Human Resource Management System for Small and Medium-Sized Enterprises based on SSM Frameworks

Haohai Fu[1,2,*], Jinmei Liu[1,a]

[1]Changchun Institute of Technology, Changchun, 130012, China
[2]Jilin Provincial Key Laboratory of Changbai Historical Culture and VR Reconstruction Technology, Changchun, 130012, China

*fuhaohai@ccit.edu.cn, aLiujinmei@ccit.edu.cn

Abstract. With the development of information technology and the arrival of the era of big data, the traditional employee management can no longer meet the needs of modern enterprises, and the informatization, automation and intellectualization of enterprise human resource management has been the trend. Therefore, we developed a human resource management system based on SSM (i.e. Spring, SpringMVC and MyBatis) framework for small and medium-sized enterprises (SMEs). By setting multiple roles, the human resource information can be efficiently and safely managed. After comprehensive testing, the system has been able to meet the basic needs of enterprises, and has a good user experience that can improve the efficiency of human resource management, and has a good reference and guiding significance for the research and development of human resource management system in SMEs.

Keywords: SSM frameworks, small and medium-sized enterprises, human resource management, management information system

1   Introduction

In recent years, with the advent of Web 3.0, all walks of life have undergone great changes, but also has brought new opportunities and challenges to human resource management. Enterprise human resource management is the key to achieve the strategic goal, and its informatization is an inevitable trend. However, the traditional human resource management cannot effectively meet the current needs of enterprises, and most of the human resource information management systems adopted have problems such as incomplete function, unfriendly interface, complex operation or low security[1]. Therefore, the design and development of a friendly interface, complete functions, high safety, and easy to use human resource management system for enterprise is particularly important[2].

At present, the traditional human resource management system only covers basic data, such as age, native place, education background, etc., and cannot provide enough detailed information about employees, let alone realize data analysis and

decision support[3]. It requires human resource management departments to manage information more deeply and comprehensively in the information era. Therefore, we have carried out a comprehensive analysis of the current situation of human resource management in SMEs. Through research and literature review, it is known that there are the following problems in human resource management of SMEs: First, the management concept lags behind in the background of the era[4]; second, the information construction planning is imperfect, the foundation is weak, and the investment is insufficient[5]; third, there is a shortage of talents and immature technology in the construction of human resource information in SMEs[6].

In the process of enterprise management, a large amount of data is generated every day, which is reflected in: (1) the data in the enterprise management system is no longer limited to human resources files, but also includes enterprise operation data and profit data, which constitute important basic information; (2) The "mobility" and security of the system make data collection no longer limited to the internal of the enterprise, and relevant data can be obtained anytime and anywhere, achieving a high degree of data aggregation. The collection, storage and efficient use of data can enhance the core competitiveness of enterprises, so it is urgent to upgrade and optimize the human resources management system[7].

To sum up, according to the current problems of SMEs and the trend of informatization, we study the modern human resource management system, and design a system based on SSM framework. Through this system, enterprises can solve many problems, such as simplifying process, improving functions, realizing sharing, increasing data security and supporting laws and regulations. It can also better improve the efficiency of employee management, meet the various needs of the task, and provide enterprises with a convenient, rapid and efficient information platform, accelerate the process of enterprise informatization, and greatly enhance the core competitiveness of enterprises.

2   Technology Overview

In order to reduce the development and maintenance cost, people always want to use the industry mature framework for application development. The classic JavaEE framework is SSH, and the current preferred is SSM, which is the abbreviation form of Spring, SpringMVC and MyBatis. As a lightweight software development architecture, SSM fully supports MVC design pattern, and its structure is clear, easy to use, and the code is open source, which can fully meet the needs of system development[8,9].

The whole framework is divided into four levels, from bottom to top they are persistence layer, service layer, control layer, presentation layer. Spring is responsible for the management of core business objects, and is applied to the Control layer and Mapper layer[10]. Through the IOC container, Spring framework enhances the dependency relationship between managed objects, which can greatly reduce the degree of application coupling and improve the testability and maintainability of applications. SpringMVC framework includes components such as controller, view

parser, processor, mapper and interceptor, which is responsible for controlling and forwarding the entire request and calling the presentation layer for display[11]. It can help developers easily build Web applications based on MVC pattern. In addition, SpringMVC also provides rich tag libraries and annotations. It can greatly simplify the design of web applications. MyBatis, as the persistence layer of data objects, provides data management for the system and provides a more concise and flexible implementation than Hibernate framework[12].

3   System Analysis

According to modern software engineering principles, the key step of management information system development is system analysis, including feasibility, business and function analysis. The necessity, significance and technical feasibility of human resource management system for SMEs have been introduced in the first two sections. This section mainly introduces the business requirements analysis and functional requirements analysis of the system.

3.1   Business Requirements Analysis

Human resource management business is divided into two categories. For ordinary users, the system should support staff's basic information management, attendance, turnover, salary information query and other services. For managers (especially those in human resource management department), the system should support the following businesses.

(1) Employee management: Managers can conveniently add, delete, modify and query the basic information of employees, such as name, gender, birthday, date of entry, post level and other basic information.

(2) Employee attendance management: It is necessary to be able to conveniently manage employee attendance information, such as sign in, sign out, leave, overtime and other business information.

(3) Employee demission management: including reasons for demission, time of demission, final salary accounts, etc.

(4) Enterprise department management: manage the establishment, merger and cancellation of internal organizations of enterprises.

The above services are for the whole enterprise and all employees, mainly to achieve batch query and statistical analysis, to provide decision support for management departments.

3.2   Functional Requirements Analysis

Functional requirement analysis refers to the systematic analysis of the business involved in the enterprise according to the ideas of high cohesion, low coupling and module reuse for the enterprise's requirements. Through functional analysis, it is necessary to identify the various participants and their respective functions, and

clarify the main process and business data of each function, so as to provide basis and guidance for the subsequent system design and development, which ensures the accuracy of functions and improve quality.

After analysis, the human resource management system for SMEs should have role login, permission allocation, UI management, account management, business data management, query, statistical analysis and so on. The corresponding use case diagram is shown in Figure 1.
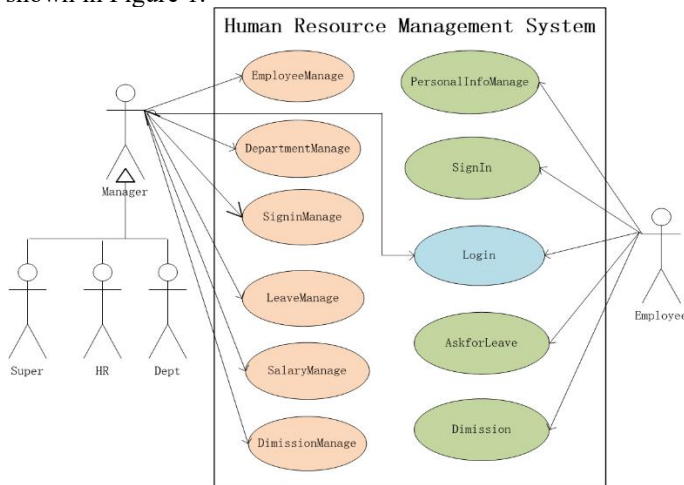

Fig. 1. Use Cases

4 System Design

The design of human resource management system for SMEs includes software architecture, functional modules, database and static structure design based on object-oriented programming paradigm.

4.1 Architecture Design

The system of SMEs adopts B/S (i.e. browser/server) structure, uses SpringMVC framework to achieve hierarchical management, uses MyBatis framework to manipulate the database, and adopts MySQL as the database management system[13]. The system architecture is shown in Figure 2.
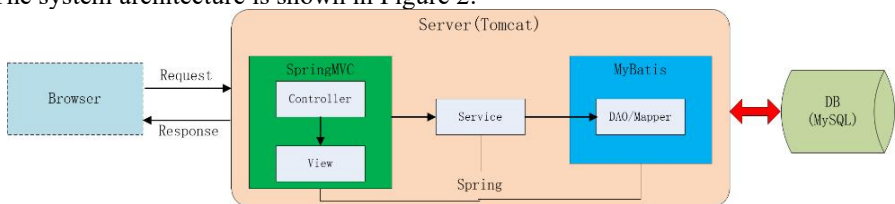

Fig. 2. System Architecture

4.2   Functional Modules Design

The system include 7 main modules as follows: login, homepage, personal information, staff management, attendance, leave application and department management. Administrators and ordinary users have different management rights. The super administrator can use all functions, including the management and configuration of all enterprise services and data. The human resource management department can manage all business data related to human resource management; the manager of each department can manage the basic information of the employees of the department; Employees can only manage their own information. The specific function modules are shown in Figure 3.
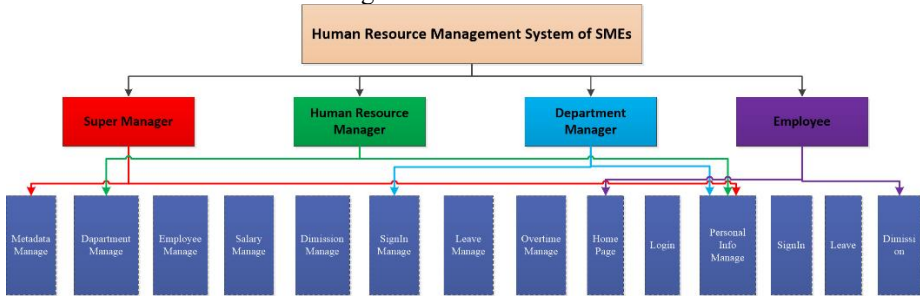

Fig. 3. System Modules

4.3   Detailed Design

Login

All users need to provide the correct credential information which includes the login name and password to log in. In addition, captcha is added to the credential information to improve system security. In the implementation process, SpringMVC is used to interact between the browser and the server, Spring is responsible for handling the certificate verification logic, MyBatis is responsible for interacting with the MySQL database. At the same time, the encryption algorithm is used to encrypt the password to prevent the security risk caused by the password exposure.

Homepage

The homepage is the first page displayed after the user successfully logs in. In addition to displaying information such as employee name and current time, the most important role is to act as a console to display user interfaces for different users and centrally manage the next step of user operations.

Personal Information Management (PIM)

This module includes three sub-modules: view employee information, attendance record and overtime information. For ordinary employees, you can view the above personal information, or you can set different query conditions (such as time interval, etc.) to filter the information, but you can only browser the information and cannot

modify it. For the administrator, you can modify and view the information of all employees, and set different conditions to achieve statistical analysis.

Employee Management

This module can only be accessed by super administrators and human resource management departments, which manages on-the-job employee, retiree, file, and staff turnover information. Through the on-the-job employee, the manager can create a new user, and grant the permissions to this user, where the employee number is a unique identification, not customizable. In the retiree, the user can query the information of employees who have left or retired, including their entry time, retirement time, etc. One can query the files of all employees (including active and retired) using file management. Through the staff turnover, one can query when an employee transferred from one position to another position, and can realize employee position transfer.

Attendance Management

This module includes attendance and overtime management. The attendance management module can view the sign in records of all users, and can conduct statistics and inquiries according to the specified time interval, department, worker identity and other conditions. The overtime management module can arrange the staff of each department to work overtime according to the daily capacity and work needs, and can modify and withdraw the overtime information.

Leave Management

This module contains the list of approved and unapproved leave requests, and the leave record of all people. The department leader can only check the leave records in the department. The list of unapproved needs to be distributed to the list of each department leader according to the department to which the employee belong, and the department leader will review whether to approve the leave. After the review, it can be viewed in the approved list. The third module is special, which is only used administrators. It can summarize the leave records of all people, which is convenient for salary and year-end evaluation.

Department Management

This module is only for the human resource manager, who can add or revoke the department of the enterprise with the system. After setting the new department, the department manager can be appointed, and the department of an employee can be modified to realize the transfer between departments. When a department is revoked, the relevant personnel information of the department should be synchronized and updated, and the reason and time of the cancellation should be recorded.

4.4　　Database Design

According to the detailed design, we established the conceptual model of the system for SMEs. To save space, we only show the E-R diagram of part of the data in Figure 4.
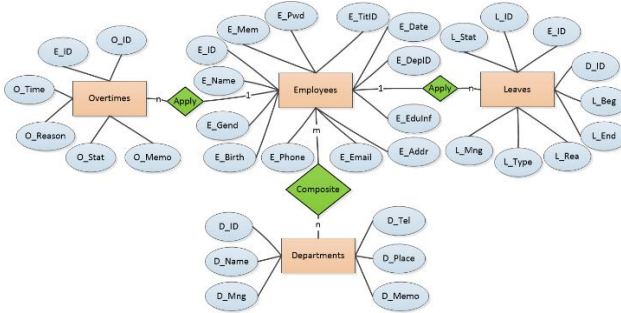

Fig. 4. E-R diagram (partial)

5　　　System UI

We show part of the user interfaces in the human resource management system in this section. Based on different permissions, the Vue framework is used to construct the user interfaces of super administrators, staff of human resource management departments, department managers and ordinary employees. Figure 5-6 show the UI of administrators and ordinary employees after logging in the system, respectively.
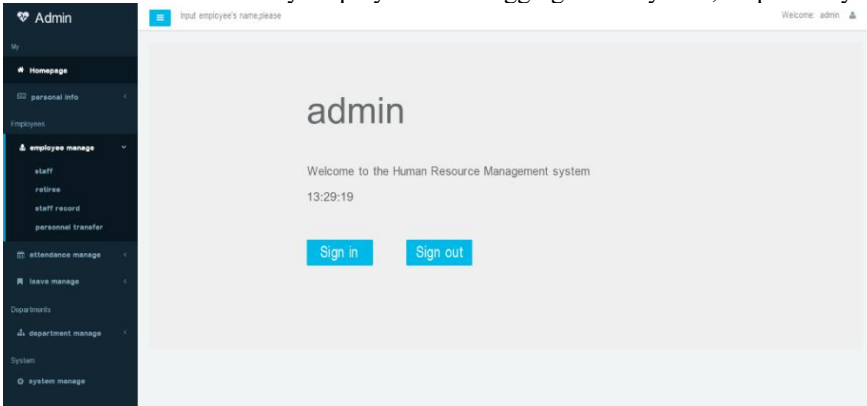
Fig. 5. Administrator UI
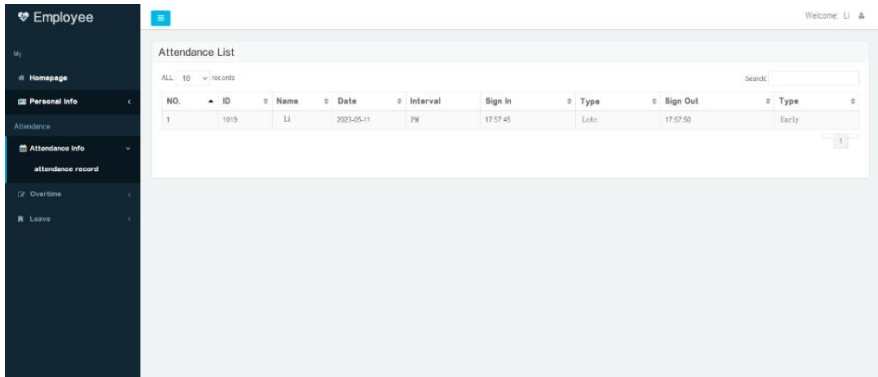
Fig. 6. Employee UI

6   Conclusion

According to the human resource management requirements of small and medium-sized enterprises, we designed and developed a human resource management system based on SSM framework. After functional testing, the system can meet the basic needs of SMEs, improve the efficiency of personnel management and the competitiveness of SMEs to a certain extent which can increase enterprise benefits, and has a good user experience. In addition, the development of this system has positive research and guiding significance for enterprise informatization and management practice.

Acknowledgement

References

1. Zhou Danqian. Enterprise human resources management informatization strategy [J]. Market modernization, 2023(22):75-77.DOI:10.14013/j.cnki.SCXDH.2023.22.058.
2. Pan Weixue. Under the perspective of informatization of hospital human resource management mode analysis [J]. Journal of human resource development, 2023(22):52-54, DOI: 10.19424/j.cnki.41-1372/d.2023.22.020.
3. Yang Jingchao. Problems and approaches of Human resource management Informatization Construction in State-owned Enterprises[J].Market modernization,2023(21):67-69.DOI:10.14013/j.cnki.SCXDH.2023.21.048.
4. Nupap S , Chakpitak N , Neubert G ,et al. Knowledge management system for Thai small and medium-sized enterprises[J].International Journal of Innovation and Learning, 2016, 19(2):150-168. DOI:10.1504/IJIL.2016. 074467.

5. Wibawa J C , Izza M , Sulaeman A .HRIS (Human Resources Information System) Design for Small for Micro, Small and Medium Enterprises[C]//2018.DOI:10.1088/1757-899X/407/1/012134.
6. Cao Jingwen. Process Improvement design of L Company's human resource Information management [D]. Xi'an University of Electronic Science and Technology, 2022. DOI: 10.27389 /d.cnki.gxadu.2022.003336.
7. Liu Ming. Research on Evaluation and Optimization of human resource Management informatization in Z Company [D].Zhongnan University of Economics and Law, 2023. DOI:10.27660/d.cnki.gzczu.2021.001632.
8. Zhang Hao. Research on Design and implementation of SSM framework in Web Application development [J]. Computer knowledge and technology, 2023, 12(08):52-54. DOI: 10.14004/j.cnki.CKT.2023.0353.
9. Li Yajun. Design and implementation of B2C electronic mall system based on SSM framework [D]. Hefei University of Technology, 2023. DOI: 10.27101/d.cnki.ghfgu.2022.000313.
10. Liu Quan. Design and implementation of Enterprise Human resource management system based on Django framework [D]. Xi'an University of Electronic Science and Technology,2021.DOI:10.27389/d.cnki.gxadu. 2020.002045.
11. Zhou Xuanyu. Design and Implementation of University Teaching Management System based on SSM framework [D]. Capital University of Economics and Business, 2022. DOI:10.27338/d.cnki.gsjmu.2020. 000124.
12. Zhang Chi, Shen Yijun, Zhang Chen et al. Design and Implementation of University Intelligent Experiment Report Management System Based on SSM Framework [J]. Journal of Chifeng Institute (natural science edition),2021(01):107-110.DOI: 10.13398 /j.cnki.issn1673-260x. 2021.01.025.
13. Peng Z, Liu T, Mai L. Design and Implementation of Dormitory Management System based on SSM framework [J]. 2020. DOI:10.1109/ISPDS51347.2020.00074.