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ABC vs TD-ABC FOR HIGHER EDUCATION: CASE STUDIES

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The purpose of this paper is to discuss how activity-based costing (ABC) and time-driven activity-based costing (TD-ABC) technique can be applied in the context of higher education institutions. It also discusses the comparison of ABC and TD-ABC and the moving from the distribution of indirect costs to the distribution of resource driver quantity.

Keywords: Universities, Activity based costs, Time-driven activity-based costing, Activity based management, cost allocation.

INTRODUCTION

In 1923, J. Maurice Clark coined the phrase ‘different costs for different purposes’, but most companies only have one costing system, which is used for all purposes: stock valuation, planning, control and decision- making (Brignall [2]).

Activity - based Costing is a sophisticated costing system, which helps in tracking out product and customers profitability and reducing the operating costs. Activity- based costing was originally developed by companies to deal with the problem of product – cost subsidization in traditional costing systems. ABC is a product of the subsequent reinvention, reunderstanding and reorganizing the managing system. It is just a consequent product of the technological era. ABC was initially developed and employed only for – profit and product – oriented manufacturing industries, but non-profit entities like academic institutions are still far lagging behind.

Only a few higher education institutions in the United States apply ABC, and these applications are limited to allocation of overhead costs such as libraries and admissions.

In Great Britain, however, several universities have adopted ABC, resulting in tighter financial management and better resource allocation. Functional based systems that contributed to the development of ABC theory and practice, and its essential potentiality as a public relations tool, can provide beneficial implementation in a higher education setting and suggest that it may be used to improve cost management and financial analysis.

A number of Australian universities have recently introduced ABC. Ernst & Young, reporting on the trial introduction of ABC into three universities: RMIT University, Murdoch University and Charles Sturt University, asserted that the past deficiency in accurate cost information was of little concern to the universities since they had been operating in a relatively non-competitive environment. However, this has now changed, since “in light of the increasingly competitive environment and the numerous other challenges that are currently facing the sector, universities must have timely, accurate and precise knowledge of all their costs” [5, p. 7].

Not stopping at a considerable literature review, we note the presence of a good review, for example, in the articles Noor Azizi Ismail [8]. The literature review is divided into three sections. The first section provides an overview of traditional cost management

(TCM) system. The second section discusses the differences and advantages of ABC/ABM system over TCM system. Finally, the third section explains how ABM system can assist higher education institutions achieve their strategic goals. Reich, F. and Abraham A. [9] present a non-traditional method of collecting staff activity data at an Australian university for the purposes of more accurately and completely identifying costs for use in an activity based costing (ABC) model.

This paper discusses some important issues relating to ABC and TD-ABC. First, it discusses how ABC technique can be applied in the context of higher education institutions, second, it is use of the term assignment, third, it is use of the TD-ABC technique, fourth, it is move from cost allocation to quantity recourse driver allocation.

THE RESEARCH CONTEXT

By example of a detailed look at the process of transition from the traditional accounting system to ABC system for higher education. [8].

Case study for Faculty of Accountancy in University Utara Malaysia (UUM) [8].

FAC is a large academic unit with over 120 lecturers. It offers two undergraduate degrees, five master degrees and a doctorate degree. Total student enrolment was 3,952, consisting of 3,055 undergraduate, 67 postgraduate and 69 PhD students. The largest undergraduate classification of students was local students with 3,780. The international students numbered a mere 36. Of the Master and PhD students, half were international.

Step 1 – obtain expenditure data. The first step in implementing the ABC model was to obtain annual expenditures for the fiscal year 2007. FAC receives its resources from the university based on its annual budgeted funds. Table 1 provides a breakdown of FAC expenditures. The largest was salaries and allowances with almost RM7.8 million in annual expenditures or 87 percent of the RM8.8 million totals.

Table 1

Traditional reporting

	RM	Percent
Salaries and allowances	7748038	87.2
Benefits	250000	2.8
Operating expense		
Traveling	140750	1.6
Utilities	159000	1.8
Supplies	153450	1.7
Rentals	168000	1.9
Maintenance	248000	2.8
Others	19600	0.2
Total expenditures	8886838	100

Source: Ismail Noor Azizi I. [8, p.44]

Step 2 – identify resources. Expenditures reported in Table 1 represented the resources to be assigned to the identified activities.

Step 3 – identify activities. As typical in many universities, academic staffs engage in four broad categories of activities: teaching; research; publication; and consultation. In

addition, academic staffs are expected to serve in other service activities such as journal editorial board member and committee of academic and professional bodies. Occasionally, academic staff also attended workshops and presented papers in seminars and conferences.

Several academic staffs also hold various administrative positions. Finally, academic administrators and administrative staff members usually involve in other service and administrative-related activities. Noor Azizi provides a breakdown of six activity pools and activities performed by academic and administrative staffs of FAC: teaching, research, publication, consultation, services, and administration.

Note, that OMB Circular A21 defined that major functions of an institution refers to instruction, organized research, other sponsored activities and other institutional activities.

Instruction means the teaching and training activities of an institution. This term includes all teaching and training activities, whether they are offered for credits toward a degree or certificate or on a non-credit basis, and whether they are offered through regular academic departments or separate divisions, such as a summer school division or an extension division. Also considered part of this major function are departmental research, and, where agreed to, university research.

Sponsored instruction and training means specific instructional or training activity established by grant, contract, or cooperative agreement. For purposes of the cost principles, this activity may be considered as a major function even though an institution's accounting treatment may include it in the instruction function.

Departmental research means research, development and scholarly activities that are not organized research and, consequently, are not separately budgeted and accounted for.

Departmental research is not considered as a major function, but as a part of the instruction function of the institution.

Organized research means all research and development activities of an institution that are separately budgeted and accounted for. It includes: 1) Sponsored research means all research and development activities that are sponsored by Federal and non-Federal agencies and organizations; 2) University research means all research and development activities that are separately budgeted and accounted for by the institution under an internal application of institutional funds. University research shall be combined with sponsored research under the function of organized research.

Thus, the direct costs includes salaries and wages; fringe benefits; travel; lab supplies; subgrants and subcontracts.

F&A cost pools includes operations and maintenance; library; general administration; departmental administration; sponsored projects administration; student services administration.

Step 4 – identify resource drivers and resource driver quantities

The resources costs will be assigned to relevant activities in six-activity cost pools via identified resource driver and resource driver quantity. A resource driver is a measure of the quantity of resources consumed by an activity. An example of a resource driver is the percentage of effort a lecturer spends across the various activities performed.

Examples include lecturing, academic advising and supervision, undertaking research and consultation and publishing books. For this purpose, academic staffs were first pooled according to their rank: professors, associate professors, senior lecturers, and lecturers. The reason is that each category of academic staff is expected to spend their times differently on each activity, which are reflected by different quantity of resource driver to each assignment. Each activity pool comprises of several activities. Teaching activity

comprises of lecturing, academic advising, and academic supervision. For each category of academic staff, the resource driver quantity will be different. A questionnaire survey was designed to determine, the resource driver quantity for each activity of each category of lecturers. For each category, ten lecturers were randomly selected to answer questions relating to the percentage of efforts that they spent on each activity. The percentage of effort of each activity for each category of academic staffs was then totaled and divided by the number of responses in each category to calculate the average percentage of effort for each activity and each category of academic staffs. Similar procedures were carried out for academic administrators and administrative staffs.

Step 5 – assign resources to activities.

Inter-module assignments. The first step is to assign resources to each activity pool using “inter-module” assignments. Results indicate that the highest activity costs was teaching (RM2,646,823), followed by, in descending order of costs amount, research (RM1,001,425), administration (RM830,962), publication (RM821,153), service (811,179) and consultation (RM336,538) activities. These activities costs data can be used by the faculty and/or university administrators to measure the performance of activities performed by the faculty.

Intra -module assignments. Service and administrative are activities that support the faculty main activities: teaching, research, publication, and consultation. Therefore, the assigned costs of both service and administrative activities need to be re-assigned to those four main activities using “intra-module” assignments. In this case, the costs were assigned to the category of “others account” of each activity, using percentage as the activity driver.

After reassigning the costs of services and administrative activities to the main activities, the next step is to reassign the costs of several main activities that have reciprocal relationships such as research, consultation and publication activities. Therefore, some of the costs incurred in conducting one activity (i.e. research) need to be reassigned (using intra-module assignments) to other benefiting activities (i.e. publication and consultation).

Finally, assigned costs from research, publication, and consultation activities need to be reassigned to the respective teaching activities accordingly (details of breakdown of costs of each activities pools before and after intra-module assignments are available from the author upon request). These activities costs, when divided by the number of outputs would yield the unit costs of each activity.

The information can be used by the faculty administrator to compare the performance of its core activities with other faculties (details of resources, resource costs, resource drivers, resource driver quantities, activity pools and activities identified in this study are available from the author upon request).

Step 6 – identify cost objects

The ultimate aim of this study was to estimate the costs of academic programs and the costs of student per program. Therefore, the cost objects identified in this study are programs and students.

Step 7 – Identify activity drivers and activity driver quantities. Finally, the total costs of teaching activities (RM6,448,079.86) will be assigned to the respective programs using the number of students that are enrolled in each program as the driver. However, different weights were used to assign the costs for local and international students. In this case, a higher weight was used for international students as it is assumed that international

students would normally need more guidance and attention (details of breakdown of activity costs, activity drivers, cost objects, driver quantities and weight used for this purpose are available from the author upon request).

Step 8 – assign activities to cost objects

Table 2 shows the comparison between traditional reporting and ABC reporting. Compared to the traditional reporting, an ABC perspective on the same data provides previously unavailable information about what the faculty and university is getting for their money. It provides managerial information useful in assessing the faculty's efficiency in teaching, research, publication, consultation, services and administration activities. This information, unquestionably, can be used by university management as a basis to make budget allocations among faculties, programs and activities.

Table 2

ABC reporting in University Utara Malaysia (UUM)

	RM	Percent
Teaching	2646823	
Lecturing	1808741	20.4
Advising	335209	3.8
Supervision	78986	0.9
Others	423887	4.8
Research	1001425	
Proposals	459208	5.2
Research	387363	4.4
Others	154854	1.7
Publication	821153	
Academic journal	229927	2.6
Professional journal	109116	1.2
Books	367597	4.1
Others	114512	1.3
Consultation	336538	3.8
Service	811179	
University/faculty	377116	4.2
Prof. service	66015	0.7
Prof. development	165166	1.9
Others	202882	2.3
Administration	830962	
Academic	412123	4.6
General	262102	2.9
Others	156737	1.8
Idle	2438759	27.4
Total expenditures	8886838	100

Source: Ismail Noor Azizi [8, p.47]

Table 3 summarizes the costs per program and per student.

Noor Azizi notes, that the process employed for accomplishing this ABM system

implementation brought to light several obstacles.

The first obstacle encountered was obtaining financial data from relevant departments. Authorization to use the financial data is also an issue. Much of data required for performing the study were either unavailable or confidential, especially expenditures relating to salaries and allowances. For example, Bursar department initially expressed reservations about releasing individual salary and allowance data.

Table 3

Costs per program per student

	Costs (RM)	No. of students	Cost per student
B. Accounting			
Malaysian	3,326,167.48	3,028	1,098.47
International	59,317.39	27	2,196.94
Sub-total BAacct	3,385,484.86	3,055	1,108.18
B. Accounting (information systems)			
Malaysian	826,049.52	752	1,098.47
International	19,772.46	9	2,196.94
Sub-total BAacct.(IS)	845,821.98	761	1,111.46
Sub-total UG	4,231,306.84	3,816	1,108.83
Master			
Malaysian	63,711.27	29	2,196.94
International	166,967.46	38	4,393.88
Sub-total master	230,678.72	67	3,442.97
PhD			
Malaysian	600,447.11	39	15,396.08
International	1,385,647.18	30	46,188.24
Sub-total PhD	1,986,094.29	69	28,783.98
Total	6,448,079.85	3,952	1,631.60

Source: Ismail Noor Azizi [8, p.47]

A similar situation can be observed in many universities, including universities in Ukraine. In our view, there is no need to attempt to determine the resources used by the salary in cash. The most inexpensive way is to use the number of FTS staff. Such an approach seems reasonable, since it does not depend on the random fluctuations in the training of teachers on different programs. An important point is the distribution of the number of bets teachers program proportional amount of activity on different programs from the same resource pool .

In Ukraine, as in many countries, funding for the program is based on a formula approach (number of students per bet). Universities finasirovanie request for the total amount wagered by teachers of their qualifications, excluding types of programs.

Since 2001, the following changes occurred: general departments (history, foreign languages, physical education) were transferred to the relevant faculties. Department of Philosophy and Cultural Studies formed the philosophical faculty. These changes were

largely associated with the implementation of the direct method of cost allocation.

The difference between actual and standard FTE staff quantity associated with saving resources. Although the Ministry rules for the Student / teacher ratio should apply to all students , in fact , this figure was overstated for students who pay tuition themselves.

Really, the public funds are used to train the students who had to cover the costs of their own funds.

In fact, the fixed costs of University covered by public funding, and additional FTE staff resources are recovered on the marginal based approach. Thus the university has received the profits that could not be used for training purposes.

Table 4
Distribution of standard (student/ teacher ratio) and actual FTE staff

Faculty	FTE staff (2001/2002)		FTE staff (2013/2014) on student/ teacher ratio	
	Actual (Reciprocal method)	Allocation On student/ teacher ratio		
Biological		37,5	33,94	48,95
Chemical		18,75	15,73	16,02
Historical		30,75	23,17	23,84
Mathematics and Computer Science		60	61,54	48,64
Economic		74	81,7	61,91
Geographical		35,25	28,42	50,86
Philological		81	72,91	
Ukrainian Languages				27,26
Journalistic				57,69
East Languages		27,5	27,93	23,82
Foreign Languages		55,5	59,47	115,29
Management		43,25	43,35	50,96
Physical		52	41,58	45,78
Psychology		21	29,76	29,66
Law		33,25	46,21	45,87
Physical training		55,75	95,89	98,44
Philosophy				40,67
General departments		96	121,6	
Total		721,5	783,2	785,66

It should be noted that changes in 12 years for the standard FTE staff on student / teacher ratio in some positions are connected, as with changes in demand and with the incorrect pricing.

Noor Azizi notes, that a second obstacle encountered was to accurately determine the academic staff salaries and allowances. Salaries and allowances are assigned to each academic staff member's faculty, yet in few instances, an academic staff may also teach one or more courses offered by other faculty and vice versa. Furthermore, several academic staff members, while serving the faculty, also held administrative position in

other department or centre. However, the corresponding costs are not charged to those faculties or departments/centres.

In this case, an assumption was made that all costs incurred by the target faculty, i.e. FAC, were incurred solely by that faculty and for the purpose of performing activities within the faculty.

By the comment above, we can add that this approach involves the use of the direct method of cost allocation, which is inaccurate.

Noor Azizi notes, that a third obstacle encountered was to accurately determine the percentage of effort performed by academic and administrative staff members on identified faculty activities. For this purpose, a questionnaire survey was designed and distributed to a sample of academic staff members to determine the average percentage of effort for each activity of each category of academic staff. In this case, an assumption was made that all academic staff in the same category would spend the same amount of time on the same activity.

In Ukraine, planned and actual teaching activity virtually identical and is reflected in individual plans for other activities necessary to use surveys. Surveys are costly process.

Such, F. Reich and A. Abraham [9] result empirical data on cost comparison of data collection methods

Table 5

Cost comparison of data collection methods

Method / parameter:	Cost Magnitude	Cost Rank
Electronic survey	1,1	3
Individual interviews	2,4	5
Supervisor interviews	1,1	2
Corporate knowledge-holder interviews	1,0	1
Timesheets	11,3	6
Revolving door method	1,3	4

Source: F. Reich and A. Abraham [9, p. 11]

Noor Azizi notes, that a fourth obstacle encountered was to determine appropriate resource driver quantity for the operating expenses. For example, the common driver used for assigning maintenance costs to activities is square feet. However, the unavailability of square footage data forced the researchers to use a simple percentage as the driver. In this case, discussions with several administrative staff members and researchers own experience was used to determine the appropriate driver quantity for each operating expenses.

A fifth obstacle encountered was to acquire the necessary operational data. Some data such as the number of students enrolled, and the number of staff member employed, were readily available.

However, operational data relating to some departments or centers were not as readily attainable. While the initial plan was to include the costs of both faculty and other main servicing departments such as library, academic affairs department, research and innovation department and computer centre, the unavailability of these operational data lead to the abandonment of the plan. Getting cooperation from the respective departments

was also a frustrating problem.

The final obstacle encountered in this study was to obtain necessary data to measure activity performance.

The last obstacle is not connected with ABC primeniam and concerns of other methods.

Note that in the article Noor Azizi used apportionment and not cost assignment.

A cost assignment is the apportionment or distribution of cost from a source object to a destination object based on the consumption of the source object by the destination object.

The degree of the observation of the consumption relationship determines if the assignment method is known as direct tracing, which is directly observable or driver tracing, the term for consumption that is not directly observable.

The use of the term assignment is more appropriate when using the approaches related to the consideration of costs as demand for resources used in the ABC method. However, the difference in the content of the concepts of allocation and assignment is due not only to the applicable accounting method (the traditional method based on full absorption costing and ABC).

Anbalagan Krishnan [1] proposes to use different types of assignment method for the various kinds of costs.

Table 6

Resource Driver and allocation process in higher education

General Ledger Items	Amount (RM)	Allocation Base
Freight and Courier	214,000	Traced
Graduation Expenses	22,300	Traced
Orientation Expenses	6,600	Traced
Printing & Stationery	18,000	Allocated by estimated
Telephone & Faxes	5,000	No Calls and Faxes
Transportation – General	1,000	Allocated
Traveling Expenses	4,600	Allocated
Visa/Permit	3,000	Traced
Salaries & Wages	348,200	Traced
EPF	41,800	Traced
SOCSO	1,000	Traced
Payroll Taxes	60,000	10% of Wages
Equipment Leasing	30,000	10% of Wages
Depreciation Expenses	40,000	By Floor Space
Utility Expenses	30,000	By Floor Space
Supplies	50,000	Allocated by estimates
Total	875,500	

Source: Anbalagan Krishnan [1, p. 95]

ABC appeared to cause two significant problems. First, setting up an ABC system can be very costly, especially if the current accounting system does not support the collection of ABC information. Second, the system needs to be regularly updated, which

further increases its cost.

These limitations motivated by Kaplan and Anderson [6] to develop time-driven activity-based costing (TD-ABC), a revised version of ABC, solving these problems, without losing the benefits.

The most important characteristic of this technique is its simplicity, as only two kinds of parameters need to be estimated: the number of time units (e.g. minutes) consumed by the activities related to the cost objects and the cost per time unit.

In the first publication of authors in 2003, excess of available resources as the maximum quantity of hours of workload for a given quantity of bets on the demand for teacher workload in the implementation of the learning process was called "break-even analysis model in non-monetary terms of the workload in the top state higher education institutions".

English version is presented in the publication [3].

Traditional method ABC is more time consuming to update the system for new conditions in company's practice. TDABC is able to encompass all special aspects of particular activity into the one time equation and needs smaller requirements to accounting system.

However, TDABC is also under critique. TDABC is no suitable for actions demanding forethought and creative thinking. Also the accurate assessment of time consumption of activities is forceless property and in many cases, the estimation of time is based on the subjective judgment.

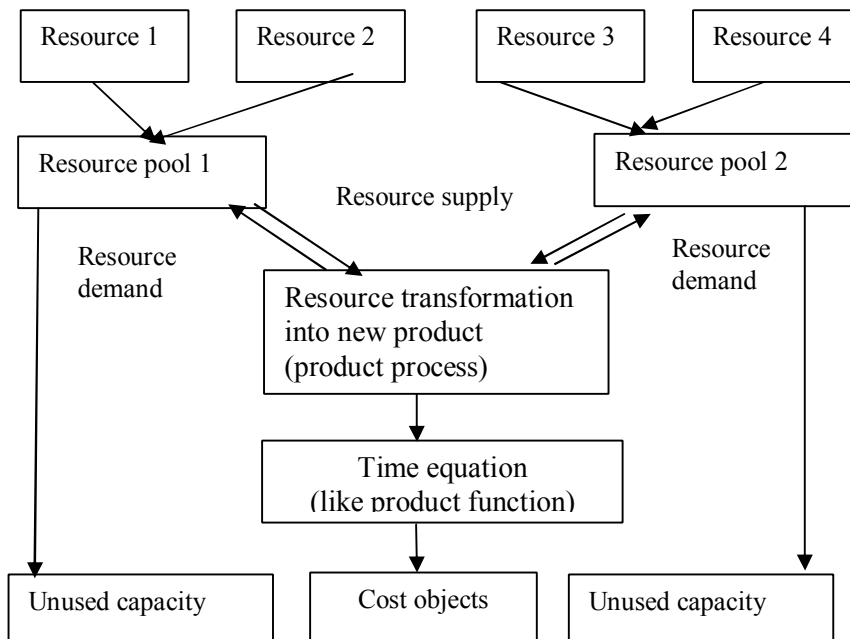


Fig 1. Conceptual TD-ABC model.

Some practical case studies are presented in Table 7.

Table 7

Practical TD-ABC case studies

Source	The section of application	Purpose of case study
Brugemann, Everaert, Anderson, Levant (2005)	Nameless distribution company in Belgium.	Improving the profitability of company – understanding of customer’s profitability. Comparison the costs allocation accuracy with ABC.
Dalci, Veyis, Kosan (2010)	Hospitality, Hotel in city Mersin, Turkey.	Understanding customer profitability analysis. Using TDABC in area of service organization.
Bryon, Everaert, Lauwers, Van Meensel (2009)	Agriculture, private farm, pig production, Belgium.	Applying the four- week batch farrowing system in comparison with the weekly farrowing with application of TDABC.
Demeere, Stouthuysen, Roodhooft (2009)	Outpatient clinic, medical sector. London hospital, Great Britain.	Improving medical service of hospital. Better supply chain in hospital.
Kaplan, Anderson (2004)	Dairy works, Kemps LLC, USA.	Improving sales system.
Hoozée, Brugemann (2010)	Belgian warehouses of nameless company.	How leadership, motivation, cognitive factors influenced application of TDABC and setting of time equations.

In the Tables 8,9 are summarized all main aspects of both methods in the mutual comparison.

Table 8

Comparison of methods ABC and TDABC in chosen aspects

View point of comparison	Method ABC	Method TDABC
Character of factors for assign of costs.	Cost drivers The method works with number of occurrence of factors (for example the number of set up).	Time drivers The method works with time of operating period, which resulting from incidence of factors (for example the time needed for set up).
The number of factors for assign of costs.	By every activity we can use only one factor.	By every activity the numbers of factors are unbounded. They indwell the relationship between factors and these relationships are respected.
The accuracy of method.	The method doesn’t capture the specification of activity, which influenced the costs.	The method captures the assign of costs to activities in suitable way. The accuracy is better than by the method ABC.
Extensiveness of system for assign of costs.	Every difference in the fulfilment of the activity needed implementation of new separated activity.	For every activity we needed only one time equation, which captured all specification and variation of activity.
Time consumption for update of system.	System is high elaborateness in actualization of costs rates.	Relatively smaller elaborateness than method ABC, because the costs rates are set up per time unit.
The ability to captured unused capacity	No	Yes

Source: Dejnega O. [4, p. 10]

Table 9

Traditional ABC vs Time Driven ABC

Critical comment traditional ABC	Approach Time -driven ABC
Interview and examination are time-consuming and expensive.	Managers make estimates for "cost per unit" and number of time units resource
Data for the model are subjective and difficult to validate	Data for the model are still subjective, but validated with managers
Data storage, processing and reporting is expensive.	By reduced amount of data is less data storage and processing is required. The report remains the same
Most ABC models provide only a limited partback of a company, rather than the overall company	Because models are easier to set up at Time drivenABC, can also facilitate the design of the company's total be set up.
ABC models are holding difficult up - to-date.	Because less data for time -driven ABC models per period needs to be refreshed, these models are easier to up -to-datehold
The model is theoretically incorrect because potentially unused capacity is not taken into consideration.	Time-driven ABC shows the unused capacity to see

Source: Bas Mutze, Dave van Ierland [7, p. 44]

SUMMARY

The method Time Driven Activity Based Costing in the comparison with traditional method Activity Based Costing assigns the costs to activities by time drivers. These time drivers are insert in the time equations, which capture all differences of given activities. Method Time Driven Activity Based Costing is able to identify unused capacity of workers and these results could be used in the design of new recruitment system, workout, education or lead to the transfer of employee between particular departments.

TDABC is suitable instrument to achieve operational improvements in practice, reduced useless activities and merge similar activities into to the one place. Although the application of method TDABC in practice is considered like target-setting process, it could be influenced by many factors, like group discussion, motivation, participation or leadership.

Despite these reports of improving utilization of ABC in the higher education sector, there is very little practical guidance on the collection of staff activity data. Indeed, Costing initiatives have met with limited success, in part because insufficient attention has been paid to the allocation of staff time to activities, with a proliferation of methods ranging from the limited use of timesheets to the arbitrary percentage apportionments based on the analysis of individual diaries.

One of the main advantages of ABS TD is the possibility of transition from cost allocation to the distribution of the amount of resource drivers. This feature is almost not reflected in the relevant literature, but it is an important point for the transition from TD ABC to TD ABM.

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Цель этой работы заключается в обсуждении того, как методы калькулирования на основе деятельности (ABC) и калькулирования на основе деятельности в факторах времени (TD-ABC) могут быть применены в контексте высших учебных заведений. Кроме того, обсуждается сравнение ABC и TD-ABC и переход от распределения непрямых затрат к распределению количества носителей ресурса.

Ключевые слова: университеты, калькулирование на основе деятельности, калькулирование на основе деятельности в факторах времени, управление на основе деятельности, распределение затрат.

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