Can Innovation of Time Driven ABC System Replace Conventional ABC System?

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Abstract: The purpose of this paper is to analyze the differences between Conventional Activity-Based Costing System (CABC) and Time Driven *Activity-Based Costing System* (TDABC). Analyzing is conducted in terms of the method that they use when assign costs to products. The CABC consist of two stages of cost assignment to cost objects that make the process is more expensive and time-consuming than TDABC. However, in the first stage, costs of resources assigned to activities have two advantages: Firstly, it is critical step to calculate cost of product accurately. Secondly, it gives information about cost of activities that can be extremely useful to manage costs. On the other hands, TDABC introduced by Kaplan and Andersen (2007) is claimed easier and faster than CABC because costs of resources are assigned directly to cost objects. Although TDABC can be applied easily, they tend to ignore the process of determining activity costs which is conducted in the first stage of CABC. Though there is limitation, this innovation can change the way management manage and determine the cost of products.

Keywords: Conventional Activity-Based Costing System, Time-Driven Activity-Based Costing System, First-stage allocation.

INTRODUCTION

Over the past three decades, activity-based costing (ABC) systems has been well known as a costing method that is designed to provide managers with cost information for strategic and other decisions. The system gives information about how to reduce cost without sacrificing customer value and measure product cost accurately. Study of companies in United Kingdom showed that companies adopted ABC significantly outperformed the companies that had not adopted ABC over the three years after implementing it (Kennedy and Afflek-Graves 2001). Despite the fact that ABC provides useful information for calculating and managing cost, it was not universally accepted (Institute of Management Accountants 1993 (U.S. evidence); Armitage and Nicholson 1993 (Canadian evidence); Innes and Mitchell 1995 (U.K. evidence). Research also showed that some firms have failed to implement the system (Horgnren 1990; Nanni et al. 1992). Complexity of the system make some companies failed to adopt or abandoned the tool. Innovation of time-driven activity-based costing (TDABC) solves this complexity. Nevertheless, there are not perfect costing systems, TDABC eliminate process of determining activity costs which is important in ABC system.

ABC is a costing method that assigns costs to products or other cost objects based on how much products or other cost objects use the activities. Activities define as any discrete task that an organization undertakes to produce or deliver a good or service. The more activities are used, the more costs will assign to product. The basic idea is based on assumption that activities are the "cause" of cost. To accomplish this objective, implementation of ABC system consists of two stages. Firstly, they assign cost of resources to activities. Secondly, they assign costs of activities to goods or services. Cost of activities, provided in the first stage, give information about how much cost of resources which is consumed in each activity. It is important because the costs of activity will determine accuracy of production cost and activities that will be modified to reduce costs. Therefore, avoidance of the first stage will reduce the advantage of the system.

The benefits provided by ABC have to be paid by the complexity in designing and implementation process. To have information about how much cost of organization's resources is consumed by activities, first ABC system designers need to identify and classify activities, and then assign cost of resources to those activities. A list of activities can be obtained in a number of different methods, including interviews with the employees who perform the activities. Ordinarily, this results in a very long list of activities. The length of such lists of activities poses a problem. On the one hand, the greater the number of activities tracked in the ABC system, the more accurate the costs are likely to be. On the other hand, a complex system involving a large numbers of activities is costly to design, implement, maintain, and use. Assigning cost of resources, which is indirect to activities, also raise problem because the process usually based on individuals' subjective estimation.

Fortunately, TDABC was developed by Kaplan and Anderson (2007) gives companies an elegant and practical option for determining the cost of products or other object costs. TDABC skips the activity-definition stage and therefore the need to allocate cost of organization's resources to the multiple activities that organization performs. The time-driven approach avoids the costly, time-consuming, and subjective activity-surveying task of conventional ABC. It uses time equations that directly and automatically assign resource costs to the activities performed and then to the final cost objects. As a result, total cost assigned to activities is based only upon time required by each activity. I argue that though conventional ABC is a complex and an expensive system, eliminating the first stage in the system will reduce its ultimate benefit.

The purpose of this paper is to analyze the differences between conventional Activity-Based Costing System (CABC) and Time Driven *Activity-Based Costing System* (TDABC). In contrast to previous articles that explained why TDABC is a better approach in costing system than conventional ABC (Kaplan and Anderson 2007), and how TDABC provides many opportunities to design accurate cost models in environments with complex activities (Everaert and Bruggeman 2007), this paper compare those models and explain the impact of eliminating the first stage of cost allocation in conventional ABC. To accomplish this objective, analyzing is conducted in terms of the method that they use when assign costs to product. The remainder of this article is organized by first providing framework for analysis both conventional ABC and

TDABC. Next, an illustration is presented to gain understanding how those approaches are difference. This is followed by a discussion of the results in terms of implications for applying TDABC.

LITERATURE REVIEW

Activity-based costing

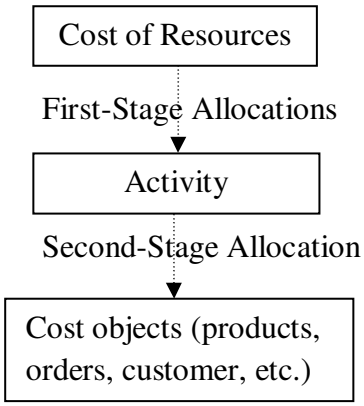
Introduced in the 1980s, ABC corrected serious deficiencies in traditional accounting systems. In traditional approach, either one plantwide overhead cost pool or a number of departmental overhead cost pools were used to assign overhead costs to products. Relying on allocation bases such as direct labor-hours and machine-hours for allocating overhead cost to product is common approach in these systems. In the labor-intensive production processes of many years ago, direct labor was the most common choice for an overhead allocation base because it represented a large component of product costs, direct labor-hours were closely tracked, and many managers believed that direct-labor-hours, the total volume of units produced, and overhead costs were highly correlated. Given that most companies at the time were producing a very limited variety of product that consumed similar resources to produce. As a consequence, the overhead costs allocated to different product was little difference.

Nevertheless, when the labor-intensive era began to change, direct labor began declining and overhead began increasing. A large number of tasks previously done by direct laborers were being replaced by automated equipment. Companies began creating new products and services at an ever-accelerating rate that differed in volume, batch size, and complexity. Managing and sustaining this product diversity required investing in many more overhead resources, such as production schedulers and product design engineers, which had no obvious connection to direct labor-hour or machine hours (Garrison, et. all. 2010). This situation made allocation of overhead costs to products by using direct labor-hour or machine hours as cost drivers are not relevance.

ABC systems solved inaccurate allocating overhead costs, which consists of manufacturing costs and nonmanufacturing costs, by introducing activity as cost driver. In ABC, an activity is any event that causes the consumption of overhead resources. The system based on the notion that product incur costs by giving rise to activities (e.g., preparation of purchase orders, machine set-ups, material handling, engineering design, etc.) which generate costs. Since activities are the cause of costs, the product which is complex in design will be allocated a large proportion of costs. This is accomplished by tracing overhead cost first to the activities performed by the organization's shared resources (first stage allocation), and then assigning the activity costs down to products, orders, and customers on the basis of the quantity of each organizational activity consume (second stage allocation).

The two-stage cost-assignment process of activity-based costing is depicted in exhibit 1:

Exhibit 1 Conventional Activity-Based Costing Model



Steps for implementing ABC system are (Hilton 2008; Garrison, et. all. 2010):

ABC Stage One

1. Identify activities, activity cost pool, and activity measures.

The first step in implementing ABC is to identify the activities that will form the foundation for the system. As noted previously, activity is any event that causes the consumption of overhead resources. Ordinarily, resources and activities are grouped together into five broad categories (Hilton et al. 2008).

- **Unit level resources and activities** are resources acquired and activities performed specifically for individual units of product or service.
- **Batch level resources and activities** are the resources acquired and the activities performed to make a group, batch, of similar products.
- **Product-level resources and activities** are the resources acquired and the activities performed to produce and sell a specific good or service.
- **Customer-level resources and activities** are the resources acquired and the activities performed to serve specific customers.
- **Facility-level resources and activities** are the resources acquired and the activities performed to provide the general capacity to produce goods and services.

Activity cost pool is a “bucket” in which cost are accumulated that relate to a single activity measure in the ABC system. To allocate these accumulated costs, the system needs an allocation base which is called activity measure. The term cost driver is also used to refer to an activity measure because the activity measure should “drive’ the cost being allocated. The two most

common types of activity measures are transaction drivers and duration divers. Transaction drivers are based on number of times an activity occurs such as number of customer orders. Duration drivers measure the amount of time required to perform an activity such as the time spent preparing customer orders. The choice of drivers depends on type of costs accumulated to an activity. If the number of times incurs the large proportion of costs within an activity, transaction driver is chosen. Whereas, the amount of time is more appropriate when the substantial amount of cost within an activity is highly correlated with the time to perform the activity.

2. Assign overhead costs to activity cost pools.

This process is also called first stage allocation. In ABC system, the process of assigning functionally organized overhead costs derived from a company's general ledger to the activity cost pools. Three cost assignment methods used in this process are direct method, driver method, and allocation method. Accuracy is improved when cost of resources is assigned by direct and driver method. In addition, activity cost pool is a foundation to provide relevant information for decision making (Noreen 1991).

Even tough activity cost pool can provide relevant information for decision making and determine the accuracy of cost assignment; it results in greater of costs of implementing and maintaining the system.

ABC Stage Two

1. Calculate activity rates.

The activity rates are total cost for each activity divided by its total activity required to produce the company's present product mix and to serve its present customers.

2. Assign overhead cost to cost objects.

The fourth step in the implementation of activity-based costing is called second-stage allocation. In the second-stage allocation, activity rates are used to apply overhead costs to products and service. Cost is assigned to each product or service based on how much activity capacity consumed multiply by its activity rate.

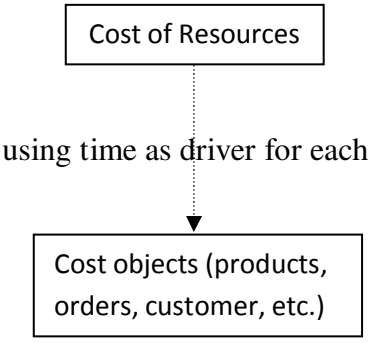
Time-driven activity based costing

Developed by Kaplan and Anderson (2007), TDABC uses time equations that directly and automatically assign resource costs to the activities performed and then to the final cost objects. The unit cost of the supplying resources and the time required to perform an activity by this resource group are parameters needed to implement the system. It means that there is only one stage of costs allocation in the system. Having only one stage allocation process makes the

system avoids the costly, time-consuming, and subjective activity-surveying task of conventional ABC. As a consequence, TDABC approach is easier to implement than conventional ABC.

The time-driven activity-based costing model is depicted in exhibit 2:

Exhibit 2 Time-Driven Activity-Based Costing



Steps for implementing TDABC (Everaert and Bruggeman 2007):

1. Identify the various resources groups that perform activities.
2. Estimate the cost of each resource group.
3. Estimate the practical capacity of each resource group.
4. Calculate the unit cost of each resource group by dividing the total cost of the resource group by the practical capacity.
5. Determine the required time for each event of an activity, based on different time drivers.
6. Multiply the unit cost (step 4) by the time required by the cost object (step 5).

Although TDABC can simplify the process of cost allocation by assigning cost of resources directly to the final cost objects, they lose relevant information provided in the first stage allocation. Noreen (1991) explained three conditions under which ABC system can provide relevant data. The first condition is that total cost can be partitioned into cost pool, each of which depends solely upon one activity. The second is that the cost in each cost pool must be strictly proportional to the level of activity in that cost pool. The third condition is that each activity can be partitioned into elements that depend solely upon each product. Both first and second condition is satisfied in the first-stage allocation. I argue that though conventional ABC is a complex and an expensive system, eliminating the first stage in the system will reduce its ultimate benefit.

The aim of this paper is to compare conventional activity-based costing system (CABC) and time driven *activity-based costing system* (TDABC). In contrast to previous articles that explain why

TDABC is a better approach in costing system than conventional ABC (Kaplan and Anderson 2007), and how TDABC provides many opportunities to design accurate cost models in environments with complex activities (Everaert and Bruggeman 2007), this paper compare those models and explain the impact of eliminating the first stage of cost allocation in conventional ABC. An illustration is developed to explain the differences.

DISSCUSSION

In this section, an illustration is presented to compare CABC and TDABC and to show why eliminating first stage allocation may reduce the accuracy of cost assignment, and not provide relevant information for decision making. It also explains conditions under which TDABC can be applied without losing its accuracy.

Stage One (ABC only)

As noted previously, the first step for implementing ABC is that activity, activity cost pool, and activity measure must be defined. TDABC eliminate this process. Assume PT MY, a shoes manufacturer, is implementing the system. The ABC team identifies activities needed to produce the shoes. To simplify the illustration, two activities, which are customer orders and product design, are used in our discussion. Then the team identified what organization resources are needed to performed activities, and how much resources are consumed by activities. This task is accomplished by surveying and interviewing the employee.

Table 1 Distribution of resource consumption across activity cost pools

Cost of Resources	Activity Cost Pool			Totals
	Customer orders	Product design	Others	
Indirect factory wages - R&D	0%	100%	0%	100%
Indirect factory wages – Supervisor	20%	0%	80%	100%
Administrative wages and salaries	25%	5%	70%	100%
Marketing wages and salaries	40%	0%	60%	100%
R & D equipment depreciaton	0%	100%	0%	100%
Office equipment depreciation	30%	0%	70%	100%

Table 1 shows distribution of resource consumption across activity cost pools. For example, indirect factory wages-R & D is distributed 100% to product design. The resource in this instance is allocated directly to design activity because it is used to perform product design activities exclusively. Furthermore, administrative wages and salaries is distributed 25% to customer orders, 5% to product design, and 70% to other cost pool. The resources are assigned

by estimating the time spent on each activity. Either allocation method or driver method can be applied in this condition.

Once the percentage distribution in table 1 have been established, it is easy to allocate costs to the activity cost pools. The results of this first-stage allocation are displayed in table 2. Each cost is allocated across the activity cost pools by multiplying it by the percentage in table 1. It is clear that costs of resources are assigned to each activity consuming those resources.

Next, the team determines that activity measure for customer orders is number of customer orders, and activity measure for product design is hours of product designs time. Number of customer order is chosen because every customer orders required the same amount of time. In contrast to design activity, design hour is chosen because each product required different time of design. In this case, there are two products which are Shoes A having simple design and Shoes B having complex design.

Table 2 First-Stage Allocations to Activity Cost Pools

Cost of Resources	Activity Cost Pool			Totals
	Customer orders	Product design	Others	
Indirect factory wages - R&D	$ 0	$60,000	$ 0	$60,000
Indirect factory wages – Supervisor	9,000	0	36,000	45,000
Administrative wages and salaries	12,500	2,500	35,000	50,000
Marketing wages and salaries	28,000	0	42,000	70,000
R & D equipment depreciation	0	22,500	0	22,500
Office equipment depreciation	7,500	0	17,500	25,000
Total	$57,000	$85,000	$130,500	$272,500

Stage Two (ABC and TDABC)

In this stage, ABC computes the activity rate by dividing total cost for each activity by its total activity. This will be used for assigning overhead costs to present product mix are computed in table 3. How overhead costs are assigned to shoes A and shoes B is illustrated in table 4.

Table 3 Computation of Activity Rates-ABC

Activity Cost Pools	Total Cost	Total Activity	Activity rate
Customer orders	$ 57,000	1000 Orders	$57 per order
Product design	85,000	2500 Hour	34 per DH
Other	130,500	Not applicable	Not applicable

Table 4 Assigning Overhead Costs to Product-ABC

Activity rate		Shoes A		Shoes B	
		Activity	ABC Cost	Activity	ABC Cost
57	per order	600	$34,200	400	$22,800
34	per DH	500	17,000	2,000	68,000
			$51,200		$90,800

In TDABC, first the capacity cost rate need to be estimated. The $0.68 rate is computed by dividing costs of capacity supplied, which is $142,000, by its practical capacity of resourced supplied, which is 210,000 minutes. The $142,000 is overhead costs that can be allocated to product. It is assumed that these costs have the same amount of ABC's overhead costs ($57,000 + $85,000). However, estimating costs of capacity supplied in TDABC does not need allocate costs of resource to activity first. Practical capacity is estimated as follow:

(2500* hours x 60 minutes) +(1000** x 60 minutes) =210,000 minutes.***

*Capacity supplied for product design

**Capacity supplied for customer order

***Assumed all the time is available for productive work

After estimating capacity cost rate, the required time for each event of an activity is determined. The time estimates can be obtained either by direct observation or by interview. In contrast to the percentage (see table 1) that employee subjectively estimate for a conventional ABC, the capacity consumption estimates in a time-driven model can be readily observed and validated (Kaplan and Anderson 2007). Finally, costs overhead is allocated to products by multiplying capacity cost rate by the time required by each product. Table 5 and 6 illustrate how the overhead costs are assigned to each product in TDABC.

Table 5 Assigning Overhead Costs to Shoes A-TDABC

Activity	Unit time	Quantity	Total Minutes	TDABC Cost
Customer orders	60	600	36,000	$24,343
Product design	30,000	1	30,000	20,286
Total				$44,629

Table 6 Assigning Overhead Costs to Shoes B-TDABC

Activity	Unit time	Quantity	Total Minutes	TDABC Cost
Customer orders	60	400	24,000	$16,229
Product design	120,000	1	120,000	81,143
Total				$97,371

In total, both CABC and TDABC incur the same amount of overhead cots that is $142,000. Nevertheless, the systems show different figure for each product. The only difference between CABC and TDABC are existence of first-stage allocation. In TDABC, overhead costs are not assigned to activities. The system allocates cost of resources to products by using activity time as a driver, which is $0.68 per minute. It means that the longer time is needed, the more resources are assigned to the products. It is peculiar because each activity consume different type and amount of resources. The product in TDABC absorbs cost of resources regardless of whether they actually consumed the cost were allocated to them. For example, indirect factory wages and salary-R & D can be allocated to shoes A when the product takes a longer customer order time.

Despite the fact that TDABC allocate all costs which is not actually consumed by the products, there are two conditions in which TDABC can calculate cost of product accurately. Firstly, there is not significant discrepancy between activities cost pool. For instance, both customer order cost and product design cost are $71,000 ($142,000 : 2). Secondly, time used as activity measure is highly correlated with all costs assigned within activities. In illustration given, not only product design costs are caused by the time, but also customer order costs are caused by the time. Under these conditions, there will be no difference between CABC and TDABC.

On the other hand, CABC system assign cost of resources that is actually consumed by the product. It is accomplished by first allocating cost of resources to activities (table 1 and 2), then activities to products (table 3 and 4). It makes CABC system more accurate because costs are assigned to each product based their actual consumption upon the activities. For example, R & D equipment depreciation can be assigned to shoes A if and only if the product need design activity. It is possible because some costs have been grouped in particular activity in the CABC stage one.

Furthermore, information about activity cost pool can provide relevant data for decision making. For example, the managers at PT MY may conclude that $57,000 or $57 to process customer order is far too expensive for an activity that adds no value to the product. As a result, they may target customer order processing for process improvement using methods for improvement, such as Six Sigma, Lean thinking model, etc. The TDABC miss information about activity cost pool because they eliminate the first-stage allocation in ABC system.

CONCLUSION

In contrast to previous articles that explain why TDABC is a better approach in costing system than conventional ABC (Kaplan and Anderson 2007), and how TDABC provides many opportunities to design accurate cost models in environments with complex activities (Everaert and Bruggeman 2007), this paper have compared those models and explained the impact of eliminating the first-stage of cost allocation in conventional ABC.

Eliminating the first-stage allocations in CABC reduce great effort to implement the system. TDABC solve the complexity by skipping that stage. However, illustration presented in this paper show that costs of eliminating stage one in conventional ABC are twofold. First, it reduces the accuracy of cost product. Second, information about activity cost pool that is useful for decision making can not generated by TDABC. It is important because the TDABC adopter should give their attention to this limitation when they intent to adopt the system.

The TDABC can compute product costs accurately when two conditions are satisfied. First, there is not significant discrepancy between activities cost pool. Second, time used as activity measure is highly correlated with all costs assigned within activities. In summary, even though innovation of TDABC can reduce the complexity of CABC, this system can not replace all the benefits provided by CABC.

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