

Design and Implement the Activity-Based Costing in Taiwan Firm

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Abstract : *We design and implement the activity-based costing (ABC) to the communication firm in Taiwan which originally adopted the existing traditional costing method (TC) to measure the unit cost. In contemporary research, the activity-based costing (ABC) was utilized to measure and analyze the product unit cost in production process. This firm originally adopted a roughly estimate based in cost system to allocate support department cost, meanwhile it adopted the direct labor hour (DLR) to allocate the conversion costs to products. This original traditional costing (TC) has the weakness on distorting the product unit cost since it pulls all of costs into the single pool and activity. We collected and analyzed field data for 24 months through interviews, files gathering, and cost data to analyze B Company's product characteristics, production process, and existing costing during 2010 to 2012. We compared and contrasted B firm implemented both ABC and TC cost allocation method on unit cost, the activity center and production system. Our researches focus on analyzing the existing cost accounting system, designing a practical ABC system and applying ABC on the support-cost allocation, comparing the cost data under the existing cost system and ABC, and providing the suggestion about the ABC implementation follow-up activities. Our results found that the traditional cost system in this firm overestimates the costs of high direct labor-hour products and underestimates the costs of high complexity products. Instead of the tradition costing (TC) or the conventional costing or the simple costing with the single indirect-cost pool and arbitrary allocation bases, the ABC creates homogeneous cost pools (activities) linked to different cost-allocation bases that have cause-and-effect relationships. Finally, our findings are that the implementation of the ABC provided more accuracy in allocating the unit cost, more reasonable information and cost allocation for the activity center, and non-financial information for the production system.*

Keywords: *Activity-based Costing (ABC), Traditional Costing (TC), Conventional Cost, ABC implementation, Cost Driver*

I. Introduction

The introduction of the paper should explain the nature of the problem, previous work, purpose, and the contribution of the paper. The contents of each section may be provided to understand easily about the paper. The traditional costing (TC) or the conventional costing only has the single indirect-cost pool and arbitrary allocation cost bases, so it overestimates the costs of high direct-labor-hour products and underestimates the costs of high complexity products. The weakness of this original traditional costing distorts product cost. Thus, the activity-based costing (ABC) is a current popular research topic and will be the future trend to implement the activity-based costing (ABC), since the implementation of the ABC provided more accurate to allocate the unit cost, more reasonable information and cost allocation for the activity center, and non-financial information for the production system.

In developed countries, Activity-based costing (ABC) studies have been implemented such as in USA (Anderson & Young, 1988; Anderson, Hesford, & Young, 2002), the UK (Al-Omiri & Drury, 2007; Soin & Seal & Cullen, 2002), and Australia (Askarany & Smith & Yazdifar, 2007; and Harrison & Reeve, 2004). In developing countries, we found that only few studies have been implemented such as China (Liu & Pan, 2007) and Taiwan (Eldenburger & Soderstrom & Willis & Wu, 2010). Additionally, majority ABC studies focused on the system design and its comparison with existing costing method. However, there are not many researchers to testify the adequacy of the design, most researchers rarely discussed the background and process of implementing ABC while comparing correlations between overhead and various cost drivers. Specially, there are very rare research papers explored in communication firm.

Thus, our researches have high contribution on exploring and comparing the transitional costing method with activity-based costing (ABC) method in Communication firm of Taiwan, and further designs and implements ABC to solve the TC problem in distorted unit cost. We not only focus on allocation of indirect cost, but also on the allocation of support department cost. Our researches focus on analysing the existing cost accounting system, designing a practical ABC system and applying ABC on the support-cost allocation, comparing the cost data under the traditional costing (TC) or existing cost system and activity-based costing (ABC), and providing the suggestions about the activity-based costing (ABC) implementation follow-up activities, etc.

The remaining sections of this paper are organized as follows. The next section discusses extant empirical research on implementation of the activity-based costing. Subsequent sections introduce data and methodology, describe the sample firm and cost system. Empirical findings are then reported and discussed. Finally we present our conclusions.

II. Literature Review

In highly automatic and newly technological developments century, the production activities and the cost structures have been changed therefore to find the accurate costs allocation that are important to managers and decision-makers. In USA, Raffish and Turney (1991) surveys manufacturing industries and they found that the cost of manufacturing overhead was approximate 30 to 50 percent. The percentage of manufacturing overhead rate was 70 to 75 percent especially for electronics industry (Johnson, 1992). Therefore, overhead cost allocation in the manufacturers has a great impact on the measurement of product costs especially for electronics related industry such as the communication-equipment company.

The tradition costing (TC) that counts only the labor-hours does not provide accurate cost information to help industrial sectors on the determination of cost policies and misleads decisions on product pricing, product mix, and parts self-manufacturing or outsourcing (Cooper & Kaplan, 1988; Cooper & Kaplan, 1991; Kaplan, 1988). Cooper (1988, 1989, 1990, and 1992) also found out with the increasing diversification of product complexity, volume and size, the calculated product costs would be deeply distorted under the existing or traditional costing (TC) system. More accurate cost information to avoid a situation of cost compensation can be obtained by the activity-based costing (ABC), which takes into account the manufacturing cost in the way of attributions from the direct and/or indirect cost driver.

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To help industrial managers analyze and determine the cost policies, our research compares the existing traditional costing method and ABC method in C communication Firm of Taiwan.

III. Data And Methodology

3.1. The Firm Description

The C firm was established in 1958 and produced plastic toys. In 1971, the C firm became the first toy OEM (the original equipment manufacturing)/ODM (Own Designing manufacturing) in Taiwan. Since 1983, with the company's business strategy to produce high-tech communication products, C firm transferred from a toy producer into a communication producer. In 1992, C firm became one of the largest manufacturers in Taiwan to produce two-way radios, corded phones, and cordless phones. In order to increase production of communication-equipment, C firm spends nearly \$20 million USD per year on the procurement of metals, plastic, connectors, and other materials. However, most of these component costs have soared in recent years. Under the threat of competitors, C firm's existing accounting system is not sufficient to support the pricing and decision making to determine the accurate unit cost. C firm is expected to improve its cost management to promote its competitiveness. Yin (1989), an advocate of case studies, said that case studies are necessary to understand the internal management system. Following Yin (1989)'s suggestions, we collected and analyzed field data for 24 months through interviews, files gathering, and cost data to analyze and to understand C firm's product characteristics, production process, and existing costing during 2010 to 2012. The participants who attended interview included an assistant director of the accounting department, a costing manager, a senior costing accountant and a senior engineer and they attended more than 20 meetings. This paper considered the business secret proprietary information of C firm, all data was multiplied by certain number.

3.2. C firm's Existing Accounting System

C firm has three departments which are the part injection molding department, the Surface Mount Technology (SMT) auto-insertion department, and the assembling department. All products are produced by order and implemented a normal job-costing system with two direct-cost categories (direct materials and direct labor) and two indirect-cost categories (production department manufacturing overhead and support department cost). The job costing system includes three key elements: direct costs per job, indirect costs per job, and general support costs. Direct costs are costs traceable to a specific job and indirect costs per job are allocable to

each project. These include cost of production department manufacturing overhead and support department cost. Figure 1 displays a current overview of indirect-cost allocation on C firm. Manufacturing overhead is directly traced to each production departments. There are two stages to allocate the indirect cost. The costs on production departments are accumulated in support departments, such as general administration, machine technique support and maintenance, quality control and Warehouse. The first stage of allocation, the costs of support departments are allocated to production departments (activity pools). All support costs are lumped together and allocated by the single arbitrary allocation bases by rough estimation since C firm does not have the estimation method to determine and support cost allocation rate. After collection of manufacturing overhead and support department cost, the cost of production departments is allocated by direct manufacturing labor-hours to products. In the simple costing system, all of indirect costs were lumped together, the cost-allocation base and direct manufacturing labor-hours are not a cost driver of the indirect costs.

C firm's existing cost accounting system has two defects. First, general support cost is allocated by single arbitrary allocation bases. It failed to track resources consumed for individual production departments under the lump-sum estimation and resulted in cost assignment error. Second, the cost of production departments is allocated by direct manufacturing labor-hours to products. Under automatic production processes, the equipment runs quickly and automatically. Managing more complex technology and producing very diverse products need an increasing amount of resources for various support functions. Additionally, direct manufacturing labor is not the only cost driver of these costs. Allocating indirect costs on the basis of direct manufacturing labor cannot accurate to measure how resources are being used by different products. It will make the product cost cross-subsidization.

3.3. Implement Activity-Based Cost Accounting System

After examining C firm's existing cost accounting system, the firm decided to adopt ABC and established a planning team in charge to implement ABC accounting system. The key point to design ABC cost accounting system is the cost system and focus on the important cost, not emphasizing reliability but relativity (Ostrenga, 1990; Cooper, 1988, 1989, 1990, and 1992). We follow the seven-step approach to implement Activity-Based Costing System to C firm's costing system and the three guidelines for refining costing systems which are increasing direct-cost tracing, creating homogeneous indirect-cost pools, and identifying cost-allocation bases that have cause-and-effect relationships with costs in the cost pool. Figure 2 is an overview of indirect-cost allocation on C firm's Activity-Based cost accounting system. Under the ABC model, support department cost and production department cost can be allocated to related cost drivers for improving two defects of C firm's existing cost accounting system.

The seven steps (Horngren, Foster and Datar, 2012; Turney, 1991) implement ABC to C firm are shown below:

1st Step: Identify the cost objects from the products. Cost objects are two-way radios, corded phones, and cordless phones.

2nd Step: Identify the direct costs from the products. The direct materials and direct labor are traced to the individual order.

3rd Step: Select the activities and cost-allocation bases to use for allocating indirect costs to the products.

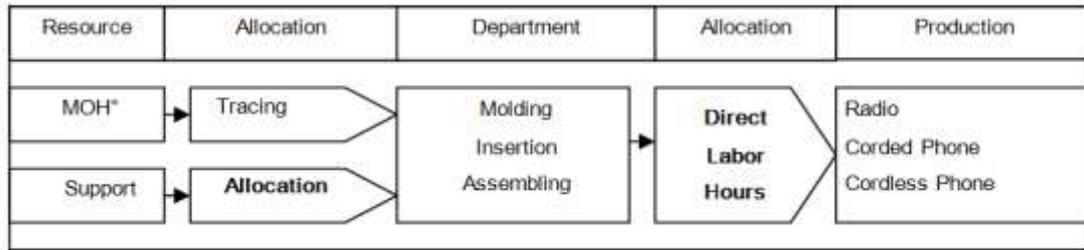
Table 1 shows for refining a costing system, we identify seven cost pools (activities), identify the cost allocation bases, and defines the number of activity pools into which costs must be grouped in an ABC system. For allocating support department cost to production department, the four activities are administration, machine technical maintenance, quality control and warehouse and this allocation belongs to preliminary cost assignment step. For allocating production department cost to products, the three activities are Parts injection Molding, SMT Auto-Insertion and Assembling, and the allocation is belonging to primary cost assignment step.

Support department cost provides the major services for production department in C firm and we ignore information about reciprocal services provided between support-departments. The direct method is implemented to support department for cost allocation. C firm allocates support department costs with allocation base to production first. After collecting direct cost, manufacturing overhead and support-department allocation cost, production-departments allocate with cost drivers to productions. More accurate support-department cost allocations results in more accurate product cost. C firm allocates support department cost with ABC costing.

4th Step: Identify the costs associated with each cost-allocation base. Next 5th step: Compute the rate per unit of each cost-allocation base. Table 2 shows the total cost on column 2, and the activity-cost rates of support-department activity are shown on column 4. 6th step computes the costs allocated to the products. 7th step computes the total cost of the products by adding all of direct and indirect costs assigned to the products. Finally, we compare the cost differences between two costing methods.

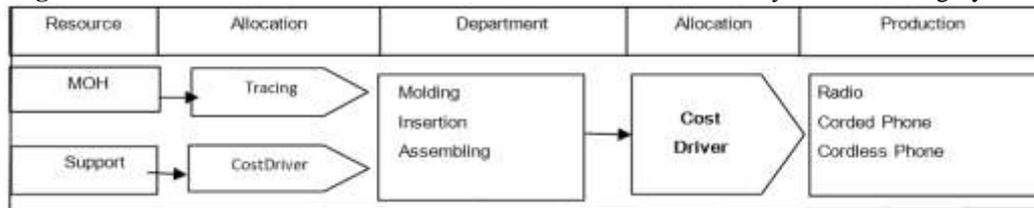
IV. Figures and Tables

Figure 1 An Overview of C firm's Existing Accounting System—Indirect-Cost Allocation



There are two cost pools, manufacturing overhead and supporting cost. *MOH: Manufacturing Overhead.

Figures 2 An Overview of Indirect-Cost Allocation on C firm's Activity-Based Costing System



The bold words show that the support Department cost and the production departments are allocated to related cost drivers by implement Activity-Based Costing System to improve original defects of C firm.

Table 1 Cost Pools of C firm

	Cost Pool (Activity)	Allocation Base (cost driver)
Support Department	● Administration	Square meter
	● Machine Technique	Maintenance times
	● Quality Control	Testing hours
	● Warehouse	Product units
Production Department	● Parts Injection Molding	Injection Molding Machine hours
	● SMT Auto-Insertion	Auto-Insertion Machine hours
	● Assembling	Assembling labor hours

Through cost analysis, support department costs are divided into four cost pools (activities); production department costs are divided into three cost pools.

Table 2 The Activity-Based Cost Rates of Support Department

Cost Pool (Activity)	Total Costs(1)	Total Allocation Base (2)	Cost Rate (3)
Management	\$ 6,877,382	\$76,500m ²	\$ 89.90
Technique	8,852,795	1100 times	8,048.00
Quality Management	2,370,295	7,600 hrs	311.88
Warehouse	2,573,122	782,000units	3.29

Cost rate (3) = Total Costs (1)/ Total Allocation Base (2)

Table 3 shows Cost-allocation base for support department is determined by the quantity demand, and C firm separately tracts activity costs for each production department.

Table 3 The demand Quantity of Cost-Allocation Base on Support Department

Support Department	Total Cost-Allocation Base (1)	Production Department		
		Molding(2)	Insertion (3)	Assembling (4)
Management	76,500m ²	13,110	15,360	48,040
Technique	1100 times	110	390	600
Quality Management	7,600 hrs	2,280	760	4,560
Warehouse	782,000 units	78,200	312,800	391,000

Total Cost-Allocation Base (1) = Molding Department (2) + Insertion Department (3) +Assembling Department (4)

Table 4 shows support department assignment cost on Column 2, direct cost, and manufacturing overhead are collected by production departments after preliminary cost assignment steps. Table 4 also shows the quantity of the cost-allocation base on column 3, and the activity-cost rates for each production activity described on column 1.

Table 4 The Activity-Base Cost Rates of Production Department

Cost Pool (Activity)	Total Cost ^a (1)	Total Allocation Base (2)	Cost Rate (3)
Molding	\$ 9,305,050	12,240hrs	\$ 760.22
Insertion	4,486,934	4,100 hrs	1,094.37
Assembling	29,980,844	131,170 hrs	228.56

a. Total cost is including direct cost, support-department allocation cost and manufacturing overhead. *Cost rate (3) = Total Costs (1)/Total Allocation Base (2)*

Table 5 shows that C firm separately assigns activity costs to each product with demand quantity of cost-allocation base.

Table 5 The Quantity demanded Cost-Allocation Base of Production Department

Production Department	Total Cost-Allocation Base (1)	Product		
		Audio Layer (2)	Corded Phone (3)	Cordless Phone (4)
Molding	12,240hrs	7,340	3,670	1,230
Insertion	4,100 hrs	1,080	1,775	1,245
Assembling	131,170 hrs	78,703	39,352	13,115

Total Cost-Allocation Base (1) = Audio Layer Product (2) + Corded Phone Product (3) + Cordless Phone Product (4)

Table 6 Compare Existing Costing and ABC Costing system on Production Department

Production Department	Existing Costing (1)	ABC (2)	Difference (%)*
Molding	\$ 1,441,253	\$ 4,467,880	210.00%
Insertion	6,771,818	8,449,053	24.77%
Assembling	21,767,773	17,063,911	(21.61)%
Total	29,980,844	29,980,844	—

**Difference (%) = { Activity-Based costing (2)- Existing Costing (1)}/ Existing Costing (1)*

Table 7 Comparison between Existing costing and ABC systems— Product

Product	Existing Costing (1)	ABC (2)	Difference (%)*
Audio Layer	\$ 19.89	\$ 12.07	(39.32)%
Corded Phone	36.23	51.68	42.64%
Cordless Phone	27.17	29.64	9.08%

**Difference (%) = { Activity-Based costing (2)- Existing Costing (1)}/ Existing Costing (1)*

V. Results And Discussions

We compare the cost differences under the existing (Tradition Costing, TC) and ABC costing accounting system. Table 6 summarize the difference in percentage between the existing and ABC costing of the support-cost assignment steps. The difference in percentage is equal to the difference between both costing systems divided by the ABC costing cost. In Table 6, we found that the difference in percentage of Parts Injection Molding is 210.00%. The result found that the Parts Injection Molding cost is underestimated seriously under the existing costing system. Therefore, we can conclude when the support-department cost allocation is inaccurate, it results in inaccurate production-department and product cost.

Table 7 presents the difference in percentage between the existing and ABC costing of the product cost. As shown in Table 7, two-way radio is to be overestimated, and corded phone and cordless phone are to be underestimated. Especially, the difference rate of corded phone is 42.64%. It displays the cost of corded phone is distorted by the existing costing system. We find that two-way radio is consumed high direct labor-hour incurring overestimates under the existing cost system. Additionally, corded phone and cordless phone are more complex production process to accompany with cost underestimates. Thus, existing cost accounting system (TC) will generate “cross subsidy.”

VI. Conclusion

To measure the accurate unit cost is an important role to help managers in making decisions and determining selling pricing. Many researchers focus to find the accurate unit cost for the managers and decision makers to measure the profitability for the company. This paper investigated the communication equipment firm in Taiwan, the ABC cost accounting system was invoked to analyse the cost generated by the actual production processes. Our researches focus on analyzing the existing cost accounting system, designing a practical ABC system and implementing ABC on the support-cost allocation, comparing the cost data under the existing cost system and ABC, and providing the suggestion about the ABC implementation follow-up activities. We collected and analyzed field data for 24 months through interviews, files gathering, and cost data to analyze C firm’s product characteristics, production process, and existing costing during 2010 to 2012. We compared and

contrasted C firm implemented both ABC and TC cost allocation method on unit cost, the activity center and production system. We found that implemented ABC cost accounting system to C firm which provided more accurate cost management, and the firm measures more accurate product cost. In comparison of previous research contributions, this paper has two majors' outstanding contributions. First, our study considers the support-department cost allocation while most previous studies tend to focus on only part of indirect cost. In addition, we implemented Activity-Based Costing accounting system on allocation of support department cost. Second, instead of a rough estimate base to allocate support department cost, this study uses the direct labor-hour to allocate the conversion costs to products. Therefore, we identify the cost allocation bases (cost driver) and show a cause-and-effect relationship. The limitation of this study is that we collected data based on the interviews and on the continued two years so the findings are not generalized. The future researchers can extend their research for a longer period of time to make the results are more generalized. The future researchers may test the different industry.

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