Design and Implementation of Activity-Based Costing in a Communication Company

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Abstract: This paper reports on a case study that describes the implementation of activity-based costing (ABC) for a Taiwan communication company. Through an in-depth field investigation over a communication-equipment factory, the ABC was invoked to analyze the cost generated by the actual production processes in the present study. The company’s existing cost system adopts a rough estimate based to allocate support department cost and uses the direct labor hour to allocate the conversion costs to products. The weakness in the design and application of costing leads to product cost distortions. Relative to the ABC system, the existing cost system overestimates the costs of high-direct-labor-hour products and underestimates the costs of products with high production-complexity. 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 create homogeneous cost pools (activities) linked to different cost-allocation base that has a cause-and-effect relations. The comparison between the ABC and the TC was also given in this paper. The results reveal that the introduction of the ABC can provide more correct information of the unit cost, more reasonable information of the activity center, and non-financial information of the production system.

Key-Words: Activity-based Costing (ABC), Traditional Costing (TC), Conventional Cost, the simple costing, ABC implementation, Cost Driver

1 Introduction

Under current manufacturing environment, which involves highly automatic and newly technological developments, the production activities as well as the cost structures are altered. Raffish and Turney [20] surveys manufacturing industries in the USA and found that the cost of manufacturing overhead was 30 to 50 percent. The percentage of manufacturing overhead rate was 70 to 75 percent especially for electronics industry [14]. Therefore, the manufacturing overhead cost allocation has great impacts on the calculation of product costs especially for electronics related industry, example for communication-equipment company. The tradition costing (TC) that counts only the man-hours does not provide accurate cost information to help industrial sectors on the determination of cost policies and misleading the decisions on product pricing, product mix, and parts self-manufacturing or outsourcing [10, 15]. Cooper [6] also pointed out that with the increasing diversification of product volume, size, and complexity, the calculated product costs would be deeply distorted under the traditional costing 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.

Previous ABC studies have been conducted in developed countries such as the USA [3, 2], the UK [1, 19], and Australia [4, 5]. Only few studies have been conducted in developing countries such as China [16], Taiwan [12]. Majority ABC studies either focused on the system design and its comparison with existing costing methods with no much validation to testify the adequacy of the design, or researchers rarely discussed the background and process of implementing ABC while comparing correlations between overhead and various cost drivers. This paper diagnoses the existing costing and compares the existing costing
and ABC for the Taiwan communication company, and further designs ABC to solve its distress. We not only focus on indirect-cost allocation, but the support-cost allocation. The purposes of this paper are:

1. To understand and analyze the existing cost accounting system.
2. To design a practical ABC system and apply ABC on the support-cost allocation.
3. To compare the cost data under the existing cost system and ABC.
4. Provide the suggestion about the ABC implementation follow-up activities.

2 Case Study

2.1 Case Company Description

The B Company established in 1958 and produced plastic toy. In 1971, the B Company became the first toy OEM1 /ODM 2 Company in Taiwan. Since 1983, with the company’s business strategy to produce high-tech communication products, B Company transferred a toy producer into a communication producer. In 1992, B Company became one of the Taiwan’s largest manufacturers of two-way radio, corded phone, and cordless phone. Figures 1 is presented the organizational structure of B Company.

Figure 1 Organizational Structure of B Communication Company

![Organizational Structure Diagram]

To make so many communications, B Company spends nearly $20 million USD annually on the procurement of metals, plastic, connectors, and other materials. Costs for many of these components have soared in recent years. Under the threat of keen competition, B Company’s existing accounting system is not sufficient to support the pricing and decision making. B Company is expected to improve its cost management to promote its competitiveness.

Yin [21], an advocate of case studies, he said that case studies are necessary to understand the internal management system. Following Yin’s [21] suggestions, we collect and analyze field data for 24 months through interviews, files gathering, and cost data analyses to understand B Company’s product characteristics, production process, and existing costing. The participants who attended interview include an assistant director of the accounting department, a costing manager, a senior costing accountant and a senior engineer and attend more than 20 meetings. This paper considers the business secret of B Company, all data are multiplied by certain number.

2.2 B Company’s Existing Accounting System

B Company has a parts injection molding department, a Surface Mount Technology (SMT) auto-insertion depart and an assembling department. All products are produced by order. It uses 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). At B Company, job costing includes three key elements: direct costs of a job, indirect costs of a job, and general support costs. Direct costs are costs traceable to a specific job. Indirect costs of a job are allocated to each project. These include cost of production department manufacturing overhead and support department cost. Figure 2 is overview indirect-cost allocation of B Company now. Manufacturing overhead is direct tracing to each production departments. There are two stages to allocation of indirect cost. Production departments cost accumulated in support departments, such as general administration, machine technique support and maintenance, quality control and Storehouse. The first-stage allocation, support departments cost is allocated to production departments (activity pools). All support costs are lumped together and allocated by single arbitrary allocation bases according to rough estimation3. After collection

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1 OEM: the original equipment manufacturing
2 ODM is Own Designing & Manufacturing
3 B Company can not provide the estimation method about support cost allocation rate.
of manufacturing overhead and support department cost, production departments cost is allocated by direct manufacturing labor-hours to products. In the simple costing system, all indirect costs were lumped together and the cost-allocation base, direct manufacturing labor-hours, is not a cost driver of the indirect costs.

Figure 2 Overview of B Company’s Existing Accounting System—Indirect-Cost Allocation

There are two defects of B Company’s existing cost accounting system. First, general support cost is allocated by single arbitrary allocation bases. It fails to track resources consumed for individual production department under the lump-sum estimation and result in cost assignment error. Second, production departments cost is allocated by direct manufacturing labor-hours to products. Under automatic production process, the equipments run quickly and automatically. Managing more complex technology and producing very diverse products also requires committing an increasing amount of resources for various support functions. But direct manufacturing labor is not a only cost driver of these costs, allocating indirect costs on the basis of direct manufacturing labor does not accurately measure how resources are being used by different products. It will lead to product-cost cross-subsidization.

2.3 Implementation of Activity-Based Accounting System

After examining B Company’s existing cost accounting system, the company decided to adopt ABC and established a planning team in charge ABC implementation. The key point of design of ABC costing is simplifying the cost system, focusing on the important cost, not emphasizing reliability but relativity [17, 6]. We follow the seven-step approach to apply ABC to B Company’s costing system and the three guidelines for refining costing systems (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)[13]. Figure 3 is overview indirect-cost allocation of B’s Activity-Based Costing System. Under the ABC model, support department cost and production department can be allocated to related cost drivers for improving two defects of B Company’s existing cost accounting system.

Figures 3 Overview of B’s Activity-Based Costing System—Indirect-Cost Allocation

The seven steps [13, 20] of implementing ABC at B Company are below:

First step: Identify the products that are the chosen cost objects. The cost objects are two-way radio, corded phone, and cordless phone.

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

Step 3: Select the activities and cost-allocation bases to use for allocating indirect costs to the products. Following guidelines for refining a costing system, we identify seven cost pools (activities) (See Table 1). Identifying the cost-allocation bases defines the number of activity pools into which costs must be grouped in an ABC system. The four activities -- administration, machine technique maintenance, quality control and storehouse—for allocating support department cost to production department, this allocation is belong to preliminary cost assignment stages. The three activities -- Parts injection Molding, SMT Auto-Insertion and Assembling—for allocating production department cost to products, the allocation is belonging to primary cost assignment stages.

Table 1 Cost Pools of B Communication Company
The majority of support department cost provides the services for production department in B Company. We ignore information about reciprocal services provided among support-department. The method of support department cost allocation is the direct method. B Company allocates support department costs with allocation base to production fist. 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. So this paper allocates support department cost with ABC costing.

Step 4: Identify the costs associated with each cost-allocation base. And step 5: Compute the rate per unit of each cost-allocation base. Table 2 shows the total cost (column 2) and the activity-cost rates of support-department activity (column 4).

Table 2 The Activity-Cost Rates for Support Department

<table>
<thead>
<tr>
<th>Cost Pool (Activity)</th>
<th>Total Costs</th>
<th>Total Allocation Base</th>
<th>Cost Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>5,290,294</td>
<td>66500 m²</td>
<td>79.55</td>
</tr>
<tr>
<td>Machine Technique</td>
<td>7,377,329</td>
<td>960 times</td>
<td>7,685</td>
</tr>
<tr>
<td>Quality Control</td>
<td>1,975,246</td>
<td>3800 hrs</td>
<td>519.8</td>
</tr>
<tr>
<td>Storehouse</td>
<td>2,144,268</td>
<td>680000 units</td>
<td>3.15</td>
</tr>
</tbody>
</table>

According to the using quantity of cost-allocation base (see table 3), B Company separately tracts activity costs for each production department.

Table 3 The Quantity of Cost-Allocation Base for Support Department

<table>
<thead>
<tr>
<th>Support Department</th>
<th>Total Cost-Allocation Base</th>
<th>Production Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>66500 m²</td>
<td>Molding 11400 Insertion 340</td>
</tr>
<tr>
<td>Machine Technique</td>
<td>960 times</td>
<td>Molding 100 Insertion 340</td>
</tr>
<tr>
<td>Testing</td>
<td>3800 hrs</td>
<td>Molding 1140 Insertion 380</td>
</tr>
<tr>
<td>Storehouse</td>
<td>680000units</td>
<td>Molding 68000 Insertion 272000</td>
</tr>
</tbody>
</table>

After preliminary cost assignment stages, production departments collect support-department assignment cost, direct cost, and manufacturing overhead (see table 4, column 2). Table 4, column 3, shows the quantity of the cost-allocation base and the activity-cost rates for each production activity described in column 1.

Table 4 The Activity-Cost Rates for Production Department

<table>
<thead>
<tr>
<th>Cost Pool (Activity)</th>
<th>Total Cost</th>
<th>Total Allocation Base</th>
<th>Cost Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts Injection Molding</td>
<td>7,157,731</td>
<td>10,200 hrs</td>
<td>701.74</td>
</tr>
<tr>
<td>SMT Auto-Insertion</td>
<td>3,451,488</td>
<td>3,426 hrs</td>
<td>1,007.44</td>
</tr>
<tr>
<td>Assembling</td>
<td>23,062,188</td>
<td>109,309 hrs</td>
<td>210.98</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Production Department</th>
<th>Total Cost-Allocation Base</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molding</td>
<td>10,200 hrs</td>
<td>Radio 3,600</td>
</tr>
<tr>
<td>Insertion</td>
<td>3,426 hrs</td>
<td>Insertion 889</td>
</tr>
<tr>
<td>Assembling</td>
<td>109,309 hrs</td>
<td>Assembling 65,586</td>
</tr>
</tbody>
</table>

With quantity of cost-allocation base (see table 5), B Company separately assigns activity costs to each product.

Compute the costs allocated to the products (step 6). And then step 7: Compute the total cost of the products by adding all direct and indirect costs assigned to the products. We can compare the cost differences between two costing.

3 Comparison of Costing Information under Existing (Tradition Costing, TC) and ABC Costing System

In this section, we compare the cost differences under the existing (Tradition Costing, TC) and ABC costing system. Table 6 summarizes the difference percentage between the existing and ABC costing of the support-cost assignment stages. The difference percentage is equal the different between both costing systems dividing by ABC costing cost. As shown in Table 6, the difference percentage of Parts Injection Molding is 207.61%. The Parts Injection Molding cost to be underestimated seriously under the existing costing system. When the support-department cost allocation is inaccurate, it will results in inaccurate production-department and product cost.

Table 6 Comparison between Existing and ABC systems—Production Department

<table>
<thead>
<tr>
<th>Production Department</th>
<th>TC</th>
<th>ABC</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molding</td>
<td>806,999</td>
<td>2,482,381</td>
<td>207.61</td>
</tr>
<tr>
<td>Insertion</td>
<td>3,791,736</td>
<td>4,730,868</td>
<td>24.77</td>
</tr>
</tbody>
</table>
Table 7 presents the difference 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 29.9%. 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. And corded phone and cordless phone are more complex production process to accompany with cost underestimates. As such, existing cost accounting system will generate “cross subsidy.”

Table 7 Comparison between Existing and ABC systems—Product

<table>
<thead>
<tr>
<th>Product</th>
<th>TC</th>
<th>ABC</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio</td>
<td>22.2744</td>
<td>19.6047</td>
<td>(13.62)</td>
</tr>
<tr>
<td>Corded Phone</td>
<td>40.5691</td>
<td>57.8720</td>
<td>29.90</td>
</tr>
<tr>
<td>Cordless Phone</td>
<td>30.4317</td>
<td>33.1908</td>
<td>8.31</td>
</tr>
</tbody>
</table>

4 Conclusion

Determining the true cost is an important role in strategic decision-making and pricing. This paper through individual case investigation over a communication-equipment factory, the ABC was invoked to analyze the cost generated by the actual production processes. The company’s existing cost system adopts a rough estimate based to allocate support department cost and uses the direct labor hour to allocate the conversion costs to products. The weakness in the design and application of costing leads to product cost distortions. The comparison between the ABC and the TC was also given in this paper. The results reveal that the introduction of the ABC can provide more accurate cost management and enables the company to compute the “true” cost of a product.

As compared with prior researches, this paper is superior in contributions to this field in two ways. 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 implement Activity-Based Costing on support-department cost allocation. Second, instead of rough estimate based to allocate support department cost and uses the direct labor hour to allocate the conversion costs to products, we identify the cost allocation bases (cost driver) with cause-and-effect relations.

References:

[12] Eldenburg, L., Soderstrom, N., Willis, V., and Wu, A., Behavioral Changes following the


