Design and Implementation of Management System of Performance Related Pay Based on Cross-Efficiency Evaluation

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Abstract: Modern enterprises lack a reasonable and effective compensation management, the traditional manual management model has been difficult to meet the modern enterprise's gradually increasing large salary management system. In order to achieve the rationalization of enterprise resource configuration, this paper adopts top-down approach to system design by optimizing business processes. Moreover, the system does a reasonable division for the modules of user management, personnel management, training management, payroll management, and comprehensive evaluation, where the comprehensive evaluation module can do a composite evaluation of employee performance level by employing the DEA cross-efficiency evaluation method; at the same time each module also provides a wealth function of report printing, facilitating the user's daily office use. Conceptual design from the design database finally provides specific database tables through E-R diagram indicates. System optimizes the related pay, promotes communication on the lower level, links the organizational goals, individual goals, and optimizes performance management.

Keywords: Personnel Pay Management, Management Information System, DEA Cross-Efficiency Evaluation

1. Introduction

With the rapid development of social economy, the scale of modern enterprises increases largely. The tasks of personnel pay management become more difficult, making it gradually increasingly difficult for traditional manual management model to meet the needs of enterprises, and there are many problems. However, human resources management in the modern enterprise management occupies a very important position, the quality of human resources management information system is also directly related to the degree of development of the enterprise, affect a reasonable full use of human resources management, the development of enterprises has its important significance and far-reaching impact [1]. Therefore, how to make all kinds of enterprises grasp the information in this enterprise talent, the first time to deal with time-varying personnel management and payroll issues, so establish a realistic personnel pay management

system is particularly important [2].

Although human resources management software has been developed for more than a decade in China, since most of our human resources management concepts and the management mechanisms are relatively backward to foreign countries, the result of the existence of human resources management software, such as the products are not standardized, manufacturers are disordered, and companies cannot grasp the true value of human resources management software "primary embryonic state." Nowadays, for many human resources management software, the idea and method of them are backward, management models of them are single, management functions of them are monotonous, and most of them only adopt a simple mechanism archives and personnel files of information is increased and maintenance, wages calculations and employee attendance statistics, the lack of recruitment, screening and training, career planning, employee performance evaluation and incentive, data

analysis and decision support software as a human resource management functions necessary. In China's current human resources management software market, the current competition cannot be considered very intense. Our products in the market are mostly developed from the personnel management system, which does not pay attention to employee motivation and management of employee performance pay. Their uses as human resource management systems were mostly in the 20th century, and were launched in the early 21st century, having been developed for ten years and is still not very mature now. And domestic products compared with foreign products with simple, user-friendly, clear process flow, advanced management concepts, technologies mature and so on. But foreign systems are often designed rigid, inflexible functional design, system suitability weak, especially after the introduction of domestic and not be able to China's actual situation integration difficult to meet the needs of local enterprises. In addition, these software division designed too small, not smooth with modules, each module is often fragmented, data processing repeats in a high rate, resulting in a lot of waste of resources [3]. In the study of designing personnel and payroll management systems, Leng and Liu [4] designed a college teachers performance salary management system, and completed it by implementing a system of management automation, information transparency, fairness efficiency and other targets. By analyzing the existing problems of the private hotel compensation management [5], they discussed the close link between pay and performance. In addition, human resource management system is designed to achieve a systematic and standardized personnel management [6, 7]. Bellé [8] advanced our understanding of the effects of monetary rewards on public employee performance and of the contingencies that may moderate these effects. In a randomized control-group experiment with nurses working at a local health authority in Italy, performance-related pay (PRP) had a larger effect on task performance when the rewards were kept secret than when they were disclosed. In addition, Sandberg [9] analysed the intertwining inequalities in wage determination and the gender-neutral legitimacy that pay systems provide by masking these inequalities.

Since the traditional system has been unable to adapt to the rapid development of computer science and technology, but also can not meet the requirements of job performance wage system [10]. Therefore, this paper needs analysis, through the use of DEA cross-efficiency evaluation method used to SQL2014 as background database, using the DEA cross-efficiency evaluation method [11] and other property assessment method for employee performance level comprehensive evaluation, optimization of pay for performance management, promoting lower levels of communication, the organizational goals and individual goals linked to improved performance management, enabling enterprises to more fully take advantage of corporate human resources [12], to achieve the optimal performance pay, promoting lower levels of communication, the organizational goals and individual goals linked to optimize performance management, reduce legal disputes in order to enhance the

efficiency of human resource management, business professionals comprehensive utilization of resources [13]. The aim of this paper is to design a system by optimizing business processes, and design the modules of user management, personnel management, training management, payroll management, and comprehensive evaluation. The comprehensive evaluation module can obtain a composite evaluation of employee performance level by employing the DEA cross-efficiency evaluation method. Finally, conceptual design from the design database designs specific database tables.

To demonstrate these points, this article is organized as follows. The DEA cross-efficiency evaluation method is precisely described in Section 2. In Section 3, the systems analysis is provided. In Section 4, we analyze the system main function modules. The database design is provided in Section 5. In Section 6, we provide the data flow analysis. Finally, the conclusions are summarized in Section 7.

2. DEA Cross-Efficiency Evaluation Method

The traditional DEA model can only be distinguished commentary DEA decision unit is valid or non-valid, the evaluation unit is about to be divided into two, does not have effective decision making units complete grading, sorting capability. In addition, an evaluation value used to calculate the efficiency weighting factor values are only in the commentary on the most favorable decision unit (and its efficiency is maximum evaluation value) of the specified range, making it easy to exaggerate the advantages, avoiding disadvantages to self-assessment mainly generated on the surface of DEA effective, but in his evaluation and ordering it in pseudo-effective decision-making unit unfavorable position. In order to solve the above problems of the DEA, Sexton and other scholars proposed cross-efficiency evaluation method in 1986 [14], which mainly introduced the cross-evaluation mechanism, the use of self-evaluation and his evaluation of a combination of views. This method not only made the decision-making unit more fully sorted, but also eliminated the weight of unreasonable or cause extreme assignment unit was rated efficiency values overestimate the problem, but this method also has many limitations. The cross efficiency evaluation improved method to solve the limitations of traditional CCR model.

There are n decision making units, each unit has m output factors and s input factors, $x_p = (x_{1p}, x_{2p}, \cdots, x_{ip})^T$ are reverse factors' values of the pth DMU, $y_p = (y_{1p}, y_{2p}, \cdots, y_{rp})^T$ are positive factors' values of the pth DMU. Define cross efficiency evaluation matrix as

$$h_{kj} = \frac{\sum_{r=1}^{m} z_{rk} y_{rj}}{\sum_{i=1}^{s} \omega_{ik} x_{ij}} , \quad k = 1, \cdots, n; j = 1, \cdots, n \quad (1)$$

where $\omega_{1k}, \omega_{2k}, \cdots, \omega_{sk}$ and $z_{1k}, z_{2k}, \cdots, z_{mk}$ present input index and output index weights by solving the k th DMU of DEA model. Denote h_{kj} as the score of the j th DMU and $0 \le h_{kj} \le 1$.

The efficiency evaluation value is provided as follows.

$$E_j = \frac{\sum_{i=1}^{n} h_{ij}}{n} \qquad (2)$$

3. Systems Analysis

Systems analysis is from the perspective of the system, the project has been determined that the object was a planned, purposeful fieldwork analysis, to determine the purpose of the system design, its importance in the system development process is self-evident [15]. The main method of systems analysis includes life cycle, prototyping, object-oriented methods. At this stage we want to fully understand customer needs, and to use scientific methods to design a new system of logic programs and to establish a new model.

With the rapid development of modern enterprises and information technology, as well as Internet successfully use some of the industry, personnel management system of human resource management has become an integral part, and it to business daily management and decision-making for

all have extraordinary significance. Personnel management system can provide enterprises with clear structured data, convenient operating functions and high security, confidentiality, storage capacity, and low cost. Through understanding business process, the present system includes personnel management, payroll management, training management, user management, comprehensive evaluation, reporting several modules. The system also has a good user interface, and is easily to use, and can provide users with improved query, modify, delete and other maintenance operations. Also, it has enough storage capacity to meet the daily operational needs of enterprises, in addition to the operation of certain user management, and user rights have certain settings.

4. System Main Function Modules

After the basic demand analysis, combined with the development of the human resources management system to draw the main features include the following modules: personnel management, payroll management, user management, comprehensive evaluation, training management, report printing. In accordance with the structured system analysis method, Figure 1 provides the example of partitioning the function modules of the system.
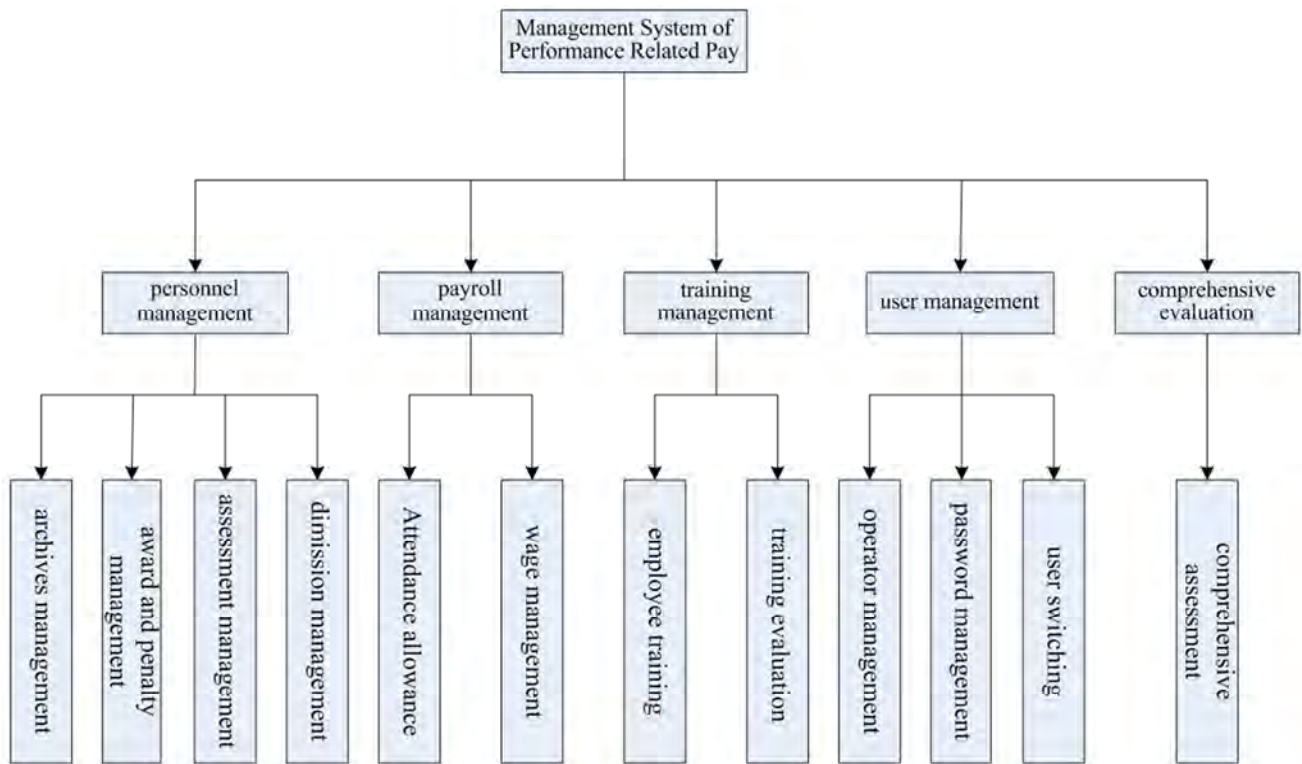

Figure 1. *Function structure salary management information system diagram.*

4.1. Personnel Management Module

Including file management, reward and punishment management, appraisal management, mobility management,

and other functions. The main operations of its archives, reward and punishment, evaluation, mobilization and other information of additions and deletions to change the

investigation. File management records basic personal information when an employee has been employed, including educational experience, work history, as well as entry jobs, etc. when an employee transfers, relevant departments should update the employee information in time.

4.2. Payroll Module

Including benefits administration, payroll summary management. The module automatically calculates employee payroll and personal income tax amount to be paid by the employee position, attendance status, basic wage, reward and punishment conditions, overtime and other information at the end of the month, and related viewing, modification, greatly reducing the tedious and error may appear artificial calculation.

Payroll module integrated employee attendance information, appraisal information, reward and punishment information.

4.3. User Management Module

Including operator management, password management, and other functions replace the operator can easily and efficiently view, modify, add operator information, change the operator password, replace the operator, etc. In addition to the operation of certain user management, and to user there are certain permissions settings.

4.4. Training Management Module

Including employee training records management, through which manager can view the training information, and can also add, modify the training information.

4.5. Comprehensive Evaluation Module

Through referring to relevant data, such as training score, reward and punishment, the manager ratings, ratings and other data, to competent staff's daily performance of a comprehensive evaluation.

Furthermore, each module also provides a wealth of exporting reports, export data can produce the Nissan management to Excel, making it easy for managers to use.

5. Database Design

The user needs to needs analysis obtained by a certain method to abstract information structure, namely the establishment of a conceptual model of the process is the concept of structural design [16]. The establishments of various data models are based on the concept of structure, because the concept of structure compared to machine-independent data model is more and more abstract, more and more stable. In other words, the database structure design concept is modeled on the world's information. Conceptual design commonly uses E-R model, which was first proposed in 1976 by P. S. Chen. Figure 2 illustrates the E-R model of management system of performance related pay.
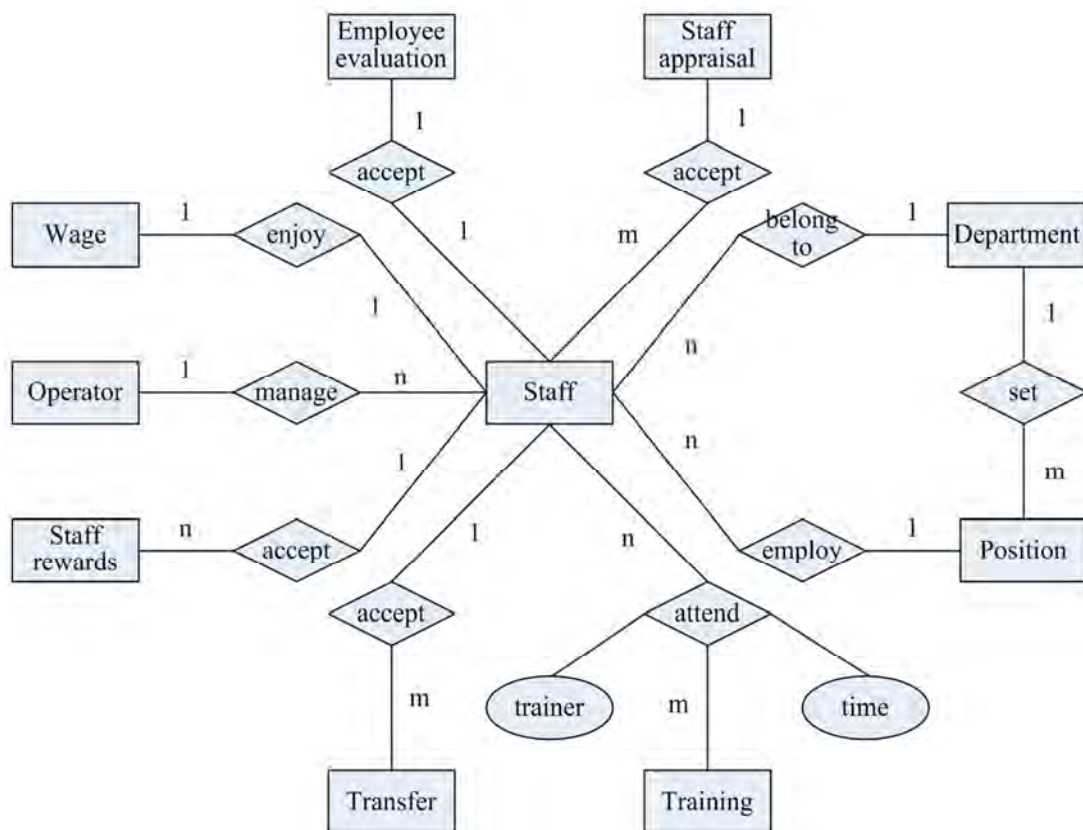

Figure 2. *Overall system E-R diagram.*

6. Data Flow Analysis

Data flow analysis is the flow of data within the current system, which is abstracted without considering the specific organizational structure of the information carrier and handling operations, but only considering the flow of data to analyze the process flow of the system [12]. Data flow analysis includes the calculation of the data, save, or modified further analysis. There may be poor data flow of data flow, data processing unreasonable, data transmission errors and the like. By data flow analysis can effectively detect and resolve these errors. Thus, design a rational and efficient data processing system of the new design by data flow analysis is very important. As shown by Figure 3, the data flow diagram of personnel salary system clearly shows the operation of the system data and data processing flow.
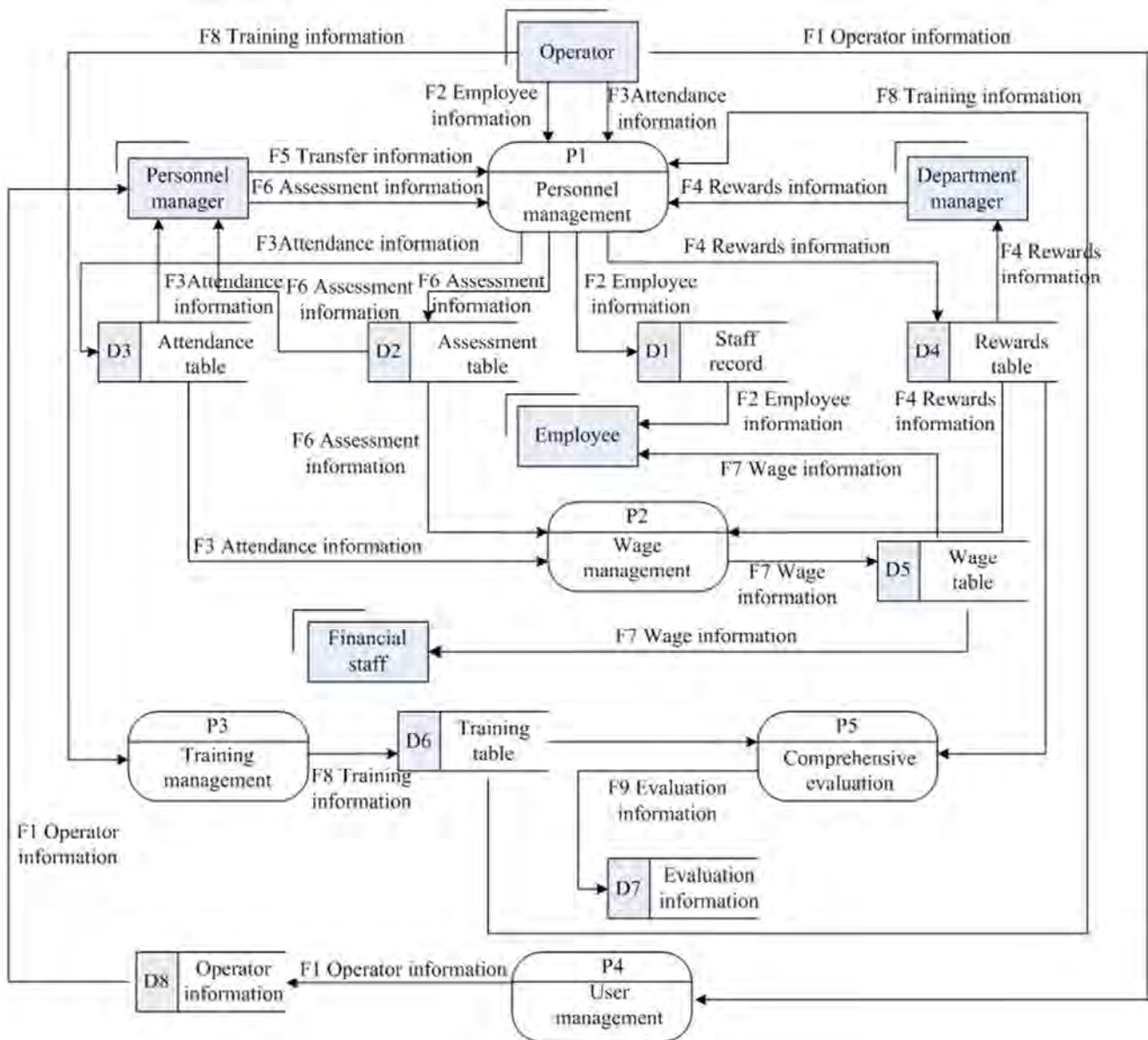

Figure 3. The data flow diagram of performance related pay system.

7. Conclusion

There are personnel management module, payroll management module, user management module, training management module, a comprehensive evaluation module-based design and development DEA cross-efficiency evaluation method of personnel pay management information system. The system is divided into modules and functions realized in which through access to relevant data, such as: training score, reward and punishment, the manager ratings, ratings and other data to competent staff daily performance of a comprehensive evaluation. Also each module provides a wealth of exporting reports, export data can produce the Nissan management to Excel, making it easy for managers to use. And effective use of data and calculation of wages, tax,

etc., to provide decision support for managers to ensure the security of data, timeliness and completeness. In addition, the system uses DEA cross-efficiency evaluation method [6] and other property assessment method for employee performance level comprehensive evaluation, optimization of pay for performance management, promoting lower levels of communication, the organizational goals and individual goals linked to improved performance management, enterprise can more fully utilize human resource.

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