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APPLICATION OF ACTIVITY-BASED COSTING IN ELECTRONIC MANUFACTURING

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Abstract

An accurate product costing is very crucial in the production environment. The traditional cost accounting (TCA) has been reported to have limitations such as inaccurate cost allocation. This study explores the benefits of Activity-based Costing (ABC) in electronics manufacturing. Furthermore, it is to appraise the strength of cost driver in ABC in order to propose a better costing structure. To overcome the limitations of TCA, we applied ABC method to the costing structure of an electronic and electrical company. This costing method is applied at inductor production line. The data collected include labor cost, maintenance cost, material cost and consumable cost. All costing data are based on 2018 information. The product unit calculated by ABC is MYR 0.72 that is lower than TCA which is MYR 1.07 which is by 32.71% difference. Thus, ABC determined the actual cost of the product to be compared to current costing method that is TCA. In conclusion, ABC provides more accurate costing information to the company than current method that is TCA.

Keywords: Activity-based Costing, cost driver, product costing.

1.0 INTRODUCTION

Generally, a company uses Traditional Cost Accounting (TCA) to calculate their product cost. However, TCA has been reported to have limitation such as inaccurate cost allocation. While it is crucial for a company to have accurate product costing, many companies are still using TCA for their product costing. ABC emerges as an alternative costing to the traditional costing. Furthermore, although Activity-based Costing (ABC) is an innovative costing method that encourage company to have better efficiency and effectiveness, some company remain using TCA as their costing stucture. This might be because of the companies seemed to be satisfied with TCA method [1].

As mentioned by [2], ABC is a system where it delivers accounting information that recognise activities conducted in the organization. Furthermore, it is a method for accurately costing products and ease decision making process by providing cost data and management information [3]. As mentioned by [4], ABC is useful as it provide the organisation with more accurate product cost information, thereby facilatating decisions related to pricing, quality improvement and others.

Eventually, ABC method provide accurate information with cost drivers during manufacturing process [5], help to accurately understand the allocation of resources through cost drivers [6] and achieved improvements at all levels [7].

Besides, ABC has been widely used in many different sectors to facilitate organization. Figure 1 shows the distribution of the application of ABC. The percentage of ABC in manufacturing is the highest which is at 38% while health care and transport and communication shares the same percentage at 13% for the lowest application of ABC. Other sectors have

19% of application followed by management 17%. Based on the data above, it is clear that ABC method has been widely applied in manufacturing industry. However, the concern is to have knowledge on the comparison of ABC with TCA in electrics and electronics industry.

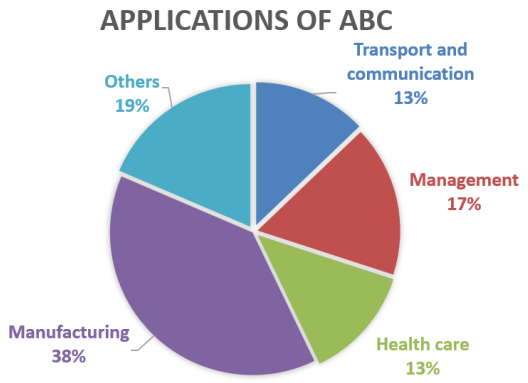

Figure 1 Applications of ABC

Referring to [8], the general idea of ABC is to allocate costs to operations through numerous activities in the place that can be measured by cost drivers. ABC is a two-stage allocation process. The first stage is resource. Activities are assigned as resource cost where the resource drivers are the factors to estimate the consumption of resources by activities. The second stage is activity. Total cost of an activity is an activity cost pool. Each activity cost pool is distributed to the products by an activity driver which is used to measure the consumption of activities by the products. ABC calculation method differs from TCA by the way cost are allocated and cost driver and eventually produce different unit cost.

Over the years, ABC has many advantages in the industry and other application such as overcoming the limitations by TCA where ABC provided more accurate cost estimates rather than TCA [7]. Furthermore, ABC also provide accurate allocation overhead, cost information on process, information on the cost drivers, deliver accurate profitability information and improve in various areas. For instance, [9] reported that by implementing ABC in inventory evaluation, decision making process has been improved. In airline management stated by [10], ABC measured accurate and relevant product, process, service and activity cost as well as calculated profitability. [12] estimated the cost of remanufactured crankshaft using ABC while [13] identified the critical and non-critical variables during remanufacturing process using Mahalanobis-Taguchi System and simultaneously estimate the cost using ABC. Currently, [14] applied the ABC as a method of cost estimation for the palm oil plantation.

This study explores the benefits of ABC in manufacturing industry especially in an electrics and electronics company.

2.0 METHODOLOGY

The Company Background

This research was conducted at an electrics and electronics company in Kuantan. In general, the company produced many other electrics and electronics products. Each product has specific process of production. Every each process requires specific machine and equipment which are maintained by the maintenance department of the company. After machine and equipment are set up, the operators begin their work by using the materials and other supplies to assemble the product. Finished products are delivered to warehouse or customers. In this study, we applied two methods which are Traditional Cost Accounting (TCA) and Activity-based Costing (ABC). All the data collected from the company are based on 2018 information.

Traditional Cost Accounting

With respect to the Traditional Cost Accounting method for the inductor in the electrics and electronics company, the cost elements are broken down into two categories which are direct and indirect costs as shown in Figure 2. Direct cost consists of direct labor cost which is operator wages and direct material cost which is cost of the raw materials. Indirect cost consists of indirect material cost such as adhesive and solder coat and overhead cost.

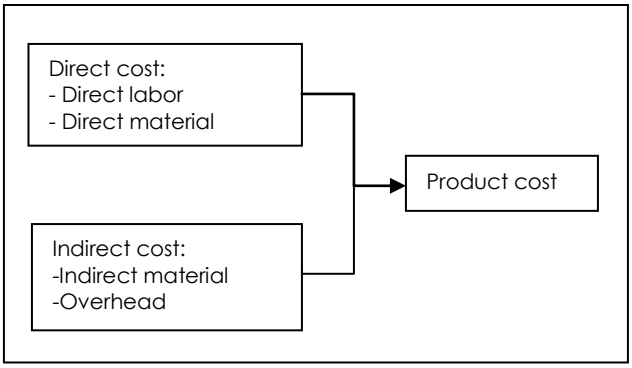

Figure 2 Analysis of the TCA cost

Implementation of Activity-based Costing

According to existing literature, there are 6 steps involved in adapting ABC [11]. Based on Figure 3, the steps are as follows.

Step 1 is to identify product for analysis. First step is to select product for this analysis. The product is an inductor. The selection is based on the volume of production which is high and continuous production. Next, step 2 is reviewing company's financial information. Financial information of the company can be obtained from production report, interviews

and other materials. Some of the information can also be obtained by observation of production operations, activities, machines used and equipment. Step 3 is to do activity analysis. All activities at each workstation are identified and analyzed. Step 4 is to determine operating cost for each activity. After the activities are clearly identified, the operating costs are calculated. There are 4 operating expenses to be considered which direct labor, maintenance, material and consumable. Step 5 is selecting cost driver. This step includes analysis of costs and the identification of appropriate cost drivers for each activity. Lastly, step 6 is to calculate product cost. Finally, by using different cost drivers, all activities are traced to the product. Thus, final product cost can be obtained.

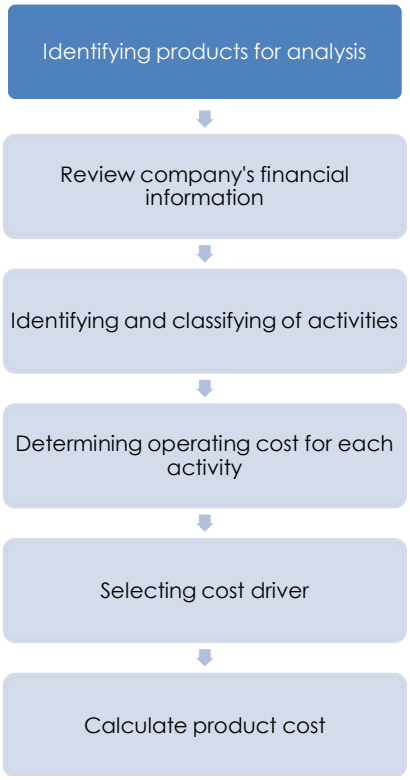

Figure 3 Steps of adapting ABC

3.0 RESULTS AND DISCUSSION

The production process of the product is as illustrated in Figure 4. The process starts with process A and ends with process M. Note that only process B is on ground floor where as the others are on level 1. The process of making the inductor begins with process A which is winding process using Computer Numerical Control (CNC) machine. A rectangular wire is being winded into coil. Auto feeder machine pull the wire from spool into the CNC machine. At specified area, the wire will be stripped. Next, both ends of the coil is flatten at process B and transferred to process C to trim the excess, and then to process D to bend the ends of the coil into 90°. Hydraulic press machines are used for process B, while pneumatic press machines are used at C and D.

Next, process E is where the ends of the coil are soldered. The coils first dipped into flux solution before being soldered. At process F, epoxy resin is applied onto another material called core. There are 2 steps of application which are 3-dots and 4-dots on the same core. Meanwhile at process G, the coil from process E is assembled with a bottom core. Then, the core and bottom core from process F and G are assembled together at process H, thus, the assembly process of an inductor is completed. Each inductor needs to be clipped for the adhesive to be secured before going for process I which is curing process. The clipped inductors are left in curing oven for 30 minutes and cool down over fan for 10 minutes.

After that, the clips are removed, and the inductors undergo boundary inspection process at J. Then, process K is a laser marking process marked on each inductor. The inductors undergo Visual and Mechanical Inspection (VMI) and co-planarity inspection at process L for further inspection in case there are any defects. Finally, at the process M, the inductors are packed and ready to be send customers or warehouse.

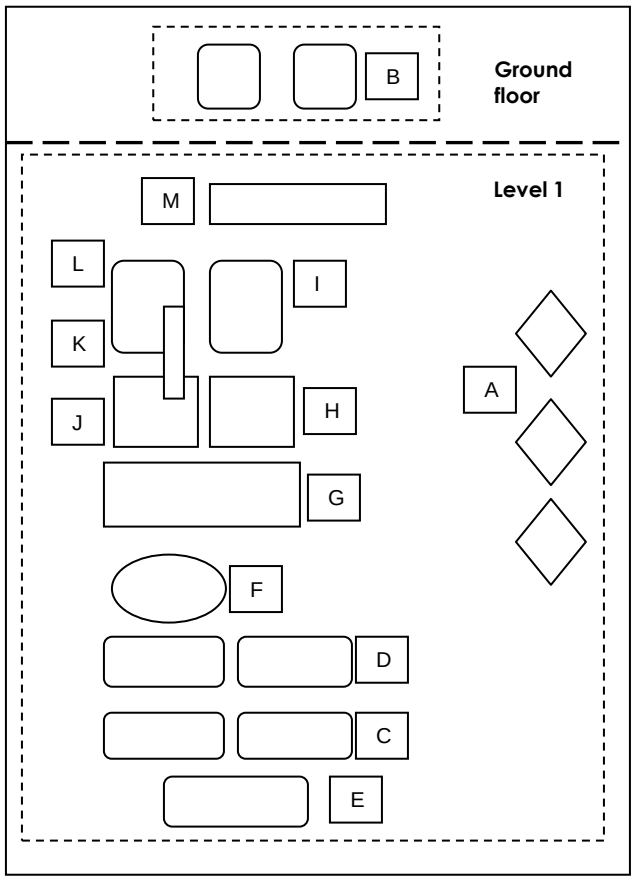

Figure 4 Schematic layout of manufacturing process

Table 1 shows the cost per unit for the inductor production process using TCA method. From the calculation, the cost per unit for inductor as well as unit cost per activity is determined. For inductor, the cost per unit is MYR 1.07.

Table 1 Costs of products using Traditional Cost Accounting

Product	Direct		Indirect	
	Material	Labor	Indirect material	Overhead
A	576,000	24,000	nil	111,744
B	nil	48,000	nil	50,400
C	nil	48,000	nil	31,200
D	nil	48,000	nil	21,120
E	nil	24,000	331,200	178,560
F	1,584,000	24,000	15,750	355,200
G	480,000	72,000	410	132,960
H	nil	48,000	nil	72,000
I	nil	24,000	nil	134,400
J	nil	24,000	nil	134,400
K	nil	24,000	nil	134,400
L	nil	24,000	nil	134,400
M	nil	24,000	576	96,000
Total	2,640,000	456,000	347,936	1,652,640
Total (MYR/unit)	0.53	0.1235	0.0722	0.3443
Total unit cost (MYR)			1.07	

Table 2 presents the cost per unit for the inductor production process using ABC method. Table 3 illustrates cost drivers per activity. Cost driver rate is obtained by dividing the total cost for each activity with the number of units produced.

Table 2 Cost of product using Activity-based Costing

Product	Operating expenses					
	Direct labor	Mainte-nance	Material	Consumable	Total (MYR)	Unit cost
A	24,000	26,449.89	576,000	nil	626,449.89	0.11
B	48,000	70	nil	nil	48,070	0.01
C	48,000	nil	nil	nil	48,000	0.02
D	48,000	nil	nil	nil	48,000	0.025
E	24,000	nil	nil	331,200	355,200	0.07
F	24,000	nil	1,584,000	15750	1,599,750	0.33
G	72,000	nil	480,000	410	552,410	0.12
H	48,000	nil	nil	nil	48,000	0.01
I	24,000	nil	nil	nil	24,000	0.005
J	24,000	nil	nil	nil	24,000	0.005
K	24,000	626.53	nil	nil	24,626.53	0.005
L	24,000	nil	nil	nil	24,000	0.005
M	24,000	nil	nil	576	24,576	0.005
				Total unit cost (MYR)		0.72

Table 2 and 3 shows that with the use of ABC method, the unit cost for the inductor is MYR 0.72. For further discussion in detail, the cost per unit for inductor consists of the following categories: direct labor, maintenance, material and consumable. For example for activity A, direct labor, maintenance, and material are as MYR 24,000, MYR 26449.89 and MYR 576,000 respectively. There is no expense reported in consumable category.

Table 3 Cost driver

Activity	Cost driver	Cost driver rate (MYR/unit)
A	Amount of material	0.11
B	Amount of load	0.01
C	Amount of load	0.02
D	Amount of load	0.025
E	Amount of consumable usage	0.07
F	Amount of consumable usage	0.33
G	Labor time	0.12
H	Labor time	0.01
I	Machine time	0.005
J	Type of jig	0.005
K	Machine time	0.005
L	Number of products	0.005
M	Number of products	0.005

A comparison between TCA and ABC method for the inductor production process is presented in Table 4. As estimated, the cost per unit computed by the two methods differs. The cost under ABC method is lower than the TCA method, which are MYR 1.07 and MYR 0.72 respectively with percentage difference of 32.71%.

Table 4 A comparisons between Activity-based Costing and Traditional Cost Accounting method

Product	TCA (MYR/unit)	ABC (MYR/unit)	Difference	
			(MYR/unit)	(%)
Inductor	1.07	0.72	0.35	32.71

The result in Table 5 showed that the price of inductor which is MYR 1.20 is higher than the cost in both TCA and ABC method. That means the company obtain profit from the product under current method which is MYR 0.13 and MYR 0.48 for ABC if the company would implement ABC in the future.

Table 5 A comparisons in profits between Activity-based Costing and Traditional Cost Accounting method

Product	Price (MYR/ unit)	TCA		ABC	
		Cost (MYR/ unit)	Profit (MYR/ unit)	Cost (MYR/ unit)	Profit (MYR/ unit)
Inductor	1.20	1.07	0.13	0.72	0.48

Finally, the result of ABC analysis indicates that the material costs have the highest impact on the costing structure. For example, the cost of material is 91.9% of the total cost for activity A. Clearly, the major priority should be concerned with cost reduction by minimalizing the cost of material used.

This electrics and electronics company has shown to be capable of producing products in large number. For example in this research study is inductors. Based on this research, it is a profitable production process whether the cost structure is constructed using TCA or ABC. The current cost of the inductor calculated using TCA is higher than the one calculated by ABC. Meaning with the actual selling price, the company gains more profit using the ABC method rather than TCA. However, there is a chance for other competitor to compete over this advantage where the company had inaccurate cost information that will lead to lose their customer. By implementing ABC, the company could still gain profit and compete among other competitors which supported by [11].

4.0 CONCLUSION

The research study can be concluded that ABC provided lower unit product cost at MYR 0.72 than unit cost by TCA which is MYR 1.07. The differences between TCA and ABC price are by 32.71%. Thus, ABC offers lower unit cost and higher profit margin for inductors in the electrics and electronics company. Besides, by implementing ABC, the company would gain transparency in the costing structure of the product chosen. This can be achieved as all the activity based for producing the product is clearly known and is included in the unit cost of MYR 0.72. Since manufacturing parameter includes man, machine, material and method, the application of ABC analysis helps to benefit where the company can have information on number of operator required per activity basis. They also gain knowledge for maintenance and material costs spend for each activity.

In conclusion, ABC provides more accurate costing information to the company than current method that is TCA. Moreover, it helps the managements to make a decision clearly as the information of the costing structure is provided. The managements could identify the profit margin of products in detail. Not only it benefits in adding more profits to the company, this method could ease the managements to eliminate the unnecessary cost to the products.

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