

The Research of ABCM Model

—Example of HZ Pharmaceutical Company

Jingwu Yuan
School of Accounting, Hangzhou
Dianzi University
Hangzhou Dianzi University
Hangzhou, China

Meiping Lin
School of Accounting, Hangzhou
Dianzi University
Hangzhou Dianzi University
Hangzhou, China

Pingxin Wang
School of Accounting, Hangzhou
Dianzi University
Hangzhou Dianzi University
Hangzhou, China

Abstract—For the company which has successfully implemented ABC-system, the urgent problem is how to use the foundation information of ABC-system to control the cost formed in the process of production effectively, establish an overall cost management system which included cost calculation and cost control, then to improve the benefit of enterprises. This paper established activity-based cost control model, formulated the activity-based cost standard model, put forward the selection principle and method of activity-based cost control index, then constructed the analysis of cost variance model and early warning system model .Finally, the paper taked HZ pharmaceutical company as a case study which had implemented ABC-system for 3 years. This blueprint design will lay the root for the realization of the following Activity-based cost control system.

Keywords- activity-based cost; control model; standard; index

I. RESEARCH BACKGROUND AND SIGNIFICANCE

At present, with the global economic crisis poised to get much worse, more and more enterprises pay their attention to the inner management by the way of strengthening the cost control. Activity-Based Costing Management(ABCM) is the international advanced cost control method. As few company in our country succeed in the implementation of ABC, the research or case based on ABCM application is rarer. The paper based on the ABC-system which has been implemented for 3 years by HZ pharmaceutical company, uses the ABC data which has been set up and gradually become perfect to conduct the activity-based cost control research, for the purpose of achieving cost control effectively, reducing product cost and improving the economic efficiency.

ABCM uses the thoughts of activity-based management to implement responsibility to every activity center and finally takes shape of a full corporate responsibility cost control system on the basis of activity center. The non value information coming from activity center about cost driver data, will not only provides the financial index, but also non financial index for the ABCM-system; It can track the source of the waste of resources not only from the way of value creation, but also the perspective of the fundamental reason of the cost formation, therefore, enterprises can expand the cost control points, take cost control into practice and finally enhance the control efficiency.

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The thought of activity-based cost control is a kind of new cost management method, for a long time, many scholars devote themselves to its theoretical research and practical application. On the basis of wide research on theories and literatures at home and abroad, ABC has not only improved the accuracy of cost calculation, but also played an important role in cost control, performance evaluation and profitability analysis. In 1992, professor Johnson and professor Kaplan chose eight big company as a pilot, and then "Implementing Activity-Based cost management, Moving from Analysis to Action" was completed, This work expounded the superiority of ABC in the cost management through empirical analysis; Since 1990s, continuous research about its theory and application, effectiveness and difficulties, application prospect had been conducting positively and comprehensively in Chinese scholars(Xuying Yu, 1991, 1995; Peng Xia, 1993; Guangyuan Wang,1995; Hang Sun, 1995; Peiyu Ou,Pingxin Wang, 2002; etc). In contrast, the application status of ABC in practice appeared relatively lag and discreetly, it is only applied tentatively in a few enterprises, ABCM application is rarer. why? The mainest reason is that enterprises have to pay high cost for ABC/ M’s application.

II. ABCM THEORY RESEARCH

A. Establishing the ABCM Model

ABCM-system is based on the financial information of ABC-system, at the same time, it also needs some information from other systems, such as daily production system. It conducts the cost management activities through extracting and processing cost control information by the principle of controllability, integrity, materiality. The main architecture of ABCM-system can be divided into five modules:

- Cost control index. Designers should define the data dictionary model first, and then a large amount of basic data, such as value, driver quantity, that can be extracted from Data Warehouse to form cost control index.
- Cost control standard. According to actual production technology and management level, standard can be divided into the optimizing standard and normal standard, etc. ABC-system is their historical basis.
- Actual cost calculation. According to the cost calculation by ABC-system, it will get the actual cost of activity center.

- Cost variance calculation and preliminary assessment. Due to various factors, usually there is some differences between actual activity cost and standard activity cost, including price variances, quantity variances and efficiency variances, etc.
- Cost warning. According to the results of the cost variance calculation, if the unfavorable variance amplitude reaches to δ or above, ABCM-system will give prompt warning. The model of ABCM can be showed in the following Figure1:

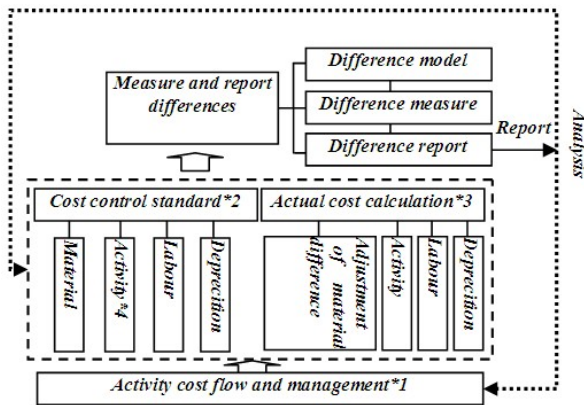


Figure 1. The Framework of ABCM Model(One Dimensional)

Note: ① When "R-Rs" < δ , it's normal fluctuation range; When "R-Rs" > δ , prompt warning will be given; Usually δ is assigned 0.05.

② *1 According to cost target, such as product, management levels, it could be conducted respectively;

*2 Cost is recessive for workshop and working team, it needs relationship conversion model "Cost/Activity" to convert cost index into non-financial index which is more easy for field control;

*3 It's the same with *2;

*4 "Activity" is included non value data.

B. The Selection of ABCM Index

1) The Advantage of ABCM Index

Traditional cost control is lack of analysis for the process cost, due to the interference of objective economic environment and the influence of the traditional accounting method, its reliability is lost. Activity-based costing makes possible multilevel and omnibearing cost control index by using multiple cost drivers to assign overhead cost with the result of presenting the process formation of cost more clearly and accurately.

2) The Principle of ABCM Index

a) *Controllability*. In order to reflect the reasonable responsibility belong to related responsibility center, the controllable cost should be separated from the noncontrollable cost before formulating the cost control index.

b) *Integrity*. Comprehensive evaluation and examination for responsibility center only can be realized by establishing multidimensional and crossed index.

c) *Materiality*. The establishment of index must be able to seize the main body, reflect the key, let the managers to master the important resources consumption situation in time.

3) The Classification of ABCM Index

Activity-based cost control index can be divided into financial and non-financial index.

Financial index mainly refers to cost value index, it could clearly show the value and directly reflect the condition of multilevel resources expenses.

Non-financial index mainly involves quantity, efficiency and quality. The three aspects are all the reference factors for ABCM. Such as cost driver quantity, resource consumption quantity, etc.

According to the actual situation, different activity center may apply different index, therefore, each department shall choose the best effective index for the construction of comprehensive index system.

C. The Setting of ABCM Standard

1) The Advantage of ABCM Standard

ABCM standard differs from traditional cost control standard. In traditional management environment, the core and starting point of cost control standard is product, and the standard would be continued in a long time without any revise with the result that enterprises often failed in cost control. ABCM standard whose core is activity provides possibility for enterprises to implement cost control to each activity or activity center which effect the cost of products, therefore, it is set by activity or responsibility center. Considering the changes of enterprise's status and the external environment, this kind of ABCM standard is not static, dynamic standard will reflect the new conditions and goals through a constant changing.

2) The Principle of ABCM Standard

a) *Integrity*. To apply it in the setting of ABCM standard, enterprises can balance interest and responsibility between different activity centers belong to the same activity chain.

b) *Materiality*. The setting of ABCM standard should seize the key point, not every item need standard. In addition, important influencing factors should be considered before the standard is set.

3) The Foundation of ABCM Standard

In the concept of activity management, activity is the basis of cost, the key of cost management, so the main body of activity-based standard system should be activity. The basis of standard can be divided into four part: The optimal value(S_h), Mobile weighted mean value(S_a), Expected value(S_e), Adjusted value(S_r). Usually S_h are created when business management level and equipment production status are in optimal conditions, it is difficult to realize; S_a represents the most close production status and technological conditions, it's close to reality and can be achieved with a little effort; S_e embodies manager's rising expectations and requirements for technical innovation and management level; S_r is involved under the condition of that great changes have taken place in the production environment, usually its coefficient should be set to 0. The final standard of ABCM will be set by the following formula:

$$\hat{S} = \frac{(\alpha S_h + \beta S_a + \gamma S_e + \eta S_r)}{(\alpha + \beta + \gamma + \eta)}$$

In the formula above, $\alpha, \beta, \gamma, \eta$ is the coefficient of S_h, S_a, S_e, S_r , respectively. According to the technological progress and the external economic environment, these coefficients should be determined by specific analysis. Therefore, activity standard is not a constant, but a kind of constantly updated standard cost with new technology, new management methods and other innovation.

D. Activity Cost variance model and early-warning system design

According to the actual consumption status, ABC-system will perform cost calculation, and then refer the result data to ABCM-system; ABCM-system will compare actual activity cost with standard activity cost, and then give early-warning through variance analysis.

1) Activity Cost Variance Calculation

The actual activity cost (AC) depends on the actual activity quantity (AQ) and actual activity price (AP), and the standard activity cost (SC) depends on the standard activity quantity (SQ) and standard activity price (SP). Due to various factors, usually the actual activity cost differs from the activity standard cost. The variance between AC and SC is called total variance (TV). Complete variance calculation and analysis consists of three steps: First, to calculate the amount of the variance and analysis the type; Second, to survey on variance; Third, to ascertain responsibility and adopt measures to improve the cost control.

Activity cost variance can be divided into two parts including price variance(PV) broken away from standard price and quantity variance(QV) broken away from standard quantity. Variance calculation model is listed below:

$$\begin{aligned} PV &= (AP - SP) \times AQ \\ QV &= (AQ - SQ) \times AP \\ TV &= PV + QV \end{aligned}$$

PV reflects the result of overruns or save by the reason that the actual activity price is broken away from standard activity price. What leads to PV? The main factors are bonus changing, the overruns or save of power, machine material's consumption, etc

QV reflects the result of overruns or save by the reason that the actual activity quantity is broken away from standard activity quantity. Through the analysis of QV, managers will be able to evaluate the efficiency of activity and find out the potential of improvement. What leads to QV? The main factors are bad work environment, lack of experience for workers, labor in a bad mood, improper selection of auxiliary equipment, etc.

2) Early-warning System Design

ABCM-system is based on the data of ABC-system, it adopts the powerful Data Mining (DM) technology to extract the information what control system needs, and then completes the integrated index difference calculation and analysis. To those accidental variances (AV), person in charge should find out the reason immediately; To those favorable variances (FV), rewards should be awarded; To those

unfavorable variance (UV), if it breaks through the difference rate that range we set in advance, early-warning should be given to indicate the direction for our further cost analysis work.

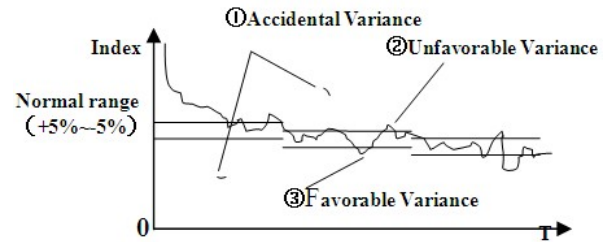


Figure 2. Schematic Diagram of Early-warning System

III. CASE STUDY

Next, the analysis and design of ABCM will be continued with the example of fermentation workshop.

A. Workshop's Cost Accounting Status by ABC

There are 5 activity centers in this workshop, the cost drivers and main products have been listed in the table 1 below.

TABLE I. BRIEF INTRODUCTION TO THE WORKSHOP

N o.	Appellation of Activity Core	Activity Drivers	Products				
			A W	Q D	D L	A F	★
1	Fermentation	Fermentation Tank Cast of $ime \times \text{Adjustment Quotient}$	✓	✓	✓		
2	Pneumatic Drying	Batch of Time in Drying	✓				✓
3	Extraction Zone 1	1					
4	Extraction Zone 2	Batch of Time in Extraction		✓	✓		✓
5	Refinement Zone 1	Batch of Time in Refinement	✓				✓

Note: "★" means that corresponding activity center may provide processing services for products from other workshop.

According to the resource drivers, activity cost is assigned to each activity center, the cost of the products will finally take shape with its circulation and gradual accumulation in each activity center.

In figure1, it shows that fermentation activity center is the largest activity cost pool. According to Pareto Principle, 80% of enterprise's cost is caused by 20% of the activity.

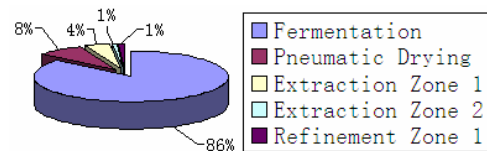


Figure 3. Scale Map of Activity Cost

Note: The data of activity cost pool came from ABC-system, February, 2012.

B. The Design of ABCM-system for the workshop

AW is the main product of this workshop and most of its cost occurred in fermentation activity center, therefore, AW

and fermentation activity center will be identified as the research object, by the reason that the other products and activity centers are similar to both of them, unnecessary details will be omitted.

According to Pareto principle, 5 kinds of main materials have been ascertained, the report of AW in fermentation activity center is showed in the following table 2:

TABLE II. THE REPORT OF AW IN FERMENTATION ACTIVITY CENTER

Output: 3865.68kg

AW-1	Unit	SQ	AQ	SP	AP	QV	PV	Dr	E-W
		a	b	c	d	e=(b-a)*c	f=b*(d-c)		
CL 1	kg	139937	137392	2.56	2.65	-6515	12365	2%	C
CL 2	kg	11944	11803	5.56	5.47	-784	-1062	-3%	D
CL 3	kg	29495	29532	4.25	4.40	157	4430	4%	C
CL 4	kg	1468	1593	14.53	15.29	1816	1211	14%	A
CL 5	kg	1816	1970	13.68	12.76	2107	-1812	1%	C
Subtota	—	—	—	—	—	-3219	15131		
Water	Ton	2296	2505	5.54	5.23	1158	-777	3%	C
Electric	kwh	341217	385280	0.60	0.60	26438	0	13%	A
Pressure	flow	969913	952788	0.73	0.74	-12501	9528	0%	D
Freeze	flow	538799	535747	0.88	0.87	-2686	-5357	-2%	D
Steam	flow	9186	10198	178.2	180.5	180369	23455	12%	A
Repair	time								
S. t	T*COD								
Subtota	—	—	—	—	—	192777	26849		
Total:	—	—	—	—	—	189558	41980		

Note: ① Warning of class A: Difference rate is greater than 10%; Warning of class B: 5%~10%; class C: 5%~0; class D: less than 0;

② Noncontrollable cost such as depreciation, artificial cost isn't involved here;

③ The setting of single standard is based on accounting period 2011.1 to 2012.1; Sh is optimal level in this period, it is difficult to realize, so α is set to 0.2; Sa is close to reality and can be achieved with a little effort, so β is set to 0.5; According to manager's rising expectations and requirements for reducing the cost, Se is set to 0.9 times of Sm, and γ is set to 0.2; AW's

production environment didn't have any changes, so η is set to 0.

From table 2, in the cost control report of this month, the cost control performance evaluation of fermentation activity center is as follows: activity cost was increased on the whole, CL 4 and steam consumption reached to class A, their difference rate were 14% and 12% respectively, the main reason is that steam consumption quantity changed greatly. Because the steam is an important resource for fermentation operation center, therefore, we should further more strengthen the use of steam.

IV. CONCLUSION AND OUTLOOK

The paper particularly introduced the control model, the setting of standards, the selection of index and the establishment of early-warning system through the research of ABCM with the example of HZ pharmaceutical company. Theory and case study indicates that the model of ABCM, especially multidimensional cost control index can evaluate the activity center from different angles of view, so enterprises will achieve comprehensive and overall process cost control, it will be highly effective in playing the role of ABC-system and improving the benefit of enterprises.

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