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Article

# Financial internal control and final accounts management in higher education: a strategy for optimizing the overall budget performance of government accounting based on the ABC model

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**Abstract:** With the development of comprehensive budget management, strengthening budget management in colleges and universities is conducive to promoting the scientific and refined management of project funds and improving the efficiency of budget expenditure and management level. This paper introduces the ABC model, realizes the construction of financial budget performance evaluation system of colleges and universities from the construction of evaluation index system and the application of combination empowerment method. Through comprehensive evaluation, it is found that the evaluation score of the budget performance of the sample colleges and universities is 2.96 points, which belongs to the medium level, in which the budget implementation process plays the biggest role in the evaluation results. Following the selection of influencing factors to construct a structural equation model to explore the influencing factors of effective implementation of financial budget performance management in colleges and universities. Administrative support, performance culture, basic resource conditions, performance-related capabilities, and implementation process all positively affect the implementation effect of budget performance management, with the most obvious effect of performance culture (0.874) and administrative support (0.804). The optimization path of comprehensive budget management is explored in depth from multiple dimensions in order to improve the management level of financial budget performance in colleges and universities.

**Keywords:** ABC model; evaluation system; portfolio empowerment; structural equation modeling; comprehensive budget performance

## 1. Introduction

With the continuous development of the economy and society, greatly promote the innovation and development of financial management work in colleges and universities. Currently in the context of the new accounting system, the financial management of colleges and universities has changed significantly. In order to effectively control financial risks and improve financial management level, we need to adhere to the principle of optimizing management and advancing with the times, and do a good job in the internal control of university finance, final accounts, budget and other management strategies.

The final account is an important part of the financial management of the school, which is a comprehensive summary and evaluation of the financial activities of the school in a certain period of

time. It should include the balance sheet, income statement and cash flow statement and other major financial statements, as well as a variety of financial reports and notes, should be prepared by professionals, and after the approval of the relevant departments and publicity to ensure the accuracy and authenticity of the final accounts [1-2]. An important role of the financial accounts is to evaluate the implementation of the university budget, forcing the financial sector to be more scientific and rigorous in the formulation of the budget program and budget implementation activities, thereby improving the level of financial management of colleges and universities [3-4]. Through the careful analysis of the financial budget implementation report, you can also understand the use of funds in colleges and universities in the last fiscal year, to ensure that colleges and universities can reasonably use the funds, optimize the allocation of resources, so as to provide an accurate basis for colleges and universities in the development of performance appraisal program, better for the healthy and sustainable development of the cause of education in colleges and universities to solidify the foundation and to provide a guarantee [5-7].

In addition, budget management is the premise and foundation of all financial activities in universities, and is the core of financial management in universities. It is able to implement fine control of the daily expenditure of universities and ensure the implementation of financial budget control in universities to achieve a healthy business situation; it can improve the efficiency of financial management in universities, shorten the financial management process, save manpower and time costs; it can help universities to be more standardized, reasonable and efficient use of financial resources [8-10]. College budget performance refers to the introduction of performance management concepts and methods in the whole process of college budgeting, implementation, supervision and evaluation, in order to improve the effectiveness and efficiency of the use of budgetary funds as the goal, by setting clear performance objectives, monitoring performance operation, performance evaluation and application of results [11]. Higher education budget performance is of great significance. It helps to improve the efficiency of using funds, optimize the allocation of resources, enhance the sense of responsibility and management level of colleges and universities, and improve the transparency and credibility of colleges and universities [12-13]. Under the new government accounting system, colleges and universities should adjust their financial management methods in a timely manner to ensure that the financial system meets the requirements of the new government accounting system, to ensure that the budget and final accounts data of colleges and universities are more authentic and reliable, and to promote more standardized financial management of colleges and universities.

This paper analyzes in detail the intrinsic mechanism of operation-based budgeting applied to comprehensive budget performance management in the context of government accounting system. Based on the operation-based budget, comprehensive budget performance evaluation indexes are selected from the three stages of budget input, budget execution and budget finalization. The assignment method combining hierarchical analysis method, ordinal relationship method, entropy weight method and coefficient of variation method is used to determine the index weights of budget performance and assess the level of comprehensive budget performance management of university finance. After that, the influencing factors are selected from the perspectives of environment, capability and process, research hypotheses are put forward, and the conceptual model of influencing factors for the effective implementation of financial comprehensive budget performance management in colleges and universities is constructed. After collecting data by means of questionnaires, structural equation modeling is applied to explore the path of each variable's effect on the effective implementation of budget performance management, as well as the relationship of influence between each variable. The analysis of the comprehensive article discusses the optimization strategy of financial comprehensive budget performance in colleges and universities.

## 2. Mechanisms inherent in the application of the ABC model to budget performance

In the process of government accounting system innovation, the way of budget performance management of business units is also adjusted to optimize the overall business unit budget performance management effect and promote the stable operation of business units. The introduction of cost accounting concepts such as operating budget in the current government accounting budget performance management reform is conducive to further optimizing the allocation of financial resources and improving the quality of public services. The operation-based budget (ABC model) is a budget prepared around the operation, which is carried out according to the logical process of “output-operation-resources”, and the key elements of the operation budget are shown in Figure 1. The following is an analysis of the performance of the ABC model as applied to comprehensive budget performance management.

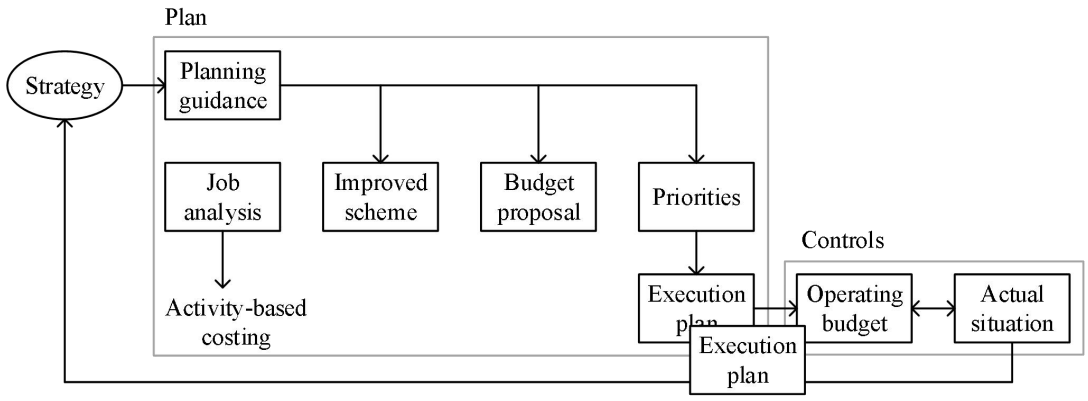


***Figure 1.*** Key elements of the job budget

### *2.1. Performance-based budgeting system*

From the perspective of the emergence of operational budgeting, it is itself a product of strengthening performance management, trying to provide a more effective method for budget performance management. While emphasizing the planning and control purpose of cost management, the operating budget further promotes the measurement and enhancement of budgetary performance in order to promote departmental operations to achieve the corresponding performance objectives, and to help them make practical judgments through operation management to obtain the best way to achieve the performance objectives. As a performance-enhancing budget system, operational budgeting can better fulfill the functions of cost reduction and efficiency improvement.

### *2.2. Accurate analysis of cost-effectiveness*

The cost information reflected in the operation-based method lays an important foundation for performance evaluation and is conducive to the realization of a results-oriented performance budget model. Since the practical application of the job cost method and job management, it has shown obvious advantages in budget performance management. The job-cost method divides the production process of public products into a series of operations, adopts cost drivers to allocate overhead costs to each operation, and reasonably apportions overhead costs to each output according to the consumption of each output by the operation, so as to avoid cost distortion.

### *2.3. Strategy-based resource allocation*

The operational budget translates the strategic plan into operations by setting out at the outset of budget preparation its linkage to the established strategy of the department and the overall resource plan required to achieve that strategy, and by establishing a process-centered allocation system to determine the level of resources to be allocated to each operation.

### *2.4. Closely linked sectoral cooperation*

Operational budgeting is more of a horizontal approach, as it focuses on departmental operations and requires the forecasting of various expected operations and their translation into specific workloads, which deepens the level of cooperation between departments for the same operation. Especially when the overall complexity of a department's business processes is high, it can even evolve into a flexible, hierarchical operating budget. Generally, the workflow of the overall project outputs involves several departments, and the workflow of the outputs needs to be integrated with the departments involved in the preparation of the operational budget.

## 3. Performance assessment of the overall budget of university finance

Through the above analysis, it is known that the use of the operating base budget for the budget performance management of institutions can promote performance improvement and resource allocation. And assessing budget performance is an important part of improving the budget performance management of university finance, therefore, this chapter is based on ABC model and constructs evaluation index system to assess the comprehensive budget performance of university finance.

### *3.1. Budget performance evaluation indicators*

Based on the application perspective of ABC model, the selection of comprehensive budget performance evaluation indexes for college finance is divided into three links: budget input link, budget execution process, and budget finalization stage.

In the budget input process, structural weight indicators such as total basic expenditure A1, personnel budget expenditure A2, public expenditure A3 and student grant budget expenditure A4 are set.

In the budget execution process, indicators such as total budget execution rate A5, budget execution rate of itemized expenditures A6, annual difference rate of budget execution of total expenditures and itemized expenditures A7, budget execution rate of expenditures at major time nodes (end of the quarter, end of the year, etc.) A8, and number of times of non-compliance with the use of funds A9, etc., are set to emphasize the cost control in the process of budget execution and to highlight the performance characteristics of the efficiency of the use of funds.

At the stage of budget finalization, the finalization link is the stage of summarizing and reporting on the results of budget implementation as well as the stage of evaluating the outputs and effects of basic expenditures. The design of indicators includes the overall budget control rate A10 (i.e., the ratio of budgeted surplus funds to budgeted inputs), the rate of difference between the actual implementation of the overall budget and the target cost A11, the completion of the annual work tasks A12, and the degree of satisfaction of teachers, students, and staff A13, among others.

### *3.2. Combination of empowerment methods*

After the indicators of the evaluation system have been finalized, the weights of the indicators need to be determined. At present, there are many methods for determining the weights of indicators, each with its own characteristics. In general, they can be divided into subjective weight determination method and objective weight determination method. In order to make the determination of the weights more reliable, this paper will choose two methods in each of the subjective and objective weight determination methods and combine them.

#### 3.2.1. Hierarchical analysis

Hierarchical analysis is a decision-making method that breaks down the decision elements associated with a decision problem into levels such as objectives, guidelines, and options, and the qualitative and quantitative analysis obtained by comparing the elements of each level two by two.

Normalize the elements in A (so that the column vector sum is 1):

$$b_{ij} = \frac{a_{ij}}{\sum_i a_{ij}} \tag{1}$$

Sum the normalized row vectors:

$$V_i = \sum_i b_{ij} \tag{2}$$

Divide the summed vector by n to obtain the weight vector:

$$\omega_i = \frac{V_j}{\sum V_i} \tag{3}$$

#### 3.2.2. Sequential relationship method

The ordinal relationship method is an improved method proposed for the hierarchical analysis method. It is a subjective method of judging the weights without establishing judgment matrices or conducting consistency tests, as it first orders the importance of each indicator.

(1) Determine the order relationship

If evaluation indicator $x_i$ has a degree of importance greater (or not less) than $x_j$ in relation to an evaluation criterion (or objective), it is denoted as $x_i > x_j$.

If evaluation indicator $x_1, x_2, \ldots, x_m$ has the relationship formula: $x_1^* \succ x_2^* \succ \ldots \succ x_m^*$ in relation to an evaluation criterion (or objective), it is said that the evaluation indicator $x_1, x_2, ..., x_m$ has

established a sequential relationship with each other in accordance with " $\succ$ ". This is the $i$ th evaluation indicator $(i=1,2,\ldots,m)$ after the ordering of $\{x_i\}$ according to the relation " $\succ$ ".

For evaluation indicator set $\{x_1,x_2,\ldots,x_m\}$, an ordinal relationship can be established in the following steps:

Step 1: the decision maker selects the one indicator in indicator set $\{x_1,x_2,...,x_m\}$ that is considered to be the most important (with respect to an evaluation criterion), which is denoted as $x_1^*$.

Step 2: The decision maker selects one indicator out of the remaining $m-1$ that he or she considers to be the most important (with respect to an evaluation criterion) and records it as $x_2^*$.

Step 3: The decision maker selects one (only one) indicator out of the remaining $m-(k-1)$ (on an evaluation criterion) that he or she considers to be the most important (on an evaluation criterion) and records it as $x_k^*$.

Step 4: the remaining evaluation indicator after $m-1$ selections is recorded as $x_m^*$.

(2) Give a comparative judgment of the relative importance between $x_{k-1}$ and $x_k$.

Let the expert's rational judgment on the ratio of the importance of evaluation indicators $x_{k-1}$ and $x_k$ be $\omega_{k-1}/\omega_k$:

$$\omega_{k-1}/\omega_k = r_k,\ k=m,m-1,m-2,\ldots,3,2 \tag{4}$$

When $m$ is large, $r_m=1$ can be taken.

Regarding the quantitative constraints between $r_k$, there is the following theorem:

If $x_1,x_2,\ldots,x_m$ has the ordinal relation $x_1>x_2>...>x_n$, then $r_{k-1}$ and $r_k$ must be satisfied:

$$r_{k-1}>\frac{1}{r_k},k=m,m-1,m-2,\ldots,3,2 \tag{5}$$

If the expert gives a rational assignment of $r_k$ satisfying the relation supremum, then $\omega_m$ is:

$$\omega_m=\left(1+\sum_{k=2}^{m}\prod_{i=k}^{m}r_i\right)^{-1} \tag{6}$$

$$\omega_{k-1}=r_k\omega_k,k=m,m-1,\cdots,3,2 \tag{7}$$

### 3.2.3. Entropy weight and coefficient of variation methods

The principle of entropy weight method and coefficient of variation method is similar, both methods are based on the characteristics of the data itself to determine the weights, which can avoid human subjective judgment and belong to the method of objective judgment of weights.

The calculation steps of entropy weight method are:

(1) Data standardization

Standardize the data of each index.

Suppose that $k$ indicator $X_1,X_2,\ldots X_k$ is given, where $X_i=(x_1,x_2,\ldots,x_n)$. Suppose that the data for each indicator is normalized to have a value of $Y_1,Y_2,...,Y_k$, then:

$$Y_{ij}=\frac{x_{ij}-\min(X_j)}{\max(X_j)-\min(X_j)} \tag{8}$$

(2) Find the information entropy of each indicator

According to the definition of information entropy in information theory, the information entropy of a set of data:

$$E_j=-\ln(n)^{-1}\sum_{i=1}^{n}p_{ij}\ln p_{ij} \tag{9}$$

Among them:

$$p_{ij} = Y_{ij} / \sum_{i=1}^{n} Y_{ij} \tag{10}$$

Defined if $p_{ij} = 0$ :

$$\lim_{p_{ij} \to 0} p_{ij} \ln p_{ij} = 0 \tag{11}$$

(3) Determine the weight of each indicator

According to the formula of information entropy, the information entropy of each indicator can be calculated as $E_1, E_2, ..., E_k$ . The weight of each indicator is calculated by information entropy:

$$W_i = \frac{1 - E_i}{k - \sum E_i} (i = 1, 2, \ldots, k) \tag{12}$$

Coefficient of variation method: The coefficient of variation refers to the "rate of standard deviation", which is another statistic that quantifies the degree of variability of individual observations in the given data. When comparing the degree of variability of two or more data, if the unit of measure is the same as the mean, the standard deviation can be used directly for comparison. If the unit and/or the mean are different, the standard deviation cannot be used to compare the degree of variability, but rather the ratio of the standard deviation to the mean (relative value).

### 3.2.4. Combined weights

Considering subjective and objective factors comprehensively, this paper establishes an optimization function for obtaining the combined weights, and uses the particle swarm algorithm to find the optimal solution. Its basic idea is to assign a corresponding weighting coefficient to the weights obtained by the above four different methods, and combine them into a new weight, so that the sum of deviations between this new weight and the weights obtained by the four different methods is minimized.

The optimization function is as follows:

$$Min\ f(W) = \sum_{i=1}^{k} \sum_{j=1}^{l} (w_j - w_{ij})^2 \tag{13}$$

$$s.t. \sum_{i=1}^{k} \theta_i w_{ij} = \sum_{i=1}^{k} \theta_i \tag{14}$$

$$0 \le \theta_i \le 1 \tag{15}$$

$$\sum_{i=1}^{k} \theta_i = 1 \tag{16}$$

In Eq. (14), $\theta_i$ is the weighting factor of the $i$ nd method. $W = (w_1, w_2 \ldots w_j \ldots w_i)$ is the weight of the established combination. $w_{ij}$ is the weight of the $j$ th indicator obtained by the $i$ th method. $k$ is the number of seeking methods. $l$ is the number of indicators. $\theta_i$ is the weighting factor of the $i$ th method. Using particle swarm optimization, the combination weights are obtained by finding the $\theta_i$ that minimizes the objective function.

## *3.3. Indicator empowerment*

This paper adopts the combination assignment method to calculate the weights of the comprehensive budget performance evaluation indicators of university finance. Fifteen experts and scholars in the field of budget management are invited to evaluate the indicators, and 1 to 9 points are assigned, and if one indicator has the same degree of importance as another, it is assigned a value of 1. If one indicator has a higher degree of importance than the other, the score is increased. The opposite is the inverse. Based on the survey data, AHP hierarchical analysis was used to calculate the weight values of the indicators, which were subsequently tested using the ordinal relationship method, entropy weight method and coefficient of variation method, respectively, and the particle swarm optimization algorithm was used to calculate the calculated four weights to arrive at the new combined weights.

The weights of financial comprehensive budget performance evaluation indicators of colleges and

universities are shown in Table 1. In the results of the analysis of the weight value of the financial budget performance evaluation indicators of colleges and universities based on the ABC model, the stochastic consistency ratios of the first-level judgment matrix, the second-level judgment matrix, and the third-level judgment matrix are all less than 0.1, and the judgment matrices pass the test. The weights of the three indicators of budget input link, budget execution process and budget finalization stage are obtained as 0.244, 0.381 and 0.375 respectively. Of the secondary indicators, four indicators, namely, the full budget control rate A10, the overall budget implementation rate A5, the rate of variance between the actual implementation of the full budget and the target cost A11, and the rate of annual variance in the implementation of the budget for total and itemized expenditures A7, have the greatest impact on the assessment of budgetary performance, with the weights of the indicators all being above 0.1.

***Table 1.*** The weight of the overall budget performance evaluation index of the university

| Primary index | Weight | Secondary index | Weight |
|---|---|---|---|
| Budget input | 0.244 | A1 | 0.077 |
| | | A2 | 0.051 |
| | | A3 | 0.075 |
| | | A4 | 0.041 |
| Budget execution process | 0.381 | A5 | 0.107 |
| | | A6 | 0.053 |
| | | A7 | 0.104 |
| | | A8 | 0.048 |
| | | A9 | 0.069 |
| Budget final settlement phase | 0.375 | A10 | 0.121 |
| | | A11 | 0.105 |
| | | A12 | 0.092 |
| | | A13 | 0.057 |

## *3.4. Budget performance evaluation*

In this study, the weighted average method is used to calculate the results of financial and budgetary performance evaluation of universities. In the first step, the weight of each secondary indicator is calculated. The second step is to calculate the average value of each secondary indicator. In the third step, the indicator weights are multiplied by the average value of the indicators and then summed to get the budget management performance level. The finance staff of 30 colleges and universities in a city are invited to rate each third-level indicator using a Likert scale, and the higher the score, the better the actual performance.

Based on the survey data, the average value of each secondary indicator is obtained, and the evaluation results of the secondary indicators of financial budget performance of colleges and universities are shown in Figure 2. The scores of the second-level indicators of financial budget performance of colleges and universities are in the range of 2.67~3.62, which is in the medium and above level. Among the second-level indicators, the evaluation scores of personnel budget expenditure A2, student grants budget expenditure A4, annual work task fulfillment A12 and itemized expenditure budget execution rate A6 are the highest, all above 3 points, which is a good level.

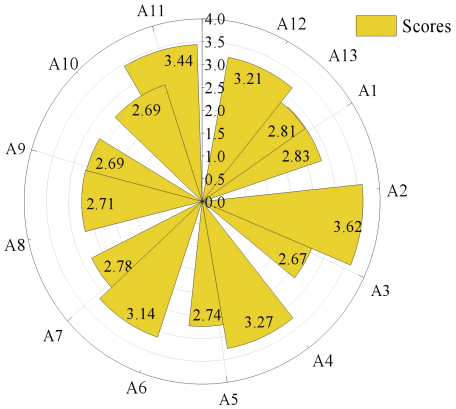


***Figure 2.*** Evaluation results of the budget performance secondary index

The evaluation results of financial budget performance of universities are shown in Figure 3. Calculated based on the ABC model of the university financial budget performance evaluation score of 2.96, slightly lower than the median of the Likert scale of 3, that is, the university financial budget performance is medium level. Among the three level indicators, the scores of budget input link and budget finalization stage are 3.02 and 3.05 points, which are at a good level, and the evaluation result of budget implementation process is 2.84 points, which is at a medium level. In summary, there is still much room for improvement in the comprehensive budget performance management of university finance.

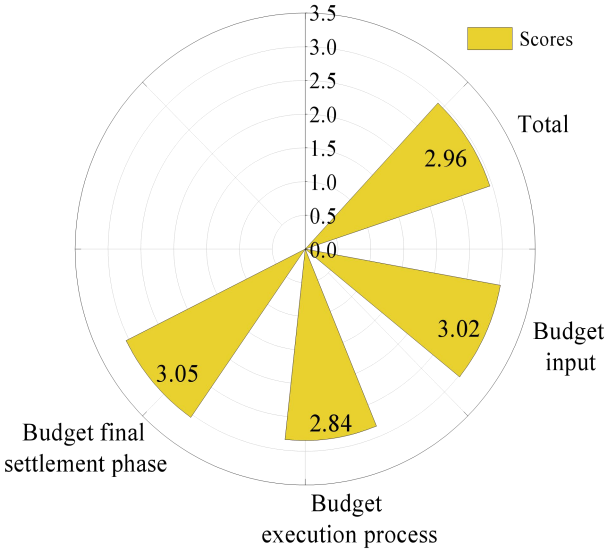


***Figure 3.*** Evaluation results of the performance of the financial budget of universities

## 4. Factors affecting the effective implementation of budget performance management

The practice of financial budget performance management in colleges and universities has achieved initial results, but there are also many problems that the core utility of budget performance management has not been fully realized. However, the implementation of budget performance management is a systematic and complex project, will be affected by a variety of factors, and there is also a complex relationship between the factors. Therefore, this chapter explores the factors affecting the effective implementation of comprehensive budget performance management in higher education finance, using structural equation modeling method to carry out empirical analysis.

### *4.1. Research methodology*

#### 4.1.1. Structural equation modeling

Structural equation modeling allows for the simultaneous analysis of a set of equations with interrelationships, especially those with causal relationships. In this paper, it is used to explore the influencing factors of financial comprehensive budget performance management in universities. Structural equation modeling has two basic modes: structural mode and measurement mode.

Structural equation: $\eta = B\eta + \Gamma\xi + \varsigma$ .

In the equation $\xi$ is the matrix of potential exogenous variables (potential independent variables), $\eta$ is the matrix of potential endogenous variables (potential dependent variables), $\Gamma$ is the matrix of structural coefficients, which represents the effect of the matrix of potential independent variables $\xi$ on the matrix of potential dependent variables $\eta$ in the structural model, $B$ is the matrix of structural coefficients, which represents the interactions among the constituents of the matrix of potential dependent variables $\eta$ in the structural model, and $\varsigma$ is the residual matrix of the structural equation.

The measurement model describes the relationship between the latent variables $\eta,\xi$ and the measured variables $y,x$ .

Measurement equation: $Y = \Lambda_y \eta + \varepsilon$ .

Where $Y$ is the matrix of measured variables for $\eta$, $\Lambda_y$ is the matrix of measured coefficients which represents the relationship between the matrix of potential endogenous variables (potential dependent variables) $\eta$ and their measured variables $Y$, $\eta$ is the matrix of potential endogenous variables (potential dependent variables), and $\varepsilon$ is the matrix of residuals from the measurement equation.

Measurement equation: $X = \Lambda_x \xi + \delta$ .

In the equation, $X$ is the matrix of measured variables for $\xi$, $\Lambda_x =$ is the matrix of measured coefficients, which represents the relationship between the matrix of potential exogenous variables (potential independent variables) $\eta$ and their measured variables $\chi$, $\xi$ is the matrix of potential exogenous variables (potential independent variables), and $\delta$ is the matrix of residuals from the measurement equation.

### 4.1.2. PLS modeling approach

Among the modeling techniques for structural equation modeling, Partial Least Squares (PLS) modeling approach is based on partial least squares path modeling method.

The main purpose of partial least squares regression is to explain the linear regression model of the latent variable $X$ about the response latent variable $Y$, that is, to build a linear model form $Y = XB + E$, where $Y$ is a $n \times m$ -dimensional matrix, $X$ is a $n \times p$ -dimensional matrix, $B$ is a $p \times m$ -dimensional matrix of regression coefficients, and $E$ is an $n \times m$ -dimensional random disturbance term. There are various methods for extracting latent variables from explanatory and response variables, such as principal component method, iterative method, and SVD method. One of the more efficient algorithms is the iterative method, in which the nonlinear iterative partial least squares (NIPALS) method is used.

The nonlinear iterative partial least squares method can be performed in the following steps:

(1) First, the explanatory variable observation matrix $X$ and the response variable observation matrix $Y$ are transformed by normalization, and the transformed matrices are denoted as $V$ and $U$ respectively, which are used as the initial matrices of the iteration, denoted as $V_{(1)}$ and $U_{(1)}$ .

(2) Calculate the weight vector $\omega_k$ in step $k$, and $\omega_k$ is the eigenvector corresponding to the largest eigenroot of $V_{(k)}^{'} U_{(k)} U_{(k)}^{'} V_{(k)}$ .

(3) Compute the $k$ th vector of explanatory latent variables $t_{(k)}, t_{(k)} = V_{(k)} \omega_k$ .

(4) Calculate factor loadings $p_{(k)}$ and $q_{(k)}$ for the extracted explanatory latent variables and response latent variables in step $k$ :

$$\begin{aligned} p_{(k)}^{'} &= (t_{(k)}^{'} t_{(k)})^{-1} t_{(k)}^{'} V_{(k)} \\ q_{(k)}^{'} &= (t_{(k)}^{'} t_{(k)})^{-1} t_{(k)}^{'} U_{(k)} \end{aligned} \tag{17}$$

(5) Calculate residuals $V_{(k+1)}$ and $U_{(k+1)}$ in the $x$ and $x$ spaces of step $k+1$ :

$$\begin{aligned} V_{(k+1)} &= V_{(k)} - t_{(k)} p_{(k)}^{'} \\ U_{(k+1)} &= U_{(k)} - t_{(k)} q_{(k)}^{'} \end{aligned} \tag{18}$$

(6) Calculate the predicted residual sum of squares PRESS.

(7) If $PRESS_{(k)} - PRESS_{(k-1)}$ is less than the predetermined precision, then go to the next step. Otherwise, return to step 2 and continue iteration.

(8) If the iteration stops at step $m+1$, then create $U$ a linear regression equation about $V$ :

$$U = t_{(1)} q_{(1)}^{'} + t_{(2)} q_{(2)}^{'} + \cdots t_{(m)} q_{(m)}^{'} = V\beta \tag{19}$$

where $\beta = \sum_{i=1}^{m} \left[ \prod_{j=1}^{i \cdots 1} (I - \omega_{(j)} p_{(k)}^{'}) \omega_{(i)} q_{(i)}^{'} \right]$.

(9) The regression equation of response variable $Y$ on explanatory variable $X$ is obtained by inverse standardized transformation.

## *4.2. Research hypothesis and conceptual model*

There are three main factors affecting the implementation of budget performance management, namely, environmental factors, capacity factors and process factors. Among them, the environmental factors are further subdivided into administrative support and performance culture, the capacity factors are subdivided into the conditions of basic resources and the level of performance-related competence, and the process factors mainly refer to the actual operational process of the main body of the implementation of budget performance management (hereinafter referred to as the "implementation process"). Comprehensive existing research and theoretical analysis, this paper makes the following hypotheses on the specific influence path of each factor:

H1a: Administrative support has a positive effect on the implementation process.

H1b: Administrative support has a positive influence on performance culture.

H1c: Administrative support has a positive influence on the conditions of basic resources.

H2a: Performance culture has a positive influence on performance-related competencies.

H2b: Performance culture has a positive influence on implementation processes.

H2c: Performance culture has a positive effect on budget performance management implementation effectiveness.

H3a: Basic resource conditions have a positive effect on implementation processes.

H3b: Performance-related capabilities have a positive effect on the implementation process.

H3c: Basic resource conditions have a positive effect on performance-related capabilities.

H4: The implementation process has a positive influence on the implementation effect of budget performance management.

Combining the above analysis, the conceptual model of the factors influencing the effective implementation of budget performance management is shown in Figure 4.

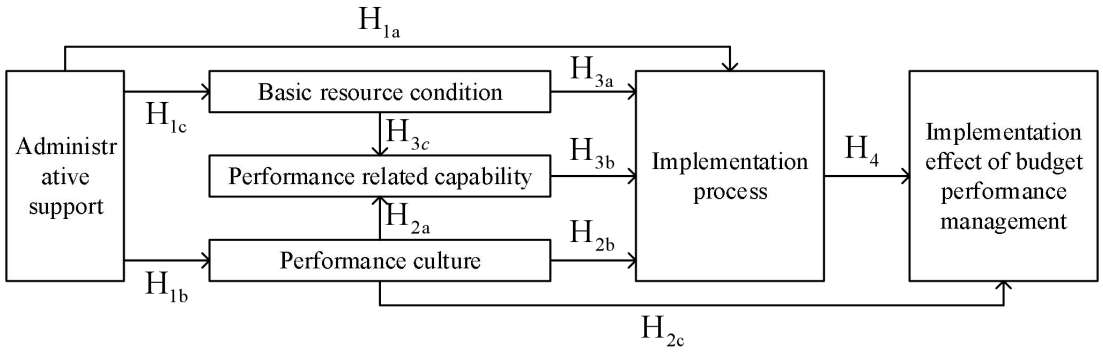


***Figure 4.*** The model of effective implementation of budgetary performance management

## *4.3. Questionnaires*

According to the above conceptual model, the corresponding measurement indicators were designed for each latent variable, on the basis of which a complete questionnaire was formed, and the questionnaire was in the form of a five-level Likert scale. The questionnaire survey on the financial department personnel of 15 universities in a city to participate in the meeting and e-mail-based, the questionnaire recovered a total of 127, a total of 109 valid questionnaires, the effective recovery rate of 85.83%, the questionnaire scale reliability and validity of the determination of the indexes basically meet the standard.

## *4.4. Model fitting and analysis of results*

### 4.4.1. Model fitting results

Structural equation modeling of the factors influencing the effective implementation of financial and budgetary performance management in universities was established using AMOS 21.0 and fitted using the PLS method. The model fit evaluation indexes are shown in Table 2. The $\chi^2$ /df is 1.032, which is less than the critical value of 3, CFI = 0.925, IFI = 0.941, which are all greater than 0.9, and the remaining three indicators, NFI, RMSEA and RMR, are also within the acceptable range, which indicates that the model has a good overall fit.

***Table 2.*** Model fitting evaluation index

| Fit index | Critical value | Model fitting index | Judgment |
|---|---|---|---|
| $\chi^2$/df | <3 | 1.032 | Good |
| NFI | >0.9 best, >0.85 acceptable | 0.826 | Acceptable |
| CFI | >0.9 best, >0.85 acceptable | 0.925 | Good |
| IFI | >0.9 best, >0.85 acceptable | 0.941 | Good |
| RMSEA | <0.05 best, <0.08 better fit | 0.033 | Good |
| RMR | <0.05 best, <0.1 acceptable | 0.061 | Acceptable |

### 4.4.2. Parameter estimation results

The path coefficients of the structural equation model are shown in Table 3, with *** indicating significance at the 1% level. The two influence paths "administrative support → implementation process" (p=0.235) and "performance culture → implementation process" (p=0.587) are not significant, i.e., administrative support and performance culture do not have a direct impact on the budget performance management implementation process. The remaining eight influence paths are all significant at the 1% level.

***Table 3.*** The path coefficient of the structural equation model

| Influence path | Unnormalized coefficient | Normalized coefficient | S.E. | C.R. | P |
|---|---|---|---|---|---|
| Implementation process← administrative support | 0.382 | 0.207 | 0.025 | 5.486 | 0.235 |
| Performance culture← administrative support | 0.519 | 0.825 | 0.044 | 2.178 | *** |
| Basic resource conditions← administrative support | 0.361 | 0.514 | 0.059 | 5.057 | *** |
| Performance related ability← performance culture | 0.737 | 0.709 | 0.055 | 4.583 | *** |
| Implementation process← performance culture | 0.452 | 0.214 | 0.02 | 2.522 | 0.587 |
| Implementation effect - performance culture | 0.865 | 0.685 | 0.054 | 3.687 | *** |
| Implementation process← basic resource conditions | 0.236 | 0.276 | 0.043 | 6.127 | *** |
| Implementation process← performance related ability | 0.517 | 0.633 | 0.049 | 3.885 | *** |
| Performance related ability← basic resource conditions | 0.259 | 0.259 | 0.05 | 5.559 | *** |
| Implementation effect← implementation process | 0.531 | 0.386 | 0.031 | 4.224 | *** |

The standardized impact coefficients among the latent variables, including direct effect, indirect effect and total effect, are collated to verify the previous research hypotheses. The standardized path influence effects among the latent variables are shown in Table 4. Taking administrative support as the independent variable, its direct effects on performance culture and basic resource conditions are 0.825 and 0.514, with significant positive effects at the 1% level, and hypotheses H1b and H1c are verified. Its effect on performance-related competencies and budget performance management implementation process has no direct effect but only indirect effect and hypothesis H1a is not valid. Similarly, administrative support has only indirect effect on the final implementation effect of financial budget performance management in universities.

The direct effect of performance culture on performance-related competencies was 0.725, which is a significant positive effect at the 1% level, and hypothesis H2a was tested. Performance culture has both direct and indirect effects on the effectiveness of the implementation of budgetary performance management, with a direct effect of 0.685, which is significantly positively correlated at the 1% level, and the hypothesis H2b is verified, while the indirect effect is 0.189 and the total effect reaches 0.874. Performance culture has no direct effect on the budget performance management implementation process and hypothesis H2c is not valid.

Both basic resource conditions and performance-related capabilities have a significant direct effect

on the implementation process, with impact coefficients of 0.276 and 0.633, respectively, and H3a and H3b are validated. Basic resource conditions have a significant direct effect on performance-related capabilities with an impact coefficient of 0.259, and hypothesis H3c is tested. Among other things, there is also an indirect effect of base resource conditions on the implementation process with a total effect of 0.433.

The implementation process has a positive effect on the effect of budget performance management implementation, with an impact coefficient of 0.386, which is significant at the 1% level, and hypothesis H4 is verified.

***Table 4.*** The effect of standardized paths between different creep variables

| Variable relation | Direct effect | Indirect effect | Total effect |
|---|---|---|---|
| Implementation process←administrative support | --- | 0.601 | 0.601 |
| Performance culture← administrative support | 0.825 | --- | 0.825 |
| Basic resource conditions← administrative support | 0.514 | --- | 0.514 |
| Performance related ability← administrative support | --- | 0.725 | 0.725 |
| Implementation effect← administrative support | --- | 0.804 | 0.804 |
| Performance related ability← performance culture | 0.709 | --- | 0.709 |
| Implementation process← performance culture | --- | 0.428 | 0.428 |
| Implementation effect - performance culture | 0.685 | 0.189 | 0.874 |
| Performance related ability← basic resource conditions | 0.259 | --- | 0.259 |
| Implementation process← basic resource conditions | 0.276 | 0.157 | 0.433 |
| Implementation effect← basic resource conditions | --- | 0.168 | 0.168 |
| Implementation process← performance related ability | 0.633 | --- | 0.633 |
| Implementation effect← performance related ability | --- | 0.253 | 0.253 |
| Implementation effect← implementation process | 0.386 | --- | 0.386 |

## 5. Strategies for optimizing the overall budget performance of university finance

Through the previous analysis of the factors affecting the assessment of financial comprehensive budget performance management and the implementation of budget performance management in colleges and universities, the roles of administrative support, performance culture, basic resource conditions, and performance-related capabilities on the financial budget performance of colleges and universities are explored. Based on this, the optimization strategy of financial comprehensive budget performance of colleges and universities is discussed under the government accounting system. The optimization strategy of financial comprehensive budget performance of colleges and universities is shown in Figure 5, which is divided into five dimensions.

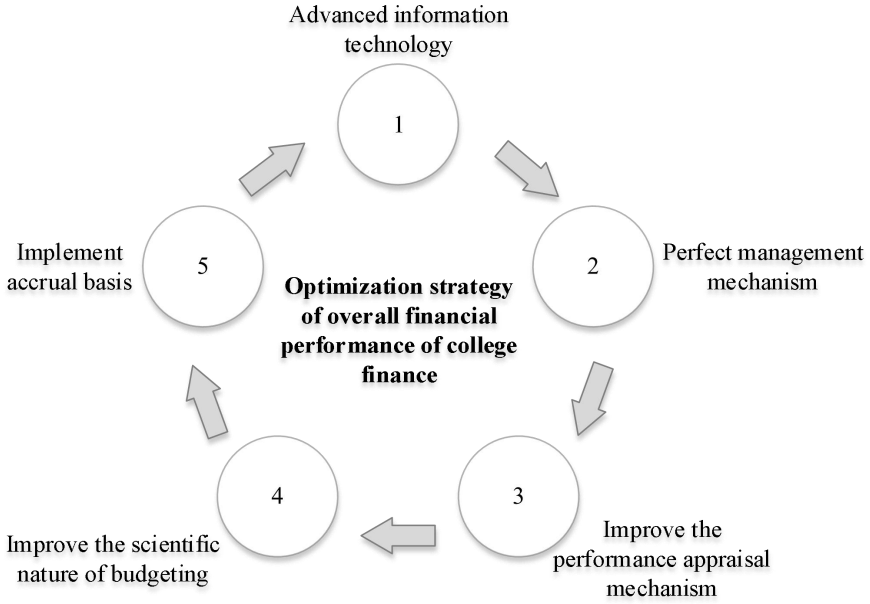

***Figure 5.*** Optimization strategy of overall financial performance of college finance

### *5.1. Application of advanced information technology*

Under the government accounting system, the financial departments of universities can realize the collaborative management of digital finance, performance management system, financial supervision system and so on through the application of advanced information technology, promote the sharing and efficient use of information resources, and further improve the feasibility, compliance and accuracy of comprehensive budget management.

### *5.2. Improvement of regulatory mechanisms*

(1) Establishing a project-focused budget management system to ensure the accuracy and effectiveness of budget management, and the process and results of budget execution will be fully recorded and tracked in real time, which will help improve the transparency of budget execution.

(2) Develop a perfect risk management system. For example, for the new special funds, it is necessary for the financial departments of universities to further refine the audit conditions from the perspectives of legal compliance and feasibility of the project, in order to prevent the special funds from being abused. In addition, it should also regularly clean up projects that have expired, recover idle funds in a timely manner, and reallocate them to other projects to effectively avoid the risk of funds at the same time, optimize the structure of funds, and maximize the efficiency of capital utilization.

(3) Develop a fair reward and punishment system. Comprehensive consideration should be given to the time limit for budget issuance, budget transfers, recovery of the budget and budget expenditure progress management and other aspects. In addition, the institutions should also strictly implement the reward and punishment system.

### *5.3. Sound performance appraisal mechanisms*

Improving budget assessment indicators and sound performance evaluation mechanisms not only help to improve the efficiency of budget implementation, but also help to optimize the allocation of financial resources. Firstly, the whole process of pre-assessment, monitoring and post-evaluation should be implemented. Second, improve budget assessment indicators through unit self-assessment, departmental self-assessment and financial evaluation. Once again, double monitoring of the completion of project expenditure performance objectives and budget execution progress, and sound performance appraisal mechanism. Finally, the financial support for projects that do not meet the performance appraisal standards has been canceled in order to improve the efficiency of resource allocation and the effectiveness of funds.

### *5.4. Improving the science of budgeting*

The financial departments of colleges and universities should correctly recognize the importance of the budget for financial management and decision-making, and combine the actual needs of the project to prepare the budget to ensure the rationality and effectiveness of budgeting. Reasonable planning of the limited budget, reasonable allocation of funds according to the funding needs of different projects, innovative budget management model and optimization of the budgeting process.

### *5.5. Implementation of accruals*

The accrual system requires the financial departments of colleges and universities to make timely entries when rights and obligations occur, so as to ensure the authenticity, timeliness and comprehensiveness of financial information. In the process of financial fund management, the implementation of the accrual system can prevent the misuse or waste of financial funds and ensure that they are effectively utilized.

## 6. Conclusion

Based on the demand for comprehensive budget performance improvement of university finance, the budget performance evaluation index system is constructed under the perspective of ABC model, and the weight value of the indexes is calculated by using the combination assignment method, and the level of budget performance management of university finance is evaluated. Then build the conceptual model of influencing factors, use the structural equation model to explore the influence of each potential variable on the effective implementation of college financial comprehensive budget performance management, and finally put forward the comprehensive budget performance optimization

strategy.

The budget implementation process makes the greatest contribution to the evaluation of college financial budget performance, with a weight of 0.381. The financial comprehensive budget performance management of the sample colleges and universities is at a medium level, with an evaluation score of 2.96 points. The evaluation scores of specific indicators are between 2.67 and 3.62, which are located in the medium and good level. Overall, the management level of financial comprehensive budget performance of universities is still to be optimized.

Administrative support, performance culture, basic resource conditions, performance-related capabilities and implementation processes all have a significant direct or indirect impact on the implementation effect of budget performance management, and the implementation effect of budget performance management is the result of the combined effect of these influencing factors. Among them, the total effect of performance culture (0.874) and administrative support (0.804) is the largest, the implementation process is the second largest (0.386), and the last is the performance-related ability (0.253) and basic resource conditions (0.168).

The government accounting system has a profound impact on the comprehensive budget management of university finance, and universities should apply advanced information technology, improve the management mechanism, improve the performance evaluation mechanism, improve the scientific nature of budgeting, and implement the accrual system to continuously meet the requirements of the government accounting system and optimize the level of budget performance management.

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