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DEVELOPMENT OF ACTIVITY-BASED COSTING IN FABRICATION COMPANY: A CASE STUDY

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ABSTRACT

The purpose of this study is to analyze and compare two costing method, namely, Traditional Costing and Activity-based Costing (ABC) costing in a selected manufacturing company. ABC is better, more accurate way of allocating overhead cost. Several steps such as identify the cost object, identify the direct costs associated with the cost object, identify overhead costs, select the cost allocation base for assigning overhead costs to the cost object and develop the overhead rate per unit. A case study was conducted to compare the benefits, advantages and disadvantages of both costing method. Step by step calculation for both traditional and ABC method was analyzed by choosing three selected products from the case study. The products selected were based from low, medium and high range of its product value. The overhead cost performance for three products were determined using ABC costing and the results were compared with traditional costing method. It was discovered that ABC method is better and more accurate in term of overhead costs.

Keywords: *ABC method, traditional costing method and overhead cost*

1.0 INTRODUCTION

A costing system is designed to monitor the costs incurred in a business. The system comprises of a set of forms, processes, controls, and reports that are designed to aggregate and report to management about revenues, costs, and profitability. Many businesses all around the world started from the costing calculation. There are basically two types of costing system that the businesses are currently follows: Traditional costing method and activity based costing method.

Traditional costing system calculates the total cost of raw material and direct labor, then allocates the overhead costs using arbitrary allocation factors such as direct labor hours (Rezaie et al., 2008). On the other hand, ABC is being developed by Cooper and Kaplan (1991) as an alternative to solve the arbitrary overhead allocation problems. ABC attributes variable, fixed and overhead directly to each product by using the activities require to produce the product in accordance with the way resources are consumed by the activities (Cooper, 1990; Cokins, 1996) An example in manufacturing industries such as, forging industry (Rezaie et al., 2008), rebar fabrication (Young Woo et al., 2011), machine assembly (Gunasekaran, 1999) and others (Alnestig and Segerstedt, 1996; Baxendale, 2001) do have teams to come out with costing calculation on each product.

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In this study, the real life example of case study company was chosen to demonstrate the calculation of manufacturing costs between traditional costing and ABC method. Manufacturing costs is defined as those costs that are directly involved in manufacturing of product which consists of direct material, direct labor and manufacturing overhead (Horngren et al., 1999). The main business of this selected company is to fabricate special vehicles components such as petrol tankers, diesel tankers, vacuum tankers, aircraft refuelers and others. Currently, the company is using traditional costing system to calculate its product manufacturing costs. The purpose of the study is to develop a ABC manufacturing costs calculation template for the company to be used at engineering department and to compare between traditional costing and ABC method.

2.0 METHODOLOGY

ABC method used several cost pools, organized by activity and allocated overhead costs. Several steps are required to implement ABC method. However, the ABC method is to identify different activities of an organization and to calculate the cost of each activity and then costing the product based on consumption of activities. The overhead rate is established for each activity. Based on this principle, different steps required to develop an ABC system as shown in Table 1.

Table 1 : Development ABC costing

Step	Description
1	Identify costly activities required to complete products
2	Assign overhead costs to the activities identified
3	Identify the cost driver for each activity
4	Calculate a predetermined overhead rate for each activity
5	Predetermined Overhead Rates
6	Determine range of product by costing range and total output
7	Allocation of Overhead Costs Driver for Products
8	Develop ABC costing template

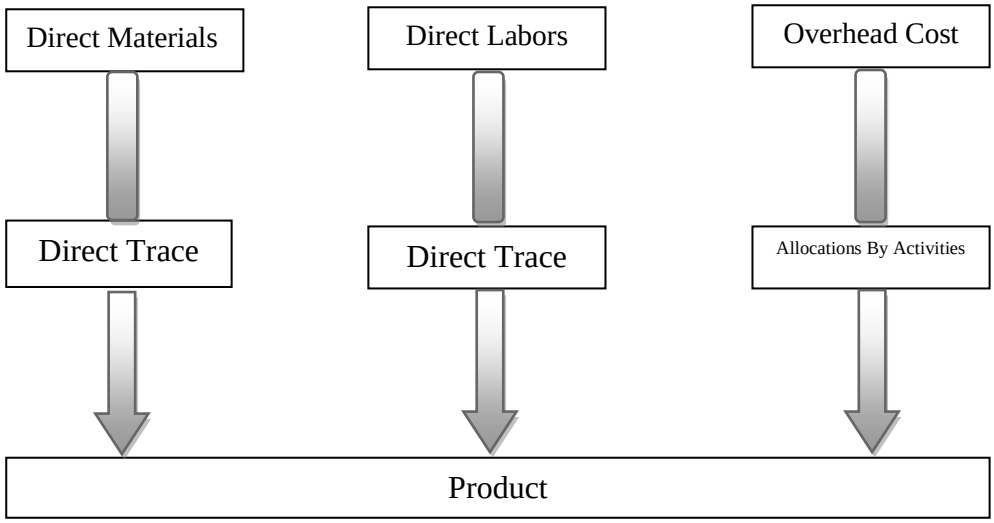

Figure 1 **:** ABC costing system flow chart

Figure 1 shows ABC costing system of the product equals total cost of raw materials and direct labor, then overhead costs are assigned to activity cost pools in accordance with the way resources are consumed by the activities. For example, activities required to produce product are purchasing materials, setting up machinery, assembling products, and inspecting finished products.

These activities can be costly. Thus the cost of activities should be allocated to products based on the product consume of these activities. Several steps are required to implement activity-based costing mainly: 1. Identifying the main activities 2. Determining the cost drivers for these activity measures.

3.0 ANALYSIS AND RESULTS

Basically this study is based on a case study from the fabrication company in order to demonstrate and apply the Activity-Based Costing method together with traditional costing method for three selected product range as shown in Table 2. Table 2 also shows the product range value (in Malaysia ringgit, MYR) and the number of units being produced in year 2014.

3.1 Case Analysis using Traditional Costing

Table 2 **:** Product range

Product Name	**Total Range of Product Value (MYR)**	**Output in Year 2014 (unit)**
1. Product A (Low Range)	80,000 to 120,000	50
2. Product B (Medium Range)	121,000 to 170,000	40
3. Product C (High Range)	171,000 to 400,000	30

Table 3 shows the typical traditional costing system which calculates the total cost of raw materials and direct labor, then applies the overhead costs using 5% of direct materials cost as allocation factor for three respective product range. Tracking and compiling the direct costs (direct materials and direct labors) are almost straightforward task, however, the most difficult parts is managing and allocating overhead costs to individual products as shown in Table 3. Miller (1996) argued that traditional costing system is like "one-stage costing" in which the overhead costs is allocated to the proportion of the amount of resources, such as, in this case 5% if direct materials costs. Lack of accurate of overhead cost allocation method will lead to distorted overall product manufacturing cost

Table 3**:** Manufacturing cost per unit by using traditional costing (MYR)

	Product A	**Product B**	**Product C**
Direct Materials	52,929.00	155,350.00	238,144.00
Direct Labors	15,350.00	15,000.00	22,660.00
Overhead Cost (5% from direct materials cost)	2646.00	7,768.00	11,907.00
Total	70,925.00	178,118.00	272,711.00

3.2 Case Analysis Using ABC Costing System

The activities performed during the fabrication process of these parts can be divided into the folowing categories as shown in Table 4.

Table 4: Number of activites

No.	Activity
1	Purchasing materials
2	Setting up machines
3	Running machines
4	Assembling products
5	Inspecting finished products

3.3 Identify The Cost Driver For Each Activity

ABC costing system will not include the direct materials and direct labors because both were directly traced to each product as shown in previous Figure 1. A cost driver is the action that causes the costs associated with the activity. Identifying cost drivers requires gathering information and interviewing key personnel in various areas of the organization, such as purchasing, production, quality control, and accounting. After careful scrutiny of the process required for each activity, the following cost drivers have been established as shown in Table 5.

Table 5 : Estimated annual overhead costs (MYR) and annual cost driver activity

Activity	Estimated Annual Overhead Cost	Cost Driver	Estimated Annual Cost Driver Activity
Purchasing materials	900,000	Number of purchase requisitions	2200 requisitions
Setting-up machines	420,000	Number of machine setups	550 setups
Running machines	300,000	Number of machine hours	1800 hours
Assembling products	250,000	Number of direct labor hours	32,000 hours
Inspecting finished products	350,000	Number of inspection hours	7000 hours

3.4 Estimation of Cost Driver Rates

Table 6 shows the estimated annual activity costs, annual estimated volume of cost driver and respected cost driver rates.

Table 6**:** Cost driver rates

Activity	**Cost Driver**	**(a) Estimated Activity Costs (MYR)**	**(b) Estimated volume of cost driver**	**(a) ÷ (b) Cost Driver Rate (MYR)**
Purchasing materials	Number of purchase requisitions	900,000	2200/requisitions	409/requisitions
Setting-up machines	Number of machine setups	420,000	550/setups	764/setups
Running machines	Number of machine hours	300,000	1800/machine hours	167/machine hours
Assembling products	Number of direct labor hours	250,000	32,000/labor hours	7.8/labor hours
Inspecting finished products	Number of inspection hours	350,000	7,000/ inspection hours	50/inspection hours

3.5 Allocating Overhead Costs to Products A, B and C

The activity costs for each product were calculated as the cost driver volume of each product multiplied by cost driver rate. Table 7 shows the cost driver volume for each product A,B and C by activity.

Table 7: Costs driver volume for a unit products A,B and C

Activity	**Cost Driver Volume Product A**	**Cost Driver Volume Product B**	**Cost Driver Volume Product C**
Purchasing materials	10	13.75	38.3
Setting-up machines	5	4.25	4.3
Running machines	13	11.25	23.3
Assembling products	100	200	633.3
Inspecting finished products	24	45	133.3

3.6 ABC Method Template

Direct materials and direct labors costs for the ABC method is similar with traditional costing because they were directly traced to each product. Table 8 illustrates how the activity costs were allocated to three different product A, B and C. These analysis also show how the highest cost driver rate (that is, purchasing materials, setting up machine) can be reduced to improve profitability of each product.

Table 8 : Manufacturing cost per unit by using ABC method

		Product A		**Product B**		**Product C**	
Direct Materials (MYR)			52,929.00		155,350.00		238,144.00
Direct Labors (MYR)			15,350.00		15,000.00		22,660.00
Activity	Cost driver rate (a)	Cost Driver Volume Product A (b)	(a x b)	Cost Driver Volume Product B (c)	(a x c)	Cost Driver Volume Product C (d)	(a x d)
Purchasing materials	409	10	4090	13.75	5623.75	38.3	15665
Setting up machines	764	5	3820	4.25	3247	4.3	3285
Running machines	167	13	2171	11.25	1878.75	23.3	3891
Assembling products	7.8	100	780	200	1560	633.3	4940
Inspecting finished products	50	24	1200	45	2250	133.3	6665
Total Overhead Cost Per Unit			12,061		14,560		34,446
Total Manufacturing Cost Per Unit			80,340		184,910		295,250

Table 9 shows the manufacturing costs consists of direct materials, direct labors and manufacturing overhead costs. The direct materials costs constitutes between 65 to 84 percent of total costs, direct labors represents between 7 to 20 percent and finally manufacturing overhead contributes between 8 to 15 percent of total manufacturing costs.

Table 9 : Total percentage of manufacturing costs by category of product A,B and C

	Product A	**Product B**	**Product C**
% Direct Materials	65.9	84.0	80.7
% Direct Labors	19.1	8.1	7.7
% Overhead	15.0	7.9	11.67

3.7 Comparison of ABC method versus traditional costing

Table 10 shows the percentage difference in manufacturing costs between ABC and traditional costing for product A, B and C is in range of 4 percent and 13 percent. Manufacturing costs variation between ABC and traditional costing could lead to poor judgement in decision making process for top management.

Table 10: Comparison between ABC and Traditional Costing (MYR)

	Product A		Product B		Product C	
	ABC	Traditional	ABC	Traditional	ABC	Traditional
Total Cost Per Unit	**80340**	**70925**	**184910**	**178118**	**295250**	**272711**
Variation in,manufacturing costs	**9415**		**6792**		**22539**	
% Variation	13		4		8	

Table 10 also shows traditional costing under cost total manufacuting cost of product A, B and C by 13%, 4% and 8% respectively. Product A has the highest manufacturing cost variation when comparing with ABC method and traditional costing method.

In the field of manufacturing, activity-based costing and traditional costing are two different methods for allocating overhead costs to products. Both methods estimate overhead costs related to production and then assign these costs to products based on a cost driver rate. The major differences are in the accuracy and complexity of the two methods. Traditional costing is more simplistic and less accurate than ABC, and typically assigns overhead costs to products based on an average rate. ABC is more complex and more accurate than traditional costing. This method first assigns overhead costs to activities and then assigns the costs to products based on the products usage of the activities.

Activity based costing systems are more accurate than traditional costing systems because they provide a more precise breakdown of overhead costs. However, ABC systems are more complex and more costly to implement. The leap from traditional costing to activity based costing is difficult. From this study, it was found based on 3 product selected showed manufacturing cost variation between 4 to 13 percent.

4.0 CONCLUSION

Activity-based costing is better, more accurate way of allocating overhead cost to manufacturing costs. Several steps such as identify the cost object, identify the direct costs associated with the cost object, identify overhead costs, select the cost allocation base for assigning overhead costs to the cost object and develop the overhead cost driver rate for allocating overhead to the cost object are all tools to support process improvement.

In this study, ABC method shows a total manufacturing cost per unit was different when comparing with traditional costing method. The overhead costs involved-for a product in traditional costing do not usually give a clear picture so as to control and reduce these manufacturing costs. Therefore, it is necessary to have a costing system based on activity done for the product. Because of this, the need for ABC method arises. Thus ABC has a wide scope in the context of cost reduction and cost control for process improvement activities in the company. Implementation of ABC should be made from shop floor to managerial level. If ABC is applied correctly, the company can gain more profits than before. Although the activity based approach looks attractive, it is unlikely to be practical to relate all overheads to specific activities. ABC system also can be successfully applied in other segments of the organization function such as administration, marketing and distribution. It can equally be applied in service sectors like banks, insurance, hospitals, logistics and others.

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