Research Article

Construction of Human Resource Management System Based on Enterprise Data Analysis Model

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With the development of social economy and the increasing maturity of information technology, we should actively explore and carry out digital transformation practice in the field of human resources to achieve accurate, scientific, and standardized management of the core management affairs of enterprises, in order to meet the needs of enterprises for human resource management and help enterprises to bring human resource management into the development channel of data. This design uses the human resource data analysis method and designs the human resource data analysis model that meets the actual demand. Based on this model, a data statistical analysis subsystem is designed to construct the human resource management system architecture, and the overall structure of human resources and the division of functional modules are described in detail. Through data analysis model to analyze employee salary, the results show that basic salary accounts for 58% of the salary structure, and the amount of performance salary accounts for 38% of the total amount of salary. Compensation and welfare are closely related to labour cost, and the colour of labour cost proportion represents the quadrant position, which can effectively inform and warn information. The data analysis model provides the basis for human resource management and lays the data foundation for enterprises to formulate human resource management policies.

1. Introduction

Today's world is a digital information age with both competition and opportunities. Subtle changes have taken place in the traditional means of management analysis and decision-making, and it is no longer possible to make decisions based on the old thinking mode. Data analysis reports generated by deep data mining play a crucial role in the operation and strategy adjustment of enterprises [1]. The informatization of human resource management is the inevitable result of the development of human resources to a certain stage, and it is an important weapon for the future development and competition of enterprises. Information management can gain advantages from the fierce competition. With the leapfrog development of enterprises, the scale and business scope of enterprises continue to expand, enterprise management is becoming increasingly complex, the control system needs to be continuously enriched and

improved, and human resource management also needs new ideas, new breakthroughs, and new development. To do a good job in enterprise human resources management, without an efficient information, management system is impossible to achieve. Whether the management system has the characteristics of fast and efficient, standard process, convenient operation, etc. has become the concern of managers. Keeping up with the development of The Times, promoting the optimization of the human resource management system plays an extremely important supporting role in the operation of the efficient development of human resources and the reform and development of the company. Human resource management will push informatization to a new level and meet the needs of the company to build an internationally competitive group [2]. A large number of data analysis requirements are application specific and require domain knowledge. Therefore, the design of the statistical analysis module of human resource data is to conduct

in-depth analysis and research on specific application business, namely, human resource management.

With the development of information system and database technology, the emergence of various data analysis technologies has put forward a new and effective analysis method for data analysis. The emergence of data warehouse provides conditions for more in-depth analysis of data. However, it is not enough to have a data warehouse. Only by applying various tools for analysis on it can a data warehouse really play a role. For problem-specific data access and analysis, decision analysts can gain insight through fast, consistent, and stable interactive access to information from multiple perspectives [3]. At present, information system has been widely used in enterprises, and a large amount of business data have been accumulated in the system. But most users lack support for statistical analysis of data. The system has accumulated a large number of complete data, but the system mainly carries on various kinds of queries to these data and commonly used forms for data viewing and display. The data provided by the system are too detailed and lack comparison between data, which is difficult to help enterprises make macro decisions. Although the integration of report tools with the system can provide various statistical reports and information query, without the help of programmers, users cannot produce customized reports or queries. The system performance deteriorates when a large amount of data are queried, which affects daily services. The existence of these problems makes the current information system still stay in the stage of the transaction processing system and cannot meet the needs of strategic and tactical decision-making management. The system has produced a large number of valuable business data, but the comprehensive statistical analysis of historical data is far from meeting the needs of auxiliary management decisions. In this paper, the human resource management system of a group is taken as the project background to verify the significance of data statistical analysis in human resource management.

2. Related Work

With the arrival of knowledge economy and people as the carrier of knowledge, the view of human capital has formed. In order to make more efficient use of knowledge, the utility of knowledge can be maximized. In order to manage human resources more properly, enterprises begin to choose the human resource management system to make it play the most effective. Because manpower system has the characteristics of clear module division and standard data processing, it has natural advantages in information application construction. In view of the fact that the personnel management business of domestic enterprises is more diversified, in order to realize the system function suitable for the company's own business situation, many domestic enterprises tend to choose customized development in the construction of human resource management system, which also makes the human resource management system in the domestic market complex and diverse. With the different business processes and management modes between different enterprises, human resource management systems also appear to be in the diversified stage, and enterprises have been unable to meet the traditional universal function of the management system and gradually to the direction of customization and specialization development. Many highly customized human resource management systems have appeared in the market, and the operating efficiency of enterprises has been significantly improved. In terms of applied research of human resource management, Rehman et al. designed and implemented the human resource management system. In this paper, the author analyzes C/S and B/S software architectures. After analysis, B/S structure is selected to complete the development of the human resource management system, and the process of system implementation is discussed in terms of login module, public class implementation, database connection, etc. [4]. Ogunyomi et al. analyzed the HUMAN resource management system of small and medium-sized enterprises from the perspective of software engineering in terms of system demand analysis, system design, and system implementation and testing and finally established a human resource management system suitable for small and medium-sized enterprises [5]. Marler et al. analyzed the functions of the human resource management system and divided its functional modules into human resource management module, knowledge management module, and system management module [6]. Yong et al. analyzed the functions of human resource management and determined the functions of the human resource management system, whose functional modules include basic personnel information management module, recruitment information management module, attendance management module, and other functional modules [7]. Munoz-Pascual et al. believe that the development trend of human resources mainly includes the following four aspects: people-oriented, learning organization, cross-cultural management, and strategic human resource management [8]. People-oriented means that managers should communicate and authorize with employees instead of command and control so as to achieve management goals and promote employee development. Learning organization refers to the coming era of knowledge economy, and every employee needs to actively learn and constantly innovate and transform knowledge into real productivity, which not only improves the competitiveness of enterprises but also realizes the real integration of individuals and work and interprets the meaning of individual life. Under the background of economic globalization, management concepts are integrated with each other, and the management of human resource management in dealing with different cultures has become a problem faced by enterprise data analysis.

3. Construct the Human Resource Management System of Enterprise Data Analysis Model

3.1. Human Resource Data Analysis Methods. The human resource management system applies front-end tools, which carry out multiangle and multilevel analysis, and query and report processing on the data in a multi-dimensional way.

Multidimensional structure is the core of decision support. The user is presented with a multidimensional view [9]. The difference is that the dimensions of the data warehouse are in storage, while the dimensions are more in user view. Most strategies involve multidimensional data storage of relational data for easy analysis so as to achieve the purpose of data analysis. This multidimensional database is regarded as a hypercube, storing data along various dimensional directions. It allows users to easily analyze data along the axis of things. The main operations supported by the data analysis model are aggregations of measures by multiple dimension values. In general, time is a critical dimension of decision support data warehouses and cubes. Summarize low-level detailed data into high-level summary data in one dimension. Slice and measure the distribution of data in the remaining dimensions after a value is selected in one dimension. If there are only two remaining dimensions, it is sliced, and if there are three, it is sliced. Rotation of data changes the position of dimensions so that the end user can view multidimensional data from another perspective.

3.2. Human Resource Data Analysis Model Design. According to the actual human resource demand, this system adopts the human resource data analysis model. There are certain differences in human resource management in enterprises, with different requirements for data analysis. Even enterprises in the same industry have their own management concerns, and business needs are constantly changing [10]. When analyzing the human resource situation of an enterprise, the leaders of the enterprise want to collect the summary data of various indicators related to personnel in different departments at different time points or periods. Through these data, we can quickly find the changes in human resources and analyze the future trend. The user is concerned about the data of specific significance at a certain point in time or within a certain period of time in the system. The model establishes the analysis model of human resource data to form a three-dimensional space by time, department, and index. The human resource data analysis model is shown in Figure 1. The analysis of human resources is composed of several types of indicators, and each type of indicator database is composed of several statistical indicators.

In multidimensional analysis techniques, analyzing data from various specialized business systems is a way of looking at business metrics from different perspectives. The data model of the human resource management system is organized around the central theme of human resources. Through the data analysis model, a relatively unified analysis dimension is established, including time dimension, division dimension, and index dimension, and the index data are the measurement values. According to the analysis angle selected by the user, the auxiliary structure is multi-dimensionally calculated, and the needs of each layer of each dimension are summarized. When querying, you can quickly see the summary data you want, and a dimension can have multiple description aspects with varying degrees of detail. The time dimension records the time of the operation without in-depth analysis based on time. In data warehouse design, time is generally one of the important dimensions of the fact table. The data collected by the data analysis module are the summary of the historical data of the system. When the data are summarized in different time periods, different granularity statistics are formed [11]. Therefore, time is taken as a dimension in the data analysis subsystem based on relevant analysis topics, which is divided into four levels, with a hierarchical structure of year, half a year, quarter, and month. Taking time as a dimension can provide users with sequential and year-on-year data analysis methods of human resource index data. Time dimension generates annual report, semiannual report, quarterly report, and monthly report to form the hierarchical relationship of this dimension.

Each employee has an attribute which is the unit or department in which he or she works. If the department leader or enterprise leader wants to see the situation of his department or enterprise personnel in a global way, he or she can make statistical analysis on the relevant indicators of employees in this attribute. Take the department dimension as the second common dimension of the data analysis module [12]. Department dimension is about the organization to which an employee belongs, including the head office, subsidiaries, and the departments of each subsidiary. In the analysis process, the company leader checks the human resource status of the group or the company's subsidiaries, and the department leader checks the human resource status of the department. Multidimensional analysis space is projected on different organizational departments to produce different views. Statistical range parameters need to be input when statistical tables generate data, and the organizational unit to which statistical personnel belong forms a division dimension.

Another important dimension of the system is the number of indicators of what kind of human resources enterprises and enterprise managers care about. Their general characteristics are that the amount of data changes over time, and the indicator dimension is the object that decision-makers want to understand and analyze [13]. The index dimension generates set grouping hierarchies by defining concept hierarchies by discretizing or grouping the values of a given attribute. Different educational backgrounds of personnel can be an analysis dimension, so the specific attribute values of personnel are integrated into the analysis model and become an analysis dimension implicitly. The different attributes of personnel can refine the index data concerned by system users and then classify the different indexes to form the conceptual hierarchy of index dimension. Education attributes can be divided into junior college or below, junior college, bachelor's degree, and master's degree or above according to the business needs. System users, experts in the business field, and data analysis engineers can provide suggestions for the refinement and classification of indicators. Looking at the personnel turnover rate indicators from different perspectives, it is subdivided into the admission rate of academic qualifications, the admission rate of age, and the admission rate of personnel. Education background, age, and personnel category
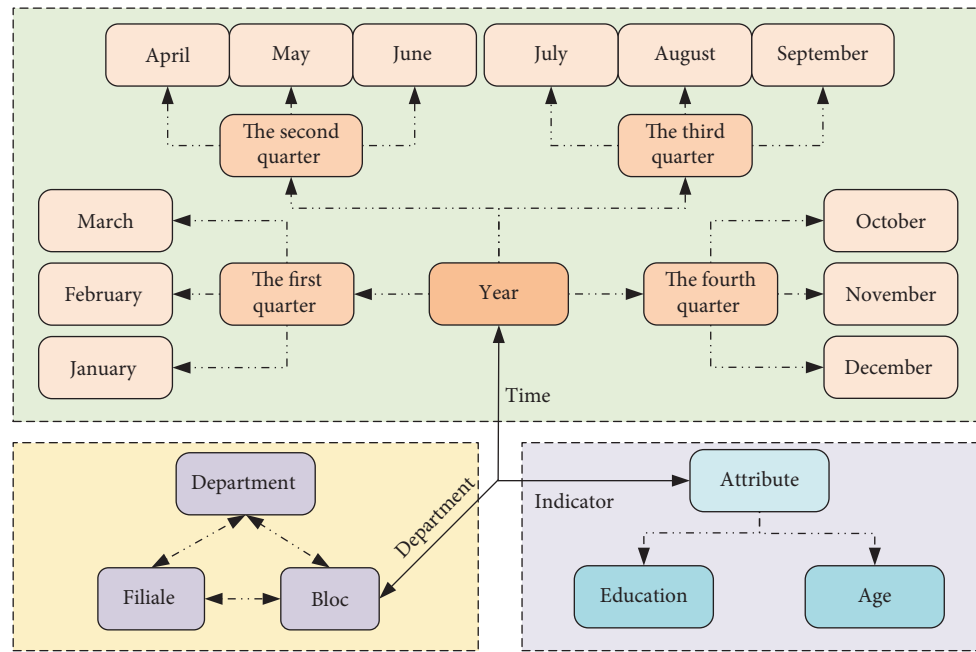
FIGURE 1: Structure diagram of human resource data analysis model.

can all be regarded as a dimension to observe and analyze index data.

3.3. Human Resource Management System Architecture Design.

The design and development of the human resource management system are based on B/S architecture. PyCharm and related components are used as development tools for the function development of the system. MySQL database management system is used for the background data storage of the system, and the system development platform is Mac OS X. The system is architecturally divided into three layers as shown in Figure 2, namely, the presentation layer, the business logic layer, and the data layer.

The main function of the presentation layer is to provide a good user interface, involving user information input, information display, and notification message prompt. This system mainly uses HTML to display the page, using the browser to show the interaction between the client and the server [14]. The business logic layer is the core layer of the system, which processes almost all functions involved in the human resource management system logically, receives the user's request instructions, and processes these requests. The system encapsulates the access to the database according to the specific access content, abstracts the data, and creates corresponding interfaces. According to different requests corresponding to different view methods for logical processing, corresponding interactive interface return results are then generated. The data layer is mainly used to access the database. When the business logic layer needs to access the data table, it will send a query request to the layer. The database access layer will operate the corresponding data table according to this request and send the result back to the business logic layer. In the database, different data table structures are constructed under different service

functions to classify and store data and improve system efficiency.

3.4. Network Topology Design.

The network structure of the system provides the necessary network foundation for the human resource management system based on enterprise data analysis [15]. By designing the network topology, it can meet the different network transmission requirements of the system server and client. The system client user operation terminal includes PC and mobile terminal. The network topology of the system is shown in Figure 3.

The system uses B/S architecture. Users need to connect to the system through the network and maintain the connection through the Internet exchange route. The constraint protocol mainly involves HTTP protocol, and the web server can directly access the database server. The internal nodes include all computers connected to the Intranet. Users can access the system through any of the computers. In some special cases, the system provides access mechanisms for Internet users who are not connected to the Intranet. Users can access the system through VPN communication and through the firewall set by the company to ensure data security.

3.5. Human Resource Management System Functional Structure Design.

This paper designs system functions according to the whole business process of human resource management and divides the system into three functional modules: core personnel management, salary management, and comprehensive query statistics analysis [16, 17]. Firstly, the management of enterprise organizational structure is realized in the core personnel module, including the creation, transfer, cancellation, enabling, and renaming of the organization, and secondly, the management of employees,
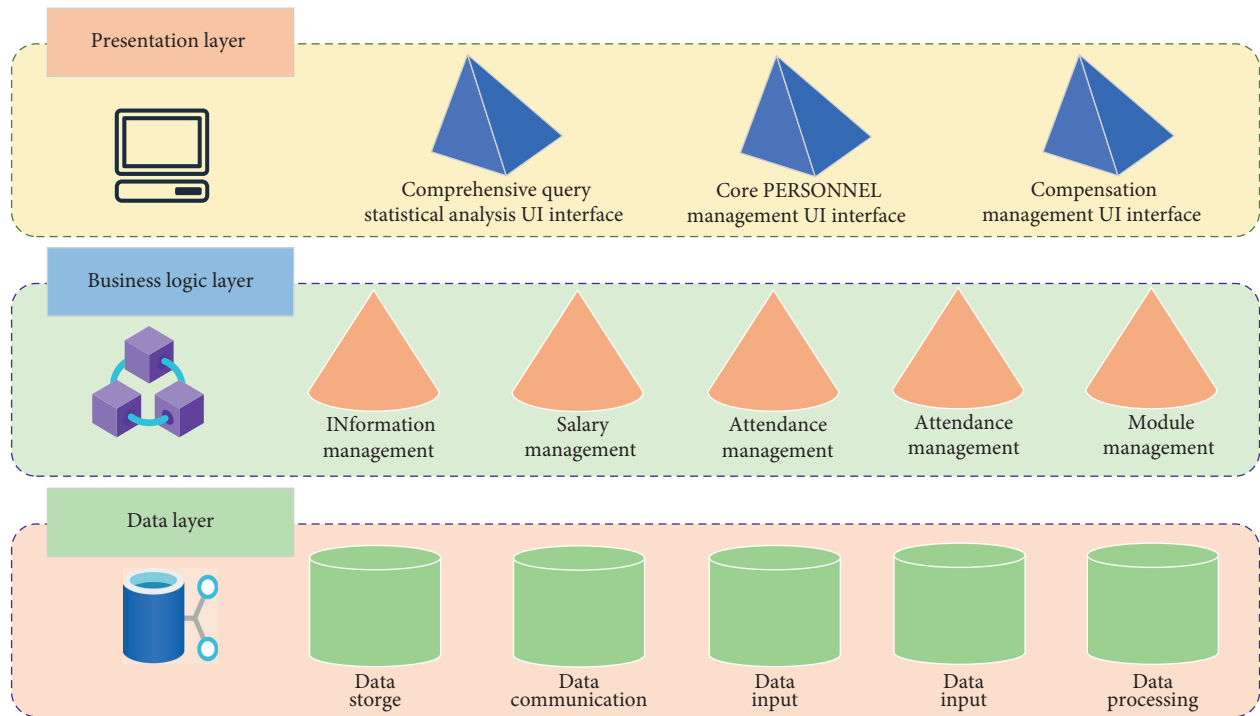
FIGURE 2: Human resource management system architecture diagram.
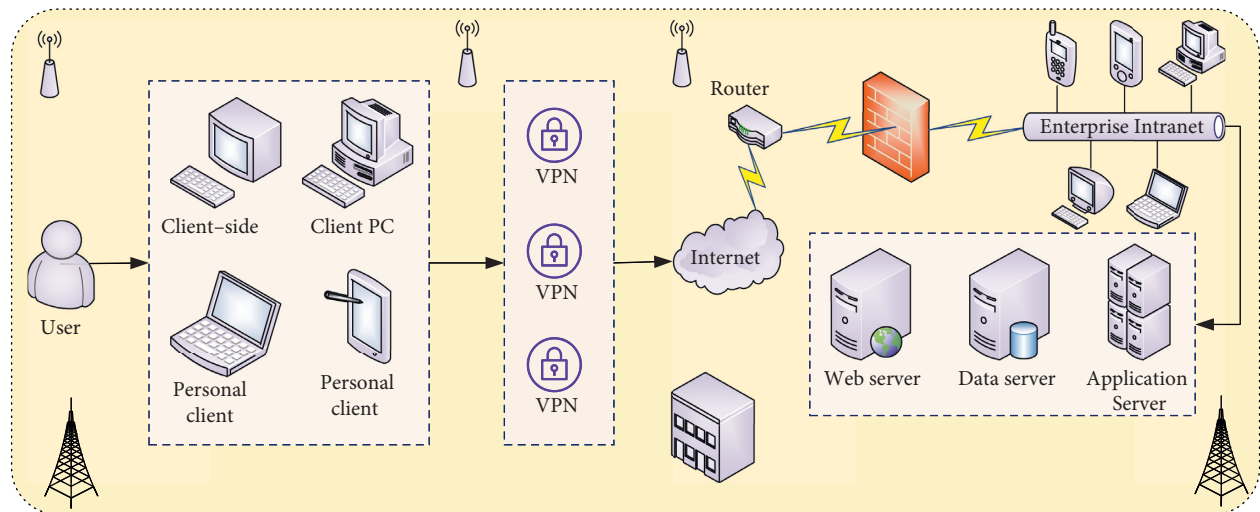

FIGURE 3: Human resources department system network topology structure diagram.

including employee entry, employee demission, employee change, employee reentry, employee information query, and maintenance. The human resource management system increases the labour contract management function and realizes the enterprise employee labour contract signing and termination as well as the labour contract status inquiry and information maintenance function. In addition, the company strictly controls the employees with labour contract system. Through the recruitment index management function, it realizes the monthly management of the recruitment index of units at all levels. At the same time, the core personnel module supports the export of fixed format reports.

Compensation management is an important module in the human resource management system, responsible for compensation and transfer to finance to calculate labour costs. In this module, the division and control of responsibilities of different business personnel are realized, and different business personnel operate different business data in the system. Sort out all salary items in the current personnel system of each unit, merge similar items, and remove useless items [18]. Set calculation logic of salary items according to salary management method and complete automatic salary calculation in the system. The main functions of this part also include the role entry of salary data, statement generation, salary approval, the generation

of bank offers, transmission to the financial department, and other functions. After the employee salary information is transmitted to the financial department, the human salary part of the business will be completed. Compensation management is the core function of the human resource management system but also the key and difficult point of system design and development. The main business scenarios of compensation management are to complete the compensation accounting of all employees, realize the integrated system management of personnel compensation, complete the financial cost accounting of compensation, complete the function of compensation cost accounting, and realize the seamless integration of personnel compensation to financial accounting. At the same time, complete the online approval of salary report. Data standard table user salary calculation automatically corresponds to the relevant standards. The salary responsibilities of users are corresponding to the management of different data standard tables. At the same time, each unit can maintain the table values of the data standard table and send the data standard to lower level enterprises for unified use.

The integrated query module is mainly used for the query and export of data in the human resource management system. This module mainly displays the analysis indicators commonly used in daily business and makes graphs and charts that meet business requirements. This module can realize the system data impromptu query can also query historical data, the historical data according to the time line statistics and analysis. The module has high query speed, high efficiency, and complete index, which can meet the needs of daily statistical analysis of business personnel [19]. The basic setting of salary includes the setting of salary item, the setting of personnel range, the setting of salary details on payroll, and the setting of the report form. The salary module has 8 roles, among which attendance specialist, social security specialist, provident fund specialist, and enterprise annuity specialist operate similarly in the system and can maintain employee information and fill in part of salary items. The salary administrator manually maintains the salary adjustment procedure and periodically maintains the basic salary of employees by importing it in batches. Payroll specialist is responsible for employee information management. The role of social security specialist involves functions such as employee information management and payroll data maintenance [20, 21]. The functions involved in the offer specialist include maintaining employee bank accounts and generating bank offers. The salary examination and approval process are initiated by the salary specialist. The salary examination and approval process can be initiated after the salary calculation is completed, and the statement is generated.

3.6. Human Resource Management System Data Statistics and Analysis. The human resource management system based on enterprise data analysis model makes use of multidimensional analysis report tools to make straight, fast, and flexible analysis for enterprise management and decision-making layer and uses these analyses to get accurate results.

Human resource management technology is through multidimensional modelling, combined with scientific analysis theory and vivid display. The data analysis model provides effective data support for dynamic analysis of human resources, abnormal situation warning, and future situation prediction. Human resource management system uses each module function, detailed analysis of the employee status, with the help of powerful analysis ability and graphical display function to assist enterprise decision-makers to make decisions.

4. Analysis of Performance Appraisal Results

The analysis of compensation and welfare indicators mainly includes the early warning panel of all indicators of human resource management and the analysis of the achievement of performance indicators that affect the quantitative performance [22]. Senior personnel to enter the system first of all need a clear and intuitive overview of human resource management. HR overview's dashboard overview of a company's labour costs enables a company to make more informed decisions on its strategic direction on a monthly basis. Managers focus on employee per capita income and its correlation with the industry average through average full-time employee earnings. Compensation and benefits are closely related to performance appraisal results, and the management needs to observe whether the performance of each department or individual is normal at any time. If something goes wrong, you need to raise the alarm, and if it is healthy, then personnel management needs a new forecast of total compensation. The analysis of performance appraisal results is shown in Figure 4.

It can be seen from the figure that the results obtained by comparison in the time dimension more intuitively show the data to the maximum. The compensation and benefits analysis of human resource management includes the comparative analysis of the payment amount and total compensation amount in the time dimension, the proportion analysis of the composition of compensation, and the effectiveness analysis of compensation. Compensation structure analysis using a compensation distribution can intuitively reflect the proportion of each component, the effectiveness of the compensation and changes can take advantage of the compensation system analysis model, and the internal compensation satisfaction model to reflect the human cost analysis can be used to analyze ratio index judging the results with the type of deviation degree; the influence of performance appraisal for compensation can use double-factor analysis of duality.

5. Total Compensation Analysis

The analysis of total salary has a year-on-year increase. The analysis of total salary of human resource management is shown in Figure 5. By extracting the company dimension, you can see the distribution of and across the country and click on individual provincial regions. When it is found that the salary of a company is much higher than that of other branches, it can be operated to obtain the composition of the
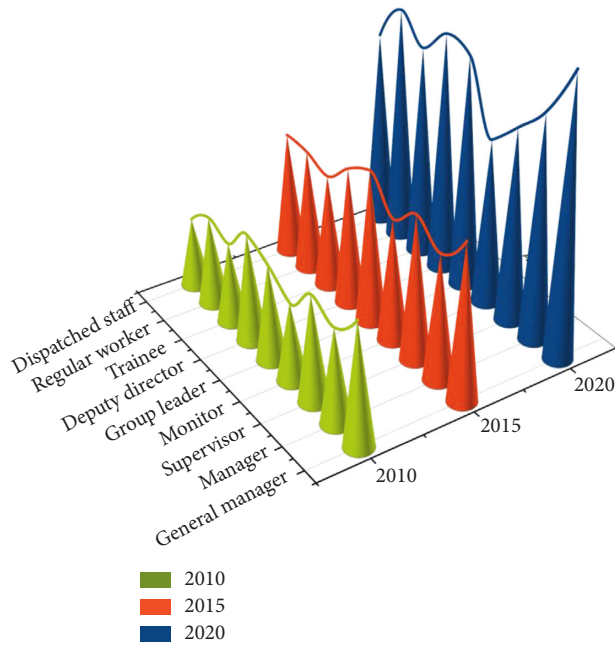
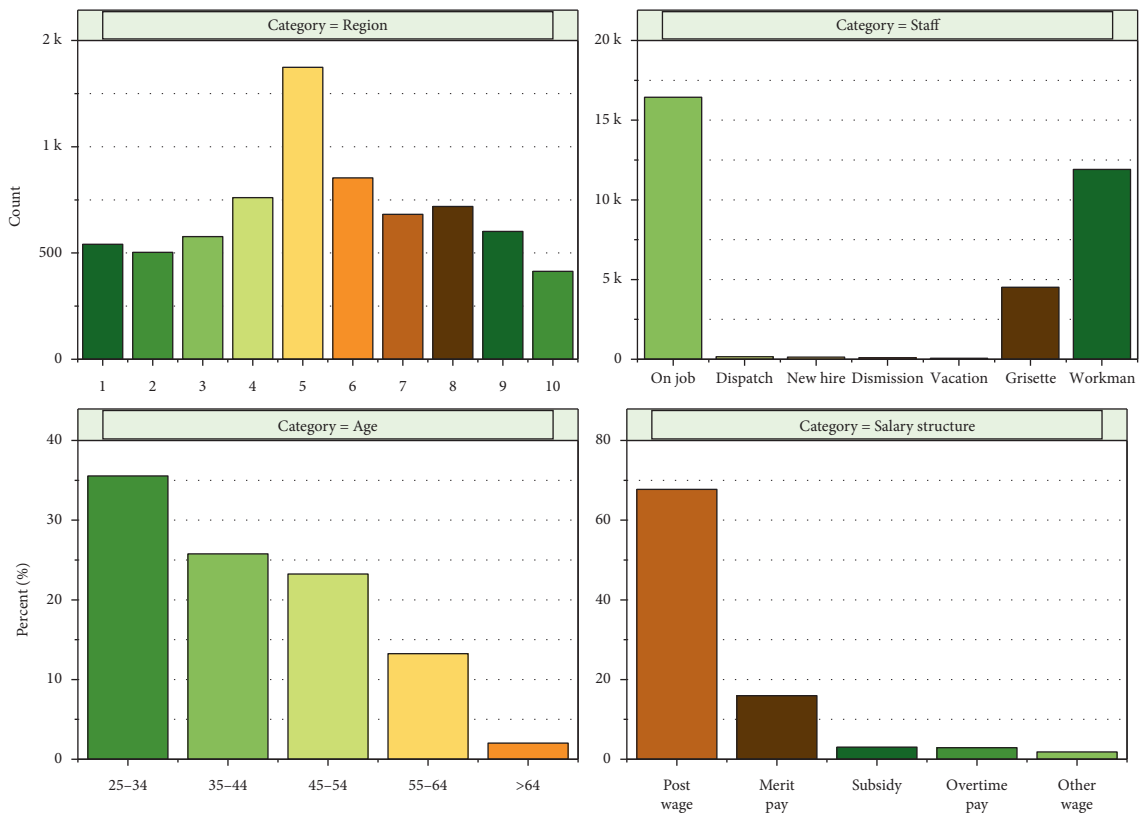FIGURE 4: Analysis chart of performance appraisal results.

FIGURE 5: Total compensation analysis chart for human resource management.

staff of each branch and then judge whether the total salary and welfare level of each company are normal.

As can be seen from the figure, after the analysis method is applied to the total salary, the largest components of the paid salary are performance salary, post salary, allowance, and overtime salary, and the rest are all summed up in other wages. As the focus of work is mainly on sales and investment, the amount of performance salary accounts for 38% of the total amount of salary. It can be predicted that the sales momentum may be quite good. The colour area of the

position where the indicator of annual wage payment progress is located can clearly know the progress of salary payment. Where the red area is not marked, it indicates the reference salary paid for the whole year. The number under the dashboard can more accurately know the annual index and the current value. After knowing the overall total amount of compensation, if you want to analyze the detailed distribution of wages at each post level, you can use the analysis model to obtain the wage measure on the post level dimension as shown in Figure 6.

As can be seen from the figure, positions in the company are classified from 1 to 15 into trainee, regular worker, group leader, monitor, supervisor, manager, general manager, chairman of the board, and dispatched staff. It is normal for employees in different departments to be on the same job level. Check the total salary of the post level to get the distribution of the total salary of different departments in a certain post level. Further analysis of the salary of a certain post level in a certain department shows the proportion of salary earned by employees of different age groups. If the rotation operation is carried out, the salary change curves of different post levels can be observed when defining the post level dimension or the department dimension, then the salary change curves of different post levels in a department can be seen. So as to monitor the index of the change rate of compensation, it can flexibly analyze each index of total compensation in the basic operation of analysis.

5.1. Analysis of Compensation Composition.

When a company's business is doing well, employees may be encouraged to earn more wages. Conversely, if the company's business is weak, the company can quickly cut costs to reduce expenses. To further quantify the impact of variable compensation on the company, the correlation between variable compensation and the company's turnover can be quantitatively analyzed. According to the job category, the salary of employees is the multiple relationships between average salary and performance, while the salary of the sales department is determined by performance. This multiple relationships can reflect the strength of salary incentive. The composition of compensation is shown in Figure 7.

It can be seen from the figure that the proportion of the amount of compensation paid to the total amount of compensation of each post level is accounted for. Data analysis is carried out by selecting a department for a certain post level, and the proportion weight chart of each component of compensation is obtained on the topic of compensation composition. The variable compensation components are combined with different departments, and the analysis model is used to analyze the compensation structure of three kinds of different objectives and help enterprises to adjust the analysis system of salary structure so that employees' income is lower than the performance level, which leads to the decrease of enthusiasm and the increase of demission rate and prevents the occurrence of too high salary cost and profit erosion caused by too high income or salary increase. The profit-sharing model based on company profits to determine wage plans should be applied to profit

centres where performance directly affects profits. The systematic way of presentation is the comparison and analysis of the enterprise profit growth rate curve and employee income growth rate curve. The revenue-sharing mode implemented by the manufacturing department of the factory is aimed at reducing costs; improving labour production efficiency; ensuring quality and safe production; improving customer satisfaction; and obtaining performance compensation for manufacturing employees.

5.2. Salary Effectiveness and Change Analysis.

Remuneration is closely linked with the staff turnover rate, and compensation is closely related to employee turnover. Analysis of the employee turnover rate shows that, at present, the company attracts candidates with the salary system, and the changes in salary satisfaction when recruiting employees are in line with the company's development strategy. The payroll management effectiveness and change analysis are shown in Figure 8. Use an overview of people entering and leaving the company to understand turnover throughout the company. The increase and decrease of personnel can be seen whether the monthly personnel changes are balanced. The cumulative difference line has positive and negative points, indicating whether the company personnel are increasing or decreasing from a certain point in time. If the number of personnel continues to increase, the management should pay attention to whether it meets the current strategic goals of the enterprise and whether such a large number of personnel are needed. At the same time, it should also pay attention to the risk of excessive growth of personnel costs eroding corporate profits and make a comparative analysis with the financial return rate. Core employees play an important role in their respective positions, and personnel change has a direct impact on the enterprise, so it is extremely important to analyze the salary efficiency and change rate of this group. Through analysis, it is necessary to control their salary and welfare within a certain range, that is, to affirm their work value with the salary and welfare higher than the per capita income and motivate the enthusiasm of other employees, but it will not affect the balance of the company and aggravate the class conflict.

The analysis chart is a holistic analysis of the core personnel, excluding the employees whose average reweighting of the annual performance appraisal is 30% for analysis. Graphical display of analysis function reports and query results makes it easy to visualize the changes in labor costs, compensation and benefit ratios, and total compensation and benefits. Graphic display can also quickly carry out a variety of analysis operations and draw a variety of graphics such as radar map. The efficiency of the analysis function provides fast management analysis. Enterprise decision-makers and business personnel complete reports and analysis reports and customize their own work. At the same time, the system provides the function of information release report template suitable for sharing by multiple institutions and different business departments, which greatly reduces the workload of custom analysis reports.
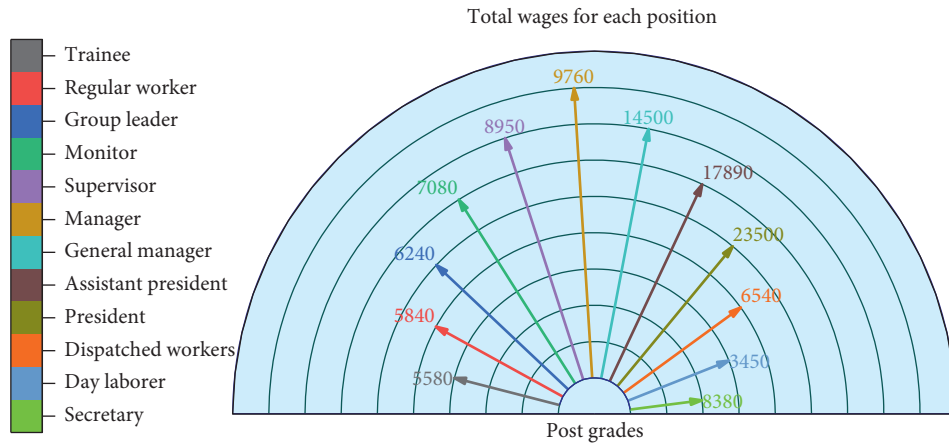
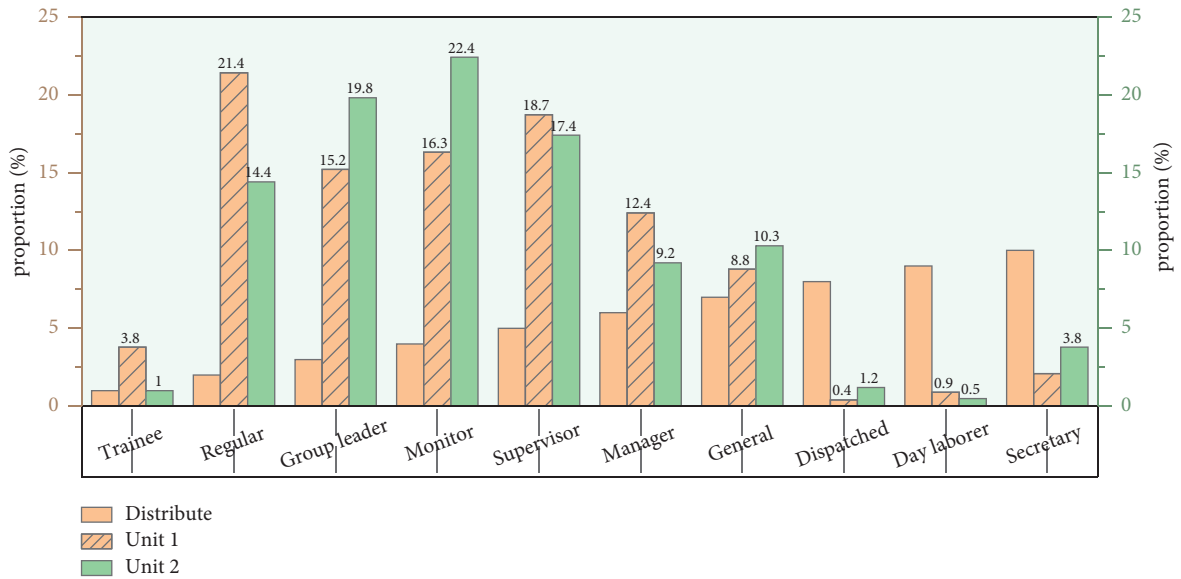Figure 6: The wage measure on the job level dimension.

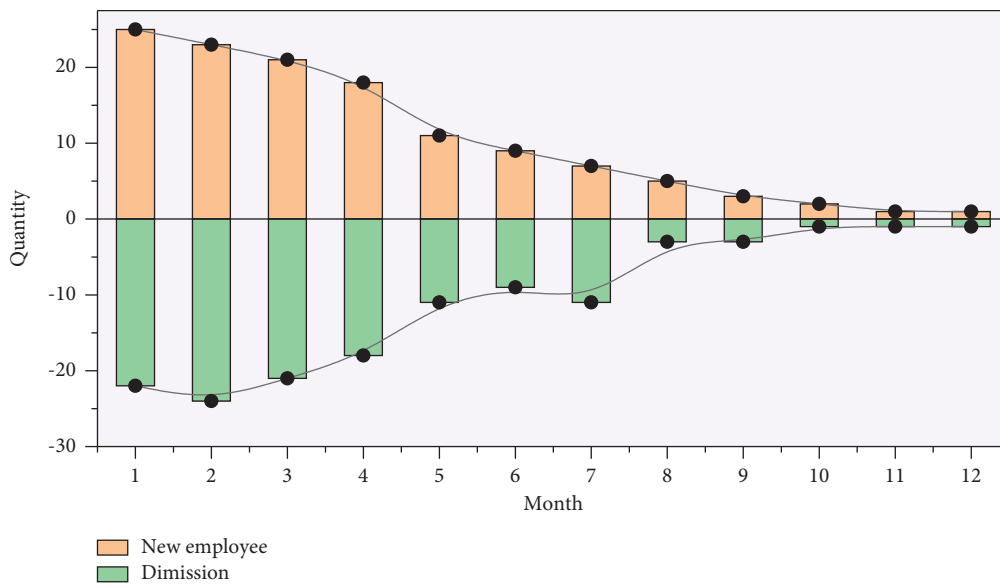Figure 7: Statistical chart of salary structure.

Figure 8: Salary effectiveness and change analysis chart.

6. Conclusion

As an emerging technology, data analysis and processing technology is sought after by major enterprises in the market and is developing with each passing day. Advanced mass data analysis technology in the field of business intelligence will be further applied to human resource management and provide users with efficient, real-time, and multiangle data presentation based on patterns in personnel management data centre, data warehouse, and other projects. In this paper, human resource data analysis method is used to design a human resource data analysis model in line with the actual demand. Based on this model, the subsystem of data statistical analysis is designed, and the architecture of human resource management system is constructed. The functional modules provide intelligent analysis methods for the decision-makers of the company. Based on the data analysis module, the system provides information publishing functions suitable for multilevel organizations and different business departments to share report templates, thus greatly reducing the workload of customized analysis reports and providing users with efficient, real-time, and multiangle data; analyze the practical application effect of the system; monitor the system function index and system performance index; and prove that the system function and performance have reached the expected goal. At present, although the system has realized the functional modules such as salary management, there are still some problems, mainly that the function of the system is not perfect, the advantages of the system are not fully played, and the intelligent level of the system needs to be further improved. The next step is to study intelligent data processing algorithms, including data mining, to make use of the large amount of data generated in the process of human resource management to provide support for the management of enterprises.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

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