Based on the Cloud ERP and TDABC for the SMEs' Logistics Cost Accounting

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Abstract. Enterprise logistics is "the final frontier of lowering enterprise costs", thus enterprise logistics cost accounting effective methods are constantly explored and used in theory and practice; TDABC (Time-Driven Activity-Based Costing) has been developed based on improving of ABC (Activity-Based Costing), and has better of using in enterprise logistics cost accounting. But the data access only can be effective on enterprise using ERP (Enterprise Resource Planning); Most of SMEs (Small and Medium Enterprises) cannot afford ERP, which results in their information management and cost accounting data getting difficult. With the advent of cloud computing, affordable cloud ERP provides a way for SMEs using ERP, cloud ERP combined with TDABC, provides an effective method of logistics cost accounting for SMEs. This paper firstly discusses cloud ERP is the inevitable of ERP development; Analyzed TDABC cost accounting method and its application; Then TDABC working principles are discussed on cloud ERP environment; On this basis, the based on cloud ERP and TDABC confirmatory analysis of the SMEs logistics cost accounting is done, and it shows the method is effective, and also provides with the data basis for SMEs logistics costs analysis. Research to focus on SMEs logistics cost data availability, TDABC cost accounting methods on cloud ERP environment are the innovation and contribution of this article.

Introduction

The relative statistics of the United States shows: Product processing time is only 5% of the total time, but the operations time of storage, handling, transport, packaging and sale, etc. is accounted for 95% of the total time, so logistics is seen as "the final frontier of lowering enterprise costs," logistics is the third profit source of enterprises. Logistics cost accounting can directly show logistics cost, identify the causes of cost increasing or reducing, provide the basis of enterprise operational optimization, and its great significance for enterprise to reduce cost and increase efficiency (Deng and Zhang,2002) [1].

Activity-based Costing (ABC) is a method of logistics cost accounting and management and Pohlen & La Londe (1994) [2] applied the ABC to logistics system studies for the first time, put forward an opinion that the analysis based on activity can help uncover the

loopholes and defects; Perrtila & Hautaniemi (1995) [3] discussed ABC in context with distribution logistics management, and the detail procedure of calculating activity-based costs of a distribution warehouse in a case-company is given; Yu (1995) [4] introduced ABC to the domestic for the first time. Many scholars home and abroad analyzed the applicability of ABC in enterprises from different angles, owing of the complexity of operation, the chronicity of implementation, the difficulty of updating, which makes this method not easy in practice.

In order to improve ABC, Kaplan & Anderson (2004) [5] proposed time-driven activity-based costing (TDABC), and the difference from ABC is to estimate the time for each activity. Brugemann (2004) [6] pointed out TDABC fits better to deal with the complexity of the logistics business than ABC, and enhances enterprises profitability. Yang & Liu (2008) [7] pointed out that TDABC had simple operation and low cost in comparison with ABC. Meanwhile, TDABC had greater flexibility; it can update and exchange the model according to the needs of business accounting at any time. Everaert, et al (2008) [8] found that the TDABC can use time equation effectively resolve the complexity of more motivation of logistics enterprise cost through case study, in addition to provide more accurate cost information than ABC. Domestic and foreign scholars, such as Bai (2008)[9] , Hoozée (2010)[10] , did a lot of researches, analyzed that TDABC had some merits compared with ABC, that were the operation was simpler and the model updating was more flexible; Similar exploring, such as, Deng, et al(2014) [11] researched the management of logistics activity-based costing based on time by contrasting between real time and standard time of each activity to improve efficiency. But there were still some imperfections, for example, it was difficult to acquire data, and it need to spend a lot of energy and money for data collection and management. The expenditure of the accounting cost was much more than the profits after cost accounting. This was unbearable for many SMEs.

To avoid falling into such a predicament, many enterprises introduce ERP to assist in the calculation. From implementation reports to mark employee's attendance, ERP control the whole information flow of the company [12-14]. In this way, it can be easily and quickly call related data information from ERP. Qin (2010) [15] used ERP to analyze and calculate the enterprise's logistics holding costs, and collected the required data of majority of logistics holding costs accounting. Xie & Li L (2010) [16] discussed about the TDABC method integrated with ERP system of enterprise. Although ERP has numerous advantages, it requires a lot of attention and resources to manage. The purchasing expense and maintenance charge of a complete set of ERP is the most of SMEs can't afford of, which hampered the development of ERP to some extent.

SMEs are accounted for enterprise total of 99%; their contribution has more than 60% of GDP, and 50% of tax and 80% of town employment in China [17]. Due to itself small scale, relative limited human, financial and material resources, SMEs invest in ERP insufficient, thus their information construction and management is also relative lag, the data acquisition and statistics analysis of introducing logistics cost in SMEs cost accounting are difficult effective implementation, and SMEs logistics cost management has been restricted, led to China SMEs logistics cost high, market competitiveness weak and profit benefits low, and it is not adverse to SMEs development. The emergence of cloud computing had saved this embarrassing situation.

With the advent of cloud computing, various companies began to consider transferring the ERP system to the cloud, so that cloud ERP was formed. On the basis of overcoming the shortcomings of traditional ERP, cloud ERP also contains the following advantages: lower cost, lower approval, easier OTA (Over-the-Air) system updating, and better data management, more sheltered of company data. SMEs do not need to buy the entire ERP software, but only need to buy the component library that required which not only reduce

costs, but also improve efficiency [18-20]. Integration the actual situation, we put forward the SMEs' logistics cost accounting based on the cloud ERP and TDABC. TDABC combines with cloud ERP were introduced to logistics cost accounting, which not only overcome the insufficient of TDABC, but make the most of cloud ERP, and play a dual role to reduce logistics cost.

Cloud ERP is the Inevitable of ERP Development

Cloud ERP is the ERP system of cloud computing development, as shown in Figure 1.
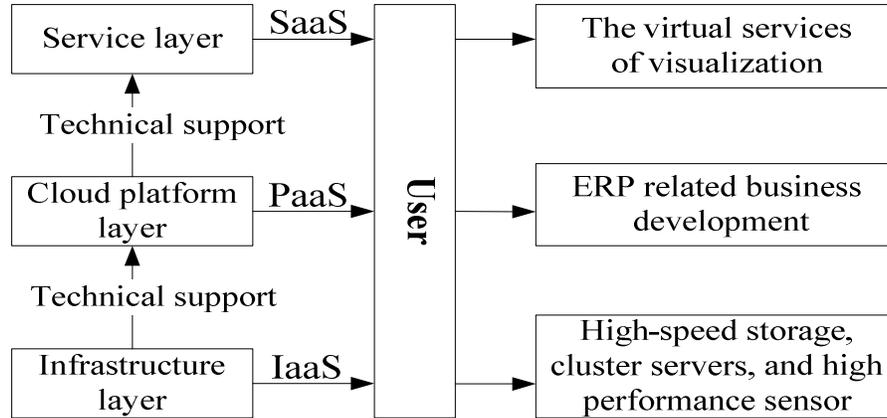

Figure 1. Cloud ERP Service System.

The Bottom layer is IaaS (Infrastructure as a Service) and provides for consumers infrastructure services with high-speed memory, cluster server and high-performance sensors and other hardware; The middle layer is PaaS (Platform as a Service) and provides a cloud platform to implementation ERP business development; the top is SaaS (Software as a Service), also known as service layer, through cloud computing, it provides for users with visual virtual services [18-20]. Cloud ERP inherited the characteristics of SaaS and open source software as service software, customers get ERP services via the Internet. Cloud ERP offers the following advantages:

Low Cost and Low License

Different from traditional ERP, cloud ERP client do not need install hardware server and software as well as build a data center room; Do not need build a full-time IT maintenance team and pay upgrades; Do need have access to the Internet any terminal equipment, such as PC, tablet computers, smart phones that access the cloud server for ERP applications. Company does not require purchase license for every user to use this system, only to pay a fixed amount for cloud ERP license, and then everyone can use the system, which greatly reduces the cost of investment.

OTA Update

Deploying cloud ERP's biggest advantage is that the company is not need continually upgrading their systems in order to get new features and new updates. Cloud ERP has update OTA (over the air technology), compared with the traditional ERP upgrades, it saves a lot of time and also decreased significantly work.

Better Data Management

The data management in the cloud has better scalability by cloud ERP. When all the data are stored in the cloud, then the company move that data is accessible anytime and anywhere, and don't have to worry about losing.

Data Security

Cloud platforms are built by some of the world's top Internet companies; they have the world's top hardware, technologies and technical talent, provide reliable protection for environment security and stability, and guarantee the data security and backup for the user, for the protection of private data.

Cloud computing and ERP two swords can bring innovation, cloud ERP is the inevitable direction of ERP.

TDABC Cost Accounting Method

TDABC is usually defined as "a cost accounting method with time as the basis for allocating resources cost, by experienced managers reliable estimating for the actual capacity and per activity time, calculating the activity driver rate, and last assessing the cost of the activity."

TDABC basic concepts include the following 5 aspects: (1) Time of unit activity, referring to the time takes to complete an activity; (2) Resources, referring to the expenditures of product operations and product services; (3) Activity, for certain purposes, work within a specific range with consumption of certain resources, is inevitable part of forming products and services; (4) Actual capacity, the production's actual production due to the internal and external factors of the production equipment under disturbance conditions; (5) Activity driver rate, also known as per unit activity cost and it is the product of the unit time cost and the unit activity consuming time.

TDABC get rid of the step which ABC allocate resources cost to activity, and the product and service costs are directly assigned to the products and services, only the two most fundamental data are needed to estimate: one is Cost Per Time Unit of Capacity; another is the Unit Time of Activities. The multiply of the two numbers equals to the unit activity cost, or the activity driver rate, and then calculate the total cost.

TDABC advantages: (1) to reflect more clearly the effective utilization of resources; (2) to better meet the demand of the complex reality of activity running; (3) easier implementation of the company's management; (4) easier the update after the completion of the system.

The TDABC Principle on Cloud ERP Environment

The TDABC Data Collection and Processing on Cloud ERP Environment

To solve the problem of enterprise logistics cost accounting data acquisition difficult and cumbersome, Information system is necessary for support, cloud ERP is a highly integrated enterprise information management systems that its data is highly integrated to support business decisions at all levels. The enterprise applying Cloud ERP provides an opportunity for logistics cost accounting with TDABC, and obtains economic, accurate and fast data for the enterprise's accounting information system, which lays the foundation for the realization of SMEs logistics cost accounting and for the reduction of logistics costs, thereby increases the applicability of cloud ERP in the logistics field.

The TDABC principle on cloud ERP environment, as shown in Figure 2, is need to base on the processing thought of TDABC, the reengineering of enterprise cost accounting process, mainly takes into account the following aspects.
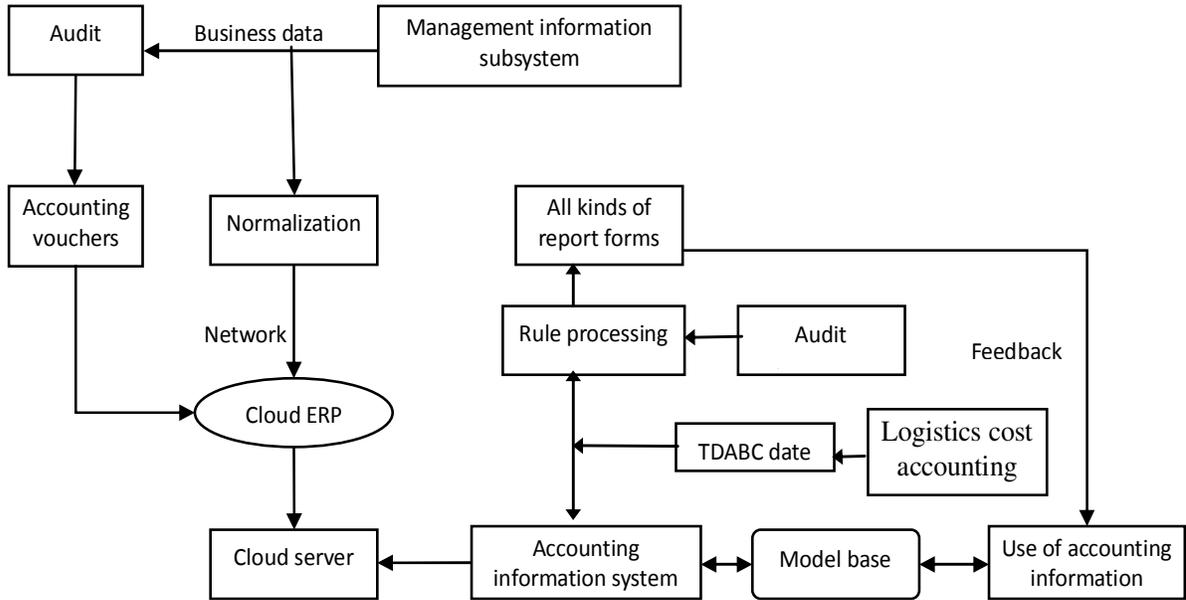

Figure 2. The TDABC Data Collection and Processing on Cloud ERP Environment.

The Collection of Accounting Data. Under the environment of cloud ERP, as soon as the business happened, the business data is collected by the management information subsystem of each business sector, and according to certain coding transfer business data to cloud ERP through enterprise network and save it. When accounting department need to use the data, directly invoke it from the cloud ERP and processing, reducing the labor intensity of accounting personnel. In the implementation process of TDABC, first of all, aggregate the costs in accordance with the departments and products. Secondly, accounting personnel are required to calculate the cost of resource capacities that input per unit time, that is the production cost per unit time.

The Processing of Accounting Data. The relevant information about business events transmitted to the information department can be used by the accounting department after the necessary transformation. Based on the TDABC, first of all, determine the activity cost drivers rate, namely activity cost per unit of one activity; Secondly, calculate the cost of products and prepare a list of the product cost allocation; Finally, in accordance with the relevant original documents to prepare accounting vouchers, and then register relevant books.

Reporting and Updating of Accounting Information. For the cost analysis report, enterprises can analyze the actual work efficiency and the untapped productivity in the current period according to a variety of data that generated; set the current cost drivers rate as the standard to predict the cost of next phase, and compare with the actual cost, forming some related management information such as budget reports and cost variance reports. For data updating, according to the time-varying management environment, pay attention to the changes of related data information of each department information system, and update in due course.

The TDABC Accounting Procedures on Cloud ERP Environment

The concrete steps of the TDABC **accounting procedures** on cloud ERP environment are as shown in figure 3.
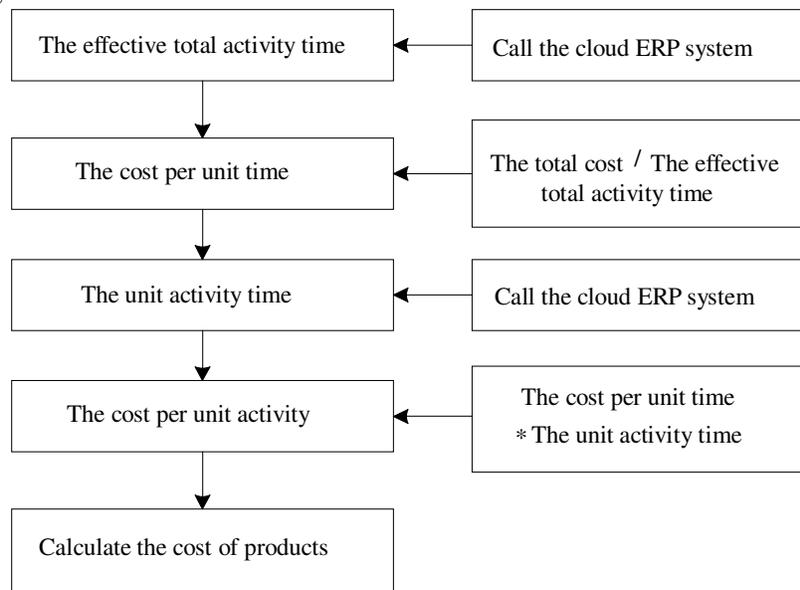

Figure 3. The Accounting Model of TDABC Integrated with Cloud ERP.

(1) View the effective total activity time

By calling the cloud ERP system, the resource's capacity that actually offered in this month would come to understand.

(2) Calculate the cost per unit time

The cost per unit time is the total cost divided by the effective total activity time.

(3) View the unit activity time

Access to relevant data from cloud ERP system, then conversed by accounting personnel.

(4) Calculate the cost per unit activity

Namely the activity cost driver rate. The cost per unit activity is the product of the two indicators that the cost per unit time and unit activity time. The economic implication of activity cost driver rate is the cost per unit activity of one activity.

(5) Calculate the cost of products

Activity-based cost can be counted in the product or service after finding the activity cost driver's rate. Finally the product or service cost is summarized to calculate.

Confirmatory Analyses

Assuming the logistics department of one SME adopts cloud ERP and TDABC to do the logistics cost accounting at the end of month. The sector employs 30 employees that work 8 hours per day and 22 days per month. With the amount of the total fee are 150000 Yuan a month. Accounting department obtains related information from the company's cloud ERP system, which the logistics activities mainly consist of three activities in this month: processing orders, packaging and delivering, the amount of activities (piece) is 3000, 2000 and 2000 respectively. The time spent on each activity can be also called from the cloud ERP

system; the accounting department does some related conversion for data and gets the following reference data. The unit activity time of processing order was 13.34, the unit activity time of packaging was 7.14, and the unit activity time of delivering was 81.21. The theory providing volumes of resource capacity are 316800 per month (30 * 8 * 22 * 60) min, according to the actual number is 80% of the theory providing volumes, so the department's actual number of resources ability is 253440 min per month, hence the cost per unit time (minute) is about 0.60 (150000 / 253440) Yuan. Making using of the above data, according to the time-driven activity-based costing to account the logistics cost, which can get the results are shown in the following table 1.

Table 1. TDABC Cost Accounting Combined with Cloud ERP.

Activities	The unit activity time (1)	Quantity of activity (2)	The total time (3)	Total cost (4) =(3)×0.60
Order processing	13.34	3000	40020	24012
Packaging	7.14	2000	14280	8568
Delivering	81.21	2000	162420	97452
The total usage amount	——	——	216720	130032
Not usage amount	——	——	36720	19968
The total supply amount	——	——	253440	150000

By calculation, time utilization rate is 85.51% (216720 / 253440), and cost utilization rate is 86.69% (130032 / 150000). By analyzing the amount of unused time, can calculate the number need to cut is 36720 / (8 * 22 * 60) ≈ 4, then rearrange and readjust the personnel according to the time needed for each activity, until the optimal. On the basis of cost drivers rate of this month to predict the cost of next month will be 132000 Yuan, then the budget report is formed. Afterwards, comparing actual costs with 132000 Yuan, the cost variance report is generated.

The perfect collision of cloud ERP and TDABC, bringing more possibilities to reduce logistics cost for small and medium enterprises:

(1) Companies no longer need to spend a lot of money to buy high performance hardware and software, but only to pay for that part service that used.

(2) The cloud ERP improves the ability and speed to get the logistics cost information for enterprise in large extent. The discretion of logistics cost is very dependent on the level of time efficiency; especially the enterprises need to implement zero inventory. It is extremely important to quickly respond to market and timely access to logistics cost information.

Summary

SMEs Using cloud ERP means no longer to need spent large of money to purchase high performance hardware and software, and just pays for that using of part service, makes SMEs Using cloud ERP affordable and better; TDABC as a simple, efficient of cost accounting method, combined perfect with cloud ERP, to a large extent, is able to reduce the expenditure of acquiring enterprise logistics cost accounting data, and also to improve the of capacity and

speed that enterprise gets the operation data; to provide a scientific and feasible way for SMEs logistics cost accounting.

While cloud ERP application, which will improve the promotion and application of ERP in SEMs, provides a wide range of services and service sites for cloud services as well as information, realize the effective management of internal and external resources, as well as reduces costs and increases benefits, improve the enterprise management level.

The paper's innovations are mainly reflected in the following aspects:

(1) The study focused on the SMEs. The home and abroad research on logistics cost accounting is mainly concentrated in the large enterprise and third party logistics enterprises, while on SMEs and SMEs logistics is particularly rarely.

(2) The study is focused on the SMEs logistics cost data availability. TDABC is SMEs logistics cost accounting effective method discussed in this paper, but the data gets difficult; ERP is the effective way of acquiring data resources by enterprise information management; But SMEs afford it difficult. Cloud ERP is the inevitable development of ERP, which brings the economic accessibility of SMEs data acquisition. Cloud ERP and TDABC integration also brings the benefits of enterprise cost efficiency and automation management by improving and changing the method of enterprise cost accounting, accounting data acquisition and processing,

Limitations of this study and subsequent research proposals

The proposes of combining cloud ERP and TDABC for SMEs logistics cost accounting brings an economic convenient feasible theory method, while also has done related confirmatory analyses, but these are established in theory analysis and research hypotheses, Empirical analyses based on cloud ERP and TDABC are need to realize the SMEs logistics cost accounting in the SMEs of using cloud ERP, to found the defects and insufficient of the theory, further to perfect SMEs logistics cost theory and practice application.

Acknowledgements

References

[1] A. M. Deng, G. F. Zhang. Logistics Engineering, first ed., Mechanical Industry Press, Beijing, 2002, pp.1-45.

[2] T. L. Pohlen, B. J.La Londe. Implementing activity-based costing in logistics, J. Journal of Business Logistics. 15 (1994) 1-23.

[3] T. Perrtila, P. Hautaniemi. Activity-based costing and distribution logistics management, J. International Journal of Production Economics. 41 (1995) 327-333.

[4] X. Y. Yu. A brief discussion on the new development of contemporary management accounting—high-tech-based, "activity-based costing" combined with the "activity management", J. Accounting Research. 7 (1995) 1-4.

[5] R. S. Kaplan, S. R. Anderson, Time-driven activity-based costing, J. Harvard Business Review. 11 (2004) 131–138.

[6] W. Bruggemam, K. Moreels. Activity-based costing in complex and dynamic environments: The emergence of time-driven ABC, J. Controlling, 11 (2004) 597-602.

[7] T. P. Yang, Z. X. Liu. The cost accounting of enterprise logistics based on time-driven activity-based costing, J. Contemporary Economics Review, 24 (2008) 144-146.

[8] P. Everaert, W. Bruggeman, G. Sarens, et al. Cost modeling in logistics using time-driven ABC: Experiences from a wholesaler, J. International Journal of Physical Distribution & Logistics Management. 38 (2008):172-191.

[9] S. Bai. Time-driven activity-based costing study, J. Accounting Communications. 8 (2008) 155-156.

[10] S. Hoozée, On the determinants and the role of costing accuracy of time-driven activity-based costing, J. Ghent University Faculty of Economics & Business Administration. 239 (2010) 283-286.

[11] A. M. Deng, H. Li, H. Wen, et al. Management of logistics cost accounting based on time [j]. Study on the Management of Science and Technology, J. 19 (2014) 195-198.

[12] J. Hu, L. K. Liao. Cost management of enterprise under ERP environment, J. Journal of Huazhong agricultural University: Social Sciences Edition, 3 (2008) 57-60.

[13] J. Du. Study on logistics cost management of enterprise under ERP environment, J. Logistics Technology. 28 (2009) 22-124.

[14] Y. C. Wang. On the management of logistics cost in enterprises under the ERP environment, J. Market Modern, 29 (2009) 51-51.

[15] C. L. Qin. The analysis and account of enterprise logistics holding cost under the environment of ERP, J. Value Engineering. 29 (2010) 10-11.

[16] L. L., Xie, L. Li. Discussed about the TDABC method integrated with ERP system of enterprise, J. Chinese Collective Economy.34 (2010) 89-90.

[17] Information on http://money.163.com/12/0214/20/7Q8H8DUA00252G50.html.

[18] P. Liu. Cloud Computing, first ed., Electronic Industry Press, Beijing, 2011.

[19] W. Xia. The problems and countermeasures discussion on cloud computing ERP applications mode, J. Computer CD Software and Applications. 23 (2013) 139-139.

[20] N. Yang, D.B. Li, Y. F. Tong. Research on service-oriented cloud computing ERP architecture, J. Manufacturing Automation. 34 (2012) 74-77.