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Time-Driven Activity-Based Costing in Service Industries

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Abstract

This article explains briefly the role of Activity-Based Costing (ABC) in service enterprises and provides a synthetic presentation of the principles and structure of Time-Driven Activity-Based Costing (TDABC), designed to reduce the complexity of cost measurement and allocation that is characteristic of ABC systems used in large enterprises, based on the original model of ABC. The new version of ABC is presented in the service industries context.

The article is the result of literature studies carried out by the author and her own reflections on the conventional and new versions of ABC. The research provided a basis for a synthetic description of ABC and Time-Driven ABC concepts, presentation of an example illustrating calculation of the costs of service activities using this method, explanation of the role of time equations in TDABC, and highlighting of the strengths and weaknesses of this new formula of Activity-Based Costing.

Keywords: **activity, Activity-Based Costing, Time-Driven Activity-Based Costing, practical capacity, service company, time equation.**

Introduction

The concept of Activity-Based Costing (ABC) has been at the centre of interest of management accounting theorists and practitioners since the first publications on the nature and structure of ABC by American professors, Cooper and Kaplan (e.g. Cooper, 1988a, 1988b, 1990; Cooper and Kaplan, 1988, 1991, 1992). Costing systems based on this idea can provide information relevant both to long-term, strategic business management and to operational management. Activity-Based Costing, reflecting the process view of business activity, is not only a method of more accurate calculation of costs of products and other objects (processes, customers), but it also is a system of measuring standard and actual costs, which allows effective management of resources, activities and processes. It is a cost accounting system which can be effectively used together with other advanced management accounting tools (e.g. Balanced Scorecard).

Activity-Based Costing has its origins in manufacturing companies in the USA, but very soon it proved to be particularly useful in entities engaged in provision of services. Service companies have virtually all of their operating expenses fixed once resource supply has been committed, therefore, they need the costing insights from ABC even more than manufacturing companies. ABC systems in service entities supply information about costs of processes and services provided and about profitability of services, customers and markets. However, in large enterprises these systems tend to be rather complex and their operation and updating may be very costly and time-consuming. This was the reason behind dissatisfaction with implemented ABC systems reported by many companies, which led some of them to giving up the use of this costing system some time after the implementation. This in turn resulted in increasing criticism of the practical utility of this approach.

In response to the criticism of the classical concept of ABC, Kaplan and Anderson (2004, 2007) have proposed a new version of ABC, which is called Time-Driven Activity-Based Costing (TDABC). The new variant was designed to reduce the complexity of activity cost calculation. TDABC makes it possible to eliminate the problems involved in implementation and operation of conventional ABC systems in large and very large enterprises, including service entities.

Kaplan and Anderson (2007, p. 8) report that by 2006 Time-Driven ABC was implemented in 200 enterprise in the US in consultation Acorn, a consultancy firm in which Anderson is the president, and prof. Kaplan is a member of the board. Recent publications on this subject have been concerned with whether TDABC is a new method of cost accounting or 'old wine in new bottles'(e.g. Dlubak, 2005; Gervais, 2009), have analysed its characteristics, advantages and disadvantages (e.g. Przytula, 2005; Szychta, 2008), have examined the underlying model (Bruggeman and Everaert, 2007) and the utility potential of TDABC (Coners and von der Hardt, 2004), and have discussed the role of time equations and factors resulting in errors in cost determination using this cost system (Cardinaels and Labro, 2008). Very few studies deal with actual applications of TDABC in particular enterprises and branches (e.g. McDonach and Mattimore, 2008; Gervais, 2009).

The limited knowledge about this innovative cost accounting system points to the need for public discussion of the issues addressed in this contribution. The aim of this study is to explain the essence and principles of Time-Driven ABC in comparison with conventional ABC and to demonstrate which characteristics and aspects of these cost systems make

them useful in service entities and customer service departments of manufacturing enterprises.

The article attempts to provide answers to the following questions:

1) what are the main reasons and purpose of using ABC in service entities?
2) in what way does TDABC simplify cost calculations?
3) how are time equations constructed and what is their role in calculating costs of different variants of performing a given activity, and particularly a service activity?

This article is based on a review, conducted by the author, of key publications by chief proponents of ABC and TDABC (Cooper, Kaplan, Anderson) and of published research on the objectives, structure and applications of ABC and TDABC, particularly in the services context. This analysis enabled the author to offer a synthetic explanations of the validity of these cost systems for service entities, and to formulate her own interpretations and opinions concerning the conventional and the new version of ABC.

The article consists of six parts. The first part highlights the applications of conventional ABC in service companies and presents the format to be used for ABC-based profitability analysis for customers, groups of customers and markets in service entities. The second part explains the reasons why Kaplan and Anderson (2004, 2007) developed a new version of ABC – Time-Driven ABC. Part three sets out the principles of the new model and provides a graphic presentation of cost determination under TDABC. Part four gives examples of service activity cost calculation under ABC and TDABC, part five describes the purpose and principles of constructing time equations, and part four discusses the benefits and shortcomings of the new formula, quoting the opinions of its creators and other authors of publications dealing with this subject.

The role of conventional Activity-Based Costing in service organisations

Under Activity-Based Costing indirect costs are grouped by processes and activities identified within a business entity and are next allocated to cost objects such as finished products, services and customers proportionately to the volume of activities which incur these costs, instead of being allocated to productive divisions, e.g. departments. Various allocation bases, which are cost drivers of these activities, are used to assign activity costs to cost objects.

The main aim of Activity-Based Costing is proper allocation of indirect costs to products (services) and customers and more accurate (than in full costing) calculation of the unit cost of product (service) for the purpose of making better operational and strategic decisions. Activity-Based Costing not only means more accurate costing, but, as Drucker (1995, p. 55) stated, ABC 'integrates what were once several activities – value analysis, process analysis, quality management, and costing – into one analysis'.

Identification of activities, calculation of their costs, selection of cost drivers and their measurement for the different activities provide an information basis for managing costs of operations through managing activities and for more effective budgeting of enterprise costs and results, called Activity-Based Budgeting. Owing to generation by ABC of reliable, accurate data on unit costs of products and services it is possible to perform analysis of profitability of the products offered, as well as customers, groups of customers and markets. Thus, data supplied by an organisation's Activity-Based Costing system provide a foundation for Activity-Based Management (e.g. Cooper et al., 1992; Kaplan and Cooper, 1998).

The ABC concept was gaining increasing popularity among entities in different branches of the economy. Activity-Based Costing systems were first implemented in large manufacturing enterprises, such as *Hewlett–Packard, Rank Xerox, Cummins Engines* and *Kingston Communications* in Great Britain (Bailey, 1991). The scope of ABC adopters subsequently expanded to include smaller enterprises and service and commercial companies operating not only in the USA and West European countries but also in other parts of the world (e.g. Innes, Mitchell and Sinclair, 2000; Bescos et al., 2001; Bhimani and Gosselin, 2002; Szychta, 2007; Wnuk-Pel, 2009). Activity-Based Costing systems found application in the services sector in such entities as public utility companies, telecommunications companies, banks, health service institutions and higher education establishments, which has been confirmed by a vast body of empirical research in the form of surveys and case studies (e.g. Cooper et al., 1992; Player and Lacerda, 1999; Friedman and Lyne, 1998; Innes et al., 2000; Bamber and Hughes II, 2001; Szychta, 2007; Swiderska and Raulinajtys, 2009).

While ABC had its origins in manufacturing processes, this costing method has become prominent in service companies and for service functions of manufacturing enterprises. This was pointed out in the mid-1990s by Drucker (1995, p. 55), who wrote that 'activity-based costing can substantially lower manufacturing costs – in some instances by a full third or more. Its greatest impact, however, is likely to be in service. In most manufacturing companies, cost accounting is inadequate. But service industries – banks, retail stores, hospitals, schools, newspapers, and radio and television stations – have practically no cost information at all'. The reason for this situation is that traditional cost accounting has not worked for service companies, because it makes wrong assumptions. 'Service companies cannot start with the cost of individual operations, as manufacturing companies have done with traditional cost accounting. They must start with the assumption that there is only one cost: that of the total system[1]. And it is fixed cost over any given time period' (Drucker, 1995, pp. 55-56).

[1] In other words, total operating activity of a service company has to be costed.

Activity-Based Costing makes the right assumptions, so used in service entities it ensures provision of information about costs of activities and services for decision-making and cost control, which was not possible with traditional full costing systems.

This lack of accurate information about services, activities and customers was not a concern for many decades of the 20th century also because most service companies operated in non-competitive markets, and many service industries were regulated (e.g. railroads, airlines, telecommunications). Managers of service organisations had little demand for cost information about services, processes and customers. In consequence, the financial systems in most service organisations were simple. They allowed managers to budget expenses by operating departments, and to measure and monitor actual spending against the functional departmental budgets (Kaplan and Cooper, 1998, p. 230).

Activity-Based Costing shows why traditional cost accounting was of little use for service entities. Because of the changing competitive environment in the service sphere (deregulation, increased competition, new forms of services as a result of development of the Internet, globalisation), managers of service companies required more and more information to improve the quality, timeliness and efficiency of the activities they perform, and to increase the accuracy of measurement of cost and profitability of their individual services and customers.

The actual construction of ABC systems for service companies is virtually identical as for manufacturing firms. The starting point is analysis of the activities of a service company. There is no essential difference between the activity-based analysis of operating expenses in manufacturing departments and doing the same tasks for the operating units of service organisations. The analysis starts by examining the expense structure of each operating department and proceeds by determining the factors that create the demands for the function performed by the department.

In service companies, e.g. in banks, many of the expenses are driven by products (services) – savings accounts, commercial loans, home mortgages, etc, but many expenses for service functions are caused by demands by individual customers rather than by service demands. ABC systems in service entities have to take into account, first of all, the customer behaviour, which is a feature distinguishing these systems from Activity-Based Costing as used in manufacturing enterprises (Cooper and Kaplan, 1991, p. 467). Thus, the main aim of ABC w in the services sector is provision of data for reports on the profitability of individual services as well as customers.

Service companies typically offer a highly diverse set of services. Each service, with its characteristics, makes different demands on the organisation's resources. Service enterprises must continually assess the economics of their service line variety, making decisions on pricing, quality, responsiveness and introduction and discontinuance of individual services. The cost and profitability of individual services, established on the basis of data from ABC system, are very important to such decisions. Beyond service–related decisions, service companies must focus on customer economics far more than manufacturing companies. In manufacturing firms only the cost of marketing, selling, order handling, delivery and service of the products might be customer-specific. For service companies, in contrast, even the basic operating costs of standard service are determined by customer behavior (Kaplan and Cooper, 1998, pp. 234-235).

Correct assignment of costs to customers using ABC allows identification of the differential profitability of individual customers or groups of customers. Analysis of customer profitability in a service company should encompass all types of services provided rather than be limited to assessment of profitability of individual services. A well designed ABC system for a service company will also provide managers with the fine detail required for intelligent management of customers, individually and over time. Such a system should also provide information for measurement of costs and profitability at the customers segment level (groups of customers) and/or at market level.

An example of a profitability analysis format for customers, groups of customers and market segments to be used in service entities, prepared on the basis of data from ABC (Figure 1).

ABC systems used in large manufacturing or service enterprises for current grouping of costs and analysis of profitability of products (services) and customers tend to be very complex, costly and difficult to adjust to the quickly changing business environment. For instance, an ABC system used some years ago at a large financial services firm required seven hundred employees at more than 100 facilities to submit monthly surveys of their time. The company employed 14 full-time people just to collect and process the data and prepare management reports which took more than thirty days to prepare (Kaplan and Anderson, 2007, p. 3).

Reasons for developing a new approach to ABC

Empirical research findings point to substantial differences in the degree of success in implementing Activity-Based Costing or methods of Activity-Based Management. As regards ABC adoption in different countries, surveys have found that this model has been implemented in:

1) 10-20 percent of companies in the USA, UK and other Western European countries,
2) about 7 percent of companies in Japan,
3) very few companies in Poland[2].

Researchers also report many cases of companies giving up ABC systems some time after the implementation (e.g. Cooper et al., 1992; Argyris and Kaplan, 1994; Shields, 1995; Friedman and Lyne, 1998;

[2]A survey by Szychta (2007, chapter 3 and 2009) has found that of the 90 companies surveyed every tenth uses a system of this type. However, direct interviews and empirical research by other authors (e.g. Sobanska, 2002; Januszewski, 2004; Wnuk-Pel, 2006, 2009) indicate that some of these companies have implemented only some elements of this system.

Market area	Poland					European Union countries				Other countries					Total
Consumer groups	K		L			M		N		O			P		
Consumers	K_1	K_2	L_1	L_2	L_3	M_1	M_2	N_1	N_2	O_1	O_2	O_3	P_1	P_2	
1.Sales of services	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XXXX
(-) 2. Cost of sales	X	X	X	X	X	X	X	X	X	X	X	X	X	X	XX
(-) 3. Costs of service for individual customers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4. Profit margin by customers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5. ROS by customers (row 4/row 1 × 100%)	R%	R%	R%	R%	R%	R%	R%	R%	R%	R%	R%	R%	R%	R%	R%
6. Sum of customer margins	X		X			X		X		X			X		X
(-) 7. Costs of service for customer groups	X		X			X		X		X			X		X
8. Profit margin by customers	X		X			X		X		X			X		X
9. ROS by groups of customers (row 8/Σrow 1 × 100%)	R%		R%			R%		R%		R%			R%		R%
10. Sum of customer group margins	X					X				X					X
(-) 11. Selling expenses by market area	X					X				X					X
12. Profit margin by market area	X					X				X					X
13. ROS by market area (row 12/Σrow 1 × 100%)	R%					R%				R%					R%
14. Sum of market margins	X														X
(-) 15. Overhead costs (common administrative, management and selling costs)	X														X
16. Total profit	X														X
17. ROS for company (row 16/Σrow 1 × 100%)	R%														R%

Figure 1. Examplary format of customer and market profitability analysis in service entities (Source: Based on Szychta (2001, p. 868))

Bhimani and Gosselin, 2002).

Main causes of dissatisfaction with ABC, as reported by employees of companies that had adopted or were implementing cost systems based on the classic ABC model, included long time taken by ABC design and implementation, its complexity and problems involved in its modification. Some employees questioned the accuracy of product and activity cost calculations based on subjective estimations of time needed for the various operations and activities. As a result, operations, sales and marketing managers spent time disputing the correctness of calculations instead of making decisions improving effectiveness of processes, profitability of products and customers, and capacity utilisation.

Operation of an ABC system in large entities (particularly in service companies with diverse activities in many divisions or units), especially those where the structure of this costing system is very complex and unfavourable behavioral and organizational conditions exist, may involve high costs and related dissatisfaction of management, which might even result in abandoning of the system.[3]

Dissatisfaction of many companies with their ABC systems and abandoning them by some of the ABC adopters were the main reason for developing by Kaplan and Anderson (2004, 2007) a new formula of Activity-Based Costing called Time-Driven Activity-Based Costing (TDABC). It was designed to eliminate the problems in ABC systems implementation and operation in large entities.

The authors of the new approach identified the following problems with conventional ABC model (Kaplan and Anderson, 2007, p. 7):

1) the interviewing and surveying process was time-

[3]Empirical research in the form of surveys and case studies (e.g. Cooper et al., 1992; Arygris and Kaplan, 1994; Shields, 1995; Friedman and Lyne, 1998) shows that companies which have not gained expected benefits from ABC adoption or have given it up treated this cost system as a technical innovation, attaching undue importance to system design and related software. Shields (1995, p. 149) points out that achievement of ABC system 'elegance' in terms of its architecture and computer software is not enough to ensure its successful implementation and long-term operation. Organizational and behavioural factors have been found to be of crucial importance for successful ABC application and for Activity-Based Management.

consuming and costly,
2) the data for the ABC models were subjective and difficult to validate,
3) the data were expensive to store, process and report,
4) most ABC models were local and did not provide an integrated view of enterprise-wide profitability opportunities,
5) the ABC model could not be easily updated to accommodate changing circumstances,
6) the model was theoretically incorrect when it ignored potential for unused capacity.

The nature of Time-Driven Activity-Based Costing

The new version of Activity-Cased Costing – Time-Driven ABC – is intended to eliminate problems in implementing and using these systems in large companies through changing the method of collecting data on activity times and modification of activity cost calculation procedure. Time-Driven ABC takes an aggregated view of resource, i.e. views it as consisting of various types of resources (e.g. materials, labour, outside services). For instance, the different resources used in the customer service department for performing such activities as invoicing, processing customer complaints and performing credit checks are treated as one resource – labour of this department's employees.

Time-Driven ABC uses time as its primary cost driver. Time is used for allocating resource costs directly to objects, e.g. transactions, orders, finished products, services and customers, which makes it possible to omit a complex step involved in conventional ABC, namely assigning resource costs to activities before allocating them to cost objects.

The authors of the new approach to ABC regard time as primary cost driver since most resources, such as personnel and equipment, have capacities that can be readily measured by the amount of time they are available to perform work. Capacities of some resources can also be established using other measures, such as storage capacity of warehouses, cars and freight wagons in cubic metres and data storage capacity in gigabytes (Kaplan and Anderson, 2007, p. 23).

In the classic ABC model cost driver rates for the different types of activities are calculated to be used for assigning indirect costs to specified cost objects (products, goods or customers), relative to their demands on the activities. To calculate cost driver rates for activities in which human labour is the main resource, direct labour time spent to perform individual activities is used as a measure of activity amount and a basis for calculating their costs. The time needed to perform the activities is established on the basis of employee surveys. Their time estimations are usually overstated due to their not excluding downtime and time spent unproductively during work hours. If actual capacity utilisation is significantly lower than available capacity, then activity cost driver rates are calculated too high[4].

Time-Driven ABC allows cost driver rates to be based on the practical capacity of the resources supplied to perform the activity, while at the same time being a simpler and more accurate model than the traditional ABC approach. Under TDABC (Figure 2) managers estimate the demand for the entity's resources (expressed in units of time) required for each activity, transaction, product or customer instead of first tracking costs to activities. Only two parameters need to be estimated for each resource type (Kaplan and Anderson, 2004, p. 133):

1) the cost per time unit of supplying resource capacity, i.e. capacity cost rate,
2) unit times of consumption of resource capacity by the activities by products, services, and customers.

To calculate capacity cost driver rates managers of the units where particular activities are performed estimate the practical capacity of committed resources using the simplified method or the analytical method, which is more accurate.

Under the simplified method the manager estimates the practical capacity of the resources supplied (at aggregated level) as percentage of their theoretical capacity. They assume, for example, that practical capacity is 85 percent of theoretical capacity. If a machine is available for use 40 hours a week (theoretical capacity), then its practical capacity is 34 hours a week. Practical capacity of a resource can also be estimated by reviewing capacity utilisation in corresponding periods in the past and choosing the period in which the greatest number of orders was processed without excessive delays, poor quality or overtime.

In establishing the practical capacity of labour or operational equipment using the analytical method the procedure is to subtract from the time available in a given period (theoretical capacity) the time of anticipated breaks, training, equipment maintenance and repairs, machine set-ups and stoppages. The theoretical capacity can also be diminished by the reserve time, i.e. emergency or seasonal capacity, allowing for short-term fluctuations in demand or other constraints without stopping the production (Kaplan and Cooper, 1998, p. 165; Kaplan and Anderson, 2007, pp. 53-54).

Kaplan and Anderson (2004) argue that whatever the method of measuring the practical capacity of a resources, a rough estimate is quite sufficient, there is no need for precise estimation. An error within several percent of the actual number will not have a significant impact on the final result of unit cost calculation.

The capacity cost rate, i.e. unit cost (e.g. per minute) of supplying capacity is calculated by dividing total costs (KO) of capacity supplied to perform activities in a given entity (process) by practical capacity of resources supplied (H), so $s = KO/H$

What managers need to do now is how to estimate the amount of time required to perform each activity (h_i) in a given entity. The time estimates can be obtained by direct observation or by interviews. Thus obtained data is more reliable and verifiable than information about the

[4] For example, at 80 percent capacity utilisation the rates are 25 percent too high, at 67 – 50 percent too high (which is established by calculating the inverse of capacity utilisation percentage, i.e. 1:0.8=1.25; 1:0.67=1.5) (Kaplan and Anderson, 2004, p. 132).

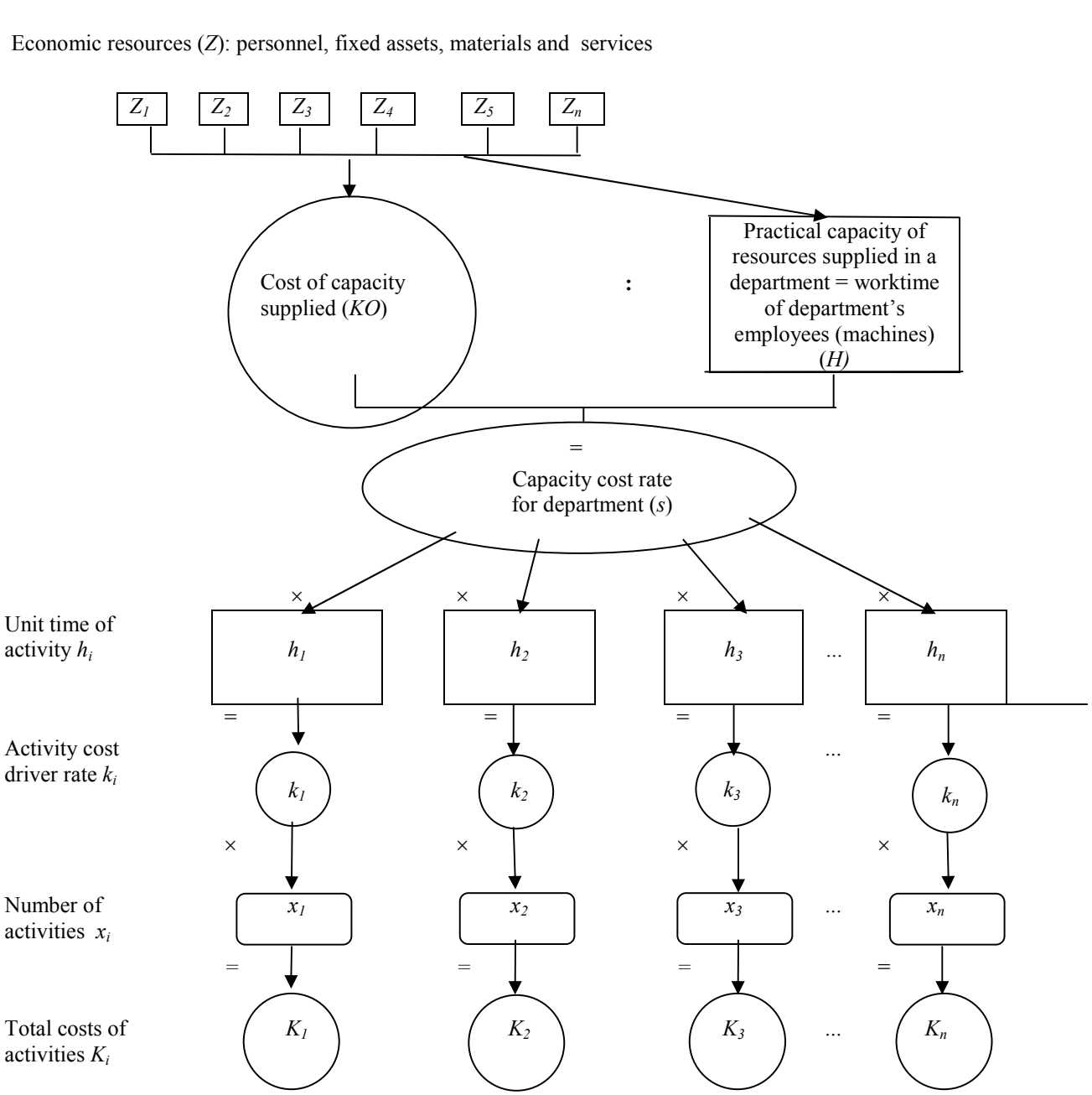

Figure 2. Activity cost calculation under TDABC (Source: Szychta (2008, p. 296))

time necessary for performing specific activities supplied by employees in survey questionnaires.

The next step is to calculate the activity cost driver rate by multiplying the activity unit time (e.g. making out an invoice) by the unit cost of capacity, i.e. $k_i = s \times h_i$. These rates are used for calculating the costs of activities performed for products (services) in given period.

Thus calculated figures are included in periodic (e.g. monthly) management reports on costs and utilisation of practical capacity in the entity, which provides a basis for calculating the cost of unused capacity and making decisions about ways of reducing these costs in the following periods.

An important issue in TDABC is correct assignment of costs of unused capacity, as these costs should not be arbitrarily allocated to products, orders or customers. It is essential to carry out a thorough analysis of this matter and to take proper decisions. If, for example, capacity has been supplied to meet the demand from a particular customer, group of customers or market, then the cost of unused capacity arising from actual demand lower than planned should be assigned to the person or entity division responsible for the given customer, group of customers or market. In the situation where unused capacity of resources supplied is related to a particular type (line) of product, the costs of unused potential should be assigned to the person responsible for the product line which did not achieve sufficient demand. In such a case costs of unused capacity cannot regarded as overhead allocated among all product lines or be allocated to particular product types. (Kaplan and Anderson, 2007, pp. 59-60).

It follows, then, that with TDABC costs of unused capacity should be assigned to the unit or level which

made the decision affecting the supply of resource capacity and declared the demand for these resources. In the profit and loss account prepared under TDABC costs of unused resource capacity can be classified as period costs or costs relating to particular customers (market segments) or product types.

In designing a TDABC system for an enterprise it is important to consider if calculation of capacity utilisation rates should be done for organisational units or responsibility centres of the enterprise, or for processes performed in these units or centres. Determination of rates for units (responsibility centres) is justified where the structure of resources supplied to each of the activities within a unit (centre) is similar. If, however, the resource structure varies for particular activities or transactions, the rates should be should be determined for processes. If, for instance, some of the machines in a production department are used for product *A,* and the remaining are used for products *B* and *C*, capacity rates should be calculated separately for the process of manufacturing *A* and separately for the other product types.

Identification of processes in an entity (centre) is also advisable if they will be measured using different measures. For instance, in the storage department (warehouse) where two processes have been identified: 'storage of boxes' and 'handling of boxes', different measures should be used for measuring the capacity of resources supplied to perform these processes. The capacity of the first process should be measured in cubic metres, while for the second process the warehouse personnel's time available for handling of boxes is the right measure. Such a solution makes possible a more accurate assignment of storage costs to finished products or commodities.

Calculation of service activity cost under TDABC

Because of application in TDABC of labour time for measuring the capacity of resources committed and for constructing time equations (discussed later in the text) this costing formula is particularly useful in service companies and in service and supporting functions in manufacturing enterprises (e.g. customer service, purchasing, sales, finance, storage, transport, information systems). It is so because capacities of such departments (processes) depend on the number of employees and their efficiency.

The usefulness of TDABC in services is confirmed by cases of successful implementation of this costing model in companies engaged in insurance, financial intermediation, distribution and computer systems, and in education (Jackson State University), as described in a book Kaplan and Anderson (2007, Part two).

Main differences between the costing of activities under ABC and TDABC will be illustrated by an example of a customer service department in company 'Alfa'. Three activities are performed in this department: process customer orders, handle customer inquiries and perform credit checks. Their volumes are measured using transactional cost drivers (Table 1, column 4).Total costs incurred in this quarter were 150,000 $. Table 1 presents determination of cost-driver rates for the activities in this department under classic ABC. With this cost system percent of time used for performing the activities in an entity during a period (Table 1, column 2) is established on the basis of employee surveys. The information supplied by customer service department's personnel indicates that 60 percent of their time during a quarter was spent on processing customer orders, 10 percent on handling customer inquiries and 30 percent on performing credit checks. Total costs of this department (150,000 $) were allocated, in due proportions, among the three activities, e.g. 60 percent × 150,000 = 90,000 for process customer orders.

With conventional ABC cost-driver rate for an activity (Table 1, column 5) is calculated by dividing activity cost by activity quantity. Next, the cost driver rate is used for assigning indirect costs (in this case customer service department) to products or/and customers in proportion to the degree of absorption of particular activity by product (service) or/and customer.

To apply TDABC in a customer service department, it is necessary to establish the practical capacity of the resources supplied. Under the simplified method, practical capacity per quarter was assumed to constitute 80 percent of theoretical capacity. The department has 10 employees. Their theoretical capacity is 8 hours per day for 22 days in a month, i.e. each worker supplies about 31,680 minutes per quarter. The practical capacity at about 80 percent of theoretical capacity is therefore about 25,000 minutes per quarter per employee and 250,000 minutes in total.

Table 1

Calculation of cost-driver rates according to conventional Activity-Based Costing

Activity	Per cent of time spent	Assigned cost ($)	Activity quantity	Cost-driver rate
(1)	(2)	(3)	(4)	(5) = (3): (4)
1) Process customer orders	60%	90,000	10,500 orders	8.57 $ per order
2) Handle customer inquiries	10%	15,000	450 inquiries	33.33 $ per inquiry
3) Perform credit checks	30%	45,000	900 credit checks	50.00 $ per credit check
4. Total	**100%**	**150,000**	X	X

Source: Elaboration based on the example by Kaplan and Anderson (2004, p. 132).

Table 2

Calculation of activity cost according to Time-Driven ABC

Activity	Activity quantity	Unit time (minutes)	Total minutes	Cost-driver rate	Total costs assigned ($)
(1)	(2)	(3)	(4)=(2)×(3)	(5)	(6)=(2)×(5)
1. Process customer orders	10,500	15	157,500	9.0 $	94,500
2. Handle customer inquiries	450	50	2,500	30.0 $	13,500
3. Perform credit checks	900	70	63,000	42.0 $	37,800
Total used			**243,000**		**145,800**
Total supplied			250,000		150,000
Unused capacity			7,000		4,200

Source: Elaboration based on the example by Kaplan and Anderson (2004, p. 135).

Knowing that the cost of supplying capacity is 150,000 $, the capacity cost rate is calculated as follows: 150,000 $: 250,000 min. = 0.60 $/min.

Next the manager of the customer service department determines the time it takes to carry out one unit of each kind of the department's activity:

- process customer order – 15 min.,
- handle customer inquiry – 50 min.,
- perform credit check – 70 min.

The cost driver rates can now be calculated by multiplying the two input variables: capacity cost rate and unit time of given kind of activity (Table 2, column 5). Cost-driver rates are:

- process customer order: 15 min. × 0. 60 $/min. = 9.0 $;
- handle customer inquiry: 50 min. × 0.60 $/min. = 30.0 $;

perform credit check: 70 min. × 0.60 $/min. = 42.0 $.

In conventional Activity-Based Costing total costs of the customer service department during a quarter were allocated among the three kinds of activities relative to the amount of time spent in a quarter on performance of these activities (60 percent, 10 percent and 30 percent). But while that distribution of cost did reflect how workers spent their productive time, the fact that their total productive time was less than their practical capacity was ignored.

Application of Time-Driven ABC, and particularly the calculation of resource cost per time unit forces the company 'Alfa' to incorporate estimates of the practical capacities of its resources, allowing the ABC drivers to provide more accurate signals about the cost and underlying efficiency of its processes. The results of activity cost calculations under TDABC reveal that the company supplied in this period 250,000 minutes of practical capacity of this department's resource, of which 2.8 percent (7,000 min) worth 4,200 $ were not used. The costs of unused capacity cannot be assigned to finished products or services; they are period costs.

Preparation and periodic presentation to management of reports on costs incurred in an entity and unused practical capacity provides a basis for assessment of costs of unused resources and deciding if and how to lower these costs in future periods. Such information may prevent managers from increasing the capacity to be supplied to a division or department.

In order to calculate capacity cost rates for the customer service department actual costs of this department were used, downloaded from the general-ledger system of company 'Alfa' (150,000$ in quarter). But in TDABC capacity cost rates can be calculated on the basis of budgeted expenses of departments or processes. This solution allows to reduce the distortions caused by variations in actual department (process) costs in successive periods. Where budgeted expenses are used in calculating capacity cost rates, actual period expenses of the department (process) will differ from those driven down to products and customers during that period. In this case, the discrepancy can be handled by a traditional spending analysis variance that reconciles the actual and the budgeted departmental expenses. The variance is assigned at the departmental or process level, were it can be managed and controlled. It cannot be driven down to transactions, products, and customers handled during the period (Kaplan and Anderson, 2007, p. 63). Time-Driven ABC can therefore be based on actual or budgeted costs.

The importance of time equations in TDABC

In calculating activity cost and cost driver rates under TDABC (in the example above) a simplifying assumption was adopted that all instances of an activity in the customer department take the same amount of time. With TDABC no such simplification is required as it would not be quite appropriate in practice where transactions of a given type can take varying amounts of time. To allow for such cases in the costing the authors of Time-Driven ABC propose application of time equations (Kaplan and Anderson, 2007, Chapter 2).

In practice the time taken to perform a particular activity may vary considerably. For example, finished goods can be shipped in standard packages or special packages, production orders can be routine or express, and customer orders can be typical or non-standard. In such a situation simple assessment of the unit time of an activity in not adequate as each variant of this activity

makes different demands on resource capacities.

Under the ABC formula variants of an activity are treated as separate activities, which results in great complexity of ABC systems used in medium-sized and large enterprises. The amount of data processed and stored grows exponentially as the number of activity variants increases (Kaplan and Anderson, 2007, p. 27-28).

With conventional ABC a list of all activities in an enterprise has to be prepared in the form of a so called dictionary of activities. With TDABC there is no need for such a dictionary, but it is necessary to assess the demand for resource capacity for each variant of a given activity. Time equations are used for this purpose, i.e. for each kind of activity an additive linear equation should be written which includes time needed to perform the standard variant of an activity and time increment resulting from each variant of this activity.

Time equation for a given activity is function of n potential factors differentiating this activity, which is expressed in the following way (compare Kaplan and Anderson, 2007, p. 31):

$$T = \beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n$$

where:

T – the time needed to perform an activity,

β_0 – standard time for performing the basic activity, e.g. 15 minutes,

β_i – the estimated time for the incremental activity i, (i =1,…,n), e.g. β_1 = 3 minutes,

X_i – the quantity of incremental activity i, (i =1,…,n), e.g. number of line items.

To construct a time equation for a process it is necessary to define the basic activity, all its major variants and all factors conditioning these variants, to estimate standard time for performing the basic activity and each of its variants by adding time needed to perform additional activities. Owing to application in TDABC of time equations the complexity of a given entity is reflected more accurately and is tackled in a simpler way than with the classic ABC formula.

The strengths and weaknesses of Time-Driven Activity-Based Costing

Kaplan and Anderson (2004, p. 134) argue that managers can easily update their time-driven ABC models in the case of changes in the operating conditions, e.g. increase in the number of activities. It is also easy to update the activity cost driver rates. Changes in cost driver rates are caused by two factors: changes in the prices (wage rates) of resources supplied, which affects the unit cost of the practical resource capacity, and a change in the efficiency of the activity as a result of continuous improvement, reengineering processes, implementation of a new production technology or a better procedure for performing the activity.

The authors of Time-Driven ABC recommend this approach as methodologically clear and easy to implement and update – a simple, elegant and more accurate formula of Activity-Based Costing. It is a way of providing managers, quickly and cost-efficiently, with information on costs of activities and product profitability (Kaplan and Anderson, 2004, 2007).

Analysis of the Time-Driven ABC model reveals that it has the following advantages:

1) eliminates difficulties involved in implementation and maintenance of the traditional ABC model, especially in large entities, e.g. it no longer necessary to conduct regular surveys to determine the distribution of work time of personnel between several activities in a department (process);
2) estimates the practical capacity of committed resources and their costs, which are not assigned to activities and consequently, to products and customers but constitute a separate item affecting the financial result for the period;
3) includes non-standard activities in cost calculation (in the phase of calculating unit times of practical capacity consumption) by using time equations;
4) is easy to update to reflect changes in operating conditions thanks time equations.

What can be regarded as a weakness of this approach is that calculations are largely based on estimates made by managers. The results of activity cost calculations may be in significant error if the estimates are too arbitrary, which generates inaccurate information about product costs and profitability.

The new formula of Activity-Based Costing is not regarded by all as a completely innovative solution. For instance, de La Villarmois and Levant (2007) argue that ways of simplifying cost calculations in the case of complex production with many types of products have previously been proposed in literature. Moreover, they claim that implementation of TD ABC results in incorrect assessment of activity costs, and the use of labour hours as a measure of capacity causes problems because it is not a very adequate measure, as Kaplan himself stated when criticizing traditional cost calculation methods. This objection does not seem justified as Kaplan and Anderson do not advocate rigorous use of times of operating personnel. Instead, they recommend the use of a capacity measure that is best suited to the type of activity performed in a given entity or process.

Others point out that conventional Activity-Based Costing allows time to be used as a measure of activity volume. Kaplan and Anderson (2007, p. 17) explain that in ABC systems the time-based measures of activity volumes are employed differently than in TD ABC. They are used in the second stage of the costing procedure, i.e. after assigning indirect costs to activities, to calculate cost driver rates, which are then used for allocating activity costs to cost objects. Time-based measures ensure greater accuracy of cost calculations, but they are more costly to obtain than quantitative measures. In Time-Driven ABC time is used for measuring the capacity of divisions or processes and direct allocation of resource costs to products, which allows elimination of the stage of assigning the costs of resources supplied to activities – activity costs are the result of their calculation. This is possible due to application of standard time rates for individual activities, which are increasingly determined and recorded in modern enterprises in operational information systems.

There have also been critical voices (e.g. Gervais, 2009), raising objections that:

- the problem of the cost of 'idle capacity' emphasized in TDABC concept is not recent discovery; this issue has been discussed in literature since the early 20th century, and today idle capacity costs are excluded from product costs as established for financial reporting purposes, in accordance with International Financial Reporting Standards and financial accounting law in many countries;
- there are problems with measuring time, especially for service activities in the time-based model, because service activity times are irregular and unstable; the problem of measurement is amplified when the time declared is taken into account; it may cause distortion of cost calculations under TDABC.

To successfully implement Time-Driven ABC and effectively use information from this system it is necessary to integrate it with systems providing operating data (e.g. about activity types and volumes in a period or unit times for individual activities) such as ERP and CRM, or to obtain structured and standardized data from an enterprise database called data warehouse (for more see e.g. Coners and von der Hardt, 2004, pp. 114-116). Therefore, application of TDABC in entities which do not have integrated information systems and data warehouses could be problematic and not sufficiently effective.

Conclusions

ABC systems employed in service entities supply information on costs of activities and services provided and are used for determining the profitability of customers, groups of customers and markets. Such information should provide a basis for managing customer profitability and for improving customer relations. However, the application of the conventional ABC model, especially in large manufacturing and service companies, often proved to be time-consuming and costly, which sometimes caused it to be abandoned. The aim of the new version of ABC, Time-Driven ABC, is to eliminate the problems involved in large-scale ABC implementations because of a changed way of obtaining data on the time required to perform the activities and a modification of activity cost calculation. This type of ABC can facilitate and speed up calculation of activity, service and customer costs in service industries and other types of enterprises.

Time-Driven ABC uses time as primary cost driver. Time is used for allocating resource costs directly to objects, e.g. transactions, orders, finished products, services and customers, which makes it possible to omit a complex step involved in conventional ABC, namely assigning resource costs to activities before allocating them to cost objects. It is the use of time as the chief measure of operating capacity of processes and duration of activities in an enterprise that makes TDABC suitable for application in service entities. This is because service activities are primarily measured on the basis of labour time used for performing a given activity. An important feature of TDABC are time equations, which provide the possibility to allow for variations in demand for resource capacity for each variant of a given activity time, i.e. for each kind of activity an additive linear equation should be written which includes time needed to perform the standard variant of an activity and time increment resulting from each variant of this activity. Owing to application in TDABC of time equations the complexity of a given entity is reflected more accurately and is tackled in a simpler way than with the classic ABC formula.

Kaplan and Anderson (2007, p. X) have reported more than 200 cases of successful TDABC implementation in companies in consultation with the authors of the new ABC formula. The new version of ABC, however, has been received by management accounting academics with a degree of caution. To be able to make a more thorough evaluation of its usefulness in practice, it is necessary to test it in a greater number of companies. It will allow a verification of Kaplan's (2006, p. 128) statement that Activity-Based Costing, although being a costly management accounting method, has a value-creation potential much exceeding the costs of its implementation and maintenance owing to generation of useful information guiding decisions made in large organisations by thousands of employees, in many divisions, and relating to huge numbers of products, processes, customers and transactions.

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A. Szychta

Laiku ir veikomis grįsta apskaita paslaugų sferos kontekste

Santrauka

Veikomis grįsta išlaidų paskirstymo koncepcija (angl. Activity-Based Costing, ABC) apskaitos teoretikų bei praktikų buvo pagrįsta ir vystoma nuo XX amžiaus antrosios pusės, t.y. nuo pirmųjų publikacijų, kuriose Amerikos profesoriai Cooper ir Kaplan išdėstė ABC apskaičiavimo esmę bei struktūrą (Cooper, 1988a, 1988b; Cooper, Kaplan, 1988, 1991, 1992). Remiantis šia koncepcija galima gauti naudingos informacijos apie tai, kaip tobulinti strateginę ir trumpalaikę įmonės vadybą. Veikomis grįstas išlaidų paskirstymas, atspindintis procesinį įmonės veiklos suvokimą, leidžia tiksliau įvertinti produktų ir kitų objektų (procesų, klientų) išlaidas lyginant su tradiciniu išlaidų paskirstymu, bet tuo pačiu jis veikia kaip planuojamų ir faktiškų išlaidų nustatymo sistema, kuri suteikia galimybę efektyviai valdyti išteklius, veiklas bei procesus. Tai yra išlaidų paskirstymo sistema, kuri gali būti efektyviai naudojama kartu su kitais valdymo apskaitos metodais.

Veikomis grįsto išlaidų paskirstymo metodas pirmiausiai buvo pradėtas naudoti gamybinėse JAV įmonėse, bet labai greitai paaiškėjo, kad jis yra itin naudingas paslaugas teikiančioms organizacijoms. ABC sistemos paslaugų organizacijose teikia informaciją apie procesų ir teikiamų paslaugų išlaidas, o tai sudaro pagrindą paslaugų rentabilumui įvertinti. Taip pat galima vertinti klientus, jų grupes bei paslaugų pardavimų naudingumą atskirose rinkose. Deja, stambiose įmonėse tokios sistemos tampa labai sudėtingos, o jų naudojimas reikalauja daug laiko ir yra labai brangus. Dėl to įdiegtos ABC sistemos daugelyje įmonių tapo nepasitenkinimo priežastimi, o dalis įmonių, kuriose buvo įdiegta ši sistema, atsisakė naudotis šiuo naujovišku išlaidų paskirstymu. Šie faktai sukelė praktikų kritiką dėl ABC koncepcijos.

Atsakydami į klasikinės ABC koncepcijos kritiką, Kaplan ir Anderson (2004, 2007) pagrindė naują koncepciją, kuri pavadinta laiku ir veikomis grįsta apskaita (angl. Time-Driven Activity-Based Costing, TDABC). Naujo ABC varianto tikslas yra išlaidų skaičiavimo ir vertinimo sudėtingumo sumažinimas. TDABC gali išspręsti problemas, kurios lydi įprastų ABC sistemų įdiegimą ir naudojimą stambiose ir labai stambiose gamybos įmonėse, taip pat paslaugų sferoje.

Kaplan ir Anderson (2007) teigia, kad iki 2006-ųjų metų naujoji koncepcija buvo įdiegta daugiau nei 200 JAV įmonių. Įdiegimą rengė konsultacinė įmonė „Acorn", kurios prezidentu yra Anderson, o prof. Kaplan įeina į šios įmonės valdybą. Naujoji koncepcija dar netapo plačių tyrimų objektu akademinėje aplinkoje, taipogi ji nėra visuotinai žinoma ir valdymo apskaitos praktikoje. Iki šiol konferencijų straipsniuose ir pranešimuose buvo analizuota, ar tai naujas išlaidų paskirstymo metodas, ar tai yra naujos teorijos sena versija (Dlubak, 2005; Gervais, 2009). Todėl mokslininkai analizavo naujos koncepcijos ypatumus, trūkumus (pvz., Przytula, 2005; Szychta, 2008; Bruggeman, Everaert, 2007). Taipogi buvo tiriamos koncepcijos panaudojimo prielaidos ir perspektyvos (Coners, von der Hardt, 2004) bei nagrinėjamas laiko lygybės vaidmuo ir veiksniai, lemiantys išlaidų paskirstymo klaidas šio skirstymo metu (Cardinaels, Labro, 2008). Tik negausūs tyrimai analizuoja TDABC naudojimą skirtingose įmonėse ir ekonomikos šakose (pvz., McDonach, Mattimore, 2008; Gervais, 2009).

Mokslo žinių, susijusių su naujos koncepcijos kaip inovacijos panaudojimu, ribotumas sąlygoja šio straipsnio mokslinį problemiškumą.

Straipsnyje ieškoma atsakymų į šiuos probleminius klausimus:

1) kokios yra pagrindinės laiku ir veikomis grįstos apskaitos panaudojimo prielaidos ir tikslas paslaugų įstaigose?
2) kokia yra išlaidų paskirstymo supaprastinimo esmė, jeigu taikome TDABC?
3) kaip reikia konstruoti laiko lygybes ir kokį vaidmenį jos vaidina įvairių išlaidų variantų skaičiavimuose, ypač paslaugų sektoriaus organizacijose.

Šio straipsnio *tikslas* – atskleisti naujos koncepcijos esmę bei principus santykyje su įprastu veiklos išlaidų paskirstymu bei nurodyti, kokie koncepcijų požymiai ir aspektai nulemia jų naudingumą paslaugų organizacijose bei gamybinių įmonių paslaugų skyriuose (aptarnavimo skyriuose).

Straipsnis parengtas remiantis mokslinės literatūros analizės metodu. Autorė analizavo svarbiausių ABC ir TDABC koncepcijų

propaguotojų (Cooper, Kaplan, Anderson) pagrindines publikacijas, taip pat svarbius tyrimus, kurie apėmė tokias temas, kaip ABC ir TDABC sistemų tikslai, struktūros bei jų panaudojimas, specifika paslaugų srityje. Ši analizė leido pagrįsti išlaidų paskirstymo sistemų įdiegimo paslaugų įmonėse tikslus ir poreikius, be to, autorė pateikė savo požiūrį apie veiklos išlaidų paskirstymo klasikinę bei naują versiją.

Straipsnis susideda iš šešių dalių. Pirmoje dalyje autorė aiškina, kam ir kada naudojamas įprastas ABC paskirstymas paslaugų organizacijose ir pateikia instrumentą, kuris reikalingas rentabilumo, klientų, grupių klientų ir prekių realizacijos rinkų analizei. Antrojoje straipsnio dalyje autorė nurodė priežastis, kurios sąlygojo tai, kad Kaplan ir Anderson (2004, 2007) parengė naują TDABC koncepciją. Trečiojoje dalyje yra pateiktas TDABC principų paaiškinimas bei pavyzdys, kaip nustatyti išlaidas pagal TDABC principus. Kitoje dalyje kalbama apie paslaugų išlaidų skaičiavimus, remiantis klasikinio ABC ir TDABC koncepcijų principais. Penktoji dalis skirta apibrėžti sintetinį tikslą bei laiko lygybės konstrukcijos principus. Paskutinėje dalyje autorė išvardino svarbiausius naujo ABC varianto pranašumus bei trūkumus, atsižvelgiant į TDABC koncepcijos kūrėjų bei kai kurių autorių, analizuojančių šią koncepciją, požiūrius.

Informacija, kurią teikia ABC ir TDABC paslaugų organizacijose, sudaro prielaidas valdyti klientų rentabilumą bei vystyti teigiamus santykius su klientais. Svarbu, kad išlaidų skaičiavimo sistema įmonėje pateiktų svarbią informaciją, naudingą įmonės vadybai, o kartu nebūtų sudėtinga, brangi bei sunkiai pritaikoma prie besikeičiančių įmonės veiklos sąlygų.

Kaip teigia Kaplan ir Anderson (2007), TDABC naudojimas turi užtikrinti, kad būtų pašalinti sunkumai, lydintys įprastų ABC sistemų įdiegimą ir naudojimą stambiose ir labai stambiose įmonėse. Tai gali įvykti pakeitus duomenų surinkimo bei išlaidų skaičiavimo procedūras. Autoriai tikina, kad TDABC - tai metodologiškai paprastas išlaidų paskirstymo metodas, jį yra lengva naudoti ir aktualizuoti, be to, metodas leidžia pateikti informaciją vadovams apie išlaidas ir produktų rentabilumą greitai ir efektyviai. Siekiant išsamiau įvertinti metodo naudingumą ir panaudojimo sąlygas, būtina jį įdiegti daugelyje įmonių, tarp jų Lenkijos ir Lietuvos įmonėse.

Raktiniai žodžiai: laiku ir veikomis grįsta apskaita, paslaugų sektorius, laiko lygybė.

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