

the vocational college training program on the problems, and then the question of the functional requirements analysis training program management systems, business processes and user roles; according to the functional requirements of the system, designed the training program system architecture, network architecture model, analysis of the database model of the system. Finally training program management system is summarized.

Acknowledgements

This work is supported by Chongqing Education Science Twelfth Five Year Plan FY2014 topics project, China (No.2014-GX-133).

References

1. Vaquero L. M., Rodero-Merino L., Buyya R., Dynamically Scaling Applications in the Cloud, *Computer Communication Review*, 2011, 41(1): 45-52.
2. Wei-Tek T., Peide Z., Balasooriya J. et al., An Approach for Service Composition and Testing for Cloud Computing, in 2011 10th International Symposium on Autonomous Decentralized Systems (ISADS), 2011: 631-636.
3. Calheiros R. N., Buyya R., De Rose C. A. F., Building an automated and self-configurable emulation test bed for applications, *Software: Practice and Experience*, 2010, 40(S): 405-429.
4. Hurwitz J. D., *Cloud computing for dummies*: Wiley Pub., Inc., Indianapolis, IN, 2009.
5. Acklesh Prasad, Peter Green, Jon Heales. On governance structures for the cloud computing services and assessing their effectiveness [J]. *International Journal of Accounting Information Systems*, 2014, 154.
6. Jeff Offutt, Vasileios Papadimitriou, Upsorn Praphamontpong. A case study on bypass testing of web applications[J]. *Empirical Software Engineering*, 2014, 191.
7. Zhi-Wei Xu. Cloud-Sea Computing Systems: Towards Thousand-Fold Improvement in Performance per Watt for the Coming Zettabyte Era[J]. *Journal of Computer Science and Technology*, 2014, 292.
8. Bulent Tugrul, Huseyin Polat. Privacy-Preserving Inverse Distance Weighted Interpolation[J]. *Arabian Journal for Science and Engineering*, 2014, 394.



Design of Education Cost Assessment Information System based on DEA Cost Minimization and DEA Efficiency

Yuanzhen He*

Aba Teachers University, Sichuan, Wenchuan, 623002, China

Abstract

With the continuous expansion of domestic colleges and universities and the rising tuition, the problems of college education cost control appear. The all-cost assessment flow of the research university education cost is analyzed, the method that combines the minimization model of DEA cost with DEA super-efficiency model is adopted. And the efficiency evaluation system of research university education cost is constructed, which provides the cost

management of the research universities for true and reliable measurement. The experimental results shows that it's feasible and effective.

Key words: DEA SUPER-EFFICIENCY, DEA COST MINIMIZATION, ALL-COST ASSESSMENT, EFFICIENCY EVALUATION

1. Introduction

In recent years, with the continuous expansion of colleges and universities and the unceasing enhancement of tuition, the problem that the consumption of colleges and universities and the education cost control attract more and more attention from the educational circles scholar as well as the state and society. Because the research universities contain a lot of funds for education which is difficult to calculate and share, the education cost is a very worth studying topic [1]. The increasing investment of education funds puts forward a huge challenge for higher learning education cost management work in China. Research university as the core group of the national education will possess more education resources and have more complex output [2, 3]. Therefore the problem of the research university education funding should deserve more attention and recognition. However, since the improper allocation of education resources and the failure of the cost control, it has seriously hindered the education resource to play a positive role for the quality of research university and China's higher education, and it mainly manifests in two aspects, that's, firstly, the shortage of higher education resource impedes the development of research universities, secondly, the utilization rate of higher education resource of the research universities is low. Under the impact of the above situation, it appears the phenomenon that the education cost management is out of control such as excessive bank loans, blind

investment and low capital utilization efficiency etc. Therefore, it need to make an effective control of education cost in the process of education [4].

The idea of all-cost assessment is adopted to construct the the all-cost assessment model of those research university education cost, and it makes an implementation of the research university education cost assessment. At the same time, by the way of the DEA cost minimization model combined with DEA super-efficiency model, the evaluation system of research university education cost is constructed. It provides the true and reliable measurement for the cost management of research universities [5-7].

2. The all-cost assessment

2.1. The All-Cost Assessment Flow of Research

The all-cost assessment process of research university education cost, namely under the premise of knowing the consumption of all kinds of resources in specific projects, through the apportionment of the indirect education cost to divide the total cost to each accounting object. In particular, it is mainly divided into three processes. First of all, to make clear the education cost accounting object and determine the scope of the education costs accrue. Then, it should determine the indirect education cost allocation standard and calculate the corresponding distribution rate.

Finally, to calculate the education cost of the cost accounting object. The specific assessment process is shown in figure 1 below.

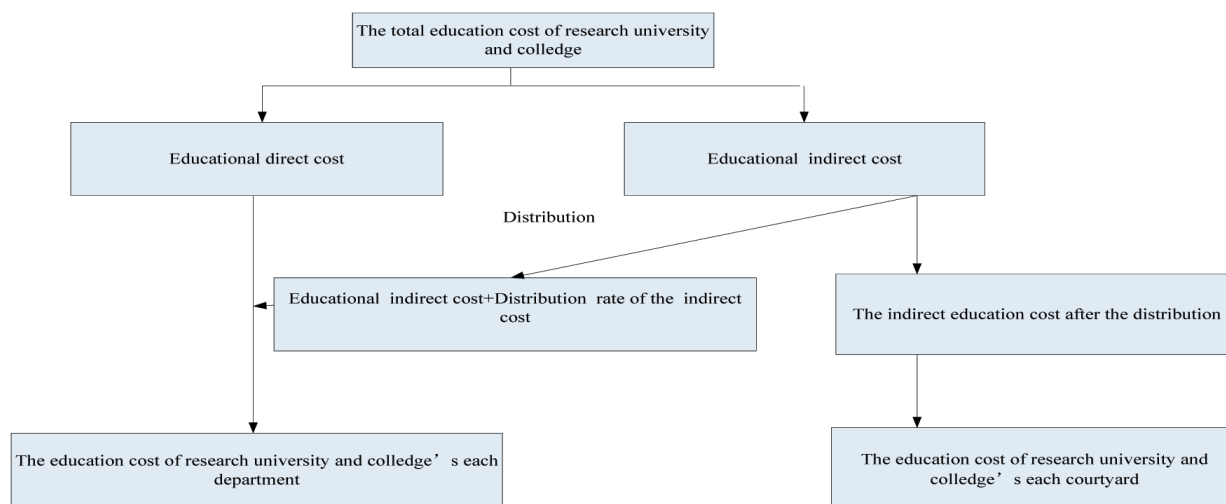


Figure 1. The Total Cost Accounting Process of Research-Oriented University Education Cost

2.2. The All-Cost Assessment Model of Research University Education Cost

According to the all-cost assessment process in figure 1, we can construct the all-cost assessment model of research university education cost, which is shown in formula 1 and 2. Among them, the formula 1 is used to calculate the education cost of education units such as various departments etc., and the formula 2 is used to calculate the amount of the research university education cost.

The education cost of all departments consists of two parts. Firstly, the direct education cost of each department. Secondly, the indirect education cost which is shared by the various functional departments. The specific calculation process is shown in formula 1.

$$WY_i = C_{Y,i} + \sum_{j=1}^{k_1} a_{ij}C_{B2,j} + \sum_{t=k_1+1}^{k_2} b_iC_{B2,t} + \sum_{r=k_2+1}^n c_iC_{B2,r} \quad (1)$$

$$TC = \sum_{i=1}^m WY_i + \sum_{v=1}^n C_{B1,v} \quad (2)$$

In the formula 1 and 2, WY_i is the education cost of department i , $i = 1, 2, \dots, m$, $C_{Y,i}$ is the direct education cost of each department i , $C_{B2,j}$, $C_{B2,t}$, $C_{B2,r}$ are the indirect education cost which needs to allocate by the three kinds of functional department, and n is the total number of sectors.

3. The establishment of the effectiveness evaluation model of education cost based on DEA cost minimization and DEA super-efficiency

3.1. C2R Model

C2R model is used to describe the DEA model that production activities meet the constant scale.

In this model, it is assumed that there are n decision-making-units, and each decision-making-unit has m input indexes and s output indexes. Among them, the input index and output index of the decision-making-unit j is shown as follows, respectively,

$$X_j = (x_{1j}, x_{2j}, \dots, x_{mj})^T > 0 \quad (3)$$

$$Y_j(t) = (y_{1j}, y_{2j}, \dots, y_{mj})^T > 0 \quad (4)$$

The corresponding weight vector of input and output indicators are shown below respectively,

$$w = (w_1, w_2, \dots, w_m)^T \quad (5)$$

$$u = (u_1, u_2, \dots, u_s)^T \quad (6)$$

Corresponding efficiency for each decision-making-unit is

$$h_{CCR_j} = \frac{u^T Y_j}{w^T X_j}, j = 1, 2, \dots, n \quad (7)$$

There are always proper weight coefficients w and u , they meet

$$h_{CCR_j} \leq 1, j = 1, 2, \dots, n \quad (8)$$

In the end, the model is given as follows

$$(P_{C^2R}) \begin{cases} \max u^T Y_{j0} \\ w^T X_j - u^T Y_j \leq 1, j = 1, 2, \dots, n \\ w^T X_{j0} = 1 \\ w \geq 0, u \geq 0 \end{cases} \quad (9)$$

3.2. DEA Evaluation Model of Cost Minimization

When using the data envelopment analysis method to evaluate the efficiency of research university education cost, it needs to add some price variables in the model above.

Then, the DEA model of cost minimization is obtained as follows

$$M(r_j x_j^*) \begin{cases} \sum_{j=1}^n X_j \lambda_j + s^- = x_j^* \\ s.t. \begin{cases} \sum_{j=1}^n Y_j \lambda_j - s^+ = y_j^* \\ \lambda_j \geq 0, j = 1, 2, \dots, n \\ s^- \geq 0, s^+ \geq 0 \end{cases} \end{cases} \quad (10)$$

The cost efficiency or comprehensive efficiency of the j st DMU, which can be calculated as follows

$$\theta_{CE} = r_j^* x_j^* / r_j x_j^* \quad (11)$$

3.3. DEA Super-Efficiency Model

When using traditional DEA method to evaluate the efficiency of decision-making-units, it may appear multiple decision-making-units, namely, the efficiency value is 1. At this point, it is difficult to further analyze the decision-making-units for researchers. In this paper, DEA super-efficiency model is put forward by the main consideration that, when it is relative to other units, the efficiency of decision-making-units evaluated do not include evaluation decision-making-unit itself compared with the traditional DEA model, the evaluation results from this model may be greater than 1, then it is called Super-Efficiency, it's as shown in the following formula.

$$\begin{aligned}
 & \text{Min} \theta_{SE} \\
 & \left\{ \begin{aligned}
 & \sum_{j=1, j \neq j_0}^n X_j \lambda_j + s^- = \theta_{SE} X_{j_0} \\
 & \sum_{j=1, j \neq j_0}^n Y_j \lambda_j - s^+ = Y_{j_0} \\
 & \lambda_j \geq 0, j = 1, 2, \dots, n \\
 & s^- \geq 0, s^+ \geq 0
 \end{aligned} \right. \quad (12)
 \end{aligned}$$

Among them, r is the combination weight of colleges and universities n , q is the value of super-efficiency, namely, the cost efficiency of this article.

4. The Empirical Analysis

The selection and instruction of the empirical sample

We select the tsinghua university, nankai university and other 8 research universities as samples to test and verify in this paper, a1, a2,... a8 is the corresponding code, respectively. These 8 universities belong to the deployment of the education department, and they are comprehensive universities. In this paper, SPSS 20.0 software is used to make a descriptive statistics for the 30 data. Table 1 is a part of results.

The empirical results of cost efficiency

Education costs money is used as the input index in this paper. The samples of 8 research universities are taken into cost efficiency model, then EMS Version 1.3 is used to calculate the efficiency of education cost. The results as shown in table 2.

Tab. 1. Descriptive Data

Index	The explanation of index	Number	Minimum	Maximum	Average	Standard deviation
B1	Personnel costs revenues	30	15008.060	159385.383	51376.592	25980.132
B2	Student affairs cost	30	3327.165	19628.782	10273.688	5184.493
B3	Utility costs	30	5236.988	21050.249	11376.809	5791.73
B4	Constructive cost	30	4895.831	206218.079	35871.834	38882.548
B5	The cost of scientific research	30	5619.407	144943.029	39004.19	43800.35
B6	Other costs	30	297.446	25200.916	5623.96	7473.758
C1	The number of faculty	30	3934.000	11604.000	6369.148	2889.181
C2	The number of students	30	29687.000	79708.000	54342.148	15493.19
C3	The fixed assets value	30	192756.970	768013.110	483769.03	199291.29
C4	The total funding	30	16969.210	302357.670	89646.09	78256.569
C5	The education budget	30	148924.620	716940.410	289527.581	168872.229

Tab. 2. The Utilization Efficiency Results of Research-Oriented Universities Education Cost

DMU	The value of efficiency	The evaluation of cost efficiency
2014 a1	114%	Effective
2014 a2	213%	Effective
2014 a3	154%	Effective
2014 a4	224%	Effective
2014 a5	154%	Effective
2014 a6	164%	Effective
2014 a7	82%	Effective
2014 a8	103%	No effective

Figure 2 is the trend of the education cost efficiency of research university, and combined with figure 3, we can see that most of the research university's education cost efficiency is on the decline, while the no effective cost efficiency number of schools has a rising trend.

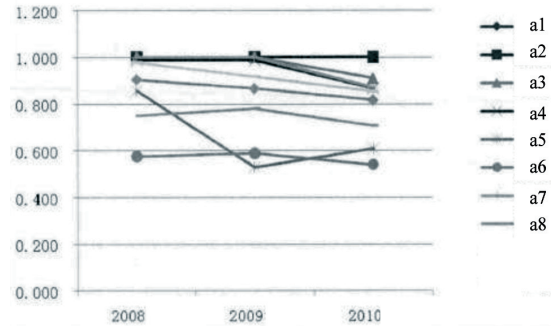


Figure 2. The Trend of Research-Oriented Universities Education Cost Efficiency

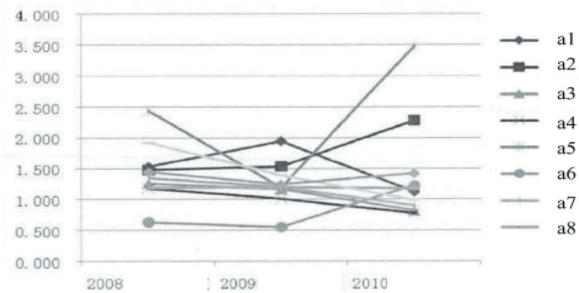


Figure 3. The Trend of Research-Oriented Universities Education Cost Utilization Efficiency

Conclusion

Education cost efficiency can be used as an important measure index of the utilization effect of research university education resource. This paper uses DEA super-efficiency combined with DEA minimum cost to evaluate the education cost efficiency. According to the result of evaluation, we can promote the university education cost efficiency in specific aspects, and then we can make a reasonable control for the education cost.

Acknowledgements

Key research topic of Aha Normal University: On Education Costing Accounting in Higher Educational Institutions under New "Accounting System in Higher Educational Institutions" Topic NO:ASA14-03.

References

1. Clark W.. Academic charisma and the origins of the research university[M]. 1st ed. Chicago: University of Chicago Press, 2006, pp.56-70.
2. Zohreha S., Nadergholi G.,Khalkhali A.. Developing a research university in Iranian higher education system: a model presentation[J]. Procedia Social and Behavioral Sciences, 2011, (15), pp. 2259-2263.
3. Yuan G. H., Yang T. Y.. Comparison of Features between Chinese and American Research, pp.210-211.
4. oriented Universities[C]. 2010 Third International Conference on Education Technology and Training(ETT), Wuhan, 2010, pp. 529-532.
5. Elchanan C.. The economics of education[M]. 3rd ed. Ballinger: Bellinger Publishing Company, 1979, pp.66-68.
6. Elchanan C., Geske T. G.. The economics of education[M]. 2nd ed. Oxford: Pergamon Press, 1990, pp.8-12.
7. Charnes A., Cooper W.W., Rhodes 1.: Measuring the efficiency of decision making units[J]. European Journal of Operational Research, 1978,2(6), pp. 429-444.



Scientometric analysis of researches in Chinese Universities

Zhao qingjun

*School of Economics and Management, Chongqing Normal University, Chongqing 401331, China
Zhaoqingjun977@163.com*

Abstract

The performance evaluation results published by the Institute of Higher Education in December 2009 have attracted wide attentions worldwide. This paper explores find gap between Chinese universities and world-class as well as the gap among Chinese universities. Research performance is measured by taking the indicators, including the number of publications and patents, total cites, h-index received by each research institute. We discussed scaling relationships between number of citations and number of publications and patents.

Keywords: PERFORMANCE EVALUATION, BIBLIOMETRICSY, RANK, R&D EXPENDITURE (KEY WORDS)