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The Design of College Logistics Management System Capability Evaluation System based on Entropy Weight

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Abstract: The accuracy of the evaluation results of the traditional college logistics management system ability evaluation system is low. Based on this, a college logistics management system capability evaluation system based on entropy weight is designed. Through the performance layer, the business layer, the support layer and the data layer, the overall structure of the logistics management system capability evaluation system is built. Through the front-end server, interface server, application server, database server, file server, the system hardware design is completed; Through the establishment of the evaluation index system, the entropy weight method is used to determine the index weight, and then the index correlation coefficient is calculated to make a comprehensive evaluation, the system software design is completed, so as to complete the college logistics management system ability evaluation system design based on entropy weight. Compared with the traditional logistics management system capability evaluation system, the experimental results show that the proposed logistics management system capability evaluation system based on entropy weight has higher evaluation accuracy.

Keywords: Entropy weight; College logistics Management system ability; Evaluation system

1. Introduction

Logistics service management in colleges and universities is an important part of the management of colleges and universities, which plays an important role in guaranteeing the education and teaching level, scientific research development and talent cultivation of colleges and universities [1]. Scientific assessment and evaluation is an inevitable requirement of logistics reform in colleges and universities, a necessary starting point for monitoring the effectiveness of logistics service work and obtaining first-hand information, and a cornerstone for promoting the continuous reform of logistics service in colleges and universities [2]. The evaluation of college logistics management system ability plays an important role in improving college logistics management system ability. Because the present evaluation system of logistics management system in colleges and universities still has some shortcomings such as evaluation accuracy, it is necessary to further study it in order to improve the shortcomings of the existing evaluation system[3-5]. Entropy weight method is essentially the basic principle of measuring information disordered state and severity of indicators, therefore, the entropy weight method can be used to calculate the difference between different indicators, and then the entropy weight can be used to calculate the entropy weight of different indicators, then through the analysis of entropy, the proportion of every index in the corresponding system can be measured more accurately, finally, an evaluation index with obvious objectivity is obtained. In recent years, the entropy weight method is widely used in various areas of practice, and this method can realize to some accurate assessment of the standards or specifications, and show the standard objective out [6-10]. Based on the above analysis, a college logistics management system capability evaluation system based on entropy weight is designed.

2. Design of College Logistics Management System Capability Evaluation System based on Entropy Weight

First, building the overall framework of college logistics management system capability evaluation system based on entropy weight, then, designing the hardware and software parts of the system, the specific design process is as follows.

2.1. The overall structure of logistics management system capability evaluation system based on entropy

The overall framework of college logistics management system capability evaluation system based on entropy

weight mainly includes presentation layer, operation layer, support layer and data layer, as shown in figure 1.

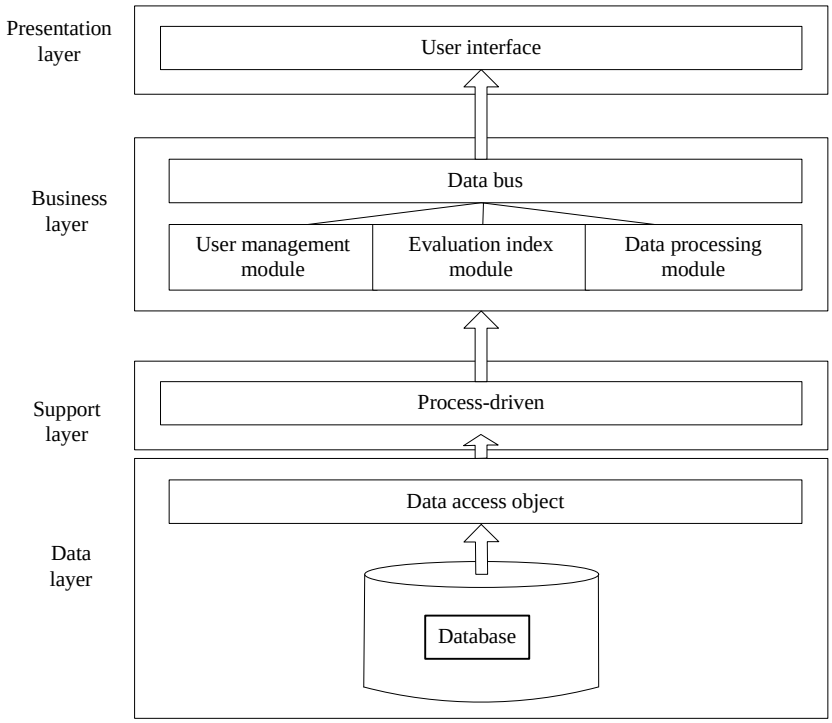

Figure 1. Overall framework of capability evaluation system for efficient logistics management system.

Presentation layer: struts + html is adopted to realize the user operation interface, and struts is adopted to realize the reading and verification of user input, jump of process, selection of user interaction interface and other functions; HTML is adopted to achieve the presentation of user input and output interface.
Business layer: mainly includes user management module, evaluation index module and data processing module. In the user management module, mainly for the system user login, system maintenance and other functions; in the evaluation index module, the main function is to establish or modify the system evaluation index according to the actual situation. In the data processing module, the entropy weight method is adopted to analyze and calculate the system evaluation indexes.
Support layer: mainly provides support for the stable operation of the system, such as process driven.
Data layer: it mainly stores the related data of the evaluation index system of logistics management system ability in colleges and universities. Users can access the database to obtain the index and other information.

2.2. Hardware design of college logistics management system capability evaluation system based on entropy weight

According to the overall framework of the system, the hardware part of the system is designed. The hardware structure of the system is shown in figure 2.

As shown in figure 2, the hardware part of the college logistics management system capability evaluation system is mainly composed of front-end server, interface server, application server, database server and file server. The specific functions of each hardware configuration are as follows:
Front-end server: the deployment of Apache service, including two main functions, one is to accept user access requests, and according to the load balancing algorithm to forward the request to the application server load point; the second is to handle static file access.
Interface server: deploy Tomcat services and JRE to interface with external systems.
Application server 1,2: apply system mirror to achieve specific application functions. Multiple application servers can be deployed according to the pressure of the system to achieve load balancing and capacity expansion.
Management server: deploy the backend management system.

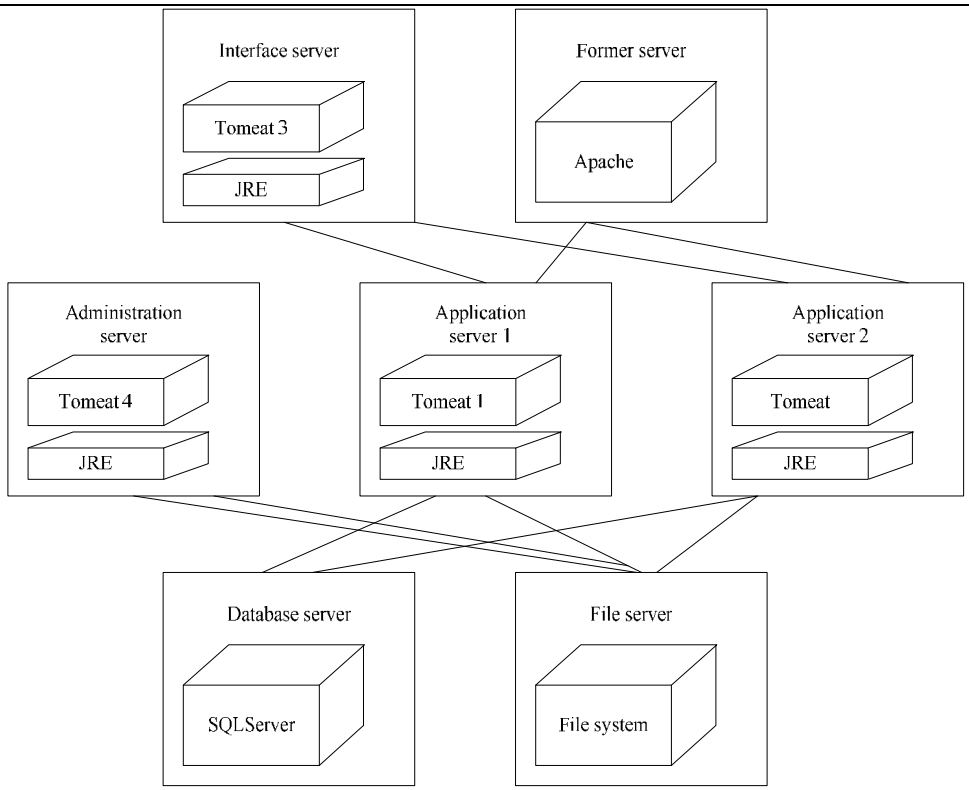

Figure 2. Hardware structure of logistics management system capability evaluation system in colleges and universities.

Database server: install SQL Server database.
File server: NAS file system, storage system static files and resources.
After the design of the hardware, to provide support for the realization of the software, the system software design.

2.3. Software design of college logistics management system capability evaluation system based on entropy weight

The software design of college logistics management system evaluation system is the process of evaluating the college logistics management system ability. The specific implementation process is as follows:
In the evaluation index module, firstly, according to the evaluation object, the evaluation index system of logistics management system ability of colleges and universities is established, as shown in table 1.

Table 1. Evaluation index system of logistics management system capability in colleges and universities

Indicator system	Primary indicators	Secondary indicators
College logistics management system ability evaluation index system	Logistics management system formulation	Humanization
		Cultural power
		Foresight
		Continuity
		Effectiveness
		Systematicness
	Logistics management system performance	Authority
		Independence
		Mandatory
		Equality
	Logistics management system improvement	Supervision system
		Evaluation system
		Adjustment method
		Complaisance
		Innovation

After establishing the index system, the data processing module can realize the data processing according to each index. First of all, based on the entropy weight method, the weight of the evaluation index of logistics management system ability in colleges and universities is determined. The determination process is as follows:

There are m evaluation index and n evaluation objects. According to the principle of combination of qualitative and quantitative, the evaluation matrix R' of multiple indexes for multiple objects is obtained:

$$R' = \begin{bmatrix} r'_{11} & r'_{12} & \mathbf{L} & r'_{1n} \\ r'_{21} & r'_{22} & \mathbf{L} & r'_{2n} \\ \mathbf{M} & \mathbf{M} & & \mathbf{M} \\ r'_{m1} & r'_{m2} & \mathbf{L} & r'_{mn} \end{bmatrix} \quad (1)$$

After R' is standardized, the following results can be obtained:

$$R' = \left(r_{ij}\right)_{m\times n} \quad (2)$$

In formula (2), r_{ij} represents the value of the j evaluation object above the index, $r_{ij} \in [0,1]$, and there is:

$$r_{ij} = \frac{r'_{ij} - \min_j \{r'_{ij}\}}{\max_j \{r'_{ij}\} - \min_j \{r'_{ij}\}} \quad (3)$$

In formula (3), max represents the maximum value and min represents the minimum value.

The entropy of the i evaluation index is defined as:

$$H_i = -k\sum_{j=1}^{n} f_{ij} \ln f_{ij} \qquad i = 1, 2, \mathbf{L}, m \quad (4)$$

In formula (4), k represents the entropy coefficient, $k = \frac{1}{\ln n}$; f_{ij} is the entropy function, f_{ij}.

The entropy weight w_i of the i index is defined as:

$$w_i = \frac{1 - H_i}{m - \sum_{i=1}^{m} H_i} \quad (5)$$

In formula (5), the values of each evaluated object on the index j are completely the same, the entropy value reaches the maximum value of 1, and the entropy weight is zero. That is, the indicator does not provide policy-makers with any useful information and could be considered for elimination. When the value of each evaluated object in the index difference is large, the entropy value is small; When the entropy weight is large, it indicates that this index provides useful information to decision makers. At the same time, it also shows that in this problem, each object has obvious difference in this index, and should focus on investigation. The larger the entropy of the index is, the smaller its entropy weight is, and the index is less important, which meets $0 \le w_i \le 1$, $\sum_{i=1}^{m} w_i = 1$. According to formula (5), the entropy weight of the index is determined, and the weight of the index is determined according to the entropy weight.

The above entropy weight method is used to determine the weight of the index, and then the grey correlation coefficient of the index is calculated:

$$\partial_{ij} = \left(\Delta_{\min} + r\Delta_{\max}\right) / \left(\Delta_{ij} + r\Delta_{\max}\right) \quad (6)$$

In formula (6), Δ_{ij} represents the sequence of matrix differences, r represents the resolution coefficient, $\Delta_{\max}$ represents the maximum difference, and $\Delta_{\min}$ represents the minimum difference.

Finally, the logistics management system ability of colleges and universities is comprehensively evaluated, the process is as follows:

First, calculating the comprehensive correlation degree t_i:

$$t_i = \sum_{j=1}^{n} w_i \partial_{ij} \quad (7)$$

Then, calculating the comprehensive evaluation value F of the index system:

$$F = \sum_{i=1}^{n} t_{ij} \quad (8)$$

Obviously, the larger t_i and F are, the stronger the university management system ability is, and vice versa. Based on the comprehensive evaluation value, the management system capacity is evaluated.

Thus, the design of college logistics management system capability evaluation system based on entropy weight is completed.

3. Experiment

Based on the entropy weight, the logistics management system capability evaluation system of colleges and universities is adopted to evaluate the logistics management system capability of colleges and universities, and the evaluation results are obtained, and compared with the traditional college logistics management system capability evaluation system.

3.1. Experiment preparation

The database of university logistics management system ability evaluation system belongs to small and medium-sized database, which uses SQL Server database. Connect the database server to the application server through a special subnet, and install the windows server operating system on the database server. Five universities were selected as the experimental target to evaluate their logistics management system capability, and the comprehen-

sive evaluation value is obtained, which is compared with the traditional logistics management system capability evaluation system.

3.2. Experiment results and analysis

The comparison results of the proposed logistics management system capability evaluation system based on entropy weight, the traditional logistics management system capability evaluation system 1 and the traditional logistics management system capability evaluation system 2 with the actual logistics management system capability values of colleges and universities are shown in figure 3.

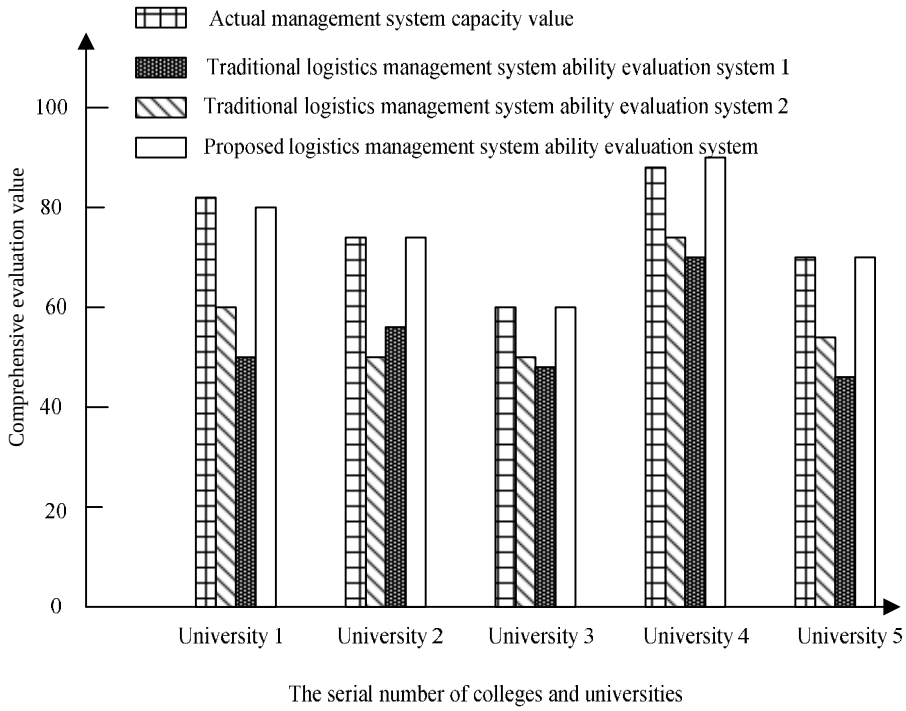

Figure 3. Comparison results of evaluation accuracy.

As can be seen from figure 3, among the evaluation results of logistics management system capability of five universities, traditional logistics management system capability evaluation systems 1 and 2 are adopted, and the difference between the evaluation value and the actual value are relatively large. Based on the proposed logistics management system capability evaluation system based on entropy weight, the difference between the evaluation result and the actual value is small, which is consistent with the actual value. The experimental results show that the proposed college logistics management system capability evaluation system based on entropy weight adopts the entropy weight method to determine the weight of evaluation index, and the evaluation accuracy is higher, which can more accurately evaluate the logistics management system ability of colleges and universities.

4. Conclusions

Aiming at the disadvantage of low evaluation accuracy of the traditional college logistics management system ability evaluation system, based on entropy weight ,through hardware design and software design, the college logistics management system ability evaluation system is designed. Compared with the traditional logistics management system capability evaluation system, the experimental results show that the proposed evaluation system has higher evaluation accuracy. It is hoped that the design of college logistics management system capability evaluation system based on entropy weight can provide some theoretical basis for the improvement and innovation of college logistics management system.

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