

Empirical Study on the Application of Activity-Based Cost Model in Marine Third-Party Logistics Cost Management

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ABSTRACT

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With the rapid development of modern social economy and the transformation of enterprise production and management concepts, more and more enterprises have outsourced their noncore business to third-party marine logistics companies with professional service functions to meet their needs. Third-party marine logistics is a form of marine logistics that adapts to such an environment and needs and is the result of the professionalization and industrialization of marine logistics. From the research summaries of the literature, it can be seen that China's warehousing industry has improved its operational efficiency and management level under the impetus of the state's implementation of macroeconomic regulation and control, highlighting the good momentum of its development. However, from the symposium on the "hot issues" of the modern warehousing industry held by the China Storage Association in July 2006, there are still many problems to be solved: the average size of the warehousing industry is small; the warehousing industry has the lowest economic efficiency; the industry has the highest asset-liability ratio.

ADDITIONAL INDEX WORDS: *Activity-based cost model, marine third party, logistics cost, management application.*

INTRODUCTION

According to Feng Xueqi's research, since the reform and opening of enterprises, the environment has changed and the internal and external environment for the survival and development of enterprises has undergone tremendous changes: more competitors are faced; market competition has intensified, and the basis and level of competition have been diversified. Diversified and personalized customer needs have also changed: changes in the business environment and new technologies and management concepts emerge in an endless stream. Against this background, in this era of China's third-party marine logistics opportunities and challenges, although more and more high-tech equipment replaces ordinary manpower, the particularity of the third-party marine logistics industry is related to these changes. The cost is getting more and more blurred. Cost is the focus of a company's attention as well as the survival of the enterprise. Many companies are paying more and more attention to it. Therefore, for the cost of third-party marine logistics companies, this paper discusses a new management cost calculation method, namely the activity-based costing method. This paper also hopes to confirm the advanced nature of the method to provide a favorable guide for enterprises to understand and cite this method (Bornmann and Haunschild, 2018).

In a history of the generation and development of activity-based costing (ABC), the earliest 20th century master of accounting, Eric Kohler, who first proposed the concept of

homework accounting, went to study job accounting. An outstanding theorist, George J.S. Taurus, is associated with the goal of decision-making usefulness; with the development of the economy and advances in technology, Robin Copper; and Robert Kaplan's series of articles were published in *Cost Accounting* and *Harvard Business Review* from 1988 to 1989, marking the beginning of the ABC approach from theory to application.

Some countries with developed marine logistics such as the United States and Japan have long paid attention to the cost of marine logistics (Li and Chen, 2018). For example, in the United States, where the proportion of marine logistics costs to gross domestic product is only about 10%, it is very concerned about the accounting cost and operational management of marine logistics activities. The ABC method is also considered to be the most promising for enterprise marine logistics cost management. For example, the ABC method is used to calculate the warehousing and distribution costs of enterprises, where analysis of resources is required for receiving, stocking, storing, order processing, packaging, labeling, and shipping of six major types of operations. Calculating the resources consumed by each operation center and finding the cost drivers for each type of operation to calculate the unit operation cost are widely known. Nan, Zhao, and Zhang (2018) analyzed how to apply the ABC method to the distribution of marine logistics management in a case-study manner. The marine logistics business has designed a very detailed cost accounting process. However, in Japan, as the earliest discoverer of the "Ocean Logistics Iceberg Theory," the country is one with relatively developed global marine logistics management. According to the statistics of the German Deutsche Bank, for the whole industry, in terms of the proportion of marine logistics costs,

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Japan's average ocean logistics cost is 6.0%, Europe's is 9.1%, Canada's is 9.5%, and the United States' is 10.0% (Mensah, Vera, and Mi, 2018). According to the data, Japan has achieved good performance in marine logistics control. This is inseparable from the Japanese government's announcement of the "standard for the calculation of ocean logistics costs." The accounting of Japanese marine logistics costs is based on the ABC method. It can be seen that the study of ABC has been quite mature.

THEORETICAL BACKGROUND

Schematic Diagram of the Activity

The development of modern marine logistics in China is still relatively late, compared with other developed countries. The study of ABC is still lagging behind other countries. Because of our old accounting system and people's ideas, this method's development is very slow, but with the development of science and technology and economy, plus the new accounting standards promulgated in China in early 2006, it has been implemented within the scope of listed companies since 1 January 2007. The new accounting standards clearly state that the adjustment of accounting objectives is reflected. Both the ABC method and the new accounting standards are conceptually consistent. Moreover, our domestic research on ABC has many new ideas and methods. From Yang Zongchang's monograph on Professor Wang Pingxin's "Actual Costing Theory and Applied Research," it can be seen that he not only refutes the paradox that "ABC is not suitable for Chinese manufacturing enterprises," but also personally designed the ABC accounting system and dynamic satisfaction. The ABC system model and operation are based on cost form analysis and the original profit model. He has made outstanding contributions to the study of the ABC method in China. For example, Qi *et al.* (2018) start from the principle of computational practicality and put forward a practical cost model based on the basic principle model of ABC, which shows the operation of resources, the consumption of products or services, and the time-driven operation proposed by Yan Hengfeng. The cost accounting of marine logistics under the cost method completely breaks the complicated problems of the original calculation method, making the calculation process simpler. This method is also easier to promote; Du Xiaoxu promoted the ABC method in the service industry, such as the finance and postal express industry. The application also points out its applicable line; Wang Libao, Luo Yujie, and Shi Yan'an's conceptual system, advantages and functions of the ABC method make it clear that people can optimize the marine logistics operations after implementing this method. Business process re-engineering shows many advantages of the target market, as shown in Figure 1, a schematic diagram of the ABC method.

As shown in Figure 1, we should improve the management level and efficiency of third-party marine logistics companies. Completely transforming from a work process to a job management concept will truly realize the unification of the value of chain-operation chain. This breaks the form of relying on advanced information technology and advanced supply-chain management ideas to seek a good warehousing strategy for third-party marine logistics companies, although the ABC method also uses information management systems to collect

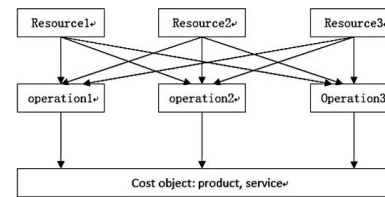


Figure 1. Schematic diagram of the activity-based cost method.

raw data; for example, Singh, Gunasekaran, and Kumar (2018) showed development on global economic integration, the opportunity of vendor (supplier) management inventory for third-party marine logistics companies; Xu Zhangyi's implementation and operation of advanced inventory supplier management strategy mechanism and implementation process; Ramly *et al.*, (2018) implemented advanced inventory strategies for zero inventory and countermeasures and management information systems.

The accounting method is directly related to the cost result. There are two main methods for accounting the cost of marine logistics in the case: (1) traditional costing method and (2) ABC method.

In the traditional costing method, product cost of the production company = direct labor + direct material + manufacturing cost allocation (Yong *et al.*, 2018). However, the marine logistics companies in this case are different from the production enterprises. They do not provide direct materials but simply provide warehousing services. In terms of direct labor costs, although we can also calculate the time spent on each contract by time, direct labor costs are obtained. However, since the artificial complexity here is relatively large, it is not easy to be truly separated. So, it is also simply treated here as a period expense together with other costs. At the same time, considering that the enterprise provides a professional warehousing business, the warehousing business should occupy a relatively large weight and the storage space is used as the basis for the expenses during the distribution of the service contract. The respective costs are calculated as follows:

$$\text{Cost of A service contract} = 185,000 \times (18,000 \div [18,000 + 32,000]) = 66600 \text{ yuan}$$

$$\text{B service contract cost} = 185,000 \times (32,000 \div [18,000 + 32,000]) = 118,400 \text{ yuan}$$

In the ABC method, the first step is to confirm the main operations involved in the marine logistics enterprise warehouse system and clarify the operation center. Through analysis, the company's warehousing system mainly includes the following operations: order processing, cargo acceptance, warehousing, and sorting.

METHODS

Resource Cost Library Collection

Step 1: Identify the resources and resource drivers involved in the enterprise warehousing system and allocate the resources to the operation center cost pool. Some resources that are specific to an operation do not need to be assigned, so

Table 1. Resource cost library collection (yuan).

Cost	Order	Acceptance	Storage
Wage	6000	4000	9000
Electric heating fee	1000	1000	2000
Depreciation	10,000	5000	20,000
Office	5000	2000	1000
Total	22,000	12,000	32,000

there is no need to identify resource drivers for them. Only those expenses that are costly for multiple jobs are needed to confirm the resource drivers. Common resource drivers include labor hours, usage times, area, distance, number of people, etc. Enterprises should allocate resources according to different situations using appropriate resource drivers to ensure that the costs allocated by the operation center are consistent with the actual situation. After inquiry and analysis, the distribution of various expenses in each operation center is obtained, as shown in Table 1.

Step 2: Confirm the cost driver and assign the operation cost of the operation center to the final product. Because of the limited space of the article, only the company's key business—the storage system—is the main research object. On the basis of this, the analysis of the storage center resources and cost drivers is carried out on the premise that the basic operations of each operation center have been determined.

Step 3: Calculate the cost of marine logistics operations. After the activity cost drivers are selected, the related costs can be collected according to the homogeneous cost drivers. Several cost drivers establish several cost pools and establish different cost pools. Assigning indirect costs according to multiple cost drivers is the operation. Cost calculations are superior to traditional cost calculations. When the operation cost of each operation cost library is allocated between the cost calculation objects, the cost of the marine logistics operation of each cost object should be calculated by determining the cost driver allocation coefficient. Its distribution formula is as follows:

Cost driver allocation coefficient = cost of the job at a job center, the amount of work that can be provided at the job center.

The cost of an operation to be assigned to a cost calculation object = the cost factor of the operation consumed by the cost calculation object × the cost driver allocation coefficient. The cost of marine logistics operations for a costing object = the sum of the operating costs of the costing object.

Through the calculation of the case above in Table 2, we find that the implementation costs of the service contract for A and B calculated by this method are 69,720 yuan and 115,280 yuan respectively and the results calculated by the traditional cost method are 66,600 yuan and 118,400 yuan. Through analysis, we find that the traditional cost calculation method is based on a single factor for the distribution of period expenses, whereas the activity cost rule is based on the different characteristics of different jobs to set the corresponding operation movements on a distribution basis. Therefore, in the allocation of period expenses, the ABC method has more clarity, accuracy, and perfection, enabling enterprises to implement more competitive price and cost strategies.

Table 2. Calculation process of the assignment cost of the activity cost (yuan).

Operation	Order	Acceptance	Storage	Storage
Activity cost	22,000	12,000	32,000	74,000
Workload	1000	3000	500	50,000
Job driver allocation rate	22	4	64	1.48

ABC is an activity-centered, tracking, and dynamic measurement of all operating activities that confirms and measures the operating costs. To eliminate “nonvalue-added operations” as much as possible, we should improve “value-added operations.” A costing method that provides useful information in a timely manner reduces losses and waste to a minimum; improves the science and effectiveness of decision making, planning, and control; and promotes the continuous improvement of corporate management. The ABC method is based on the two premises of “work consumption resources, product consumption operations,” so it includes five elements of resources, operations, products or services (cost objects), resource drivers, and operational drivers.

RESULTS AND DISCUSSION

The use in our country is not optimistic. Since Professor Wang Pingxin broke the constraint that “ABC is not suitable for Chinese manufacturing” in theory and examples, many domestic accounting theories and practical experts and scholars have also conducted in-depth research on the ABC method. Many domestic enterprises are also indirectly applying the ABC system to manage and guide the daily work of the company. The efficient improvement of their work is very obvious. We will have a clear feeling through the examples below. However, because of the special environment and conditions required by the ABC method, the development and application of this method in China have not been extensive so far. A survey collected 531 companies from 1985 to 1998 on advanced experience in corporate finance.

CONCLUSIONS

The samples are distributed in at least 27 provinces and municipalities, and 397 are valid samples. Through the statistics of 397 samples, there are 189 samples of various cost management methods and ABC. The statistical results show that there are six enterprises using the ABC method, accounting for 3.17% of the enterprises surveyed. No examples have been found in the enterprises that clearly use the ABC method and can be regarded as the “initial” of the ABC method. That is to say, the sample companies are basically “unconsciously” using the ABC method, which means that the name “operational cost” is not used. Although the actual working method is very close to the ABC method, the ABC method is spontaneously formed and developed.

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