

A REVIEW ON THE APPLICATION OF ACTIVITY-BASED COSTING AND TIME-DRIVEN ACTIVITY-BASED COSTING IN MANUFACTURING INDUSTRY

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Abstract

Activity-based costing (ABC) and Time-Driven Activity-based Costing (TDABC) are example of costing structures that bring benefits to an organization and it is supported by numerous published papers. However, it is acknowledged that there is no report on comparison of ABC and TDABC on product costing in manufacturing industry. Therefore, the purpose of this study is to examine the research gap of ABC and TDABC in manufacturing industry. There are 130 of published papers on ABC and TDABC from period 2011-2018 to be analyzed. Through the application of ABC, it improves effectiveness, helps in decision making process and provides information for critical analysis. Furthermore, TDABC overcomes the limitations of ABC and it provides an accurate costing process. It promotes direct allocation and represents accurate unused capacity.

Keywords: Activity-based costing, time-driven activity-based costing, product costing.

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1.0 INTRODUCTION

Activity-based Costing (ABC) and Time-driven Activity-based Costing (TDABC) are both innovative costing method that encourage company to have better efficiency and effectiveness. However, there is no report on comparison of ABC and TDABC on product costing in manufacturing industry. In this study, the research gap of ABC and TDABC in manufacturing industry is identified.

As mentioned by [1], 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 [2].

Eventually, ABC method provide accurate information with cost drivers during manufacturing process [3], help to accurately understand the

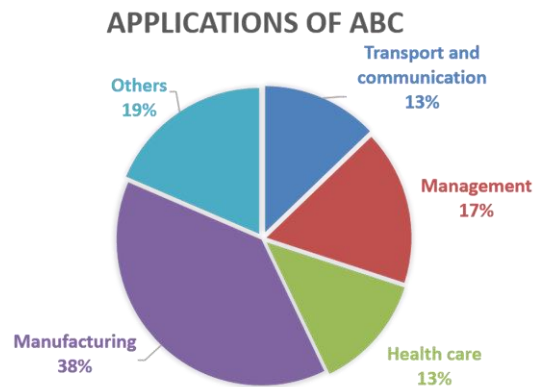


Figure 1 Applications of ABC

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 other available method namely, in this study is TDABC.

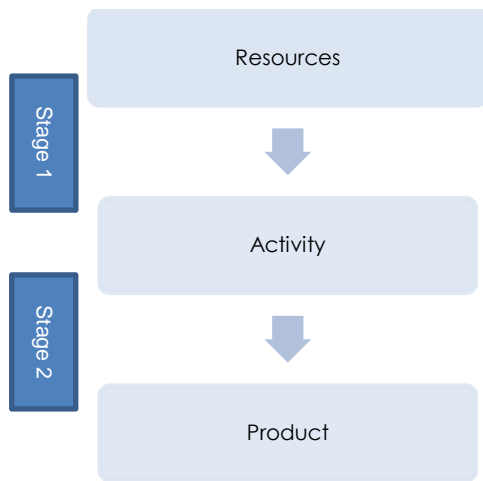


Figure 2 Concept of ABC

Referring to [6], 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 as shown in Figure 2. 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.

On the other hand, a costing model known as Time-driven Activity-based Costing (TDABC) uses time as an inducer in costing. TDABC provides cost of activities by calculating time consumption per activities [7].

The advantage of this method is, it provides accurate estimates of care cycle cost and more transparency into the cost drivers [8]. Moreover, significant information on idle capacities is delivered and unused resources recognized by TDABC [9].

APPLICATIONS OF TDABC

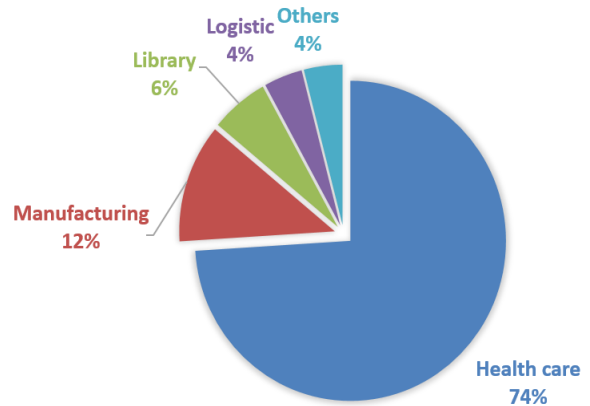


Figure 3 Applications of TDABC

Since it is introduced, this method has been used in different sectors such as health care, manufacturing, library, logistics and others. Figure 3 shows the percentage of TDABC used in different sectors. Based on the pie chart, health care dominated the highest percentage which is 74% while the lowest percentage is 4%, shared by logistics and others. Manufacturing sector is the second highest at 12% and followed by library at 6%. Thus, information of TDABC in manufacturing sector especially in production environment is limited [10].

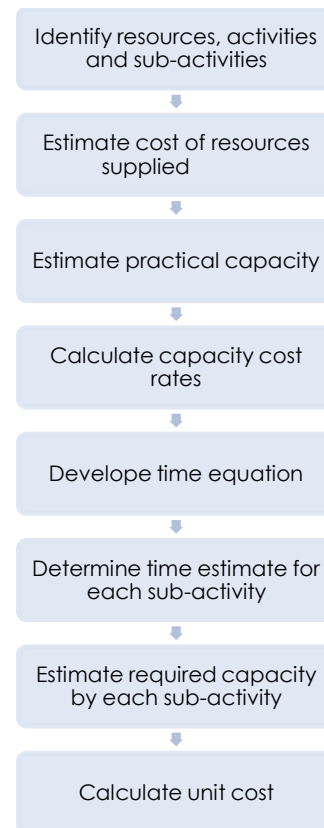


Figure 4 Concept of TDABC

According to existing literature, there are 8 stages to calculate cost using TDABC [11]. By referring to Figure 4, the first step is to identify and analyse activities to understand the scope and sequence of events. Secondly, the cost of resources supplied in each activities and sub-activities is listed and estimated. Practical capacity details about employees working hours which to be used for calculation of capacity cost rates. Next, TDABC time equation is developed to calculate the estimated production time. The estimated capacity required by each sub-activity is calculated and finally, the unit cost is determined.

2.0 METHODOLOGY

In this study, 75 ABC papers are considered and analysed. Those papers are published from 2011-2018 from different journal publications and only open accessed papers are considered. Table 1 shows classification of ABC papers based on journal publications.

Table 1 Classification of ABC papers based on journal publication

Journal publication	Quantity
Computers and Operations Research	1
Intangible Capital	1
IOP Conference Series: Materials Science and Engineering	1
International Urogynecology Journal	1
Digital Policy, Regulation and Governance	1
Journal of Applied Accounting Research	4
Accounting, Auditing & Accountability Journal	1
Policing Journal	1
Procedia Manufacturing	1
International Journal of Physical Distribution & Logistics Management	1
PSU Research Review	1
Procedia CIRP	1
Clinical Lymphoma, Myeloma and Leukemia	1
International Advances in Economic Research	1
Business: Theory and Practice	1
Management Science Letters	1
Review of Quantitative Finance and Accounting	1
Health Care Management Science	1
Journal of Cleaner Production	3
Journal of Global Mobility	1
Industrial Management & Data Systems	2
International Journal of Contemporary Hospitality Management	2
Cost Effectiveness and Resource Allocation	1

Journal of Quality in Maintenance Engineering	1
International Journal of Production Research	4
Collection Building	1
Business Process Management Journal	1
Procedia Economics and Finance	1
BMC Public Health	2
Estudios Gerenciales	1
International Journal of Quality & Reliability Management	3
Journal of Management Control	1
Advances in Accounting	1
Electronic Library	1
European Journal of Operational Research	1
Asian Review of Accounting	1
Health Policy and Technology	1
Procedia Technology	1
Procedia Social and Behavioral Sciences	1
Journal of Cost Analysis and Parametrics	1
Archives of Orthopaedic and Trauma Surgery	1
Iberoamerican Journal of Project Management	1
Physics Procedia	1
Journal of Air Transport Management	1
Mining Technology	1
Pathology	1
International Journal of Production Economics	1
International Journal Digital Libraries	1
Worldwide Hospitality and Tourism Themes	1
Energy	1
Economic Research	1
Procedia Environmental Sciences	1
British Accounting Review	2
Qualitative Research in Accounting and Management	1
Library Management	1
Journal of Modelling in Management	1
BMC Health Services Research	1
Bottom Line	1
Construction Innovation	1
Engineering Economist	1
Decision Support Systems	1

While for TDABC, there are 50 TDABC papers considered published from 2011-2018. Only open accessed papers are considered. Table 2 represents classification of TDABC papers based on journal publication.

Table 2 Classification of TDABC papers based on journal publication

Journal publication	Quantity
Journal of Intelligent Manufacturing	1
Journal of Engineering Manufacture	1

Journal of Health Policy	1
Journal of Qualitative Research in Accounting & Management	2
Clinical Orthopaedics and Related Research	1
Mayo Clinic Proceedings: Innovations, Quality & Outcomes	1
International Journal of Production Economics	1
Journal of Industrial Engineering and Management	1
International Journal of Logistics: Research and Application	1
Engineering Management Journal	1
Gest. Prod.,	1
International Journal of Radiation Oncology	2
Seminars in Spine Surgery	1
BMJ Open	1
Journal of Arthroplasty Today	1
Journal of Pediatric Surgery	3
The Engineering Economist	1
International Journal of Colorectal Disease	1
The Journal of Cancer Surgery	1
Academic Radiology Journal	1
Foot & Ankle International	1
Radiotherapy and Oncology	1
International Journal of Clinical Pharmacy	1
Journal of Diabetes Science and Technology	1
Journal of Clinical Apheresis	1
Health care: The Journal of Delivery Science and Innovation	3
The journal of Academic Librarianship	1
International Journal of Annals of Emergency Medicine	1
The Journal of Arthroplasty	1
MDPI Journal	1
Research in Social and Administrative Pharmacy	1
European Archives of Oto-Rhino-Laryngology	1
Public Library of Science Library Management	1
The Journal of the Association of European Research Libraries	1
The Lancet Journal	1
Journal of Health Organization and Management	1
Journal of Collection and Curation	1
Journal of Spatial Science	1
Journal of the American College of Surgeons	1
Journal of Pediatric Urology	1
The Knee	1
Journal of Pediatric Orthopaedics	1
American Cancer Society	1

stages of filtrations to identify the research gap. Further details will be discussed in the results and discussion section.

3.0 RESULTS AND DISCUSSION

TOPICS OF ABC

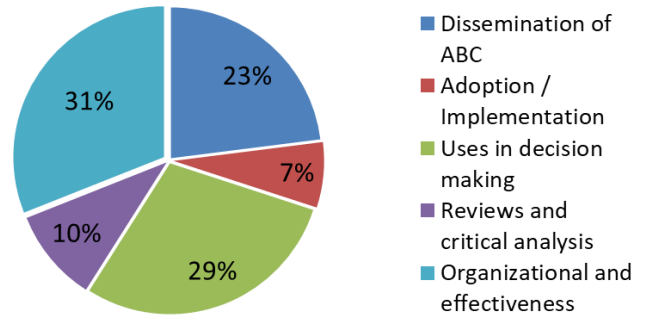


Figure 5 Topics of ABC discussed in papers

According to [12], ABC has been classified into five topics. Figure 5 displays the percentage of ABC topics. The organizational and effectiveness of ABC and the usage of ABC in decision making are the most commonly addressed topics at 31% and 29% respectively. The list followed by dissemination of the method (23%), reviews and critical analysis (10%) and the least at 7% for adoption or implementation of ABC. We focused on the adoption or implementation topic as it has the lowest percentage of paper discussed.

Table 3 shows 6 papers that discussed about adoption or implementation of ABC. All 6 papers are further discussed into the elements of ABC.

Table 3 Elements of ABC

Author	Elements of ABC			
	Activity map	Activity analysis	Assign cost categories	Cost drivers
[1]	/	/	/	-
[2]	-	/	/	/
[3]	/	-	/	/
[4]	-	-	/	-
[5]	/	-	/	/
[6]	-	/	/	/

By referring to Table 3, firstly, [1] did not mention about cost drivers that gives the information for the decision making process. Secondly, according to [2] and [6], the work on activity map was not highlighted. It is important to have every activities and sub-activities identified for the analysis. Moreover, activity analysis where activities are analysed for improvements to increase performance

Once ABC and TDABC papers have been sorted into journal publication, the next step is to apply two

was not stated by [3] and [5]. Lastly, the work by [4] did not emphasize the activity map and activity analysis while it is crucial because to have effectiveness and efficiency, the activities must be clearly defined and analysed.

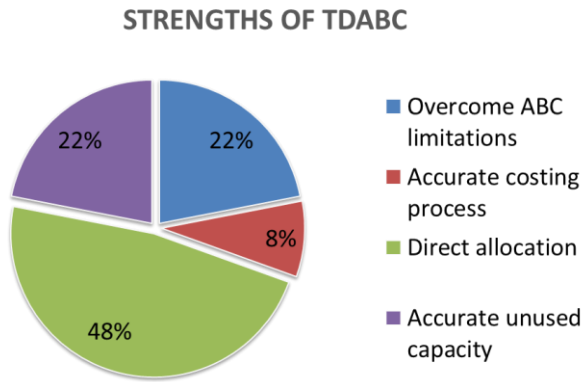


Figure 6 Strengths of TDABC

Based on [10], the strengths of TDABC are listed as: overcome limitations by ABC, provides accurate costing process, promotes direct allocation, and represents accurate unused capacity. Figure 6 displays the proportions of TDABC strength in percentage. We focussed on the least percentage that is accurate costing process at 8%.

Table 4 shows the elements of TDABC. Through the list of strengths of TDABC, 50 papers were narrowed down to 7 specific in accurate costing process.

Table 4 Elements of TDABC

Author	Process mapping	Time equation	Capacity cost rate	Unused capacity	Fore-casting
[7]	/	/	/	-	-
[8]	/	/	/	-	-
[9]	-	/	/	/	-
[10]	-	/	/	/	-
[11]	-	/	/	/	/
[12]	-	/	/	/	/
[13]	-	/	/	/	/

First of all, referring to [7] and [8], unused capacity was not defined in order to have accurate costing information while forecasting is crucial for any decision making process. In [9, 11, 12, and 13], the work did not emphasize process mapping that is important to understand the process, the activities and sub-activities. According to [10], forecasting was not mention and it is good to have supported information for the future analysis. Process mapping was not highlighted as well to have detail insight on the activities for costing.

4.0 CONCLUSION

In conclusion, above works showed the gaps in ABC and TDABC and it could be filled in the future research. Through the application of ABC, it improves

effectiveness, helps in decision making process and provides information for critical analysis. Furthermore, TDABC overcomes the limitations of ABC and it provides an accurate costing process. It promotes direct allocation and represents accurate unused capacity. Indeed, the strength of TDABC would be beneficial to the company as it delivers accurate costing process to calculate product cost in manufacturing industry.

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