

GUIDELINES FOR OPTIMAL PURCHASING OF CONSTRUCTION WITH THE USE OF BUDGETING BASED ON TDABC ACCOUNT

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Abstract— The article elaborates about the optimal purchasing process with the use of budgeting based on Time-Driven Activity-Based Costing (TDABC). It has been defined the basic assumptions of the TDABC model. Collected by vehicle examination, has been identified indications are conditioning the use of TDABC, as well as the factors and barriers that prevent the use of TDABC.

Keywords— optimal purchasing, construction services, construction purchasing budget, TDABC

I. INTRODUCTION

THE searches for appropriate instruments to optimize enables the development of the company, and that in the final result affects their position on the market. In the case of construction services, it is important to find the appropriate instruments, which will be characterized by not only universality, but also by their ease of use. In such a specific service, which is building service, an instrument of optimization must be integrally associated with these areas of activity, which are the most cost-consuming. One such area in the construction business is the sphere of purchasing and to meet such needs comes the opportunity to use modern forms of cost calculation based on time. The bill TDABC (Time-Driven Activity Based Costing) is an effective tool for the management and its use makes it possible to optimize processes in the sphere of purchasing.

II. SPECIFIC NATURE OF BUDGETING THE PURCHASING'S SPHERE IN CONSTRUCTION COMPANY

Construction services are different from production in many ways. Designing services may be either tangible or intangible. The service can be associated with artifacts and other matters, including communication, environment and behavior. Regardless of the form of service, it must be consistent and easy to use [1].

Construction services should be considered in terms of production. Integrating the concept of service with the specifics of building production. The construction sector belongs to the realm of the economy clearly defined and

conditioned by the law. Construction facility as a product of a construction service is unique and one-off. Not only because of its own characteristics but also because of the method and the conditions under which it was realized. Noting the characteristics of the construction service should be replaced [2]:

- 1) *seasonality,*
- 2) *immobility of construction output,*
- 3) *fluctuation of staff,*
- 4) *the durability of the production cycle,*
- 5) *longevity of building objects,*
- 6) *unique nature of the construction product,*
- 7) *technical conservatism, despite the development of technology and technique,*
- 8) *the sensitivity of the construction industry to economic fluctuations,*
- 9) *size and mass of building objects,*
- 10) *arrhythmicity in construction output,*
- 11) *high investment costs*
- 12) *formation of large quantities of waste.*

Referring to the features mentioned, the right approach to the budgeting's method of purchasing's sphere is a process approach. A process approach to the budgeting of the manufacturing in the form of construction investment, especially in the area of purchasing, determines the need to coordinate decisions taken at a different level. In this case, the budget reflects the decisions taken [3]. Budgeting today is regarded as one of the most important tools for controlling and making managerial decisions. It should, however, be guided by the aim of ensuring the highest degree of reality at a later stage of the implementation of the budget. This means that the forecasted costs must allow the execution of tangible tasks in a given period, and should protect the growth of the rational use of resources and eventually be able to obtain security of financial reserves.

III. ASSUMPTIONS OF TDABC

In TDABC appears a simplification to the approach to the process of cost calculation. Newer approach recommends assigning resource costs directly to the cost objects by calculating, in the first place, production capacity, and then is estimated cost objects demand for

production capacity. The demand for cost objects is mostly expressed in time. Therefore, you can talk about the activity based costing controlled by time (Time-Driven Activity Based Costing). This model simulates the kind of real processes. Definitely in a better way than the classic ABC account, shows the diversity and complexity of the processes, while maintaining optimal demand for computing power, estimates and data processing. This method of estimating demand and production capacity is also the possibility of proper business planning in a way to necessary meet the anticipated demand for services [4]. On the other hand, this bill through the use of equations of time and they're specific design serves to specify the size of the cost of unused resources. Therefore it contributes directly to the quality of decision-making in expanding the potential of the resources available to the company [5].

The essence TDABC account is time. Time as a key element in a Time-Driven Activity-Based Costing (TDABC) is the carrier of activities in the process of purchasing. The amount of time for the action is determined by the answer to the question how the action should go on. This is time-consuming. An essential element in building a delivery schedule or performance of the contract, as well as a factor in shaping the way of purchasing's budgeting in the company. Time consumption is inextricably linked to labor-intensity (they are not the equivalent; labor-intensity is part of time-consuming) is a kind of factor in the execution of the action. Labor intensity in this case is understood, as the number of hours necessary to complete the operation is the value whose level depends directly on the project, and the specifics of the company. Therefore, based on this you can calculate the direct cost of labor in a given task. Time consumption however is a period dedicated to the implementation of the action and is directly linked to the creation of schedule, budget, and directly affect the completion date. It can therefore be concluded that if the time consumption can be able to become a part of budgeting, the component must be labor intensity, and at the time of the task will be influenced by factors such as:

- 1) *labor intensity (P),*
- 2) *number of employees in the task (I),*
- 3) *ability to realizing (U),*
- 4) *the percentage of time in which the workers realizing task may spend on its implementation (P),*
- 5) *organization of work (O).*

To this, time consumption and its impact on the implementation of the action, can be represented by the formula (1) [6]:

$$T = f(R, I, U, P, O) \quad (1)$$

Time consumption, however, will not always be measured linearly, so attention is paid to the use of different techniques in the process of estimating time-

consuming and labor-intensity [7]. One of the basic requirements of TDABC is the recognition the time for the carrier of costs. In this case it uses the equations of time. An example of the time equations is represented by formula (2). Time's equation determines the cost items of account [8].

$$\text{time of sending the order (in min.)} = 480X_1 + 240X_2 + 240X_3 + 480X_4 + 120X_5 + 120X_6 \quad (2)$$

where:

480 – the estimated duration of the action

X – another action.

It is therefore necessary to adopt constant assumptions of using possibilities of TDABC in purchasing budgeting of construction services. Summary of obligatory assumptions conducting TDABC has been contained in Table I.

TABLE I
 ASSUMPTIONS OF TDABC MODEL

No.	Assumptions TDABC	Characteristics (parametric features)
1	Costs must express the expenses incurred to acquire only a real needed resources	Obtaining resources or determine the available resources should be useful. Must be used resources that are only necessary for the operation thus eliminating the purchase or reservation of resources, which despite emergence in the field of manufacturing are unnecessary. There is the possibility of a rational waste elimination.
2	Defined and identified actions lead to the use of resources at a certain time.	Realistically used resources are consumed within the stipulated time and the estimated cost of their consumption. Deviations from the assumptions are measurable, which is characterized by the utility valuation of activities time but not of resources. Time control of action does not affect the change of pace and the availability of resources in action.
3	Cost carrier of activities in the process is the time unit.	The process is the sum of activities time measured in whole. Time priced individually determines the cost incurred for action at this time.
4	A certain number of actions is measured by units of time (eg. 1 minute) for the whole process.	Delimitation of the process time stimulates a number of actions in the process but not their duration. There is a possibility to control a time of activities within the time limits of the process.
5	Costs are grouped by activities, not products, and settled on the basis of a measure of costs carriers.	The cost is the total cost of activities time, instead the total cost of products and resources. The duration means the cost of the process.

Source: own study

IV. USE OF TDABC IN PURCHASING'S BUDGETING OF CONSTRUCTION PROJECTS

The research was conducted using a method of focus, on a group of 22 Polish entrepreneurs. Its aim was to use TDABC in practice and determine its suitability for the purchasing of construction services. In practice, the

development of the concept of Time-Driven Activity-Based Costing, for the sphere of purchasing is to identify actions of purchasing. They provide the execution of service. You can also identify activities, which do not bring added value. The tasks of the activity based costing should also control the implementation of the functions of purchasing, and the elimination of activities with very high costs. Moreover, it is a concept that allows controlling the number of suppliers, delivery time, purchasing's cost of materials, as well as it is the model of identifying and providing information to improve controlling, supply management process and significantly raising the level of quality of services [9]. This results from the fact that there is a possibility to control the time and expense in time by radically effective use of resources. It is therefore important seems to be the cost budgeting of activities at supply construction sites. Proper forecasting costs included in the budget of construction, leads to changes the demand for resources that result from the process improvements [10].

The construction of the model allows you to make changes and the introduction of additional elements and actions based on the results of empirical research. It is also the basis for determining the budgeting of construction projects based on TDABC. Table II proposes a model of TDABC for construction investment (test result).

TABLE II
 MODEL OF TDABC FOR CONSTRUCTION PURCHASING

process name	the cost of activities in zł	operating time in min	number of measures*	cost / min / measure
the process of construction purchasing				
Preparation of demand	50	60	3	0,28
Determining the supplier base	150	160	3	0,31
Generate RFQ	200	70	5	0,57
gathering and elaboration of tenders	250	85	5	0,59
supplier selection	100	90	4	0,28
preparation of order	50	30	3	0,56
sending order	50	15	3	1,11
site preparation to receive delivery	200	55	4	0,91
delivery reception	60	135	6	0,07
allocation of material to work fronts	50	170	3	0,1
term and cost sharing in place of formation	40	45	5	0,18

* number of sub-activities

Source: own study based on focus research

The model is the result of the research. It was recognized that this is an appropriate form and possible to implement. This makes it possible to clarify the utility of TDABC, and thus determine the degree of its impact on the optimization of purchasing sphere in construction services.

V. REASONS FOR OPTIMIZATION OF CONSTRUCTION'S PURCHASING WITH THE USE OF BUDGET BASED ON TDABC

Thanks to research in the field of TDABC utility specifies that the optimization of purchasing sphere should in particular rely on the efficient use of time. With account based on time possible to use effective time management of the purchasing process, thereby reducing costs. The cost is converted to one minute in each activity. By using the model in practice, it indicated the main determinants of optimal purchasing and budgeting the costs with using the TDABC. The most important determinants include:

- 1) *The company should be able to accurately determine the quantity and quality of available resources to apply the TDABC.*
- 2) *The company should have the human resources capable build, maintaining and operating TDABC and conduct proper managerial inference on the basis of account.*
- 3) *The company should have the resources to accurately estimate the duration of projects.*
- 4) *The company should have an entity providing proper conduct of the purchasing process, including purchasing of material, supply planning, supplier selection, making offers.*
- 5) *The company should carry out more than one project at a time, from the point of view of economic efficiency of TDABC's use.*
- 6) *The company should have the resources to the valuation of undertaken projects, and must keep a budgeting system of projects.*

Therefore, you should formulate the following prerequisites to use TDABC to optimize the purchasing of construction services:

- 1) *Having the right, skilled human resources;*
- 2) *Having the knowledge and skills of costing activities and ability to build the account based on the identification of activities in the project.*
- 3) *There is a need to optimize the time spent on the project, especially if the company has more than two constructions.*
- 4) *The need to diversify resources.*
- 5) *The desire to increase the competitiveness and the possibility of increasing the purchasing power of company by reducing the offer price of construction services on the market.*
- 6) *The situation in which purchasing processes are managed centrally, but their organization proceeds in a diversified manner at various construction sites*

(a hybrid form of purchasing's divisions), which often makes it impossible to control the cost of purchasing of materials and purchasing organizations.

These indications, however, are dictated by external factors and barriers that may arise in the budgeting process of purchasing's sphere using the TDABC. This is important especially in view of the proper use of time and cost estimation. Factors and barriers of purchasing's budgeting with using of TDABC have shown in Table III.

TABLE III
FACTORS AND BARRIERS OF PURCHASING BUDGETING
BASED ON TDABC

No.	Factors influencing	Barriers preventing
1	Precise estimates of the duration of activity	The inability to accurately determine the duration of the project
2	Precise estimates of the activity cost	The inability to estimating costs based on actual data (no prediction)
3	Accurate planning of resource consumption	The inability to identify the necessary resources
4	Knowledge of account maintenance	Lack of qualifications in the field of activities cost accounting
5	Identification of all departmental costs	No development of cost estimates, and the lack of identification of the cost structure of the company
6	Knowledge of budgeting	The high costs of implementation and complicated procedure of conducting TDABC (mainly SMEs)
7	Proper planning of the services production process	Lack of scheduling works
8	Estimation of capacity	Lack of resources or insufficient resources
9	Maintaining the rules implemented in stages of an account	Chaos in the settlements
10	The designing account in accordance with the financial and technical structure of the project.	Lack of division designated to design the account; complicated form of the account

Source: own study based on focus research

VI. CONCLUSIONS

As a result of the conducted research and presented way of thinking must be to formulate the following conclusions:

1) *Through the use of Time-Drive Activity Based Costing controlled time comes to optimize the sphere of purchasing in construction's company.*

- 2) *Optimization occurs in terms of time and cost..*
- 3) *The cost charged per unit of time (1 min) allows you to control time.*
- 4) *The construction the account allows you to use it to calculate the cost of spatial works.*
- 5) *Due to the structural vulnerability of TDABC to run real-time changes in cost and cost items, the TDABC has flexibility in its expansion.*
- 6) *The use of equations of time is the basis of development of budgetary positions in construction investments.*
- 7) *The essence of the account is the use of real needed resources.*
- 8) *Occurs the elimination of redundant resources.*
- 9) *The cost of unused resources is not the position*
- 10) *in the budget*
- 11) *Despite the many barriers acknowledged that estimating the costs of purchasing in minutes reduces the cost of investment.*

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