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Evaluation of the Balance of Management Power Distribution in Universities Based on Analytic Hierarchy Process

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ABSTRACT

In order to realize the optimal distribution of university management power under the overall planning and scheduling mode, an evaluation model of university management power distribution balance based on analytic hierarchy process (AHP) is put forward, and a method based on the integration of Internet thinking and technology, a sampling model of characteristic information of university management power distribution balance under the overall planning and scheduling mode, According to the quantitative recursive analysis results of the sample data of university management power distribution balance under the overall planning and scheduling mode, the information fusion of university management power distribution under the overall planning and scheduling mode is carried out, the association rule fusion characteristic distribution parameter set of the panel data of university management power distribution balance under the overall planning and scheduling mode is extracted, and the data fusion of university management power distribution balance under the overall planning and scheduling mode is carried out by combining the joint statistical probability density distribution detection method. Combined with the piecewise linear estimation method, this paper constructs the statistical characteristics of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode, analyzes the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode according to the quantitative recursive analysis results of prior samples, extracts the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode, and clusters the information of the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode by structural characteristics extraction and fusion clustering methods. According to the results of distributed integration of features, it evaluates the balance of management power distribution in colleges and universities under the overall planning and scheduling mode. The simulation results show that this method has high accuracy and good confidence in evaluating the balance of management power distribution in colleges and universities under the overall planning

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and scheduling mode, and improves the ability of managing and controlling the balance of management power distribution in colleges and universities under the overall planning and scheduling mode.

Keywords: overall planning, Scheduling mode, Distribution of management power in colleges and universities, Balanced evaluation, Quantitative recursive analysis

1. Introduction

Based on the analysis of the related literature of university management informatization in China, this paper first affirms the infrastructure construction of university management informatization in China. However, there are still a lot of problems in university management informatization in China due to the backward management concept, imperfect system and mechanism, unspecific strategic planning, difficulties in data integration management. Secondly, the research on the informatization of university management in China is mostly focused on a specific aspect, such as system mechanism, system integration, personnel training and other independent aspects, but it lacks a unified overall management method. Therefore, it is difficult to fundamentally put forward an overall and unified solution. Information management is "three points in technology and seven points in management"[1]. Only by changing ideology can we better guide the development of information management in colleges and universities. It is necessary to build a balanced evaluation and monitoring model of university management power distribution under the overall planning and scheduling mode, adopt the big data information fusion method to evaluate the balanced distribution of university management power under the overall planning and scheduling mode, and improve the ability to evaluate and predict the balanced distribution of university management power under the overall planning and scheduling mode. Through the balanced evaluation results of university management power distribution under the overall planning and dispatching mode, the balanced control of university management power distribution under the overall planning and dispatching mode is carried out, and the balanced characteristics of university management power distribution under the overall planning and dispatching mode are analyzed by combining the statistical analysis results of the balanced characteristics of university management power distribution under the overall planning and dispatching mode. Establishing the balanced evaluation model of university management power distribution under the overall planning and dispatching mode, reducing the balanced distribution of university management power under the overall planning and dispatching mode, and improving the balanced supervision level of university management power distribution under the overall planning and dispatching mode, the research on the related balanced evaluation model of university management power distribution under the overall planning and dispatching mode has attracted great attention[2].

The prediction of university management power distribution equilibrium under the overall planning and scheduling mode is based on the detection and feature extraction of university management power distribution equilibrium big data under the overall planning and scheduling mode, and a discrete big data analysis model of university management power distribution equilibrium feature quantity under the overall planning and scheduling mode is constructed. Using big data mining and statistical analysis method of the equilibrium characteristics of university management power distribution under the overall planning and dispatching mode, the equilibrium evaluation of university management power distribution under the overall planning and dispatching mode is carried out.Literature [3] puts forward an evaluation model based on fuzzy subspace clustering and feature identification, establishes a big data distribution model, and combines feature space reconstruction technology to extract features to improve the ability of distribution balance evaluation, but this method has high computational complexity. Literature [4] puts forward an

evaluation algorithm based on Lyapunov prediction, which extracts Lyapunov features and evaluates according to the clustering results of feature fusion, but the information fusion degree and prediction accuracy of this method are not high. In reference [5], an evaluation model based on matched filter detection is proposed to classify samples and realize balanced evaluation, but the adaptability of this method is not good.

In view of the above problems, this paper puts forward an evaluation method of university management power distribution balance under the overall planning and scheduling mode based on structural characteristics. Firstly, a statistical model of university management power distribution balance information under the overall planning and scheduling mode is established[6], and the evaluation of university management power distribution balance under the overall planning and scheduling mode is realized by combining big data fusion, structural feature extraction and fusion clustering methods. Finally, a simulation test analysis is carried out to obtain a valid conclusion.

2. Information fusion of management power in colleges and universities under the mode of information sampling and overall planning and scheduling of the equilibrium characteristics of management power distribution in colleges and universities

2.1. Sampling the information of equilibrium characteristics of power distribution in colleges and universities

In order to realize the balanced evaluation of university management power distribution under the overall planning and dispatching mode, it is necessary to construct a sampling model of the balanced characteristic information of university management power distribution under the overall planning and dispatching mode, fuse the information of university management power distribution under the overall planning and dispatching mode according to the quantitative recursive analysis results of the balanced sample data of university management power distribution under the overall planning and dispatching mode[7-8], and collect the characteristic quantity of quantitative evaluation of university management power distribution under the overall planning and dispatching mode. The state equation of the balanced characteristic distribution of university management power distribution under the overall planning and dispatching mode is described as:

$$A(x) = AJ(x)a(x) + B(1-b(x)) \tag{1}$$

Let $A = \{a_1, a_2, \ldots, a_n\}$ be the fuzzy sample set of the equilibrium characteristic quantity of university management power distribution under the overall planning and dispatching mode, $B = \{b_1, b_2, \ldots, b_m\}$ be the category set of quantitative recursive analysis of segmented samples, and the attribute value of the equilibrium of university management power distribution under the overall planning and dispatching mode of a_i is $\{c_1, c_2, \ldots, c_k\}$. In the process of evaluating the equilibrium of university management power distribution under the overall planning and dispatching mode, a connected undirected graph $G = (V, E, W)$ is used to represent the distribution structure of university management power distribution under the overall planning and dispatching mode [9-11]. V is the characteristic attribute set of the equilibrium distribution of university management power under the overall planning and dispatching mode, and $V = \{v_1, v_2, \cdots, v_N\}$, based on the system mechanism, system integration and personnel training, establishes the equilibrium characteristics of university management power distribution under the overall planning and dispatching mode. The estimated results are as follows:

$$Y_k = \left[y_{k1}, y_{k2}, \cdots, y_{kj}, \cdots, y_{kJ} \right] (k = 1, 2, \cdots, N) \tag{2}$$

Wherein, y_{kj} represents the steady-state characteristic quantity of university management power distribution under the overall planning and dispatching mode, and N is the length of equilibrium data of university management power distribution under the overall planning and dispatching mode. Based on the correlation between various indicators, the equilibrium characteristics of power distribution in university management under the overall planning and dispatching mode are restructured[12-13]. A discrete dataset for evaluating the equilibrium of university management power distribution in this mode is generated. The equilibrium state of the university management power distribution is then detected using a random probability density model, with the characteristic detection components as follows:

$$z(t) = x(t) + iy(t) = a(t)e^{i\theta(t)} \tag{3}$$

Wherein: $z(t)$ represents IMF component of equilibrium characteristic quantity of university management power distribution under overall planning and scheduling mode, $x(t)$ represents harmonic state set of big data distribution of university management power distribution under overall planning and scheduling mode, and $y(t)$ represents ambiguity factor of evaluation of university management power distribution equilibrium under overall planning and scheduling mode.

The equilibrium characteristic quantity fusion model of university management power distribution under the overall planning and scheduling mode is constructed as follows:

$$\begin{aligned} &\max F(X) = \left(F_1(X), F_2(X), \ldots, F_n(X)\right) \\ &s.t.g_j(X) \le 0\left(j = 1, 2, \ldots, p\right) \\ &h_k(X) = 0\left(k = 1, 2, \ldots, p\right) \end{aligned} \tag{4}$$

Under the overall planning and scheduling mode, the ambiguity function of the characteristic information sampling of the equilibrium distribution of university management power is as follows:

$$\begin{aligned} x_i^{(k+1)} &= (1-\omega)x_i^{(k)} + \frac{\omega}{a_{ni}}\left(b_i - \sum_{j=1}^{i-1} a_{ij}x_j^{(k+1)} - \sum_{j-i+1}^{n} a_{ij}x_j^{(k)}\right) \\ i &= 1, 2, \cdots, n \\ k &= 1, 2, \cdots, n \end{aligned} \tag{5}$$

Therefore, a sampling model of equilibrium characteristic information of university management power distribution under the overall planning and scheduling mode is constructed, and quantitative recursive analysis of panel data is carried out according to the data sampling results[14].

2.2. Information fusion of university management power under the overall planning and scheduling mode

According to the quantitative recursive analysis results of the sample data of the equilibrium distribution of university management power under the overall planning and scheduling mode, the information fusion of university management power under the overall planning and scheduling mode is carried out[15-17], and the association rules of the panel data of the equilibrium distribution of university management power under the overall planning and scheduling mode are extracted to fuse the characteristic distribution parameter set, and the characteristic distribution set of the statistical distribution of the equilibrium distribution of university management power under the overall planning and scheduling mode is as follows:

$$S_b = \sum_{i=1}^{c} p_i\left(\vec{m}_i - \vec{m}\right)\left(\vec{m}_i - \vec{m}\right)^T \tag{6}$$

Wherein, $\vec{m}=\sum_{i=1}^{c} p_i \vec{m}_i$ is a multiple regression component. By using segmented pre-whitening matching method, the equilibrium factor of university management power distribution under overall planning and scheduling mode is evaluated, and the characteristic distribution parameter set of association rules fusion includes variables. The fluctuation of university management power distribution equilibrium under overall planning and scheduling mode can be represented by $\{y_1, y_2, \cdots, y_n\}$. Through big data fusion results, the association rule set of university management power distribution equilibrium under overall planning and scheduling mode is represented by a_j, and the panel data linear programming function of university management power distribution equilibrium evaluation under overall planning and scheduling mode is described as:

$$\begin{cases} G_1 = b_{11}a_1 + b_{12}a_2 + \cdots b_{1n}a_n \\ G_2 = b_{21}a_1 + b_{22}a_2 + \cdots b_{2n}a_n \\ \cdots \quad \cdots \quad \cdots \\ G_n = b_{n1}a_1 + b_{n2}a_2 + \cdots + b_{nn}a_n \end{cases} \tag{7}$$

Wherein, G_j and G_k represent the panel coefficient of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode, G_j represents the correlation dimension of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode, and b_{nn} is the main component of the equilibrium characteristic quantity of university management power distribution under the overall planning and scheduling mode. The equilibrium evaluation of university management power distribution under the overall planning and scheduling mode is carried out according to the linear programming results [18-19].

3. Evaluation and optimization of balance of management power distribution in colleges and universities

3.1. Extraction of equilibrium characteristic quantity of university management power distribution under the overall planning and dispatching mode

In this paper, a fuzzy C-means-based balanced evaluation model of university management power distribution under the overall planning and dispatching mode is proposed, and the data fusion of the balanced distribution of university management power under the overall planning and dispatching mode is carried out by combining the joint statistical probability density distribution detection method[20-22]. Combined with the piecewise linear estimation method, the statistical analysis model of the balanced evaluation of university management power distribution under the overall planning and dispatching mode is obtained as follows:

$$\frac{\partial u_i}{\partial p_i} = \frac{Gh_i}{\sum_{j=i} h_j p_j + \sigma^2}\left(\frac{1}{1+\gamma_i} - \beta_{c_1}\right) \tag{8}$$

According to the environmental factors of power distribution in colleges and universities, the self-adaptive prediction of the balance of power distribution in colleges and universities under the overall planning and scheduling mode is made, and the distribution parameter set of association rules fusion characteristics is obtained as follows:

$$\eta_{comm} = \frac{k_1 \cdot l}{E_{conm}} \cdot \left(1 - p_{arop}\right) \tag{9}$$

Wherein, p_{drop} is the attenuation coefficient of university management power distribution equilibrium under the overall planning and scheduling mode, and the cost of university management power distribution under the overall planning and scheduling mode is $CH_i\left(i \in C_1\right)$.

According to the data mining results of university management power distribution equilibrium under the overall planning and scheduling mode, the characteristics are clustered, and the output is as follows:

$$f(x)=\operatorname{sgn}\left\{\sum_{j=1}^{l} \alpha_j^* y_j K\left(x, x_j\right)+b^*\right\}, x \in R^n \tag{10}$$

Wherein, $b^*=y_i-\sum_{j=1}^{l} y_j \alpha_j K\left(x_j, x_i\right), i \in\left\{i \mid 0<\alpha_i^*<u\left(x_i\right) C\right\}$. According to the above methods, the fuzzy C-means clustering analysis method is adopted to establish an evaluation model of the equilibrium of university management power distribution under the overall planning and scheduling mode [23]. The integrated scheduling set of the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode is as follows:

$$\left.\begin{array}{l} \min \limits_{w, b, \xi} \dfrac{1}{2}\|w\|^2+C \sum\limits_{j=1}^{l} u\left(x_j\right) \xi_j \\ s.t. y_j\left(\left(w \cdot x_j\right)+b\right)+\xi_j \geq 1 \\ \xi_j \geq 0, j=1,2, \ldots, l \end{array}\right\} \tag{11}$$

By using the piecewise quantitative recursive analysis method, the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode are predicted, and the kernel function $k\left(x_i, x_j\right)$ of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode is obtained. The fuzzy C-means clustering function of the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode is as follows [24-25]:

$$\left.\begin{array}{l} \min _{w, b, \xi} \dfrac{1}{2}\|w\|^2+C \sum\limits_{j=1}^{l} u\left(x_j\right) \xi_j \\ s.t. y_j\left(\left(w \cdot x_j\right)+b\right)+\xi_j \geq 1 \\ \xi_j \geq 0, j=1,2, \ldots, l \end{array}\right\} \tag{12}$$

According to the results of fuzzy C-means clustering, this paper extracts and predicts the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode [26].

3.2. University management power distribution balance evaluation output

According to the results of quantitative recursive analysis of prior samples of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode, this paper analyzes the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode, extracts the equilibrium characteristics of university management power distribution under the overall planning and scheduling mode[27], and obtains the principal component model of analysis and prediction of

university management power distribution under the overall planning and scheduling mode as follows:

$$x_{n,G} = x_{n,G} + \Delta x_i \tag{13}$$

According to the results of feature distribution integration, the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode is made, and the statistical average is as follows:

$$\overline{x} = \frac{1}{N}\sum_{i=1}^{N}|x_i| \tag{14}$$

Variance of equilibrium evaluation of management power distribution in colleges and universities under overall planning and dispatching mode;

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}|x_i - \overline{x}|^2 \tag{15}$$

Combining the piecewise linear estimation method, the statistical characteristic quantity of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode is constructed [28], and the characteristic distribution matrix of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode is obtained:

$$R = \begin{bmatrix} r(V_1, V_1) & \cdots & r(V_1, V_{k-1}) \\ \cdots & \cdots & \cdots \\ r(V_{k-1}, V_1) & \cdots & r(V_{k-1}, V_{k-1}) \end{bmatrix} \tag{16}$$

Fuzzy decision-making optimization is adopted to analyze the reliability of the equilibrium evaluation of university management power distribution under the overall planning and scheduling mode, and the confidence function satisfies the normal distribution as follows:

$$p(Q_s) = \frac{1}{\sqrt{2\pi}\sigma_s}\exp\left[-\frac{(Q_s - \langle Q_s \rangle)^2}{2\sigma_s^2}\right] \tag{17}$$

$$\int_{-\infty}^{\infty} p(Q_s)\,dQ_s = 1 \tag{18}$$

If Q_0 and $\langle Q_s \rangle' s$ evaluation threshold Q_c make:

$$p\left(|Q_0 - \langle Q_s \rangle| > Q_c\right) \le 0.05 \tag{19}$$

To sum up, this paper uses structural feature extraction and fusion clustering method to cluster the information of the equilibrium features of university management power distribution under the overall planning and scheduling mode, and evaluates the equilibrium of university management power distribution under the overall planning and scheduling mode according to the distributed fusion results of features[29].

4. Simulation analysis

In order to verify the application performance of this method in the balanced evaluation of management power distribution in colleges and universities under the overall planning and dispatching mode, a simulation experiment is conducted. Taking Q colleges and universities in S province as an example, its information public service platform covers a number of systems with the

highest frequency and the widest range in schools, so that it is convenient for them to find and use their identity corresponding services in the systems. However, while completing these humanized functions, it is not difficult to see from the data that the public service platform of colleges and universities in S province Q has only completed part of the system integration of 83 existing systems, and the integration rate is less than 50%. Moreover, although these systems have achieved unified account management, unified application authentication, secure single sign-on, unified user authorization, centralized access control, and unified log audit through unified user management system, data synchronization and information sharing between systems have not been fully realized, and the scope and depth of system sharing are at a low level. Under the overall planning and scheduling mode, the sample length of the information on the equilibrium of university management power distribution is 2000 , the training feature set of the equilibrium evaluation of university management power distribution is 20 , the number of steps of adaptive iteration is 120 , the minimum prediction window coefficient of the equilibrium evaluation of university management power distribution is $C_{\min}=1.5$, the prediction window coefficient $W_{\min}=0.4$ of the equilibrium evaluation of university management power distribution, the minimum correlation dimension $W_{\max}=0.9$ of the equilibrium evaluation of university management power distribution, The maximum correlation dimension $C_{\max}=2.0$ of university management power distribution balance evaluation is $[0,4.5]$ and $[0.8,60]$. According to the above parameter settings, the university management power distribution balance evaluation under the overall planning and scheduling mode is carried out, and the sampling results of university management power distribution data under the overall planning and scheduling mode are shown in Figure 1.

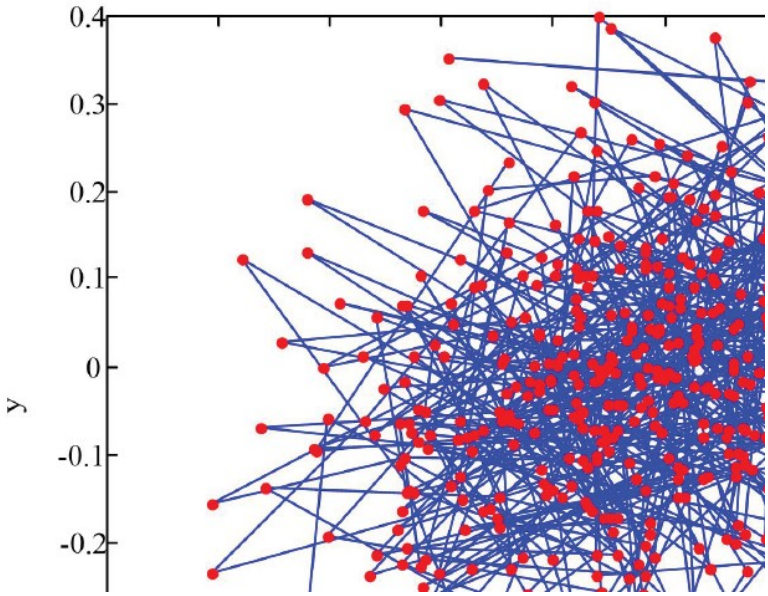

Fig. 1. Sampling results of university management power distribution data under overall planning and scheduling mode

According to the characteristic results, the balance of management power distribution in colleges and universities under the overall planning and dispatching mode is evaluated. Among the respondents, 44.06% are males and 55.94% are females. The proportion of people aged 26-35 is the highest, accounting for 32.18%, and the proportion of people aged 55 and above is the lowest, accounting for 8.91%. The proportion of colleges and universities is the highest, accounting for 55.44%, and the proportion of 985 or 211 colleges and universities is 31.19%. Among them, the proportion of staff members is the highest, accounting for 39.6%, and the proportion of department-level and above is the lowest, accounting for 12.38%. The number of respondents in administrative positions is the highest, accounting for 36.63%, and the number of assistant teaching

is the lowest, accounting for 7.43%. In this paper, the method is used to distribute the management power of colleges and universities under the overall planning and scheduling mode, and the data clustering results of balanced distribution are shown in Figure 2.

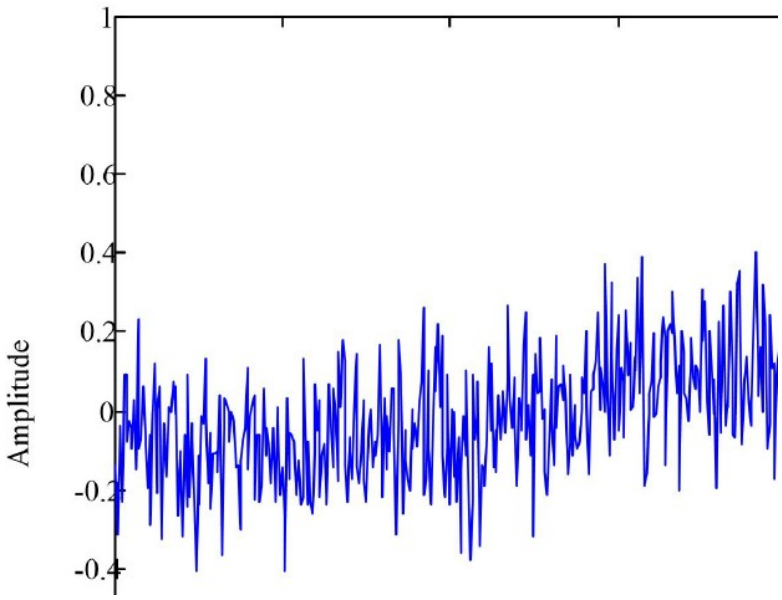

Fig. 2. Results of distribution of management power in colleges and universities under overall planning and scheduling mode

According to the analysis of Figure 2, the balance of university management power distribution under the overall planning and scheduling mode by this method is good, and the feeling degree of power information sharing platform and the overall evaluation of university information sharing state are high. The comparative results of testing the balance evaluation accuracy of university management power distribution under the overall planning and scheduling mode are shown in Figure 3.

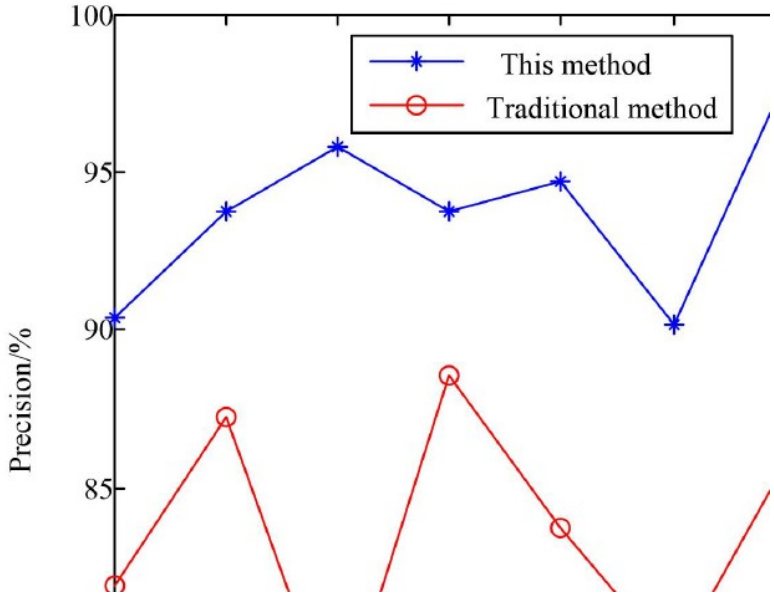

Fig. 3. Comparison of the accuracy of the evaluation of the balance of management power distribution in colleges and universities under the overall planning and scheduling mode

According to the analysis of Figure 3, the accuracy of this method in evaluating the equilibrium distribution of university management power under the overall planning and scheduling mode is high, and the time cost of running the system of equilibrium distribution of university management power under the overall planning and scheduling mode is tested, and the comparison results are shown in Figure 4.

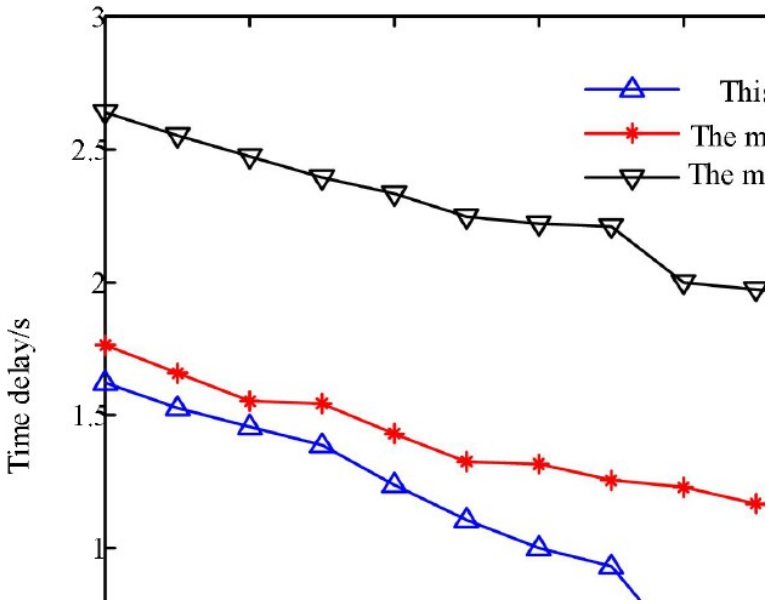

Fig. 4. Comparison of evaluation time of balance of management power distribution in colleges and universities under overall planning and scheduling mode

The analysis of Figure 4 shows that the time cost of this method to evaluate the balance of management power distribution in colleges and universities under the overall planning and scheduling mode is short, and the confidence level of the balance evaluation of management power distribution in colleges and universities under the overall planning and scheduling mode is tested, and the comparison results are shown in Table 1. The analysis of Table 1 shows that the confidence level of this method to evaluate the balance of management power distribution in colleges and universities under the overall planning and scheduling mode is high.

Table 1. Comparison of confidence level of balance evaluation of management power distribution in colleges and universities under overall planning and scheduling mode

Iterations	Methods of this paper	Methods of Reference [3]	Methods of Reference [4]
100	0.934	0.834	0.764
200	0.956	0.876	0.834
300	0.967	0.943	0.865
400	0.987	0.966	0.887
500	1	0.965	0.913

5. Conclusions

The development of information sharing in colleges and universities should have a clear structure to ensure the effective connection of all work in the process of information sharing, so that the information sharing in colleges and universities can be continuously developed and optimized. It is necessary to set up a corresponding expert and scholar supervision group to be responsible for and guide the key technical work in the process of building the internal management information

sharing platform in colleges and universities, and to determine the establishment of resource database and the collection of encrypted files according to the self-demand and resource distribution of various departments and colleges. At the same time, we should coordinate and manage the technical standards for the construction of data information sharing resources and the network security maintenance of the platform system, so as to strengthen the connection between various departments and colleges within the university, and then effectively promote and implement the construction of the information sharing platform within the university. In this paper, the big data information fusion method is used to evaluate the balance of management power distribution in colleges and universities under the overall planning and scheduling mode, and the ability to evaluate and predict the balance of management power distribution in colleges and universities under the overall planning and scheduling mode is improved. This paper puts forward an evaluation method of the balance of management power distribution in colleges and universities under the overall planning and scheduling mode based on structural characteristics. This paper collects the information of the characteristic quantity of quantitative evaluation of university management power distribution balance under the overall planning and scheduling mode, extracts the association rules of the panel data of university management power distribution balance under the overall planning and scheduling mode, fuses the characteristic distribution parameter set, constructs the linear programming function of panel data of university management power distribution balance evaluation under the overall planning and scheduling mode, and adopts the piecewise quantitative recursive analysis method to predict the characteristics of university management power distribution balance under the overall planning and scheduling mode. The analysis shows that the method in this paper has high accuracy, high confidence level and short running time, which can improve the ability to evaluate the balance of management power distribution in colleges and universities under the overall planning and scheduling mode.

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