

A Review on Time-Driven Activity-Based Costing System in Various Sectors

Sri Nur Areena Binti Mohd Zaini^{1*} and Mohd Yazid Abu¹⁺

*Correspondence

arena5582@gmail.com

+This author contributes equally to this work

¹ Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, 26600, Pekan, Pahang, Malaysia

Articles Info:

Received **1 January 2019**

Received in revised form

5 March 2019

Accepted **15 March 2019**

Available Online **26 March 2019**

Keywords:

Palm oil plantation; time-driven activity based costing; process map; capacity cost rate; time equation; forecasting

ABSTRACT

Time-Driven Activity-Based Costing is a type of method which can describe as a costing model that consider a time which known as inducer time. This method is providing the cost of activities with base that consume of time per activities. In this study, published works was based on literature studies from 56 journals from period 2011-2018 which including in area of healthcare, industrial and library. The study reported only 10 papers out of previous 56 papers that focus for more efficient as their main advantage from using Time-Driven Activity-Based Costing's four methods which are process map, capacity cost rate (CCR), time equation and forecasting. However, there is no paper show the methodology uses of Time-Driven Activity-Based Costing in palm oil plantation. The aim of this study is to explore the research gap of Time-Driven Activity-Based Costing in the journals that can be as guideline in applying Time-Driven Activity-Based Costing system in palm oil plantation. In this study, Time-Driven Activity-Based Costing is a new system able to apply in various environments in order to get better process in each workstation and also the time will be more accurate in each activity or sub-activities of a product. This costing method can also increase organizations' profits because the unused product capacity is counted in this method. The advantage of TDABC is that it provides an accurate cost accounting starting point for providers. As resources become more limited in the future, providers will need to understand their real costs in the provision of specific services.

INTRODUCTION

Application of Time-Driven Activity-Based Costing (TDABC) in palm oil plantation is still not found based on reseach gap that published from previous papers. By applying this method, the organisation can has accurate costing system and operate smooth process in the workstation. TDABC is a type of method which can describe as a costing model that consider a time which known as inducer time. This method is providing the cost of activities with base that consume of time per activities.

As mention [1], in the new time-driven approach, resource costs are directly allocated to cost objects using an elegant framework that only requires two sets of estimates. First, it calculates the supply capacity costs. Secondly, TDABC uses the cost rate of capacity to reduce departmental resource costs to cost objects by estimating the resource capacity demand required by each cost object.

Some of the advantages of TDABC are costing of all activities perform is can clarify areas for improvement [2], providing more reliable of information for decision making process [3], help managers focus on value-adding activities and limit nonvalue-adding [4], and to identify inefficiencies [5]. As mention by [6], TDABC has the advantage of detailed process mapping which capable to identify cost-saving opportunities. [7] indicated that TDABC can separate the unused potential from the total capacity to be compared. With ABC the idle capacity cannot be easily identified if not all drivers are duration types. In contrast, TDABC effectively measures the time efficiency, accurately identifies the idle capacity and separately lists the used and unused capacity.

Based on literature studies from 56 journals, TDABC had been applied in three different fields. These fields including in area of healthcare, industrial and library. Figure 1 shows the iilustration of pie chart that show the percentage of distribution of those three application fields. Based on the pie chart, the highest percentage that applied TDABC method was in area of healthcare which is 66%, followed in area of industrial, 23%, and library area is 11%. For example, activities in healthcare area that applied TDABC method are such as in radiation therapy, spine care, and laparoscopic surgical treatment.

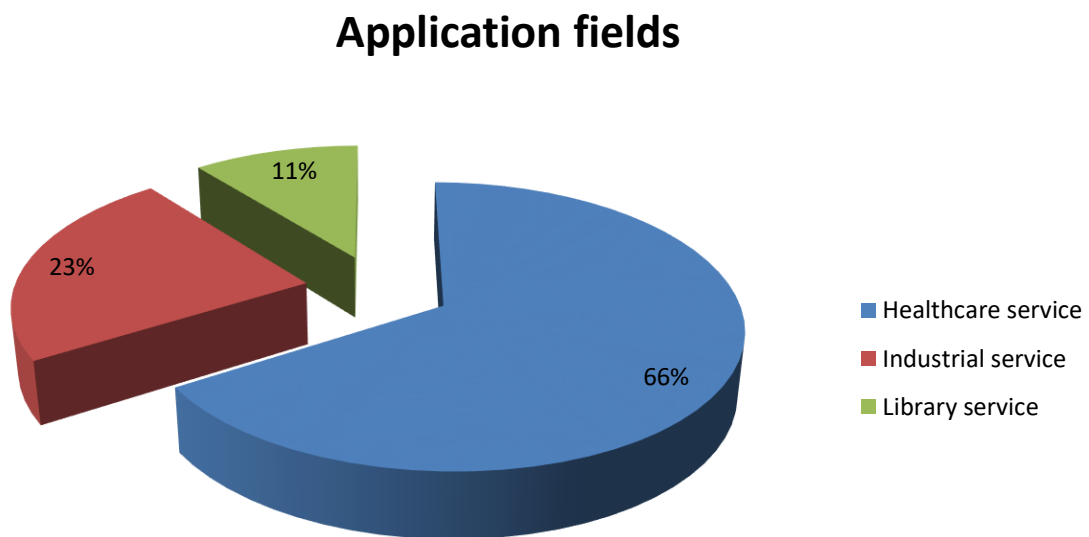


Figure 1: Application fields that using TDABC cost accounting system

Generally, there are seven basic steps to conduct TDABC in cost accounting system.

Step 1: Select the Period Condition

The first step in performing TDABC is to select the period condition. Generally, providers will have to arbitrarily select a beginning and end point, usually a 12-month period.

Step 2: Define the Activities and Sub-activities

Next, all activities and sub-activities should be defined for a complete cycle until finished product is achieved. This requires the provider to take a holistically view of all the activities and services that a product undergoes in receiving care for that condition beyond just the provider-directed activities. In performing this type of analysis often activities that are nonvalue added are uncovered. This becomes important when determining which steps add value and which steps should be eliminated.

Step 3: Develop Process Maps

The next step is to develop a process map of all the activities. The more detailed this process map is the better. This is usually the most cumbersome step for providers. There have been many different methods described to perform a process map. Usually following a patient through the process with a stopwatch, detailing the resources involved, is the best method. Some groups have performed this step through a multidisciplinary meeting where providers estimate the time required to complete this task. Having an individual familiar with process improvement is helpful in this step as often areas for improvement are noted and corrected during this process.

Step 4: Obtain the Time Estimates

Once a detailed process map has been constructed the amount of time each resource is used should be calculated. For consistent resources a standard time can be allocated. For high consumption resources it is critical to measure the time accurately. In plantation often many workers are involved concomitantly in delivering that resource. It is important to separate out these resources to give an accurate time. Often times are calculated with a stopwatch, but this is cumbersome, and is prone to error.

Step 5: Estimate the Cost of Supplying Resource

This step involves calculating the numerator in TDABC. For personnel this requires knowing the salary of the individual along with their benefits. It is important to use the practical capacity of the resource as using the theoretical capacity can provide a misleading number. As mentioned above the costs of each resource are also added to this number. When calculating equipment costs it becomes important to take into consideration the depreciation of the equipment.

Step 6: Calculate the Capacity Cost Rate (CCR)

The goal of this step is to calculate the unit cost. Specifically in this step the cost of the resource is divided by the amount of time that resource is used. For an example, in the case of personnel a clinician's salary is divided by the number of minutes that individual is involved in delivering patient care. For equipment the cost of the machine is divided by the number of minutes the machine is used or the number of tests the machine performs. The goal is to come up with a unit cost (RM/min).

Step 7: Calculate the Total Cost of Product Produced

Once all the calculations have been made the total cost of product can be conducted. The costs of all personnel, equipment, and space are then aggregated to come up with a total cost of product produced. This can be compared with the reimbursement to ensure that there is a positive margin for that service or procedure.

In addition, according to [8], TDABC has developed eight steps that illustrates in Figure 2. Step 1 is used to identify the activities taking place and understand its scope and specific sequence. Step 2 explains if the resources used fall under the same activity, costs can be allocated directly to the activity. However, if resources are used for several activities, an allocation method based on the appropriate cost-driver has to be used. Then, step 3 is estimating the practical capacity for an employee or equipment which must be straightforward and unbiased. Later, step 4 is used to drive departmental resource cost to cost objects by estimating the demand for resource capacity that each cost object requires. In step 5, time equation is calculated to find the principal factors that create demands for process capacity, changes in process efficiencies, product volume and mix, customer order patterns, and channel mix. TDABC time equation is able to incorporate all the time needed to undertake all sub-activities in each activity center within a single equation. Later, continued with step 6 which is estimating production time for each activity by developing time equation. Capacity is required to perform the activity such as performing a production run and processing an order. In step 7, the estimated capacity required by each activity was determined by quantifying the frequency of the activity with the total time spent to complete it. Finally, cost per product unit can be calculated in step 8.

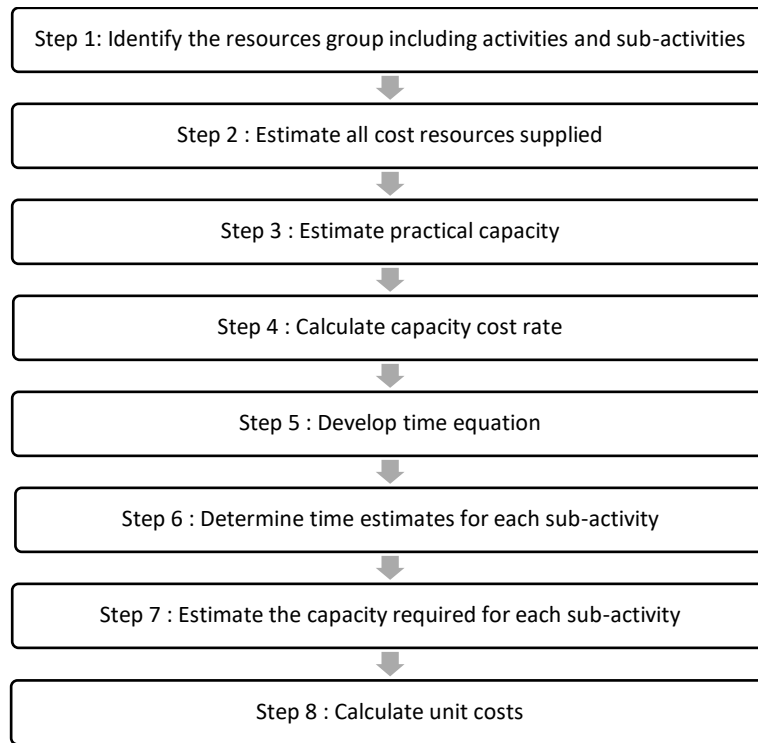


Figure 2: Concept of TDABC

METHODOLOGY

In this section, TDABC consider 56 papers which published from 2011-2018. These papers were analyzed according to the types of different publications. Table 1 shows the classifications of TDABC papers based on journal publication.

Table 1: Classification of TDABC papers based on journal publication

Journal publication	Quantity of papers
Evidence Based Library and Information Practice	1
Journal of Applied Accounting Research	1
International Journal of Logistic Research and Application	1
Engineering Management Journal	3
Procedia Social and Behavioral Sciences	1
Journal of Engineering Manufacture	1
International Journal of Contemporary Hospitality Management	1
Journal of the Association of European Research Libraries	1
Journal of Surgical	1
Journal of Health Organization and Management	1
Journal of Spatial Science	1
Journal of American College of Surgeons	1
Journal of Pediatric Urology	1
The Knee	1
International Journal of Annals of Emergency Medicine	1
Journal of Cancer Surgery	2
Journal of Pediatric Pedorthopaedics	1
Journal of Library Management	2
Journal of Industrial Management	1
Journal of European Laryngological	1

International Society for Pharmacoeconomics and Outcomes Research	1
International Journal of Health Care Quality Assurance	1
Journal of Pediatric Surgery	3
Journal of Sustainability	1
Journal of Intelligent Manufacturing	1
International Journal of Radiation Oncology	2
International Journal of Physical Distribution and Logistics Management	1
Journal Devoted to the Problem of Capital Investment	1
Journal of Arthroplasty	3
Journal of Diabetes Science and Technology	1
Journal of Production	1
Journal of Academic Librarianship	1
International Journal of Colorectal Disease	1
Journal of Clinical Apheresis	1
International Journal of Clinical Pharmacy	1
Academic Radiology Journal	1
Collection building	1
Procedia CIRP	1
Foot & ankle International	1
Healthcare Research	6
Seminars in spine surgery	1

After classified TDABC papers based on journals publication, research gap can be done in details in results and discussion. In the research gap, there are two filtrations for TDABC method which firstly based on expected strengths reported in Keel et al. (2017) and secondly, TDABC will classified into more efficient for cost accounting system which related to its advantage.

RESULT AND DISCUSSION

According to [9], TDABC can be classified into six categories. Figure 3 illustrates the pie chart of reasons for applying TDABC based on expected strengths reported in [9]. Based on the pie chart, we had figured that accurately capture the cost of care has the highest number of percentage with 39% in terms of the expected strengths of applying TDABC as reported in the literature. It then followed by support operational improvement (26%), manage the complexity inherent (22%), more efficient (9%), while simple than traditional ABC and informs reimbursement policy shared the same percentage which is 2%.

Reasons for applying TDABC based on expected strengths reported in Keel et al. (2017)

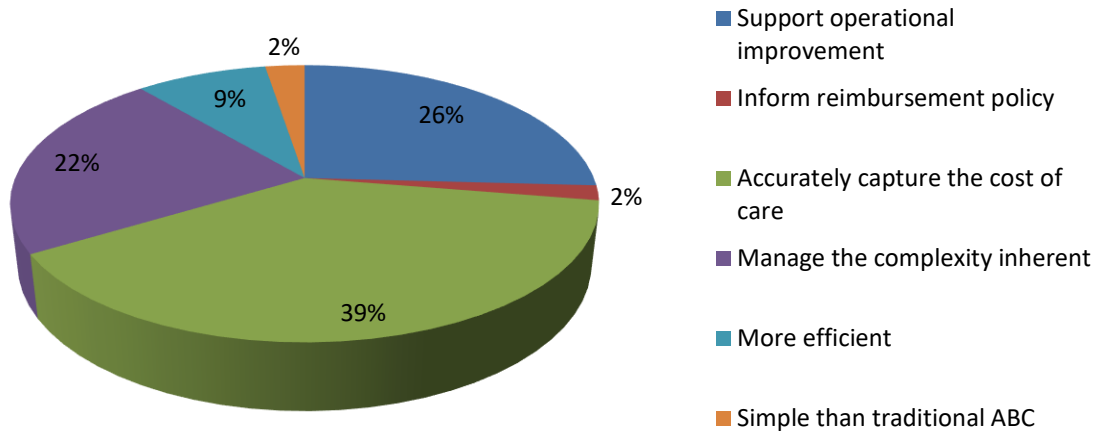


Table 2 shows only 10 papers out of previous 56 papers that focus for more efficient as their main advantage from using TDABC’s methodology which are process map, capacity cost rate, time equation and forecasting.

Table 2: Methodology of TDABC that been used in the 10 journals

Author (year)	Application	Concept (Method)			
		Process Map	Capacity Cost Rate (CCR)	Time Equation	Forecasting
Zhuang and Chang (2017)	Product mix in industrial service	√	√	√	√
Wouters and Stecher (2017)	Medium-sized manufacturing company in industrial service		√	√	
Anzai et al. (2017)	Radiology department in a healthcare service.	√	√	√	
Yu et al. (2017)	Paediatric appendicitis in healthcare service	√	√	√	
Keel et al. (2017)	Health care organizations	√	√	√	
Kont (2015)	Acquisitions process in library service.	√	√	√	
Yun et al. (2016)	Emergency Medicine in healthcare service	√	√	√	
Sarokolaei et al. (2013)	Fuzzy logic theory in industrial service.		√	√	
Kont and Jantson (2011)	University libraries		√		
Kont (2011)	Library employees’ performance		√		

From the findings in Figure 3, most efficient was chosen as the reason to apply TDABC based on expected strengths that reported in [9]. Based on Table 2, all research papers that contained the most

efficient reason in their literature studies had been listed out. From there, the method used for every study can be identified.

Zhuang et al., (2018) were the only researchers from all 10 studies that applied all four methods in their research, which are process mapping, capacity cost rate, time equation and forecasting. The study is entirely focused in industrial service. Wouters, M., & Stecher, J., (2017) and Sarokolaei et al., (2013) had undergoing studies in industrial service by using only two methods, which are capacity cost rate and time equation. Yun et al., (2016), Yu et al., (2017), Anzai et al., (2017), and Keel et al., (2017) had researched in healthcare service by using only three methods of TDABC which are process mapping, capacity cost rate and time equation. Beside, Kont, K. R. (2015) also used the same methods in his study in library service. Kont, K. R., & Jantson, S., (2011) and Kont, K. R., (2011) solely used capacity cost rate to find the result of finding in the library sector. In a nutshell, this total research gap was constructed compliance to the current data as it was based on legit research findings.

CONCLUSION

In this study, TDABC is a new system that can be used in different environments to improve the process at each workstation and the time for each activity or sub-activity of a product. This costing method can also increase organizations' profits because the unused product capacity is counted in this method. More unused capacity is known, an organization will make more profit. If TDABC is used more frequently by providers, the process of carrying out this analysis may develop more accurately. The advantage of TDABC is that it provides an accurate cost accounting starting point for providers. As resources become more limited in the future, providers will need to understand their real costs in the provision of specific services. TDABC's uniqueness is that it uses time as its denominator. The intensity involved in the delivery of this service is not differentiated.

Acknowledgement

This research is fully supported by RDU1703157 and RDU1803102. The authors fully acknowledged Universiti Malaysia Pahang for the approved fund which makes this important research viable and effective.

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