Design of Activity-Based Cost Accounting System for Software Enterprises Against the Background of Big Data Analysis

Xiaoxia Ke

School of Economic Management, Ningxia Institute of Science and Technology, Shizuishan, Ningxia, China

Keywords: Software Enterprise, Activity-Based Costing, Big Data Technology, Cost Accounting System.

Abstract: Based on the related theory of activity-based costing, this paper analyzes the cost structure and characteristics of software enterprises through big data technology and further evaluates the application necessity and feasibility of activity-based costing in software enterprises in such an era of big data. The basic principles of activity-based costing are adopted to design a set of activity-based cost accounting systems for software enterprises in terms of confirming activities and activity centers, determining resource costs, selecting both resource and activity drivers, deciding costing objects and costing periods, and setting up account systems, aiming to improve the costing accuracy, upgrade the level of cost management, and more facilitate the development of software enterprises.

1 INTRODUCTION

The software industry, a national strategic emerging industry, constitutes the important foundation for the national economy and social informatization. As shown by the data in the 2021 Statistical Bulletin of Software and Information Technology Service Industry released by the Ministry of Industry and Information Technology of the People's Republic of China, China's software industry registered an operation revenue of 949.94 billion yuan in 2021 with an increase of 17.7% over the same period of the previous year. By the end of 2021, China boasted more than 40,000 IT companies and 809,000 employees. In such an era witnessing the rapid development of the software industry, the key to the development of current software enterprises lies in how to scientifically conduct cost accounting, improve cost control and make accurate decisions. While the current cost accounting of software enterprises still features traditional costing methods, which fail to accurately account for the product cost of software enterprises and provide the correct accounting information, thus affecting the decision-making and development of software enterprises.

On August 16th, 2013, the Ministry of Finance issued the Enterprise Product Costing System (for Trial Implementation) to stipulate that software enterprises should adopt activity-based costing for cost accounting. Activity-based costing refers to a way of cost accounting and management based on dynamic tracking and feedback to measure activity and cost objectives and assess work performance and resource consumption. With activity costs calculated based on resource drivers and product costs based on cost drivers, the management level of enterprises can be effectively enhanced from the basic level of cost management, which will, in turn, promote the production and management of enterprises. During the production process, software enterprises tend to consume fewer direct costs but more indirect costs, accounting for a larger proportion of total costs. Such a characteristic of the software industry fits in the implementation requirements of activity-based costing. At the same time, big data technology provides technical support and development opportunities for the promotion and application of activity-based costing. It is characterized by huge data volume, fast data generation speed, various data types, concerns about related relationships, etc. This technology can solve the bottleneck of driver analysis and complex multi-level calculation in the application of activity-based costing from various aspects such as data extraction, data analysis, data calculation, and data processing, which in turn facilitates the application of activity-based costing. Therefore, it is imperative to promote activity-based costing in China's software enterprises in the era of big data.

2 RELATED CONCEPTS OF ACTIVITY-BASED COSTING

The concept of activity-based costing was first proposed by American scholars Robert S. Kaplan and Robin Cooper in the 1980s; that is, indirect resource consumption is allocated according to resource and cost drivers to make the cost allocation results more scientific and reasonable, thus improving the cost management system of enterprises and creating conditions for raising the cost accounting accuracy and the superiority of enterprise management decisions (Robert, Robin, 1998). The activity-based costing, centered on activities, guarantees the reasonable identification and calculation of all the activities that exist in the production and management of enterprises. The resource consumption of each activity can also be properly calculated to select an effective activity driver to reasonably allocate the resource costs to different products (Guo, 2019). And the following several elements are included in activity-based costing.

2.1 Resource

Resource refers to the human, material, and technical resources consumed in the production and operation of the enterprise to obtain economic benefits. The role of resources under activity-based costing is to be treated as the target of allocation at the starting point of all accounting activities and also the initial point of departure.

2.2 Activity

Activity, carried out for a specific goal, stands for a link between resources and cost objects. Each link and process in the production and operation process can be regarded as an activity.

2.3 Resource Driver

Resource driver, whose foundation is to reasonably allocate production and operation costs, is the way and reason behind the consumption of each activity, and also the main cause influencing the production and operation costs. It exists as the most appropriate indicator of the intensity and frequency required by activities, costs, or other resources.

2.4 Activity Driver

With the activity costs apportioned to expense targets or allocated to other activities, the status of the consuming activity can be reflected. For example, the activity driver of information services falls on the number of services.

2.5 Activity Center

The fact that activities sharing similar objectives can be combined and organically connected, given the unified activity driver, depends on the role of the activity center. The activity center can clearly summarize the related activities for the enterprise to manage.

3 COST COMPOSITION AND CHARACTERISTICS OF SOFTWARE ENTERPRISES

3.1 Cost Composition of Software Enterprises

Through the analysis of big data technology, the cost composition of software enterprises can be divided into the following categories.

3.1.1 Human Costs

Differences exist between software enterprises and traditional manufacturing enterprises. Software enterprises are those selling wisdom, products, and services that are often tailored to the needs of the customers. In this way, the highly sophisticated talent reserve and regular training of software personnel highlight the importance to software enterprises, which leads to higher human costs.

3.1.2 Software Development Costs

Software development costs usually include software development costs tailored to the user and the development costs of new projects, of which the development risks and difficulties of new projects are relatively high. This, to a certain extent, increases the development costs of new projects and results in higher development costs for new projects than general software development.

3.1.3 Enforcement Costs

For those sold software products, software enterprises provide the expenditure for installation, debugging, training, acceptance inspection, and maintenance services for customers. Software products, unlike other products, require software enterprises to not only provide all the funds for software implementation but also follow up on its subsequent application throughout the implementation process and after-sales services, leading to an increase in software enforcement costs.

3.1.4 Hardware Consumption Costs

The material assets largely possessed by software enterprises are electronic equipment, which constitutes hardware consumption costs of software enterprises. Compared with other material assets, electronic equipment features a relatively fast rate of renewal and short service life. Thus, it is imperative for software enterprises to upgrade electronic equipment in order to ensure normal production and operation, increasing the costs of software enterprises to a certain extent.

3.2 Characteristics of Cost Accounting in Software Enterprises

3.2.1 Simplicity in Accounting

At present, most software enterprises work around specific software projects. With relevant project teams developing software projects and functional departments covering administration and manpower, the project's operation process is traceable. Moreover, software products are virtual things with almost no inventory costs. The relatively fewer cost types also make accounting simple compared to manufacturing enterprises.

3.2.2 Simplex Standard for Indirect Cost Allocation

The indirect cost allocation standard for software products in software enterprises proves to be simple as dominated by the proportional method of labor hours. Such a simple method is prone to deviate software products from the true costs, which is not conducive to the reasonable pricing of software products and accurate decision-making of enterprises, thereby affecting the long-term development of enterprises.

3.2.3 Inadequacy in Inventory Costs

Software products of software enterprises are Internet service products existing in the form of service network users. Given its virtual nature, software enterprises have almost no physical inventory.

4 ANALYSIS OF THE NECESSITY AND FEASIBILITY OF ACTIVITY-BASED COSTING FOR SOFTWARE ENTERPRISES

4.1 Necessity Analysis

4.1.1 Ability to Correctly Account for Indirect Costs

Indirect costs constitute an important part of the organization and production of software enterprises. Compared with direct costs, indirect costs are more difficult to allocate. The traditional costing methods currently used by software enterprises have led to the distortion of cost information to a large extent. And the introduction of activity-based costing can make up for the defects of the traditional methods by taking activities as the allocation objects, establishing activity centers with the same attributes, and using different methods to allocate indirect costs according to different cost drivers, which can improve the costing accuracy and provide more valuable information for decision-making (Lu, 2017).

4.1.2 Improvement in Capital Utilization

Software enterprises, highly dependent on technology, require a large amount of capital for research and design. In addition, given the low return of funds and the different project life cycles, only when software products are accepted that corresponding revenue can be generated, highlighting the importance of fund adequacy. Therefore, it is necessary for software enterprises to make reasonable planning for the relevant production process, account based on the activity completion at each stage, improve the fund utilization, and ensure the effective withdrawal from circulation so as to maintain the normal operation of enterprises (Kuang, Wang, 2020).

4.2 Feasibility Analysis

4.2.1 Suitability to the Application Conditions of Activity-based Costing

The main business of software enterprises is to develop customized software products according to customer needs. The diversity of software products and the periodicity of R&D are in line with the activity-based cost accounting system. Therefore, it is feasible to apply activity-based costing to software enterprises, which can help them operate and develop better and enhance their competitiveness.

4.2.2 Ability to Process Data through Big Data Technology

While activity-based costing proves to be complicated in the calculation and requires the collection of information from various links, software enterprises boast advanced data processing ability and data backup conditions, under which big data technology can be used to connect different isolated islands of information and collect various data samples to enrich the content in database and guarantee data from different perspectives, thus providing a sufficient database for the application of activity-based costing (Zhao, Wu, 2017).

4.2.3 Advanced Management Concepts

Generally large in scale, software enterprises tend to locate themselves in developed areas where advanced resources and management concepts at home and abroad can be obtained in a timely manner. During the implementation process, enterprises can quickly accept the most advanced research theories and apply the latest enterprise management concepts to help software enterprises successfully implement activity-based costing and ensure its implementation effect.

5 DESIGN OF ACTIVITY-BASED COST ACCOUNTING SYSTEM FOR SOFTWARE ENTERPRISES

Against the background of big data analysis and according to the basic principle of activity-based costing as well as the characteristics and cost composition of software enterprises, the activity-based cost accounting system for software enterprises can be designed as follows.

5.1 The Confirmation of Project Activities

The project development workflow of a software enterprise generally necessitates project establishment, project budget, software development, software testing, software operation and maintenance, online promotion, etc., based on which the whole process of software enterprises can be divided into activities:

(1) Project establishment, including market research, product positioning, product feasibility analysis, etc.
(2) Project budget, including accounting, budgeting, budget report, etc.
(3) Software development, including development plan, DEMO production, software programming, UI design and development, sample demonstration, etc.
(4) Software testing, including system testing, internal testing, and external testing.
(5) Software operation and maintenance, including the operation and maintenance of software projects.
(6) Online promotion, including the development of online plans, software promotion, and online software.

5.2 The Confirmation of Activity Centers

Activity centers should be established based on

Table 1: Summary Table for Activity Centers [Ower-draw].

Activity Center	Related Activities
Project Center	Market research, product positioning, feasibility analysis, etc.
Development Center	Development plan, DEMO production, software programming,
Test Center	UI design and development, sample demonstration
Operation and Maintenance	System testing, internal testing, external testing
Center	Software maintenance, software promotion

activities sharing the same attributes. And four activity centers can be established given the above six activity attributes, as shown in Table 1.

5.3 The Determination of Resource Costs

The following resource cost items are determined according to the resources consumed by software enterprises.

(1) Labor cost. In software enterprises, labor costs account for a large proportion of the costs of software products. As several links ranging from software design, research, and development to maintenance highly rely on the ability and experience of the relevant personnel, the intellectual output of employees dominates the software costs.

(2) Depreciation costs of buildings. The buildings where software enterprises locate are mainly office buildings, which are equivalent to the "production plant" of software products. Therefore, the depreciation costs of office buildings should be apportioned according to the degree of operation of each software project and then be included in relevant business costs, generally apportioned based on the area occupied by functional departments.

(3) Depreciation costs of office equipment. The major office equipment of software enterprises is computers. Computer depreciation costs are calculated given the length of use because the computer works only when employees work, making it reasonable to allocate the depreciation costs of computers and other equipment based on labor hours.

(4) Other expenses include travel expenses, information service fees, water charges, electricity, property management fees, network service fee, and other office expenses. Among them, travel expenses are allocated by travel duration and information service fees by the number of services. Electricity is related to electricity consumption, which mainly comes from the daily operation of computer equipment and lighting. But as computer equipment consumes more electricity, the electricity can be allocated according to the working hours of the machines; since software projects mainly rely on online networks with computer equipment involved, the network service fees can be allocated according to the working time of computer and other equipment; water, property, and office expenses are all allocated given the occupied area of the building.

5.4 The Choice of Resource Driver

In light of the costing conditions and the determination of different resource costs of software enterprises, the selected resource drivers determined by big data analysis are shown in Table 2.

5.5 The Choice of Activity Driver

In light of the determined activity centers, the activity drivers are selected as follows: labor hours (hour) of the initial planning of software projects for the project center; labor hours (hour) consumed by program and UI in software development for the development center; testing time (hour) of system testing, internal testing, and external testing for the test center; and labor hours (hour) of software promotion and maintenance for the operation and maintenance center.

Table 2: Table for Resource Drivers [Ower-draw].

Activity Center	Resource Type	Resource Driver
1	Labor Cost	Labor Hour (Hour)
2	Depreciation of Buildings	Occupied Area (Square Meter)
3	Depreciation of Computer Equipment	Service Duration (Hour)
4	Travel Expense	Travel Duration (Hour)
5	Information Service Fee	Number of Services (Times)
6	Electricity	Service Duration (Hour)
7	Network Service Fee	Service Duration (Hour)
8	Water Charge	Occupied Area (Square Meter)
9	Property Management Fee	Occupied Area (Square Meter)
10	Office Allowance	Occupied Area (Square Meter)

5.6 The Confirmation of Costing Objectives and Costing Period

5.6.1 Costing Objectives

The product costs of software enterprises can be mainly divided into the costs before and after the project establishment. Without project establishment in the development of software products, there will be great uncertainty and no specific object for cost accounting, which is then uniformly grouped into the R&D cost. After the software products are established, the analysis of production costs will be carried out according to the product batch dominated by the production of a single piece and a small batch. In this way, the object of costing is the product batch.

5.6.2 Costing Period

The production of software enterprises, given the development size, can be concluded as small projects and large projects. While for small projects with production cycles not too long, the costs incurred can be carried forward in the month. For large projects with inter-year production cycles, the costs should be calculated according to the percentage of completion.

5.7 The Arrangement of Costing Accounts

5.7.1 The Arrangement of General Accounts

In order to meet the cost accounting needs of software enterprises, "technology development cost," "technical service cost," and several "activity cost" general accounts are set. The "technology development cost" account is used to collect the costs of technology development projects, the "technology service cost" account to collect the costs of technology service projects, and the "activity cost" account to collect the costs incurred for the activity.

5.7.2 The Arrangement of Subsidiary Accounts

The subsidiary accounts of software enterprises are determined by the general accounts, and the specific settings are as follows.

The arrangement of "technology development cost" and "technology service cost" subsidiary accounts: to set up secondary subsidiary accounts according to each division, establish columns according to cost items, and generally set up tertiary subsidiary accounts given R&D projects, the specific items of which include labor cost, depreciation fee, travel expense, information service cost, water charge, electricity, property management fee, network service fee and other costs.

The arrangement of "activity cost" subsidiary accounts: to set up secondary subsidiary accounts according to each division under the general account of "activity cost," establish columns according to cost items, and generally set up tertiary subsidiary accounts given each activity, the specific items of which include labor cost, depreciation fee, travel expense, information service cost, water charge, electricity, property management fee, network service fee and other costs.

6 CONCLUSION

In the era of big data, it remains an urgent problem for software enterprises to scientifically conduct cost accounting, improve cost control and make accurate decisions. However, most software enterprises currently suffer from problems such as simple accounting, too simplex standards for indirect cost allocation, and inaccurate cost accounting. Therefore, it is especially important to design a scientific and reasonable cost accounting system for software enterprises against the background of big data analysis. This paper applies the accounting principle of activity-based costing to design a set of activity-based cost accounting systems for software enterprises in terms of identifying activities and activity centers, confirming resource costs, selecting resource drivers and activity drivers, determining costing objects and costing periods, and setting accounts, which aims to improve the costing accuracy, upgrade the level of cost management, and boost the development of software enterprises.

ACKNOWLEDGMENT

REFERENCES

Guo J.M. Research on the Application of Activity-based Costing[J].Accounting Research,2019, 40(9):21-24.

Kuang F.H., Wang Z.J. Discussion on the Optimal Costing Method for Small and Medium-sized Production Enterprises - A Comparative Analysis based on Traditional Costing Method and Activity-based Costing[J]. Accountant,2020(03):87-88.

Lu J.Y. Research on the Promotion and Application of Activity-based Costing in Modern Enterprises[J]. Accountant,2017,14(12):66-68.

Robert S. Kaplan, Robin Cooper. Promise and Peril of Integrated Cost System[J].Harvard Business Review,1998,(4).

Zhao H.C., Wu M.N. A Comparative Study of Activity-based Costing and Traditional Costing Method - A Case Study of a Large Mechanical Processing Enterprise[J]. Friends of Accounting,2017,35(9):20-23.