Application Research of Standard Cost Method in Multiple Material Situations

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Abstract: Standard cost method is an indispensable part of management accounting system. Standard cost method is a new method that adapts to the idea of scientific management. However, domestic analysis of the difference of standard cost method is too simplistic and cannot meet the cost. In order to meet the needs of management, this paper tries to provide a more practical analysis system to meet the needs of cost management by establishing the difference index and model derivation for the raw material analysis of standard cost method.

1. The origin of the standard cost method and the significance of this study

Management accounting has gone through the cost accounting stage (1920-1950), and the modern management accounting stage (1950-1990) is now in the “postmodern management accounting stage”. The standard cost method is one of the important components of the management accounting system. The standard cost method is a cost control system that establishes the standard cost, compares the standard cost with the actual cost to obtain the cost difference, and analyzes the factor of the cost difference, thereby strengthening the cost control.

The standard cost method was born in the 1920s. The "father of management" Taylor introduced science and standardization into management in its "Scientific Management Principles", emphasizing that standardized management methods should replace empirical management. Accounting is to serve the economic development, and the standard cost method is produced in this context. In 1919, the National Association of Cost Accountants was established, which further promoted the application of standard costs. By 1930, the American accounting community incorporated it into the accounting system, making it a true standard cost accounting system.

In the past 100 years, new methods of management accounting have emerged, and the research field has shifted from the initial post-event analysis to the advance prediction. In various areas of management accounting, such as the quantitative analysis of “quantity and profit analysis”, “performance evaluation”, “operational forecast”, and internal control”, inventory decision “has been developed. For example, this quantitative analysis can be used as a value. The way of analysis (Liu Xiaoyi, 2018), the application of this quantity has been extended to the evaluation of enterprise value [1]. The research field of performance evaluation has expanded from traditional manufacturing industries such as home appliance enterprises (Feng Lezhu, 2018) to government functions such as At the level of the judges of the People's Court (Xie Liang, 2018), his research methods have also expanded from the initial traditional simple indicator analysis to the current complex “research on the performance evaluation system based on the combination of EVA and BSC.” Internal control has developed to “the return of nature” With the integration of internal control "[2] and the earliest origin of the standard cost method" in recent years, there are few studies, most of which are concerned with the application of its methods, for example, Mais Farkas in "modern watchmaking industry about the actual cost of the three methods The application of law, standard cost method, and variable cost method is still concerned with

the application of the method itself [3]; A Nura De Zoysa examined and analyzed the standard cost method for adaptability in the "Standard Cost Method in Japanese Enterprises" [4]. It can be seen that in the past 20 years, there has been little further research on the method itself. At present, the theory of standard cost method is too simple, and the method is too single to meet the requirements of management. In fact, standard cost method is the earliest part of management accounting content. With the improvement of business complexity, standard cost method should adapt to its development. The application of the method and the refinement of the model are further refined to meet the needs of management. The core content of the standard cost method includes four aspects, raw material difference analysis, artificial difference analysis, variability manufacturing cost difference analysis and fixed manufacturing cost difference. This paper only selects the application of standard cost method in raw materials to analyze and try to construct a convenient way in material difference analysis to meet the needs of differential analysis and cost control.

2. The theoretical basis of the procedure and material analysis of the standard cost method

The procedure of the standard cost method is: first, we must set standards for the products, and formulate material standards, manual standards, variability manufacturing cost standards, and fixed manufacturing cost standards according to the components of the product cost. Second, organize the factory to process and produce according to the standard. Then the actual cost is collected. A difference analysis is performed based on the standard cost and actual cost data. Finally, the accounting treatment under the standard cost method is carried out. Material differences are broken down into quantity differences and price differences in material analysis. The difference in quantity is the difference in the amount of material used, and the price difference is the difference between the standard unit price of the raw material and the actual unit price. In order to illustrate the difference between the standard cost method analysis and the raw material differences, see the following figure:

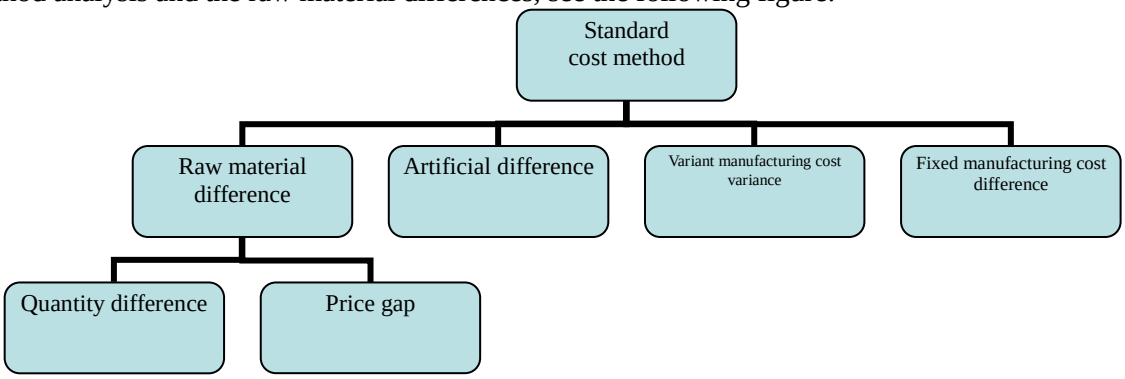

Figure 1 Standard cost method difference composition chart

According to the standard cost method principle, the difference is equal to the difference between the actual cost and the standard cost, that is, the difference = the actual cost - the standard cost. The total difference can be further decomposed into quantity difference and price difference. For raw materials, quantity difference = (actual consumption - standard consumption) unit price standard; price difference = (actual unit price - unit price standard) × actual material consumption. The analytical method used is factor analysis. So how do you understand the standard cost? The understanding of standards in the application of standard costing is a key issue. In order to deepen the understanding of the standard cost, see the following information 1.

Information 1

A company plans to produce 100 products in a certain month, and the actual production volume is 110. According to the average cost in 5 years, the cost standard for the product is 100 yuan. The actual total cost for this month was 11,110 yuan. The data is organized as shown in Table 1:

Table 1 Production and cost table

Project	Plan（a）	Elasticity（b）	Actual（c）
Production Q	100	110	110
Unit cost C/U	100	100	101
Total cost TC	10,000	11,000	11,110

Total difference = actual - plan = actual cost - elastic cost + elastic cost - planned cost = [c-b] + [b-a] = elastic difference + static difference.

Total difference: 11110-10,000=1110, where b-a static difference = 1000, c-b = elastic difference = 1010; total difference = 1000 + 110.

The standard cost method is actually a way to analyze the difference in elasticity. The difference between the actual cost under actual use and the standard cost under actual variable.

According to the above formula, the elasticity difference = the actual cost - the elastic cost, can also be understood as the actual cost - the standard cost. For ease of analysis, all of the following differences in elasticity, the difference between actual cost and standard cost, are replaced by differences. Then analyze the difference between the two and analyze the difference according to the factor analysis method. Taking materials as an example, the basic theory is:

Actual cost = actual material quantity × actual material unit price (3)

The material cost under actual usage reflected in the standard unit price is:

Actual material consumption × unit price standard (2)

The material cost measured by standard dosage and unit price standard is

Standard cost = standard consumption × unit price standard (1)

Price difference: (3)-(2)=(actual unit price-unit price standard)×actual amount;

Difference in dosage: (2)-(1)=(actual dosage-standard dosage)×unit price standard

3. Difference analysis in multi-material context

According to the principle of material difference analysis under the standard cost method above, material analysis can be analyzed as price difference and usage (or efficiency) difference. How to apply this analysis method when a product uses many different materials? First, build a model based on the basic principles, and verify the model, and then give a case for analysis.

3.1. Difference system

The difference in materials is the difference between the actual cost and the standard cost. According to the previous analysis, it can be seen that the difference in materials can be divided into efficiency difference and price difference, which is

Poor efficiency = (actual amount - standard dosage) × standard unit price, price difference = (actual unit price - standard unit price) × actual amount. Under the multi-material difference analysis, it can also be divided into price difference and efficiency difference. Since the product production uses a variety of materials, the efficiency difference can be divided into output difference and combination difference, and the price difference can be divided into price differences of different materials. The difference system diagram is shown in figure 2.

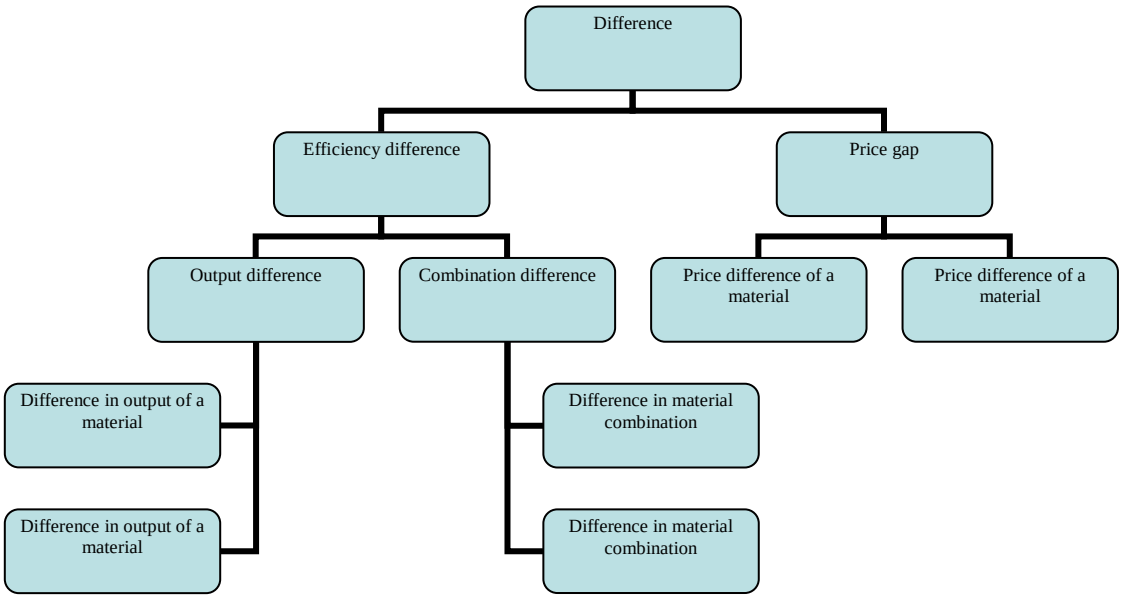

Figure 2 Difference system diagram

3.2. Model establishment

Under a variety of materials, differences can be broken down into efficiency differences and price differences, first analyzing efficiency differences.

3.2.1. Establishment of efficiency difference model

Poor efficiency = Σ (the actual amount of a material - the standard amount of a material) × The standard unit price of the material.

According to the basic formula of the difference in efficiency, it can be further decomposed into output differences and combination differences.

Output difference = (actual usage - standard consumption) × average standard unit price, output difference is further decomposed according to the consumption of materials into their respective output differences, that is, the difference in output of a material = (actual usage - standard dosage) × Material standard dosage proportion × standard material unit price; combination difference = (actual average unit price - standard average unit price) × actual dosage. The difference in composition is further broken down into the combined differences of the various materials. The difference in material combination = (the actual specific gravity of a material - the specific gravity of a material) × the standard unit price of a material × the actual amount.

According to the efficiency difference formula, the efficiency difference = (actual amount - standard dosage) × standard unit price, when a variety of materials are used, the actual amount and the standard amount are the total consumption index of multiple materials, and the unit price should be the average unit price, assuming the premise The two materials are of the same nature and can be substituted for each other in quantity.

Then the difference in efficiency = (actual total usage - standard total usage) × the average standard unit price of the material. In order to facilitate the establishment of the model, indicators are replaced by symbols. See Table 2 below:

Table 2 Symbol meaning table

Material name	Standard dosage	Standard unit price (standard unit cost)
A	ma	pa
B	mb	pb

First, calculate the average standard unit price of the material.

Calculating the average unit cost according to Table 2 can be expressed as:

$$\frac{m_a p_a + m_b p_b}{m_a + m_b} = k_a p_a + k_b p_b$$

It can be seen that the average unit cost is expressed as the sum of the ratio of the amount of each material used and the corresponding unit cost. The total cost of the material is expressed as: $(k_a p_a + k_b p_b) \times (m_a + m_b) = m_a p_a + m_b p_b$

Secondly, according to the efficiency difference formula, the efficiency difference = ∑ (the actual amount of a material - the standard amount of a material) × the standard unit price of a material, establish a model. The model building process is as follows:

Table 3 Actual Cost and Standard Cost Table

Variety		The actual amount	Standard unit price	Actual cost	Standard cost	Standard dosage
A		m1	P1	m1P1	n1P1	n1
B		m2	P2	m2P2	n2P2	n2

Efficiency difference = Σ (actual usage - standard dosage) × standard price of a material

A efficiency difference $(m_1 - n_1) \times p_1 = m_1 p_1 - n_1 p_1$

B efficiency difference $(m_2 - n_2) \times p_2 = m_2 p_2 - n_2 p_2$

Subtotal $m_1 p_1 + m_2 p_2 - n_1 p_1 - n_2 p_2$ Formula 1

The above formula, the formula 1 variant:

$$\frac{m_1 p_1 + m_2 p_2}{m_1 + m_2} \times (m_1 + m_2) - \frac{n_1 p_1 + n_2 p_2}{(n_1 + n_2)} \times (n_1 + n_2)$$

Continue to morph, count into a project, and subtract one and the same project to get:

$$\frac{m_1 p_1 + m_2 p_2}{m_1 + m_2} \times (m_1 + m_2) - (m_1 + m_2) \times \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} + (m_1 + m_2) \times \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} - (n_1 + n_2) \times \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$ Formula 2

Its meaning is: average actual cost × actual usage - average standard cost × actual consumption + actual production × average standard cost - standard consumption × average standard cost. Split the formula 2 into two differences, the combination difference and the output difference.

(Average Actual Cost - Average Standard Cost) × Actual Usage = Combination Difference; Average Standard Cost × (Actual Usage - Standard Consumption) = Output Difference

First analyze the difference in output:

$$[(m_1 + m_2) - (n_1 + n_2)] \times \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} = (m - n) \times \frac{n_1}{n_1 + n_2} p_1 + (m - n) \times \frac{n_2}{n_1 + n_2} p_2$$

The difference in output of a material = (actual total amount - standard total amount) × the standard amount of the material × the standard unit price of the material

$$A: (m - n) \times \frac{n_1}{n_1 + n_2} p_1$$

$$B: (m - n) \times \frac{n_2}{n_1 + n_2} p_2$$

Analysis of combination differences

(Average actual cost - average standard cost) × actual total usage

$$\left(\frac{m_1 p_1 + m_2 p_2}{m_1 + m_2} - \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}\right) \times (m_1 + m_2)$$

$$\left(\frac{m_1}{m_1 + m_2} p_1 + \frac{m_2 p_2}{m_1 + m_2} - \frac{n_1}{n_1 + n_2} p_1 - \frac{n_2}{n_1 + n_2} p_2\right) \times (m_1 + m_2)$$

$$\left[\left(\frac{m_1}{m_1 + m_2} - \frac{n_1}{n_1 + n_2}\right) p_1 + \left(\frac{m_2}{m_1 + m_2} - \frac{n_2}{n_1 + n_2}\right) p_2\right] m$$

Combination difference of A materials

$$\left(\frac{m_1}{m_1 + m_2} - \frac{n_1}{n_1 + n_2}\right) p_1 m$$

Combination difference of B materials

$$(\frac{m_2}{m_1+m_2}-\frac{n_1}{n_1+n_2})p_2m$$

That is, the difference in the combination of a material is:

(The actual specific gravity of the material - the standard specific gravity of the material) × the unit price standard of the material × the actual total amount

3.2.2. Price difference model establishment

According to the principle of the second part, the price difference = Σ (the actual unit price of a material - the standard unit price of a material) × The actual amount of a certain material, according to the principle of the factor analysis method, the price difference should be obtained on the basis of the actual amount. The price difference of a material should be based on the difference in material composition and the actual cost instead of its standard cost.

Recalling the difference in the output of a material, the calculation process of the difference in the combination of a material,

The difference in output of a material = (actual amount - standard dosage) × the proportion of the standard amount of the material × the standard unit price of the material, expressed as:（m-n）ki×pi

The difference in material combination = the actual amount × (the actual amount of the material - the standard proportion of the material) × the standard unit price of the material, expressed as: m×(fi-ki) × p

Then the price difference of a material = the actual amount × the actual proportion of the material × (the actual unit price of the material - the unit price of the material), expressed as:

m×fi×(pi'-pi)

Add an indicator to the actual unit cost of the indicator.

The actual amount	Standard dosage	Standard unit price	Standard cost	Actual cost 1	Standard cost 2	Actual unit price
M1	N1	P1	N1P1	M1P1	M1P1'	P1'
M2	N2	P2	N2P2	M2P2	M2P2'	P2'

According to the formula of price difference: material price difference = Σ (actual unit price - standard unit price) × actual use of a material

（p1'-p1）× m1+(p2'-p2) × m2 Formula 3

The formula 3 is deformed, and the molecular denominators of both items are added to m to obtain the following formula.

$$\frac{(p_1'-p_1)m_1}{m}m+\frac{(p_2'-p_2)m_2}{m}m$$

$$m\frac{m_1}{m}\times(p_1'-p_1)+m\frac{m_2}{m}(p_2'-p_2)$$

Its meaning is the actual total amount × the actual amount of a certain material × (the actual unit price of a material - the standard unit price of a material).

Therefore, the price difference of a material can be expressed as: mfi△pi, m is the actual total amount, fi is the actual proportion of the material, and△pi is the unit price difference.

4. Case study

An enterprise produces a red wine and uses two kinds of raw materials, assuming that the two raw materials can be substituted. The information is as follows:

It plans to produce 2,800 bottles and actually produce 3,000 bottles. The material A unit dosage standard is 0.4 kg, and the material B unit dosage standard is 0.6 kg. The actual amount of A material is 1500 kg, and B material is 1200 kg. The actual unit price of material A is 18 yuan, and the actual unit price of B material is 23 yuan. The material price of material A is 20 yuan, and the unit price of B material is 22 yuan. Ask for the difference in the business.

Table 4 Budget Cost Calculation Table

Yield	A material consumption quota	B material consumption quota	Subtotal
2,800 bottles	0.4 kg	0.6 kg	2,800 kg
Plan unit price	20 yuan / kg	22 yuan / kg	/
Budget cost	2,800×0.4×20=22,400	2,800×0.6×22=36,960	59,360

Table 5 Actual cost calculation table

Yield	Actual consumption of material A	Actual consumption of material B	Subtotal
3,000 bottles	1,500 kg	1,200 kg	2,700 kg
Actual unit price	18 yuan / kg	23 yuan / kg	/
Actual cost	27,000	27,600	54,600

Table 6 Total Difference Analysis Table

Material	Actual cost	Budget cost	Difference
A material	27,000	22,400	4,600
B material	27,600	36,960	−9,360
Subtotal	54,600	59,360	−4,760

The difference in the difference analysis table is 4,760 yuan, because it is a difference in production, the budget cost corresponds to 2,800 bottles, and the actual output is 3,000 bottles. Therefore, it is not reasonable and it should be adjusted to the actual output of 3,000 bottles and then compared. The adjustment process is shown in the table below.

Table 7 Post-adjustment difference analysis table

Project	Actual cost (3)	Flexible cost (2)	Budgeted cost (1)
Yield	3,000 bottles	3,000 bottles ←	2,800 bottles
A material	1,500×18=27,000	3,000×0.4×20=24,000	2,800×0.4×20=22400
B material	1,200×23=27,600	3,000×0.6×22=39,600	2,800×0.6×22=36960
Subtotal	54,600	63,600	59,360
Dosage	2,700	3,000	3,000
Average unit cost	20.22	21.2	21.2
Difference	Budget difference	（2）－（1）=63,600－59,360=4,240	
	Flexibility difference	（3）－（2）=54,600－63,600=－9,000	
	Subtotal	－9,000+4,240=－4,760	

Further analysis of the difference in elasticity difference savings 9,000

Flexibility difference = actual cost - standard cost = actual amount × actual unit price - standard amount × standard unit price

The factor analysis method is used as follows: standard dosage × standard unit price a

Standard dosage × standard unit price b

Standard dosage × standard unit price c

Then the difference in elasticity = (b-a) + (c-b)

= (actual usage - standard dosage) × standard unit price + actual consumption × (actual price - standard price)

= efficiency difference + price difference

According to the previous case data, the elasticity difference = -9000. The difference can be further broken down into efficiency differences and price differences.

Efficiency difference = (actual usage - standard dosage) × standard unit price =

(3000×0.5 - 3000×0.4) ×206000

+ (3000×0.4 - 3000×0.6) ×22 - 13200 - 7200

Price difference = (actual cost - standard cost) × actual usage

= (18 - 20) ×3000×0.5= - 3000

+ (23 - 22) ×3000×0.4=1200 - 1800

Total -9000

According to the relationship established in the third part of the principle part, the efficiency difference can be further decomposed into output differences and combination differences. Output difference = (total actual consumption - total standard consumption) × average standard unit price; combination difference = total actual consumption × (average actual unit price - average standard unit price). The unit price calculation process is as follows, see Table 8.

Table 8 Unit cost calculation table

Project	Actual cost 2	Actual cost 1	Standard cost
Yield	3,000 bottles	3,000 bottles	3,000 bottles
A material	15,00×18=27,000	1,500×20=30,000	3,000×0.4×20=24,000
B material	12,00×23=27,600	1,200×22=26,400	3,000×0.6×22=39,600
Cost	54,600	56,400	63,600
Dosage	2,700	2,700	3,000
Average unit cost	20.22	20.888889	21.2

Then the output difference = (2700-3000) × 21.2 = -6360; combination difference = 2700 × (20.88889-21.2) = -839.997 -840 Subtotal, totaling to save the difference of 7200.

According to the third part of principle 3-2, the difference in output and the difference in combination can be further decomposed by material.

Difference in output of a material = (total actual consumption - total standard consumption) × standard weight of the material × standard unit price of the material

The difference in material combination = total actual consumption × (the actual amount of the material - the standard proportion of the material) × the standard unit price of the material. The difference in output and the difference in combination can be obtained for each material. Calculate the difference in output and the difference in composition, and know the proportion of the material. The specific gravity of the material is calculated as follows, see Table 9.

Table 9 Gravity Table

Material	Standard dosage	Specific gravity	The actual amount	Proportion
A	1,200	40%	1,500	55.556%
B	1,800	60%	1,200	44.444%
Subtotal	3,000	/	2,700	/

Then the difference in material cost of A is (2700-3000)×40%×20=-2400; the difference in output of B material is

(2700-3000) × 60% × 22 = -3960, total -6360.The difference in A combination is 2700 × (55.56% - 40%) × 20 = 8400, and the difference in B combination is 2700 × (44.4444% - 60%) × 22 = -9240, and the subtotal is -840. The difference between portfolio and output is -7,200 yuan.

According to the second part of principle 2-3, the price difference can be further decomposed. Price difference = (actual price - standard price) × actual usage, price difference of a material = total actual consumption × actual weight of the material × (the actual price of the material - the standard price of the material). Then, the price difference of the A material is 2700×55.55%×(18-20), which is near about3000, and the price difference of the B material is 2700×44.4444%×(23-22)=1200.

Summarize the difference calculation process as shown below:

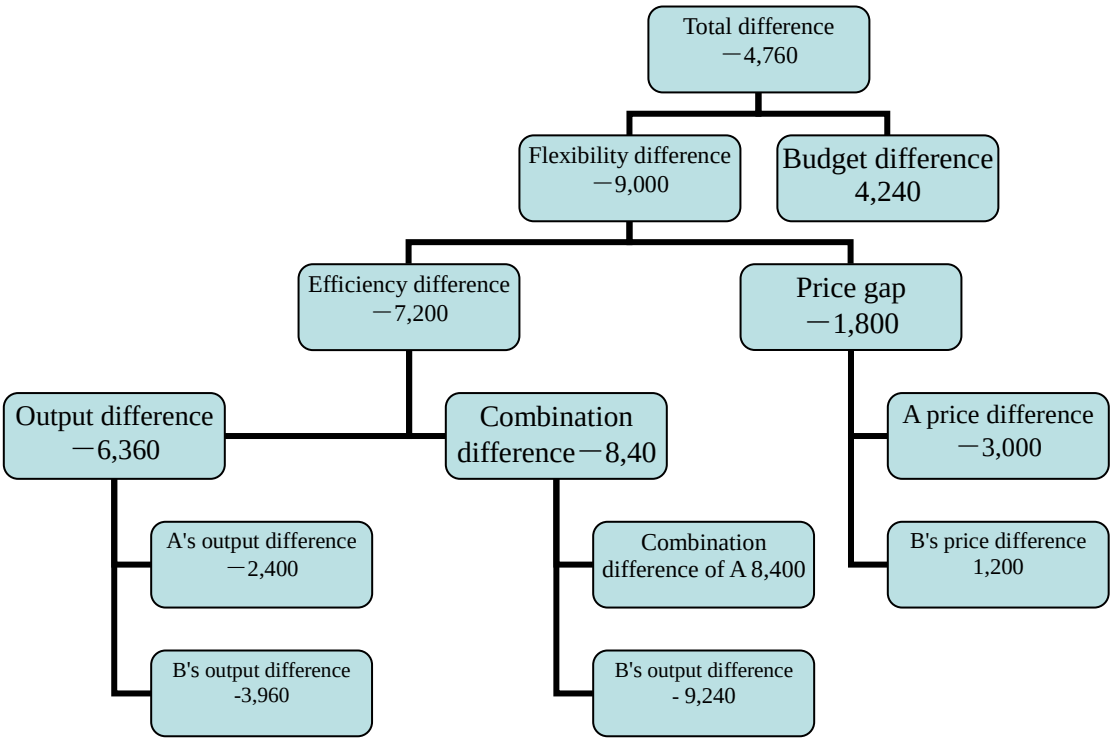

Figure 3 Difference exploded view

5. In conclusion

The application of the standard cost method is appropriate to facilitate cost control and facilitate the promotion of responsible accounting [5]. The standard cost method has a wide range of applications and can be combined with auxiliary production cost accounting [6] to promote auxiliary production costs to occur according to standards and reduce differences. The standard cost method can also be combined with the activity-based costing method [7] to standardize operations. The standard cost method was originally established on the premise of mass production with a single variety or a small variety, and the difference analysis is relatively simple. Material difference analysis is divided into efficiency difference and price difference. With the development of the economy, single material analysis is no longer applicable to enterprise cost control and management. It should be further broken down to the specifics of each material to provide more useful information for the difference analysis. Based on the traditional difference analysis theory, this paper establishes a difference analysis system, then builds the model, and the model is pushed to the argument, and gives detailed cases, which proves that in the multiple materials analysis, the standard can be realized based on the factor analysis method in order to improving cost differences. Of course, there is still a way to go before the standard cost method is promoted in China. At present, the standard cost method has not been included in the current cost accounting system [8]. In some countries, such as the United States, the standard cost method has already been incorporated into the accounting system, which is consistent with the requirements of the external reporting standards. The requirement of convergence of international accounting standards requires that China pay attention to the difference between international accounting treatment, and the inclusion of standard cost method into China's accounting system will also become an expression of international convergence.

Acknowledgments

This paper is supported by Project Title: Special Research Project of the fourth Plenary session of the Twelfth Central Committee of Heilongjiang Province(Title: A study on the Construction of

Management Accounting system for revitalizing the Economic Development of the Old Industrial Base in Heilongjiang Province)

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