. For the analysis of the actual needs, a lightweight technology architecture design model is proposed. The architecture model is based on MVC (Model View Controller) design pattern and adopts JFinal technology framework and WeChat enterprise account highly integrated development model. The traditional and classic MVC design pattern is mainly divided into three different levels: model, view, and controller. The architecture is shown in Figure 3.

The architecture mainly includes three modules: input part, processing part, and output part. The controller is the input module. The model is a data processing module, and the output module corresponds to the view. The communication between the three modules is shown in Figure 3. When the controller resolves the user's input, the controller changes the state and activates the corresponding model. The model processes and maintains data based on a well-written business logic and notifies the view. The view receives the notification and obtains the data results from the model and refreshes the page. The new small and medium enterprise management system adopts the evolution model based on MVC architecture, which is optimized to four levels: the view layer, the controller layer, the service layer, and the model layer. The overall architecture is shown in Figure 4.

The view is used to display the interface, which obtains the data and state from the model and renders it to the form of the page. The system is implemented by Bootstrap framework, including JSP and HTML. The controller is used to distributing and controlling the incoming requests, invokes the model to interact with the database, and returns the data to view in some form. It includes filter requests and processing requests. The system adopts the Controller class of JFinal framework to implement. Service is the implementation of specific business logic processing, including transaction operations, using the Service class of JFinal framework. The model can encapsulate business according to needs, store the data processed by the upper layer for database operation, and substantiate the database table structure. The database table is mapped to the Model class of JFinal through the ORM model. The model is different from the traditional MVC architecture. The optimized model includes functions of Dao and Service, highlighting the simplification of the overall frame structure. In addition, it is a hyperemia model. When dealing with more complex business processes, the service layer can be separated and processed. The technical framework of the lightweight and compact mode system is then designed in combination with the JFinal technology framework and WeChat enterprise account. The system architecture deployment is shown in Figure 5.

The system architecture consists of a WeChat enterprise account, WeChat server, enterprise management system, and database. When the enterprise user sends the instruction by the WeChat enterprise account server, WeChat public

TABLE 1: Comparison between the JFinal framework and the SSH framework.

	SSH framework	JFinal framework
Frame configuration	Configuration support and more complexity	Zero configuration, no XML
Persistent layer	Configuration support and more complexity	Simple encapsulation SQL statement
Frame weight	Many related components	The volume is tiny, and there is no third-party dependence.
Support extension	Support	Support
Learning cost	There are more rules and need to be learned	Grammar is simple, easy to learn
Development efficiency	A large amount of code, low development efficiency	High efficiency, save 60% of the amount of code
Scope of application	Suitable for significant project development	The rapid development of small and medium-sized projects

TABLE 2: System role permission description.

Role	Permission description
General manager	It has the right to initiate and approve all enterprise tasks and the right to check all the information
Ordinary staff	With the daily income accounting, supplemental application, new suppliers, suppliers classification, and other rights
Personnel matters	The highest permissions of the staff management module
Finance	The highest permissions of the revenue management module
Purchase	The highest permissions of the supplier management module
Information manager	With system authority maintenance, database background import, and other privileges

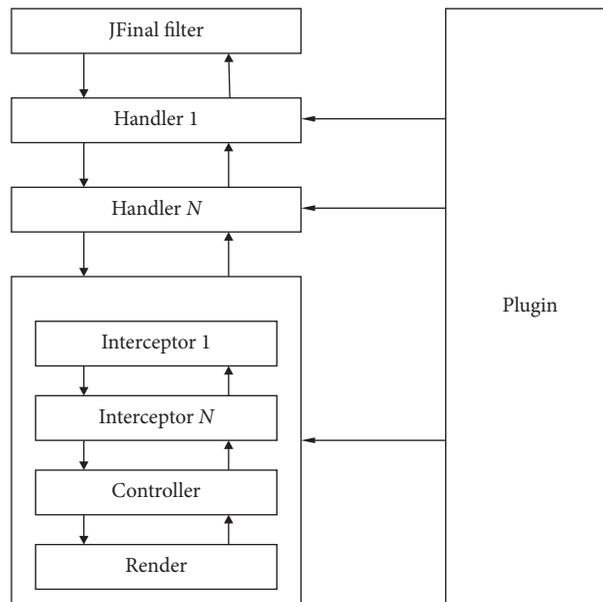


FIGURE 2: JFinal frame structure diagram.

platform receives the instruction and forwards it to the small business management system. According to the instruction, the system processes the corresponding business logic, interacts with the database, and returns the processed results to the WeChat server. The server sends the results to the mobile devices of the corresponding users through the WeChat enterprise account and completes the automatic landing of WeChat authentication and the automatic push of specific service in the requirements. In addition to supporting closed-loop transmission, even if the enterprise account does not send instructions, the system can automatically trigger instructions to the enterprise account for display. The

designed technical architecture mode belongs to open source and can be used as the bottom shelf of different types of systems.

2.3. *Design of the Multiunit Management Module.* In system module design, the main goal of the system development is to implement a lightweight new enterprise management system for small and medium enterprises, which brings convenience to the managers and the employees of small and medium enterprises. On the one hand, the system can provide a fast and secure system channel. So that employees

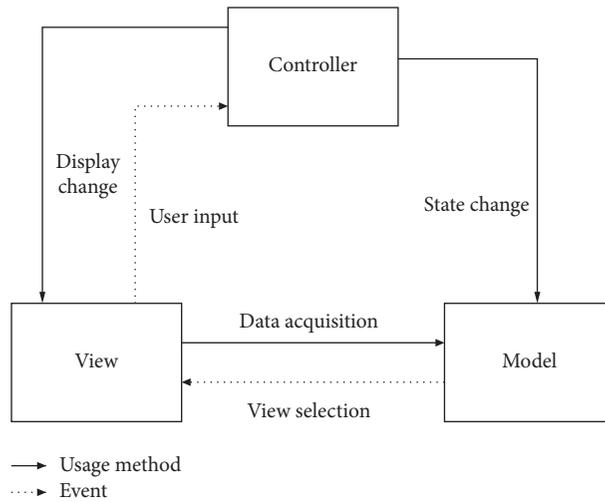


FIGURE 3: MVC schematic diagram.

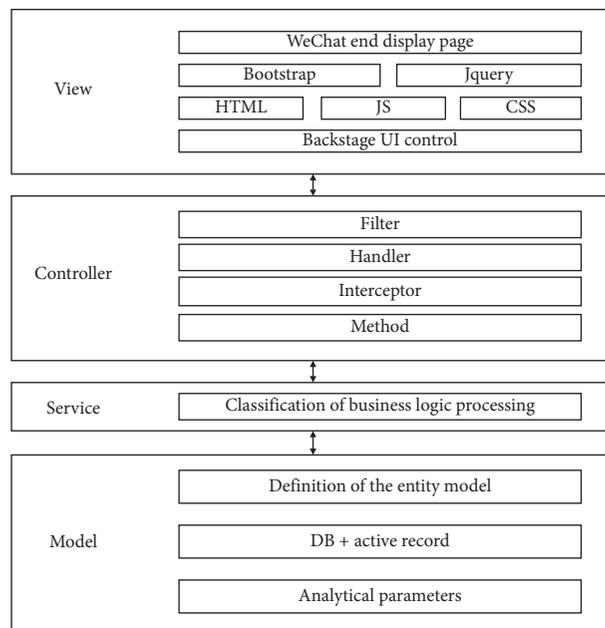


FIGURE 4: System architecture design.

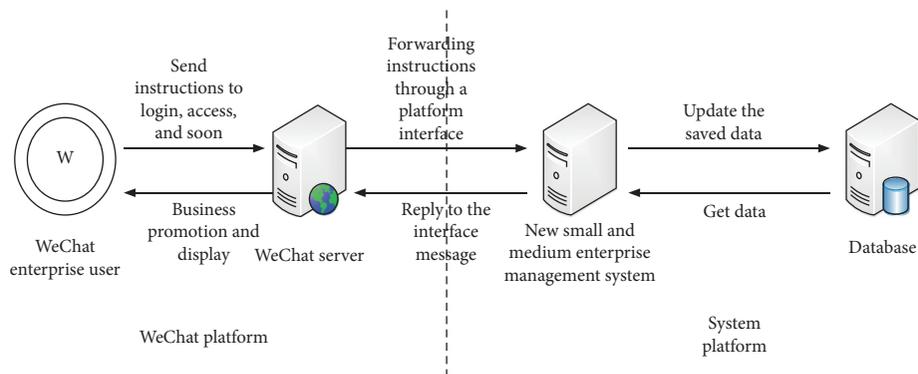


FIGURE 5: System architecture deployment diagram.

can enter the system without any user name and password through a WeChat enterprise account on their WeChat interface and directly login to the system for remote online management. It can quickly handle all kinds of business in the enterprise and understand and analyze the business situation in real-time, effectively helping the enterprise manager to achieve the purpose of strengthening the internal management of the enterprise in real time and conveniently. On the other hand, the system integrates the improved algorithm to the actual needs and provides effective solutions for managers to solve complex decision-making problems. The management system applicable to small and medium enterprises should always focus on the actual needs of small and medium enterprises. It must integrate new information technology, computer network technology, and data mining algorithm to improve the system gradually for the sustainable development of the Internet, intelligence, and light direction. This system can realize low cost and convenient deployment through the public cloud in the future and gradually develop into a mobile Internet platform for the management of small and medium enterprises. An enterprise management system should have the role management function and permission management function. User operation authority in a system depends mainly on role control. In general, the system has two types of roles: system role and business role. The system role is mainly super administrator, general manager, or information manager, mainly used for system establishment, control of enterprise management, and other operation privileges. The business role is mainly used to control the right to use and operate functional modules. The system needs to specify and assign a user role after creating a new employee user. The user can automatically inherit the specific permissions given by the role. The system divides users into six roles: general manager, general staff, personnel, finance, purchasing, and information manager. The specific permissions of each role are shown in Table 2.

Through multicomunication with enterprise staff, it is determined that the new small and medium enterprise management system should be a lightweight business platform with a complete upstream and downstream. According to the actual needs of small and medium enterprises, the system function is divided into four main modules: employee management module, income management module, supplier management module, and WeChat enterprise account service module. The WeChat enterprise account module is an essential basic service module, and the others are core business function modules. Each functional module has its submodules to realize the specific business functions, which cover the basic needs of small and medium enterprises.

3. Implementation of Small and Medium Enterprise System Management

In this section, we will study different features of the proposed system in the context of implementation, for example, data management with storage mode, employee

management processes, management of enterprise expenditure, and implementation of operation propaganda management.

3.1. Setting the Data Management Storage Mode. The main purpose of database design is to analyze and define data information, one of the core technologies in system development. The E-R (Entity-Relationship Approach) model is an important method in database conceptual design, consisting of the entity set, attribute, and relationship set. Firstly, the E-R model is set up to explain the semantic relationship between entities in the system database. The system determines the following six entities: employee information entity, supplier information entity, daily income entity, daily income recording entity, role entity, and authority entity. The entity E-R model is shown in Figure 6. In Figure 6, the rectangle box represents the entity type of the database. The ellipse box represents the entity's properties, and the diamond box represents the relationship between the entities. The relationships between entities are marked in the model diagram, such as one to many relationships (1 : N) or many to many relationships (M : N).

According to the design of the E-R model, it can be transformed into the data structure and relational schema acceptable by the computer, and the logical design and physical design of the database of the system are carried out. Based on the E-R model of Figure 6, the database and database tables of the system are created, including the database tables of employee, role_permission, daily receipts, daily receipts supplement, and supplier and the dictionary tables of 'dict' input types and dict supplier category. The dictionary table id is the primary key, and the code column is the unique index, which can directly traverse the database. The dictionary table content can be automatically updated by the Database Management System (DBMS), and its scalability is strong. The relationship between storage entities adopts MySQL database, which belongs to the relational database management system. MySQL database is smaller and less comprehensive than Oracle and DB2. However, because of its small size, fast running speed, low overall cost, and open code, the MySQL database is popular in small and medium projects and economical for development and maintenance costs.

3.2. Adjusting the Employee Management Process. Employee management is one of the basic core functions of the new small and medium enterprise management system. It is mainly responsible for maintaining the information of all managers and employees, including staff new addition, employee information query, employee information modification, employee information abolition, employee role maintenance, role and authority mapping, and maintenance. If employee management has changed, the WeChat enterprise account can automatically push WeChat messages to the relevant personnel. Use case analysis of the employee management module is shown in Figure 7.

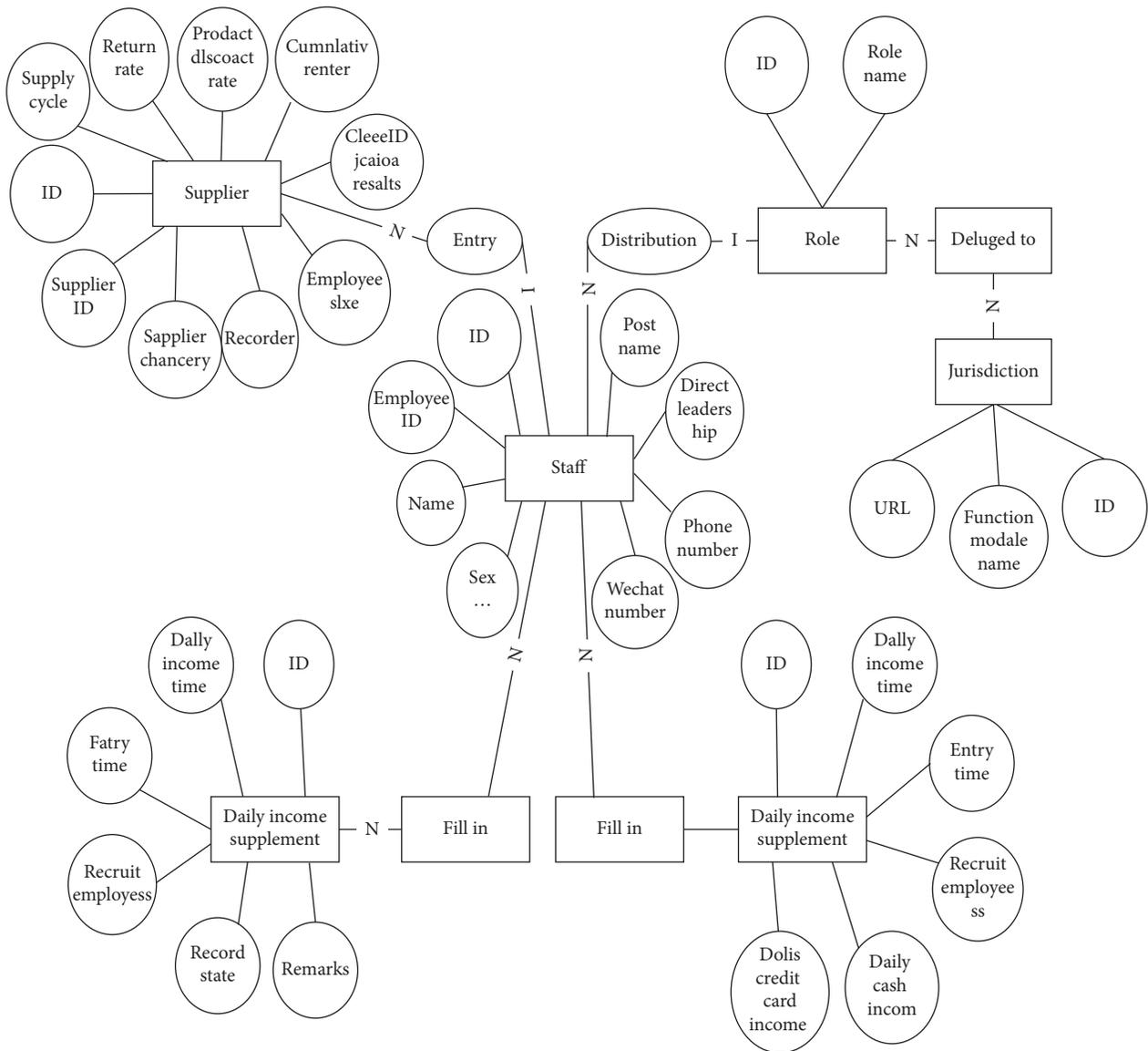


FIGURE 6: Database E-R model.

According to the analysis of the actual needs, the staff management module includes four parts: new employee addition, staff information maintenance, employee role maintenance, and role rights maintenance. Each maintenance function includes adding, deleting, modifying, querying, and other specific operations. The role of owning the module is human resource and information manager. The new employee will fill out all basic staff information by human resource and save it to the database after verification. The human resource can query all valid employee information in the database, modify them, and update the contents to the database. It can maintain the role of all employees, ensure that each employee has at least one role, and save the mapping relationship between employees and roles to the database. The information manager has operation permissions to maintain the mapping relationship between roles, privileges, and roles and permissions and can be maintained in two ways in system page and database

backstage. The data flowchart of the employee management module can be obtained through the business process analysis and data flow analysis of the module, as shown in Figure 8.

3.3. *Implementation of the Management of Enterprise Expenditure.* Managers of small and medium enterprises will strictly control and supervise the overall income and expenditure of the enterprise. Managers want to know the business and revenue of the enterprise anytime and anywhere and hope that their employees can enter all the information of income and expenditure following the rules and regulations. Therefore, income management is another critical basic function of the new small and medium enterprise management system, including the normal entry of daily income, the revision of daily income, the supplement and input of daily income, the total income query, and the

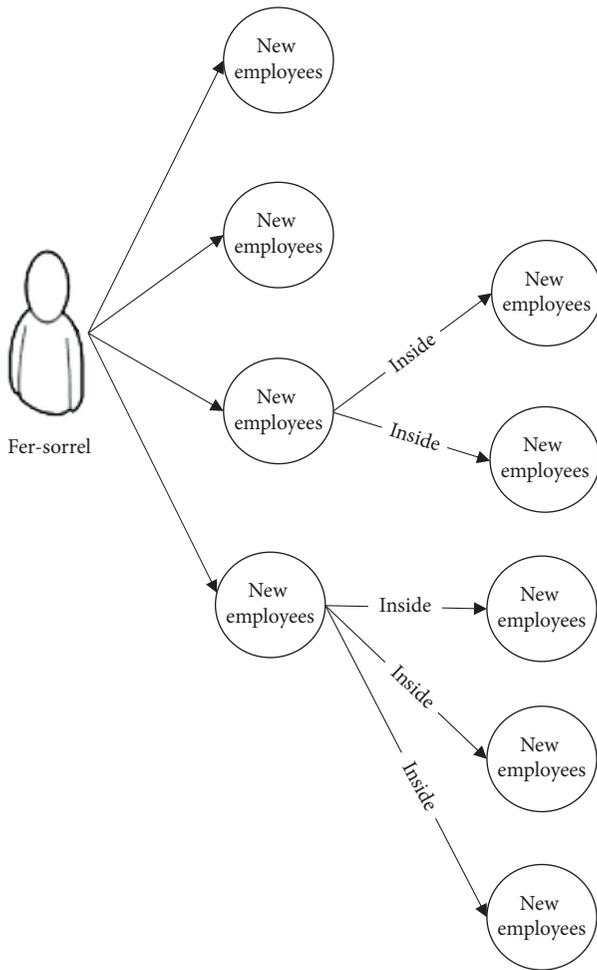


FIGURE 7: Employee management module.

total income statistics. When an ordinary employee enters a daily income or changes the daily income in a nonprescribed time, it is necessary to first apply to the manager before approval. Whenever a daily income is dynamically updated, the system automatically pushes messages to the manager through the WeChat enterprise account. Use case analysis description of an income management module is shown in Figure 9.

The income management module consists of five parts: daily income input, daily income modification, daily income supplement, total income query, and total income statistics. The role of authority is ordinary employee, finance, and general manager. The system stipulates that ordinary employees are required to enter all day income before 22 o'clock per day. The input can be successfully saved to the database within the prescribed time, and the system will automatically push the contents of the input to the WeChat of the general manager. If the entry time exceeds the time specified by the system, the ordinary employee must initiate a supplementary application. The application of the amendment is similar to the application principle of the remedial application. The ordinary employee can only initiate it. After the application, the manager will receive the WeChat push and enter the application for examination and approval in the

system. After approval, employees receive a WeChat push and access to the system's supplementary data. Only the supplement and amendment approved by the general manager can be saved to the database table. The finance and general manager can inquire about all the income in the enterprise and obtain the statistical results of total income. Then business process analysis and data flow analysis are carried out by using the income management module.

3.4. Implementation of Operation Propaganda Management. The traditional mobile terminal enterprise management system is mostly a mobile phone native application. Its development and maintenance costs are not high enough for small and medium enterprises. Users also need to download, install, and update software regularly, occupying the mobile phone running space, and the overall experience mode is poor. Therefore, the enterprise management system needs to be light and fast. In 2012, Tencent Inc. launched WeChat public platform function, which provides consultation and service through public accountability. It includes the service account, subscription account, and enterprise account. The comparison of the three accounts is shown in Table 3.

From Table 3, it can be seen that the WeChat enterprise account is more consistent with the characteristics and requirements of the system. WeChat enterprise account can help enterprises establish an upstream and downstream supply chain, which has obvious advantages over the native application or Web App. A fast, low-cost, and high-quality enterprise mobile light application is realized by combining the popular and novel WeChat enterprise account with the system platform. The management office model of the enterprise is transplanted into the intelligent mobile phone by the enterprise account so that the enterprise's management and business management can be completed through WeChat. According to the needs of target users, the system needs to realize two functions of WeChat authentication automatic landing and specific business automatic push. When a specific business occurs, the user can receive the corresponding information push, which helps the employees control and deal with the work at anytime and anywhere and improve the efficiency of the work. WeChat enterprise account provides advanced functional interfaces with enterprise user information interaction, WeChat push, custom menu, and rights login. The docking between the enterprise management system and the WeChat enterprise account needs to be built with web business. According to the requirement analysis, the service module mainly completes the WeChat authentication landing and specific business push functions. When users click on the WeChat menu to enter the button of the system, they can directly access the system through login authentication and enter the work platform corresponding to the user role. When a specific business occurs, such as daily income entry, daily income supplement application, daily income modification application, employee information change, supplier confirmation, and supplier information modification, the system can automatically push WeChat messages to relevant internal personnel WeChat enterprise account.

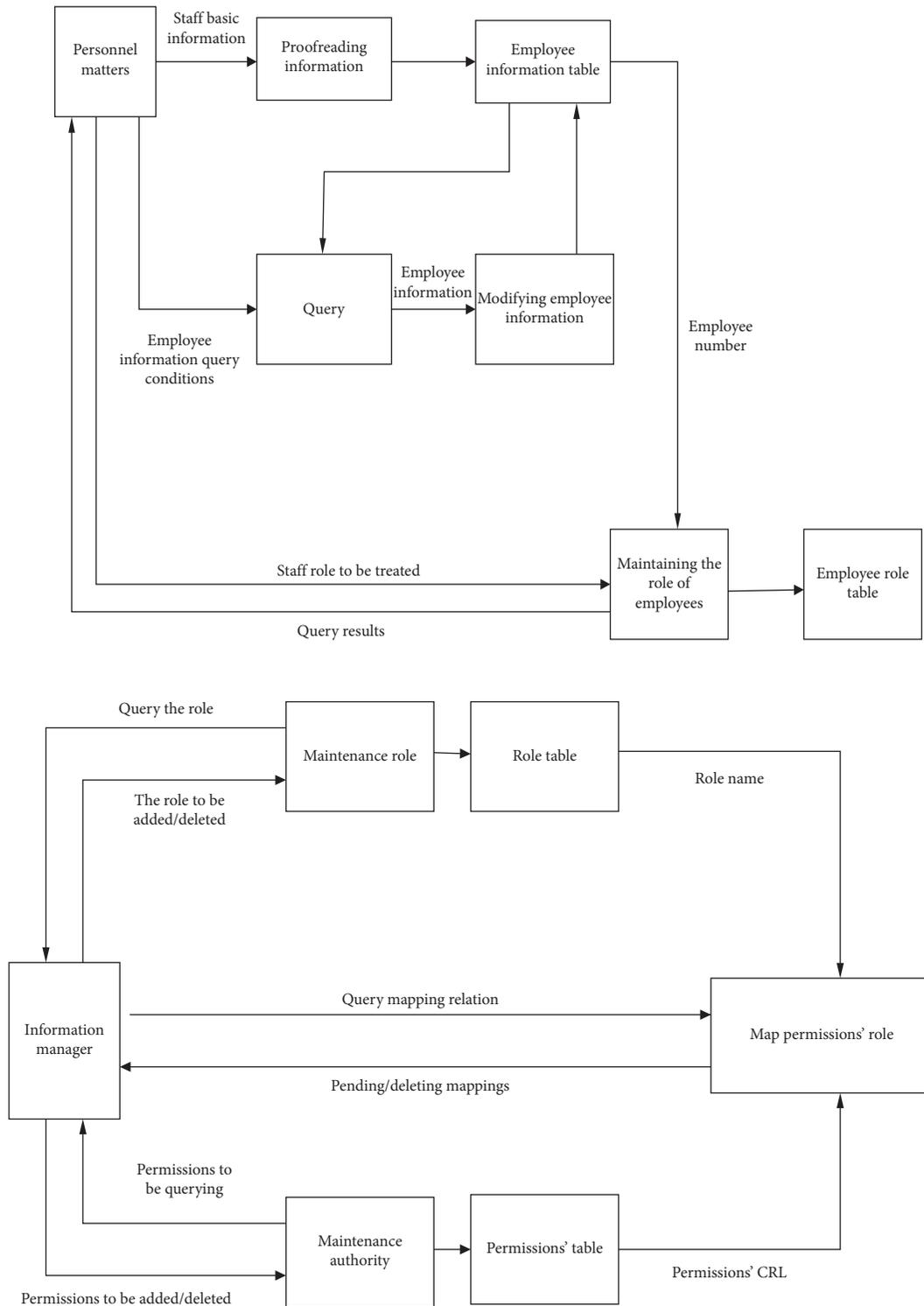


FIGURE 8: Employee management function data flow.

4. Experimental Analysis

4.1. *Experimental Process.* In order to verify the effectiveness of the small and medium enterprise management system based on clustering algorithms, the following comparative experiments are designed. With the same small and medium enterprise management as the experimental object, it is

divided into two groups, in which the small and medium enterprise management system based on clustering algorithm is the experimental group, and the traditional small and medium enterprise management is the control group. Under the premise of controlling a single variable, the enterprise income and expenditure management efficiency and employee demand processing efficiency are recorded

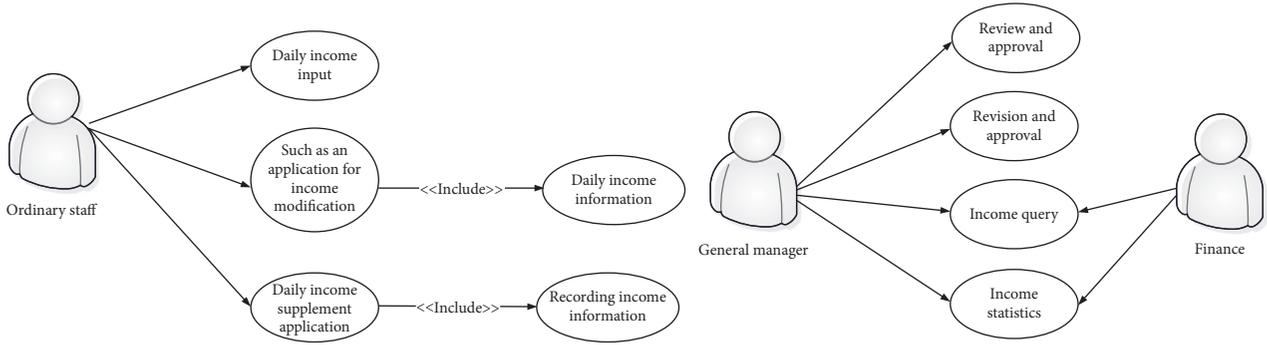


FIGURE 9: Use case analysis description chart of the revenue management module.

TABLE 3: Comparison of three different types of WeChat public accounts.

Finance	WeChat enterprise account	WeChat service account	WeChat subscription account
Target user population	We are facing the unit and organization, realizing the mobile management of the enterprise.	Enterprise, organization, service to users	Media and personal information dissemination
Message number limit	A maximum of 1000 times per minute	Send the number of information on a monthly basis, where the quantity cannot exceed 4	The number of groups is limited by 1 per day strip
Identity of the concern	Back-end address book member	Any WeChat user	Any WeChat user
Confidentiality	High secrecy	Low secrecy	Low secrecy
Advanced interface	Support	Support	Nonsupport
Custom application	Support	Nonsupport	Nonsupport

separately in two groups. The conditions are set for the two groups of experimental data. In order to ensure the fairness of the experiment, the parameters of the experimental group and the control group are always consistent. In order to verify the differences between the two systems, the experimental group will operate on the small and medium enterprise management system based on the clustering algorithm following the requirements. In contrast, the traditional small and medium enterprise management mainly takes artificial processing.

4.2. Comparison of Income and Expenditure Management Efficiency. The experimental group and the control group managed the same enterprise’s income and expenditure work at the same time and compared their management efficiency. The income and expenditure of 2, 4, 6, 8, and 10 days were recorded. In order to avoid interference caused by sudden events, the experimental group and the control group had the same processing parameters. The results are shown in Figure 10.

From Figure 10, it can be seen that, with the increase of time, the efficiency of the experimental group has been relatively stable, and the management efficiency is relatively high, which is 95%. In the control group, the efficiency of the control group gradually decreased after three days of the management time, and the overall efficiency is not stable.

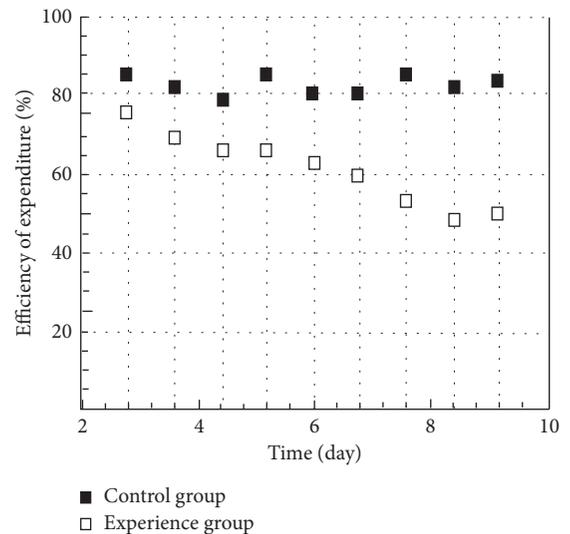


FIGURE 10: Comparison of the efficiency of the enterprise’s revenue and expenditure management.

The efficiency of the control group is about 79%. It can be proved that the efficiency of clustering algorithm-based management is raised by 28% compared with traditional enterprise management.

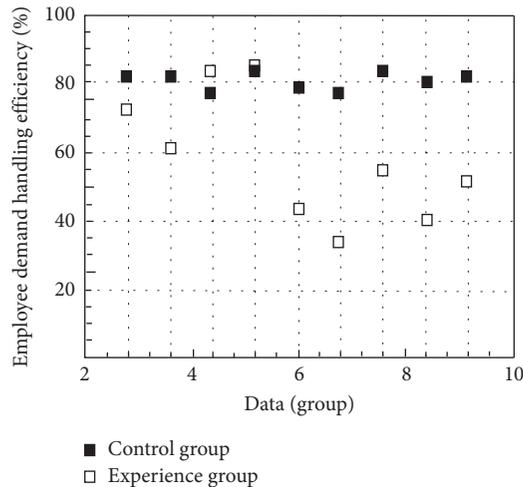


FIGURE 11: Comparison of employee demand handling efficiency.

4.3. Enterprise Management Demand Handling Efficiency.

The experimental group and the control group simultaneously processed the needs of the same number of employees. The processing efficiency of 20, 40, 60, 80, and 100 groups after processing the demand data is recorded. The results are shown in Figure 11.

From Figure 11, it can be seen that, in the process of employee demand processing, with the increase of demand for treatment, the management system based on clustering algorithm has been relatively stable and has a high success rate, which is kept at about 92%. With the increasing demand for treatment in the control group, the processing efficiency shows a dangerous downward trend, and the processing efficiency is about 70%. It proves that the small and medium enterprise management system based on clustering algorithms can effectively improve the efficiency of employee needs.

5. Conclusions

With the rapid development of mobile Internet technology and the popularity of the “Internet plus” idea, the management information system plays a more critical role in managing the enterprise. Both large and small enterprises need innovation at the information technology level. Therefore, in the research process of small and medium enterprise management systems based on clustering algorithms, the system mainly provides necessary basic functional modules, such as employee management and income management. Combined with the current mobile Internet and intelligent information technology, the system will be highly integrated with the WeChat enterprise account to realize employees’ mobile and intelligent offices. The lack of scientific classification management of suppliers of small and medium enterprises and improved clustering algorithm is proposed. It provides targeted and effective solutions for small and medium enterprise target users. It helps small and medium enterprises to introduce a convenient and efficient management system for enterprise decision-making [22].

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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