Evaluation of Cost Management Controlling System in Petroleum Enterprise

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Abstract: In this paper, for the implementation and supervision of the strategic management, we proposed a model that will evaluate cost management controlling system under various market scenarios in petroleum enterprises. The outlined model classified cost controlling methods into five grades in the different strategy. These methods include origin management, activity improvement, activity chain optimization, value engineering, cost variance analysis, budget management, performance evaluation system and incentive mechanism, quality cost management, funds operation and human capital operation. The model assigned a value to each grade by expert scoring method, and calculated the score of cost management controlling system by formulas. It is the conclusion that if the score > 0, cost management controlling system made positive contribution to strategy; If the score < 0, negative contribution to strategy. The use and benefits of the proposed model are illustrated on a case of The Fourth Oil Extraction Plant of Daqing Oilfield Company Limited.

Keywords: Cost, cost avoidance, cost control, cost management, evaluation.

1. INTRODUCTION

Cost management evaluation is a kind of scientifically value judgment about production and operation, with specific indicators and standards, for cost management objectives and the ultimate goal. It is the core part of cost management controlling system. It sets the direction for supervisors and employees, and lays the necessary foundation for incentive mechanism effective operating. Cost management controlling system evaluation is the integral part of evaluation system, referring to cost management methods.

Research has been continued on cost management controlling system evaluation. There are many a research achievements such as investment center performance evaluation by using indicators including rate of income on investment, residual income, Economic Value Added (EVA) and non-financial indicators in the middle of the 1960s [1]; input and output evaluation by local production efficiency, complete production efficiency, operating production efficiency and process production efficiency in the middle of the 1980s [2, 3]; activity performance evaluation by business processes value analysis from three respects including efficiency, quality and time in the early 1990s [4-8]; strategic cost management evaluation by Balanced Scorecard Card (BSC) in the end of the 20th century [9]. The thinking of cost management performance evaluation was summarized by Professor Xuying Yu in 1994 [10]. Cost management process evaluation was put forward by Professor Heai Huang in 1998 [11]. A model of comprehensive evaluation on cost management level was proposed by Professor Xijiang Guo in 1999 [12]. An integrated evaluation method was provided by Professor Qiaogen Feng in 2002 [13]. It is proposed that matching cost management with enterprise management strategies should be applied to cost management evaluation [14].

Many defects exist in the current methods, such as overgeneralization and lack of the guidance to the enterprise market competition. The evaluation of cost management controlling system has the function of evaluating the enterprise cost management level comprehensively and promoting the process of cost management application in enterprises and marketing.

2. COMPONENT ANALYSIS OF COST MANAGEMENT CONTROLLING SYSTEM

Controlling system contains all of the cost management activities except cost calculation. It consists of two levels, cost avoidance and cost control. Cost avoidance is to cost as little as possible in activities, and then avoid the unnecessary costs. Cost control is to increase the availability of cost, which is inevitable. In this paper, we will analyze cost management controlling system at two levels above.

2.1. Cost Avoidance

Based on the definition of cost avoidance and the characteristics of various cost management methods, we should summarize cost avoidance methods as shown below.

1) Origin management: Origin management is to focus administration on the origins of the costs in daily management and to emphasize the supervision of the origin. The origins of costs include time origin, space origin and operation procedure. The basic conditions of costs are situated on the intersection of origins above. They are the nature of the economic resources which could be utilized and the connections between each other. They consist of the technical performance of means of labor, the quality...
standard of object of labour, the skill and quality of labourer, technical standard of products, organizational structure of enterprise, segregation of duties, management system, corporate culture and key external relationships. To improve the basic conditions of costs could reduce costs continuously. It is fundamental.

2) Value Engineering: Value Engineering is a kind of management technology and a method of thought. It contains a series of organized activities which focuses on function analysis, in order to achieve the necessary function of products and operations stably at the lowest cost. The main ideas of Value Engineering are to extract the maximum products value at the minimum costs, to reduce cost by functional analysis and to get rid of “surplus quality” and “exorbitant cost” by value analysis [15]. From the perspective of the cost avoidance, application of Value Engineering in Target Costing, VE consists of marketing value engineering presenting products information based on originality, designing value engineering controlling improvement by feasibility analysis and optimum analysis and manufacturing value engineering improving continuously in the process of manufacturing.

3) Activity improvement: Activity refers to the process of resource consumption in order to provide certain products or services within an organization. We call resource consumption in the activities activity cost. The completion of activities should consume resources so that products value would be given. Value following the product would be transferred to the next activity. It is repeated in order to promote manufacturing process, until the final process were completed and product was sold to consumers. It shows that product manufacturing process, known as process of valuing, contains products consuming activities and activities consuming resources [16]. In activity based cost management, activities are divided into value-added and non-value-added, maximizing value-added efficiency has the roles to avoid cost. Consequently, activity improvement by any means to maximize value-added efficiency is the embodiment of cost avoidance.

4) Activity chain optimization: Resources are consumed continuously in the production operation. As long as resources are consumed, the activities are there [17]. Some activities could be combined into one in order to simplify the calculation. The production can be recognized as the transfer between activities. So activities costs could be divided into the cost in activities and the cost between activities. In some cases, the cost in activities is not high, not waste and even considerable saving, nevertheless most is consumed in the transmission [18]. Thus, the reasonable arrangement for the transmission between activities and to reduce or even eliminate the transmission are effective methods of cost avoidance. Macroscopically speaking, from the perspective of value chain, value chain is activity chain. It is an inconvenient truth that cost avoidance could be achieved by optimizing the value chain [19]. Therefore, this article classified value chain optimization as activities chain optimization.

5) Other methods of cost avoidance: In addition to the cost avoidance methods above, common methods include the rational use of capital and human resource. Capital plays a very important role in daily business. We can streamline capital utilization, increase capital utilization efficiency, control and supervise capital flows for more reasonably and legitimately, prevent unreasonable expenses strictly and spend smartly, to avoid idle assets, waste money, occupying production funds, blind construction and blind procurement [20]. The rational allocation and utilization of human resources refers to a series of activities which destination not only is preservation and increase of human capital value, and is the maximization of team contribution and organization benefits, including establishing a particular technology structure, reserving human resource by means of strategic investment, establishing the incentive mechanism and integrating resources.

2.2. Cost Control

Based on the definition of cost control and the characters of cost management methods, the cost control methods are shown as follows.

1) Budget management: Budget management in short is a plan made to achieve business goals. The important is to guide the steady production. Therefore, budget management is the first to be discussed [21]. Budget is the quantitative description of operation scheme. It shows operation plan with figures and tables, which is used as a basis for controlling activities and evaluating result. The methods of budgeting consist of flexible budget (A budget aiming at the problem of fixed budget, is based on quantitative relation between different items, such as revenues, costs, expenses and activities), zero-base budget (A budget starting from scratch, calculates any cost from zero, not considering the data base) and rolling budget (A budget keeping a span of 12 months, completes the next month’s budget instead of the beginning one by a rolling way).

2) Cost variance analysis: Cost variance analysis on one hand regulates the variance between planning and execution in daily operation for short-term objectives, on the other hand further analyzes daily variance to improve the goals and schemes in the course of continuing operations, which would provide the basis of long-term benefits. Cost variance analysis consists of target cost control, standard cost system and cost analysis [22]. Target cost control, which is a method of target management, is to strictly limits, supervises and guides each cost with reference to target cost, to obtain the biggest economic benefits with minimal cost. Standard cost system is to compare the actual data with standard one and then find out the reasons for difference, to achieve the purpose of cost control and evaluation. Cost analysis refers to analyzing daily cost difference collected in order to provide improvement advice for next cost cycle.

3) Performance evaluation system and incentive mechanism: Performance evaluation system and incentive mechanism are essential. Performance evaluation system should have an insight into organizational activities, while incentive mechanism should be implemented to
motivate all staff word harder to achieve the ultimate objective.[24] Performance evaluation includes a series of activities in that order, senior managers setting standards for department managers by budgeting and planning, and then measuring performance for inspection. Measuring the performance of each departments in organization is a prerequisite for the allocation of resources in the organization. When a new business is started, it helps senior managers allocate subsequent resources to forecast revenues, costs and investment, and then compare actual data and budget one periodically. Performance measurement of managers can be used to determine their salary, bonus, task and promotion. Each measurement could urge them to try their best to achieve the targets which was set in evaluation. Evaluation indicators are divided into financial and non-financial ones. Incentive mechanism is an important part of management. It would reward actors with what they expect, if the action could help for achieving goals.

Except the management methods above, controlling in quality cost management, the funds operation and human capital operation is inconvenient. All of them should be considered in different strategy. Additionally, there are some other cost management methods, such as kaizen costing, cost-volume-profit analysis, pricing and profitability analysis, and inventory management. But their core ideas are embodied in the cost managements above which had been discussed, so we choose them as representatives.

3. EVALUATION CRITERION OF COST MANAGEMENT CONTROLLING SYSTEM

Cost management evaluation aims at assisting to establish competitive advantage. Therefore, strategic cost management system evaluation is based on competition strategy. Different criterion should be used in different strategy. Additionally, there are some other cost management methods, such as kaizen costing, cost-volume-profit analysis, pricing and profitability analysis, and inventory management. But their core ideas are embodied in the cost managements above which had been discussed, so we choose them as representatives.

3.2. Classifying and Assignment

According to the different concerns and requirements in different strategy, cost management methods are classified into five grades: A, B, C, D, E. Assign a value to each grade by expert scoring method. The results are shown in Table 2:

3.3. Individual Frequency Statistics

Analyze the cost management methods used in enterprise, then solve the following problems:

Which cost management methods have been adopted in enterprise, get the total number;

Which cost management methods shouldn’t be considered because of the characteristics of industry or special cases, the cost management methods without considering are deemed as adopted, get the total number;

Which cost management methods should be adopted but not, get the total number.

3.4. Calculating The Score and Conclusion

According to the basic score of each grade and the rating capacity (projects number in each grade), calculate aggregate score of each grade in different strategy, the sum of aggregate scores of all grades. The arithmetic average of aggregate score of each grade, and then calculate the difference between aggregate score of each grade and the arithmetic average of aggregate score of each grade, summarize the differences, and the sum is score of cost management controlling system. If the score > 0, cost management controlling system made positive contribution to strategy; If the score < 0, cost management controlling system made negative contribution to strategy. Formulas are shown below.

\[ X_i = n_i \times x_i \]  
\[ X = \sum X_i \]  
\[ X_a = \frac{X}{5} \]  
\[ X_e = n_e \times x_i \]  
\[ I = \sum (X_e - X_a) \]

Where i=A′B′C′D′E; Xi is the basic score of each grade; ni is projects number in each grade; nie is projects number in each grade in enterprise; Xi is aggregate score of each grade in different strategy; Xie is aggregate score of each grade in enterprise; Xa is the sum of aggregate scores of all grades; Xa is The arithmetic average of aggregate score of each grade; I is score of cost management controlling system.

4. APPLICATION OF EVALUATION OF COST MANAGEMENT CONTROLLING SYSTEM

The cost controlling methods in The Fourth Oil Extraction Plant of Daqing Oilfield Company Limited are shown as follows:
Table 1. Cost control methods for different strategy.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Cost Avoidance Methods</th>
<th>Cost Control Methods</th>
<th>Other Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-cost</td>
<td>origin management; activity improvement; activity chain optimization; value engineering</td>
<td>cost variance analysis; performance evaluation system and incentive mechanism; budget management</td>
<td>quality cost management; human capital operation; funds operation</td>
</tr>
<tr>
<td>Differentiation</td>
<td>origin management; activity improvement; activity chain optimization; value engineering; human capital operation</td>
<td>cost variance analysis; performance evaluation system and incentive mechanism; quality cost management</td>
<td>budget management; funds operation</td>
</tr>
</tbody>
</table>

Table 2. Classifying of cost control methods for different strategic.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Low-cost strategy</th>
<th>Differentiation Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>origin management; marketing value engineering; designing value engineering (rational concept and emphasis on material desires and practicability)</td>
<td>activity improvement; activity chain optimization (emphasis on marketing)</td>
</tr>
<tr>
<td>B</td>
<td>cost variance analysis; performance evaluation system and incentive mechanism</td>
<td>origin management; marketing value engineering; designing value engineering (sentimental concept and emphasis on material desire and glamour; Innovative concept and emphasis on glamour and spiritual desire; high-grade concept and emphasis on the spiritual desire and practicability); quality cost management; human capital operation</td>
</tr>
<tr>
<td>C</td>
<td>manufacturing value engineering; budget management</td>
<td>cost variance analysis; performance evaluation system and incentive mechanism</td>
</tr>
<tr>
<td>D</td>
<td>activity improvement; activity chain optimization</td>
<td>manufacturing value engineering</td>
</tr>
<tr>
<td>E</td>
<td>quality cost management; human capital operation; funds operation</td>
<td>budget management; funds operation</td>
</tr>
</tbody>
</table>

(1) origin management belonging to cost avoidance by strengthening regulation and monitoring: to strengthen utilities management, to prevent The power loss, to optimize the operation of power grids, to utilize advanced energy-saving technology, to adjust the structure of injection and production, to track the pipe pressure of water injection system, to adjust the running water injection pump, to control the dosage of cooling water, to supervise data transfer, to apply salt resistant polymer positively in waste water recovery system;

(2) activity chain optimization belonging to cost avoidance by cutting some costs: some stochastic activities such as replacing the tubing, replacing the rod, housing repairs and replacement of pumping unit model, are not annual. So these items should be cut from budget, more capital could be used in urgently needed activities;

(3) activity improvement belonging to cost avoidance by promoting the transformation of scientific and technological achievements: promoting the transformation of geologic research, the application of mature technologies.

(4) value engineering belonging to cost avoidance one by transferring cost: to transfer surplus capital of old oilfields reconstruction into payment for electric well instead of motor-pumped well, motor-pumped well instead of electric well, screw pump instead of pumping unit, Oil pumping well instead of water well, the other by recycling: to repair the old equipment, to use waste materials.

(5) Set up a separate cost budget department and strengthen cost budget for reasonable budgets and forcing control.

(6) Implement cost assessment system strictly, establish an incentive mechanism, set up a contract system, and organize cost comparison activities.

(7) Emphasize capital operation to maximize cost-effectiveness of funds.

Based on the analysis of cost controlling methods in The Fourth Oil Extraction Plant of Daqing Oilfield Company Limited, we can judge that these methods meet the requirements of low-cost strategy. Requirements of grade A have been met, because of single variety and short supply, market-
ing value engineering and designing value engineering have not to be considered, origin management belonging to cost avoidance has been used in type(1). Requirements of grade B have been met, because of The particularity of products, cost variance analysis which made little contribution to resources exploitation has not to be considered, performance evaluation system and incentive mechanism have been used in type(6). Requirements of grade C have been met, manufacturing value engineering belonging to cost avoidance has been used in type(4), budget management has been used in type(5). Requirements of grade D have been met, activity improvement and activity chain optimization have been used in type(1) and (3). Requirements of grade E have basically been met, The Fourth Oil Extraction Plant as the belonging enterprises is weak in quality cost management due to single variety and the high purity of crude oil, and in human capital operation due to that theory and technology are equally important for mining, resulting in equally important of different departments and employees. Funds operation has been used in type(7).

For The Fourth Oil Extraction Plant of Daqing Oilfield Company Limited was evaluated on cost management controlling system for the first time in the paper, there is no reference indicator. According to the rule that each grade score equals to the sum of subordinate scores, we define the score of each grade: A-50, B-25, C-17.5, D-8.75, E-8.75. The score of cost management controlling system is shown in Table 3:

Table 3. Values of cost management controlling system.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$X_1$</td>
<td>$X_2$</td>
</tr>
<tr>
<td>A</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>C</td>
<td>17.5</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>8.75</td>
<td>8.75</td>
</tr>
<tr>
<td>E</td>
<td>8.75</td>
<td>2.92</td>
</tr>
</tbody>
</table>

The conclusion is cost management controlling system of The Fourth Oil Extraction Plant of Daqing Oilfield Company Limited made positive contribution to strategy.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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