The Research on Evaluating the Performance of the Experimental Center: Cased by a Finance and Economics University

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Abstract. In order to research the performance evaluation of the experimental center in finance and economics university. Taking one of the finance and economics university as an example to realize the goal of talent training in university as the prerequisite, based on Analytic hierarchy process (AHP) and the evaluation index system for state-level experiment teaching demonstration center in the laboratory construction and management requirements and establish efficient management innovation mechanism, the application of system theory research idea “target function - structure”, to form multi-level integration model and by applying total quality management method to achieve the goal of construction of security. Therefore, this paper puts forward the idea of integrating the construction and management of the integration of the experiment center.

Introduction

In the middle of the 1990s, economics and management disciplines of China's universities began to gradually introduce the experimental teaching. At present, China's economics and management colleges have set up the corresponding experimental teaching section. The construction of experimental teaching centers is flourishing and has made great achievements, and has entered into the National Laboratory system as science experiment. In 2007, the experimental economics and economics management laboratory (EMEL) Specialized Committee belonging to China Information Economics Society was set up. However, due to various factors, there are still some major problems in the construction and management of economics management laboratory:

Laboratory of economics and management faced a variety of problems. Strengthening laboratory construction and improving the level of management have become the key to guaranteeing the quality of experimental teaching and improving the experimental teaching system (Chen Yu, 2010). Therefore, combined with the specific situation one of the university, the evaluation of the construction and management of the experimental center of it, and put forward suggestions for improvement have become the focus of this study.

Theoretical Review

In view of the problems existing in the economic management laboratory, the scholars have carried on the thorough discussions. Such as: Human capital is the core resources of the construction and further development of economics management laboratory, and only the development of high quality economic management talents and the construction of high quality teachers can make the laboratory get long-term stable development (Huaiying Zheng, 2005); Laboratory management mainly includes open management, management system and personnel management (Shanshan Shang et al. 2007); We can improve the management level of economics management laboratory from three aspects of hardware management, software management and personnel management (Bingxin Zhang, 2006). According to the requirements of "pay attention to the foundation, strengthen the training, promote the comprehensive ability”, integrated, open and sharing arts comprehensive experiment teaching platform which embodies the characteristics of the subject and cover many disciplines (professions)
can be constructed through systematic design (Xu Ping, 2010). Comprehensive laboratory should be based on economics, management, arts, science and other disciplines as the backgrounds, be constructed by the dominant ideology of "focusing on the foundation, reflecting the modern, strengthening the application and tracking the forefront to establish a multi-level network unified platform, making data centralized processing and software resource sharing, Implement modular experimental teaching(Yang Jin,2011; Li Lei,2012).

Thus, the existing researches mainly focus on the characteristics of economics and management disciplines, study the construction and development of economics management laboratory from the perspective of technical or human resources. But it lacks of research from the national experimental teaching demonstration center requirements and comprehensive laboratory construction and management of a more targeted and comprehensive perspective. Therefore, the existing researches cannot meet the needs of the rapid development of economics management laboratory construction and management practice, but also cannot meet the needs of the national economic management demonstration center construction.

Model Establishment

First of all, establish the steps of the evaluation system of the economics management experimental center layered integrated construction and management innovation model;

Then, set up the scoring system of the evaluation system: Analytic hierarchy process (AHP) is to decompose the problem into different levels according to the nature of the problem and the general goal to form a multilevel analytical structural model. It is a kind of analytic hierarchy model, which is a combination of qualitative analysis and quantitative analysis. Comparison of the relative importance of the same level of factors uses the 1-9 scale method, as shown in table 1:

<table>
<thead>
<tr>
<th>Judgment scale</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>It means that for Am, the factor Bi and Bj are equally important.</td>
</tr>
<tr>
<td>3</td>
<td>It means that for Am, the factor Bi is slightly important than Bj.</td>
</tr>
<tr>
<td>5</td>
<td>It means that for Am, the factor Bi is more important than Bj.</td>
</tr>
<tr>
<td>7</td>
<td>It means that for Am, the factor Bi is obviously important than Bj.</td>
</tr>
<tr>
<td>9</td>
<td>It means that for Am, the factor Bi is absolutely important than Bj.</td>
</tr>
<tr>
<td>2,4,6,8</td>
<td>Between the two judgment scales.</td>
</tr>
</tbody>
</table>

Note: the opposite situation is to take the countdown.

Secondly, establish the evaluation objects: This article issued questionnaire through the university’s teachers and related staff. There are 50 copies, with the recovery of 50 copies, and effective questionnaires of 50, the effective rate up to 100%. After further sorting and induction of statistics, the data becomes the data source of the subject, and will be put into the judgment matrix of AHP. We set the assessment set \( U=\{U_1,U_2,U_3...U_n\} \), \( n=1,2,...,50 \).

Again, determine the evaluation elements set: according to the core content of the relevant laboratory construction and management in the national experimental teaching demonstration center assessment indicators, after comprehensive sort, this paper chose the seven aspects as the standard layer:"Management system, information platform, operating mechanism, equipment, maintenance operation, environment, security", each of which is classified into several indicator layers under the criteria layer, as shown in Table 2:
Determine the Weight of Indicators by AHP

Establish a Hierarchical Model

This is the key step of the analytic hierarchy process (AHP), which is divided into different levels according to the types of indicators in the evaluation index system. The comprehensive evaluation index system of the comprehensive project has been described in detail in the fourth part, no repeat here.

Determine the Weights of the Evaluation Indicators

The determination of the weight of each evaluation index is an important step in the fuzzy hierarchy evaluation method. The determination process includes the establishment of the weight judgment matrix, the calculation of the weight, the compatibility judgment and the error analysis.
(1) Establish the weight judgment matrix

Assuming that the above-mentioned element Am is the criterion layer, Am has a dominant relation to the elements B1, B2, ... Bn of the next layer. To this end, under the criterion Am, give B1, B2, ... Bn the corresponding weight according to their relative importance. For many problems, especially those that do not have a unified indicator, only relying on the individual's judgment and estimation, it is often necessary to derive its weight by appropriate means to give the importance of a quantitative indicator or direct judgment element. The analytic hierarchy process is a two-way comparison method, the decision maker or the expert system to answer repeatedly Bi and Bj, the lower element of the criterion Am, which are more important. In order to quantify the judgment, it is generally quoted by Saaty's 1-9 Proportional scale method.

(2) Calculation of weights

According to the judgment matrix, calculate the eigenvector W of the judgment matrix and then normalize to satisfy it. Then we can find the relative importance of Bi on Am, that is, weight.

(3) Fault tolerance judgment and error analysis

In the evaluation process, the evaluators can not accurately determine the value of bij and they can only estimate it. If there is an error in the estimation, it will inevitably lead to the deviation of the eigenvalues of the judgment matrix. When constructing the judgment matrix, the judgment is not required to be consistent, that is, it does not require the establishment of the formula bij*bjk=bik, which is determined by the complexity of the objective things and the diversity of people's cognition. However, it is desirable to ask for a general agreement. If objectively X is extremely more important than Y, Y is extremely more important than Z, Z is extremely more important than X, this situation is clearly a violation of common sense. Therefore, after obtaining λmax, it is necessary to check the consistency of the value, which is a necessary condition to ensure the reliability of the conclusion. Steps are as follows:

Calculate the consistency index CI.

\[ CI = \frac{\lambda_{max} - n}{n - 1} \]  \hspace{1cm} (1)

In order to measure whether the judgment matrix of different orders has satisfactory consistency, the average randomness index RI value of the judgment matrix is introduced.

Calculate the consistency ratio CR.

\[ CR = \frac{CI}{RI} \]  \hspace{1cm} (2)

when CR <0.1, it is generally believed that the consistency of B is acceptable, otherwise you need to adjust the judgment matrix to make it have a satisfactory consistency.

Combination weight calculation

After calculating the weights of the indicators at all levels on the upper level indicators, you can start from the top level, and obtain combination weight of the various levels of indicators on evaluation target from top to bottom. The calculation process is as follows:

We set level A has m indicators A1, A2, ..., Am, and their combined weights for the evaluation target are a1, a2, ... an. At the next level of the Aij level, there are n sub-indices B1, B2, ... Bn. Their weight vector bi for the index Ai :

\[ b^i = (b^i_1, b^i_2, ..., b^i_n)^T \]  \hspace{1cm} (3)

Then the combined weight of the index Bj for the evaluation target is:

\[ W = b^j a_i, \text{ } j = 1, 2, ..., n \]  \hspace{1cm} (4)

The combined weight of a certain index is the product value of the weight of the index and the combined weight of the upper level index. The formula for combining weights shows that if you want
to compute the combined weights of a given level, you must first know the combined weights of the upper level. So the combination of weight is always from the highest level, followed by recursive calculation.

**Determination of membership function of the lowest level index and calculation of membership degree**

The bottom indicator is in the lowest level of the comprehensive evaluation hierarchy model of the grid planning, and there is no indicator of the next level. In the multi-index comprehensive evaluation, the dimension of the indicators used to evaluate the different aspects of the same thing may be different. This shows the difference in the unit of measurement. On the other hand, even if they have the same unit of measurement, the order of magnitude of the index may also be different. The difference in the form of the relative numbers reflect the difference in the actual quantity level of the index. Although they are relative numbers with no measurement unit, there is also a dimension effect. Nondimensionalization is necessary to eliminate these effects. From the point of view of technical method, nondimensionalization solves the integration problems between indexes.

1. Establish membership function of evaluation index

The dimensionless process is essentially the establishment of the membership function. If you want to integrate a number of evaluating indicators of different dimensions into a total membership degree, it is necessary to select and establish some kind of membership function to transform the index value into membership degree according to different realistic scales. This membership degree is a relative number, which indicates the relative position of the evaluation object from the evaluation index, and also describes the contribution degree of the indicator to the relative position of the evaluation object. The dimensionless approach follows the principles of objectivity, simplicity, and feasibility. There are many kinds of dimensionless methods. But there are three categories: linear dimensionless method, broken line dimensionless method and curvilinear dimensionless method when summed up. From the application point of view, the linear dimensionless formula is the simplest.

2. Calculate membership

Put the actual measurement value of the evaluation index into the membership function to calculate the membership degree of each evaluation index. For the sake of simplicity, the distribution of membership functions is divided into two categories: the semi-trapezoidal distribution and the descending half trapezoidal distribution. The membership calculation is shown in Table 3:

<table>
<thead>
<tr>
<th>Actual measured value</th>
<th>Subordinate threshold</th>
<th>Membership function distribution</th>
<th>Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>x [a, b]</td>
<td>Up semi-trapezoidal distribution</td>
<td>(x-a)/(b-a)</td>
<td></td>
</tr>
<tr>
<td>x [a, b]</td>
<td>Down semi-trapezoidal distribution</td>
<td>(b-x)/(b-a)</td>
<td></td>
</tr>
</tbody>
</table>

**Data analysis and summary**

According to the current evaluation of the collection:

<table>
<thead>
<tr>
<th>very poor</th>
<th>poor</th>
<th>qualified</th>
<th>good</th>
<th>excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0, 0.2)</td>
<td>[0.2, 0.4)</td>
<td>[0.4, 0.6)</td>
<td>[0.6, 0.8)</td>
<td>[0.8, 1]</td>
</tr>
</tbody>
</table>

Through the calculation, the economic benefit index, the social benefit index, the safety index, the comprehensive plan completion index and the whole comprehensive plan score are obtained. The
scores of the indexes are analyzed by the comparative evaluation set to find out the reason of the lower scores and put forward suggestions for improvement.

**Conclusion**

Based on the statistics and calculation results of the analytic hierarchy process, the index of the evaluation of the construction of the experimental center is 0.729, which is in “good” index.

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**References**


