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## ACTIVITY-BASED COSTING AS AN INSTRUMENT OF LOGISTICS CONTROLLING

**Summary.** The article deals with clarifying the relevance of using one of the key tools of logistic controlling (activity-based costing). An algorithm for using this tool is described in the article. The authors proposed a description of the model creation process for the pricing of warehouse services.

**Key words:** logistics controlling, warehouse logistics, activity-based costing, centres of responsibility, pricing, logistics costs.

**Formulation of the problem.** Nowadays the problem of pricing in domestic logistics companies is the lack of an appropriate methodology for determining the cost of their services. Usually, such methods (standard-cost or direct-cost) are used and this fact subsequently leads to a situation, when the amount of economic resources spent for the provision of services cannot be accurately determined. Consequently, there is no clear correlation between the necessary resources (to ensure the provision of services) and the proportional transfer of the cost of these services to their price, which in turn can generate such price level that will make provision of this service unprofitable. Based on abovementioned the need of appliance of logistics controlling instrument (activity-based costing – ABC) arises in order to solve these problems.

**Analysis of recent research and publications.** The study of the concepts of logistics and controlling was carried out both by foreign (D. Bowersox, M. Habereck, G. Fandel, V. Trosky), and domestic scientists (E. Krikavsky, N. Chukhrai, E. Koroleva, L. Malyarets and others). Disclosure of the essence of the logistics control instrumentation (ABC) taking into account the application in logistics systems can be found in the works of N. Moiseeva [1], G. Levkina [2], N. Kurshakova, E. Kopteva [3], L. Malyarets [4]. Despite the wide exposure of this problem, it does not find its application in the narrow functional areas of logistics, namely warehouse logistics.

**The purpose of the article** is to determine the mechanism for applying the activity-based costing in the process of forming the price for warehouse services, taking into account the transfer of all costs for their services.

**Presentation of the main material of the study.** Logistics controlling as a concept of information-analytic support of management of flow processes and management decisions, maintains internal balance of economic resources logistics enterprise system, by creating information on costs and revenues.

As it is shown by the study of logistic controlling by Küpper and Hoffmann, conducted among German industrial enterprises [5], in practice, logistic controlling coordinates the achievement of various logistic goals (table 1).

Table 1  
 Research of logistic controlling in Germany – purposes of logistics-oriented controlling (sample size is 143 enterprises)

Logistic goal	Of the 143 respondents	
	Number of applicants	Percentage of total
Optimization of stocks	60	42,0
Transparency of logistics costs and results	59	41,3
Minimization of logistics costs	59	41,3
Obtaining decision-oriented information	43	30,1
Support the required level of continuity of supplies	32	22,4
Reduced lead times	27	18,9
Optimization of transport	8	5,6
Optimal capacity utilization	4	2,8
Minimizing supply risks	3	2,1

The results of study of logistic controlling by Küpper and Hoffmann [5] also are definition and gradation of main functions of logistics controlling according to prevalence rate of practical usage (table 2).

Thus, it can be said that among the logistic goals and functions, the logistic controlling takes an important place in such a functional area as warehouse logistics. In general, it is necessary to expand the list of those tasks and operations that can be solved with the help of logistic controlling in this functional area of logistics (table 3).

This list should also be supplemented with an informative and analytic function, the purpose of which is to provide top management with the necessary information for making managerial decisions. Such information can be data on all costs, using which, it is possible to form appropriate level of prices for warehousing services. For correct and optimal transfer of warehouse costs, it is worth to use such a tool of logistic controlling as activity-based costing.

Activity-based costing (ABC) is the technology that enables to assess the real value of the product or service regardless of the organizational structure of the company. Both direct and indirect costs are shared by products and services based on the amount of resources needed at each stage of provide service. Actions are taken at these stages, in the context of the activity-based costing method are called activities.

The aim of ABC is to ensure proper distribution of funds allocated for the provision of services for the direct and indirect costs. This allows the most realistic estimate of costs [3, p. 100–104].

Table 2

Research of logistic controlling in Germany – distribution of functions by their importance

Functions of logistics controlling	Of the 140 respondents	
	Number of applicants	Percentage of total
Planning and control of logistics costs	86	61,4
Analysis of deviations of actual and planned logistic indicators	45	32,1
Optimization and inventory accounting	39	27,9
Preparation of decision-oriented information	28	20,0
Supply planning	25	17,9
Transport planning	23	16,4
Material flow planning	21	15,0
Unscheduled accounting operations	18	12,9
Definition of indicators	17	12,1
Sales planning	16	11,4
Production planning	12	8,6
Planning and control of logistics services	12	8,6
Control over the course of production	11	7,9
Coordination of logistics subsystems	7	5,0
Reporting	7	5,0

Within the traditional financial and accounting methods of the company measured by functional operations, and not for services provided to the customer. The calculation of the efficiency of functional units held on the implementation of the budget regardless of whether it brings benefits to the client company or not. In contrast, activity-based costing is a tool process management that measures the cost of implementation services. Evaluation is performed for functions that increase the value of the service or product, and with the additional features that do not change this value. If traditional methods calculate the costs of some activity only according to the categories of costs, the ABC shows the cost of all stages of the process. The ABC explores all the possible functions in order to most accurately determine the costs of providing services, and ensure the modernization process and improving productivity [6].

In fact, the ABC method works according to the following algorithm:

- 1) determine the sequence of functions necessary for production services;
- 2) determine the full annual costs and working hours for each function;
- 3) determine quantitative characterization of cost source (cost driver) for each function using estimates from paragraph 2;
- 4) once all functions will be determined the source of costs is made final payment of costs of production of a particular product or service.

If the initial cost estimate is correct, the income (before taxes) will be equal to the difference between the sales price and the cost calculated by the ABC method. Moreover, once it becomes clear whether production of the products or services will be unprofitable (their sale price will be lower than calculated costs). Based on this information, it can be quickly taken

Table 3

Functions of logistic controlling in warehouse activities

Function	Operations
Defining the parameters of inventory management systems	– supplies interval; – determination of stock levels (maximum, optimal, threshold, insurance); – calculation of the volume of orders
Optimization of inventory allocation	– conducting of ABC-XYZ analysis; – appropriate zoning of the warehouse; – tracing of “dead stocks”
Valuation of inventories and their accounting	– choose and usage one optimal of the method for estimating the cost of inventories (average cost method, specific identification method, FIFO method, LIFO method: one-time accounting during the reporting period or ongoing accounting); – inventory accounting by the time of their occurrence
Valuation of warehouse activities	– analysis of stock turnover; – definition of performance indicators of the warehouse work; – definition of performance indicators of staff work; – comparative analysis of deviations of actual indicators from planned
Warehouse parameters	– selection of the optimal placement for warehouse; – definition of the main parameters of the warehouse; – definition of the concept of warehouse operation activity

the corrective measures, including review objectives and business strategy for the coming periods.

So, to develop a model of pricing for storage services, as a first step, will be used for the following operations when processing inbound and outbound (incoming and out coming material flows):

- 1) pallet unloading;
- 2) receiving boxes;
- 3) unloading returned pallets;
- 4) unloading returned boxes;
- 5) packing incoming pallets;
- 6) placing boxes on storage line;
- 7) placing pallets on shelves.

As the operations of handling outgoing material flow will be determined the following operations:

- 1) selection boxes from the storage line;
- 2) selection of pallet from the storage line;
- 3) comparing data with the information system;
- 4) labeling of boxes;
- 5) boxes packaging;
- 6) palletizing;
- 7) input data to the informational system;
- 8) packing pallets;
- 9) loading boxes;
- 10) loading pallets.

Additional activities according to customer order can also be included to the list of operations of processing incoming or outgoing material flow.

As a second step of creating a model of pricing all costs should be allocated. The costs should be calculated based on the volume

of order (which has volume of incoming material flow; volume for storage; percentage of goods that are subjected to the additional services, such as: repalletizing, labeling, stickering and so on; volume of outbound material flow that may take the form of pallets or boxes or separate units depending on the features of customer's order). Thus, the tariffs will be divided as follows: tariff for acceptance and stowage; storage of goods; selection, completing and shipment.

Costs that form the price for storage services include the following:

1) costs related to staff (they also included additional costs required for certain categories of workers):

1.1) costs related to payment of wages staff working directly for a particular customer order fulfillment (direct people);

1.2) the salary of personnel involved in the performance of indirect sales order (indirect people);

1.3) the salary of administrative staff to be included as a certain percentage (this type of spending is singled out at its discretion since assessing the contribution and spending time on special order too difficult);

1.4) costs of wages of temporary staff, which is employed in low quantity of existing staff;

2) costs related to information (if a client service must purchase a specific hardware or anything):

2.1) license costs;

2.2) costs of office and warehouse equipment;

2.3) costs of computer infrastructure;

2.4) costs of project development;

2.5) costs of radio frequency equipment;

3) costs related to investment (in this case their cost is transferred to the tariff in some respects for the use of equipment and interest on which it is involved in the execution order of a client – usually implemented with large-scale projects):

3.1) construction costs;

3.2) costs storage;

3.3) costs for specific operations;

4) maintenance costs of warehouse;

5) costs of IT materials;

6) costs of materials for cargo service;

7) costs of the warehouse:

7.1) cost of renting warehouse;

7.2) maintenance warehouse costs;

7.3) costs for electricity, heating and water supply;

7.4) costs for security of warehouse;

7.5) cost for waste handling;

8) insurance costs (liability insurance, insurance against damage, cargo insurance).

Table 4

Identifying cost drivers of list for processing operations of the input material flow

№ of operation	Name of operation	Cost driver
1	Pallet unloading	pallet
2	Receiving boxes	box
3	Unloading returned pallets	empty pallet
4	Unloading returned boxes	box
5	Packing incoming pallets	pallet
6	Placing boxes on storage line	box
7	Placing pallets on shelves	pallet

Thus, all these costs should be grouped so that all of them are transferred in proportion to their use for the order at the cost of storage services for a client.

Also, the rate of marginal income should lay in tariff, such as that usually is 10%.

The next step has the need for determining cost-drivers for each transaction processing of incoming and outgoing material flow (table 4, table 5).

As a fourth step is to create a model of pricing for storage services in any spreadsheet software. Thus, the document of information model for pricing of storage services may have the following sections/

1. Information on the customer-company characteristics of its order (features and necessary services, volume, storage and dispensing features).

2. Data and calculations on order (only numeric data are necessary to calculate for each operation – cost drivers).

3. The order volume and seasonality (in this section will be made calculation and planning of the client's order seasonality for planning the distribution of economic resources, and identify peak periods).

4. Human Resources (indicated for all positions of employees who will be involved in fulfilling the order, their salaries, insurance premiums, etc.).

5. Productivity (performance summary table of personnel on each specific operation, which requires the use of standard time for each operation in logistics company. The need for certain supplies and information materials also are mentioned in this section).

6. Setting and expenditure (programmed output data on schedule, and the percentage of marginal income. Determine the percentage of transfer fixed costs to variable on request. These articles include: administration costs team leader, support functions and other personnel costs (to direct staff, administration, team leader, supporting functions and management personnel), garbage disposal, self-insurance, administrative budget and storage).

7. The cost of economic resources (output soar staff according to their performance (calculated in section 5 "Performance") and cost (calculated in section 4 "Human Resources"), price of manipulation equipment and supplies (information and supplies for maintenance of material flow).

8. Warehouse costs (includes raw data on costs of warehouse and contains information about the area of warehouse, rates for ser-

Table 5

Identifying cost drivers of list for processing operations of the output material flow

№ of operation	Name of operation	Cost driver
1	Selection boxes from the storage line	box
2	Selection of pallet from the storage line	pallet
3	Comparing data with the information system	unit order
4	Labeling of boxes	box
5	Boxes packaging	box
6	Palletizing	pallet
7	Input data to the informational system	SKU (Stock Keeping Unit)
8	Packing pallets	pallet
9	Loading boxes	box
10	Loading pallets	pallet

vices, rent, heating and water per square meter area, insurance, the cost of waste handling and other charges which are included in the cost of communications and office equipment).

9. IT costs (may be used if there is the necessity of purchases specifically for a particular client order execution).

10. Investment costs (relating to the construction, equipment maintenance and storage operations).

11. Breakdown of tariffs (distribution of material flow volume in percentage view according to their distribution to operations).

12. Consumables (planning for months).

13. Calculation (summary of all data of document for their integrated presentation with decomposition of logistics processes).

14. Operating Budget (the value of the order on all items of costs).

15. Reduction of tariffs (output value per unit tariff for each service).

Based on this approach, cost-sharing for bone-drivers was carried out, which led to a similar cost of warehousing services, which are given in table 6.

Table 6

General view of the consolidated tariffs for storage services

Operation	Tariff, UAH/unit	Volume, units	Annual budget, thousands UAH
Service of incoming material flow			
Reception	3,03	17 746	54
Service of outgoing material flow			
Labelling	0,14	120 000	16
Sending pallets	23,88	8 019	192
Sending boxes	23,93	30 168	722
Storage and Administration	Fee per month, UAH	Number of months	Annual budget, UAH
The rate for warehousing	359 671	12	4 316
Rate management	1 583	12	19
The total annual budget	443 227	12	5 319

**Conclusions.** From the above-mentioned, we can formulate the following conclusions that activity-based costing as the main logistics controlling instrument can serve as a transparent pricing system for storage services. Using this model of pricing, it can be tracked the value of all costs for each order at each stage of the warehouse

business process to cover all costs and profits in accordance with the planned volume. This model of pricing is extremely important in today operation activity of all logistics providers.

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**Позняк О.В., Бойко М.Ю. Функціонально-вартісний аналіз як інструментарій логістичного контролінгу**

**Анотація.** Стаття присвячена актуальності використання одного з ключових інструментів логістичного контролінгу – функціонально-вартісного аналізу. Описано алгоритм використання цього інструментарію. Авторами запропоновано опис створення моделі для тарифікації складських послуг.

**Ключові слова:** логістичний контролінг, складська логістика, функціонально-вартісний аналіз, центри відповідальності, ціноутворення, логістичні витрати.

**Позняк О.В., Бойко М.Ю. Функционально-стоимостной анализ как инструментарий логистического контроллинга**

**Аннотация.** Статья посвящена актуальности использования одного из ключевых инструментов логистического контроллинга – функционально-стоимостного анализа. Описан алгоритм использования данного инструментария. Авторами предложено описание создания модели для тарификации складских услуг.

**Ключевые слова:** логистический контроллинг, складская логистика, функционально-стоимостной анализ, центры ответственности, ценообразование, логистические затраты.