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## LOGISTICS COSTS MEASUREMENT AT ENTERPRISES

**Abstract.** Rapid development of logistics and extending scope of activities associated with managing logistic processes result in the rise in demand for deepened analysis of logistics costs. Unfortunately, universally used systems of the bill of costs do not deliver all necessary information, because they are not adapted for explaining structural and dynamic aspects of managing logistic activity. Basing at literature and empirical studies, the author has collected and organized the main problems with logistics activities cost accounting in the company and made a critical evaluation of methods to measure the logistics costs.

**Keywords:** logistics costs; logistics costs recording; logistics costs measurement.

**JEL Classification:** M20, M41

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### ВИМІРЮВАННЯ ЛОГІСТИЧНИХ ВИТРАТ НА ПІДПРИЄМСТВАХ

**Анотація.** Динамічний розвиток логістики і розширення спектра завдань, пов'язаних із управлінням логістичних процесів, вимагають поглибленого аналізу логістичних витрат. Вони мають значну частку в загальній вартості ведення бізнесу й різняться залежно від методів ідентифікації, конкретної галузі, розміру компанії. На жаль, часто використовані системи обліку витрат не надають усієї необхідної інформації, тому що не призначені для обліку структурних і динамічних зрушень в управлінні логістичною діяльністю. На підставі проведеного аналізу літературних та емпіричних досліджень автором статті виявлено основні проблеми, пов'язані з обліком витрат логістичної діяльності в компанії, та критично оцінено методи вимірювання витрат на логістику.

**Ключові слова:** витрати на логістику; облік логістичних витрат; вимірювання витрат на логістику.

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### ИЗМЕРЕНИЕ ЛОГИСТИЧЕСКИХ ИЗДЕЖЕК НА ПРЕДПРИЯТИЯХ

**Аннотация.** Динамичное развитие логистики и расширение спектра задач, связанных с управлением логистических процессов, требуют углубленного анализа логистических издержек. Логистические затраты имеют значительную долю в общей стоимости ведения бизнеса. Они различаются в зависимости от методов идентификации, конкретной отрасли, размера компании. К сожалению, часто используемые системы учета затрат не предоставляют всей необходимой информации, потому что не предназначены для учета структурных и динамических сдвигов в управлении логистической деятельностью. На основании проведенного анализа литературных и эмпирических исследований автором статьи выявлены основные проблемы, связанные с учетом затрат логистической деятельности в компании, и критически оценены методы измерения затрат на логистику.

**Ключевые слова:** затраты на логистику; учет логистических затрат; измерение затрат на логистику.

**Introduction.** Taking into consideration the purpose assigned in the company, the mission and objectives of logistics, it is possible to notice that they are main elements deciding about quality and the level of processes which influence the effectiveness of the company's functioning. These processes make the logistic system of the company up, where this system is called «acting of the synergistic sense, which is optimizing the combination of all elements that makes the certain integrity up» [1].

Logistic processes include both material and information processes as well as elements of financial processes, lead to costs generating. Causes of this occurrence can be found in the following areas:

1. Considerable asset, essential for the completion of logistic processes in the form of: buildings, warehouses, means of transport, machines and devices for the service of magazines, computer hardware or software. Keeping and exploitation of assets bring the need to bear the costs and additionally losses rise as a result of the lost benefit from the blocking of capital.

2. High labor costs, caused by employment many employees, essential for the service the physical flow and information processes.

3. Material supplies, being a component of current assets, which guarantee the stable business activity and the adequate continuity and intensity of logistic processes, generate costs because of the need to keep them, as well as costs of capital, frozen in them [2].

The amount of logistics costs in the company is not simple to determine. It depends from many factors, i.e. from the size of

the entity, industry in which it acts, as well as character of its activity (production, trade, services). Depending on these variables, the managers take various organizational solutions and logistic challenges. However, it is out of the question that costs of the logistics have the largest reserves and possibilities of the savings amongst all costs in the company. Some authors are quoting examinations according to which costs of the logistics constitute 10-40% of the sold goods value [3].

**Purpose** of this article is to collect and organize the leading aspects of accounting and measurement of logistics activities cost in the company, considering the previously published empirical studies, as far as there are a few publications on logistics costs problems in companies, and their contents are the area of theoretical principles.

**Brief Literature Review.** Many times determining the notion and the cost structure of the logistics constitutes a many-sided problem. Wide literature sources often present logistics costs in various aspects. Some of them focus on sources of their generating, others – on a diverse cost structure, incurred in the logistic system. Such wide comprehending is not limiting costs of logistics exclusively to a few definitions.

Significance of the cost itself is perceived in the company as the base of its further existence in competitive surroundings. The cost constitutes the economic category and its material meaning of the value creation for a buyer of the product or service, next reflected in an income statement of the company. According to W. Malec, cost is «an expression of normal, possible to be accurately predicted in advance, consuming of fixed

and current assets and outsourced services, evaluated in prices of the purchase, payments of employees, as well as a part of an additional product – incurred as a part of intentional, economically or socially justified activity of independently balancing individuals» [4]. During the cost analysis, managers have a possibility to know about weak and strong points from the side of the company's operations financing. Strengths of the company should be enhanced and developed, since in a long run they influence the reduction of costs, incurred in the company; however, imperfections should be subjected to the improvement or removed with the help of available managerial methods.

Logistics costs result from consuming of resources (employees, fixed assets, materials etc.) during actions, carried out in the range of the logistic processes service of the flow of materials, work in progress, finished products and kept stores. Apart from actions connected with the product, there are many activities, generating logistics costs, which do not directly add value to the products (accompanying materials, products or goods) and are designated for the labor organization of the company, enabling the correct course of logistic actions (planning and forecasting, controlling, analyses, supervision, scheduling of actions, development of stores). Logistics costs arise also in consequence of financial expenses for all payments, licenses, the handling of credits and loans dragged for logistic activity, freezing capital in supplies (in the warehouse, transport, during production) [5].

According to one of the definition, «logistics costs are measured as a percentage of turnover and comprise six individual components: transport, warehousing, inventory carrying, (logistics) administration, (transport) packaging, and indirect costs of logistics» [6]. This classification resembles that used by Naula et al. [7] and Toyli et al. [8]. The classification that has been widely used, identify transportation, warehousing, inventory carrying and administration as components of logistics costs [9]. Gunasekaran et al. include the opportunity cost of capital and storage, risk costs, and the possible costs of lost sales under inventory costs, thus, combining the elements of inventory carrying and warehousing [10].

The researchers identify a wide range of logistics cost components in addition to transport, warehousing, inventory carrying and logistics administration. For example, Zeng and Rossetti [11] add customs, risk and damage as well as handling and packaging to the list; and other researchers include «other logistics costs» to reflect the fact that logistics costs can rarely be divided and measured accurately [12;13]. Klaus and Kille [14] and Klaus et al. [15] single out order-entry costs from other administration costs as a separate component.

K. Ficon thinks that logistics costs allow assessing productivity of the modern methods of logistic management, but distinguishing them amongst other costs is unusually difficult on account of [2]:

- too high level of the processes, carried out in the subject, coherence causes administrative and organizational impediments in bright appointing exclusively costs concerning the logistic operations of the company;
- diversified logistics costs structure and interrelations within it not allowing for their calculation according to individual divisions.

Almost each of the authors thinks that separating logistics costs is hampered on account of their too great nesting in all registered costs, but without their precise identification evaluation of the logistic system efficiency becomes impossible. According to P. Blaik [16], Poland lacks regular and comprehensive cost analyses of logistics. For such state of affairs he blames the level of the information systems, applied in companies, progress, which are based at obsolete methods of registering. Admittedly, these methods provide needed information, including financial activity of the entire company, however, they do not provide entities the proper quality of information, necessary in aspiration to the high effectiveness of logistic system and do not solve problems of modern logistics. It is caused mainly with omitting costs of the logistics hidden in other costs [17].

Logistics actions, ranked into the chain of the product development, require precise identification of logistics costs in the procedural presentation:

- detailed registration of actions,
- assigning indispensable resources to them for the operations implementation;
- determining measures of individual actions;
- measurement of the stores consumption level in the result of carried out actions.

Exactly actions decide on logistics costs, which by consuming resources transfer the value to the final product. As dispersed and functionally folded actions of the logistics are, cost structure of the logistics is extended and blurred, as well as interrelations of individual groups dynamics of storage costs are ambiguous [5].

**Methodology & Result.** Observation and testing the level, structure and dynamics of logistics costs can be led under the condition that in the bill of costs of the company requirements in the register and grouping costs are met. Because it is impossible to use the bill of costs for the purpose of managing logistic processes without the accurate acquaintance of individual components of costs, reasons for their formation and mutual proportions and connections.

The register of costs of the company's basic activity is made conditional on the unit of the record variant established by the executive committee. This choice is the reason of the need for costs information in order to report purposes and manage the subject, depending on the specificity and the size of its activity. In practice of Polish companies costs of the operational activity are usually being recorded according to two or of three possible variants [18]:

1. **I<sup>st</sup> Variant – simplified** – costs grouping is limited only to a costs classification, in which straight costs are being recorded (homogeneous, which cannot be divided into more elementary elements). System of costs according to the kind enables a determination of an amount of incurred costs and getting a view on mutual proportions of individual kinds of costs of an economic entity as a whole. The usefulness of the costs classification for the purposes of managing the activity of the company is very much limited, therefore this variant of registers of costs can be applied by small economic entities, in which the need to analyze costs according to the areas or varieties of activity does not exist. Grouping costs only according to the kind, information about the place of bearing the cost and the connection with the product are not being gained, what is simply essential at setting the costs of the product manufacture in both global and individual view. Since general-economic register (statistical) consists in practice in adding up figures, got by individual business entities, only these sizes, acquired on the base of homogeneous and objective criteria, can be an object of the summing up. Only a costs classification register meets these conditions [19].

2. **II<sup>nd</sup> Variant – simplified** – the register of costs is held only in a diameter of types of activities (creating cost centres).

3. **III<sup>rd</sup> Variant – full** – the register of costs includes costs both in the costs classification, as well as according to places of these costs forming, which are functions, distinguished in the company, cells or workstations. The division of costs according to places of their forming is aimed at increasing liabilities of managers for the amount of the costs, as well as streamlining the planning and the cost control [20]. According to places of every type of costs forming, the activity (core, support, management costs) can be divided.

Ways of the register of costs applied in practice group logistics costs as part of all sorts of units, so they are unreliable with reference to costs generated in individual phases of the flow. As an example, it is possible to give the costs of purchase, which include only costs borne up to the moment of goods accepting at the first place of storage. The further observation of supply costs is impossible, because it not embraces: payments and mark-ups to payments of employees of the warehouse, maintenance costs of the supplies department, the receipt and the quality check of supplies, telecommunications charges etc., as they are already ranked

among on costs. Similarly recorded costs of sales include costs after providing products from own warehouses directly for the dispatch, and costs associated with ensuring the sale of products. Like in the previous case, costs of the remuneration of stock employees, supporting the sales department, are not included [21]. Bookkeeping costs in the very general way and the lack of the system to join these costs with actions, which they concern, prevent the effectiveness of the company's functioning verification. Such a precise determination of logistics costs requires their manual allocating in entities, recording costs only in the costs classification or even according to places of their forming.

### Logistics costs in the procedural presentation

Logistics costs result directly from the execution of logistics tasks (processes) taken in spheres of supply, production and distribution. And similarly as those processes, costs are closely connected with themselves, from which considerable problems result at the division of costs objects into groups. It requires systematicity and particular involvement. It is also important to define in the company reliable solutions in grouping costs, so that they were at the most useful to test and decision-making purposes. Only after appropriate classification of logistics costs, more advanced tools of accounting, than traditional calculation variants, can be applied. Thanks to using them, it is easier to create reporting system based on indicators, which will determine the unit cost of logistic action. Later, information about costs can be compared with the performance of other companies or contractors' offers and constitute the starting point for deliberations of costs optimization.

Getting the competitive edge by the company is often conditioned by the way of organization and performance of individual processes and actions comprising the entirety of the customer value creating. The procedural management enables to accommodate itself to requirements, put by surroundings, creating new opportunities of the competitive edge achieving. Due identification of processes, their modelling, implementation, control and improving affect the return, level of customers satisfaction fundamentally and, in consequence, competitiveness of the business entity. The procedural attempt of the business administration forces to apply the sub-system of accounting, which is accountings of processes, is compatible with it [22].

The process-based approach to logistics costs of the company allows for more accurate and elastic management of products or services. Aims of the process-based approach up to costs are above all [23]:

- increasing the transparency of costs in indirect areas of the company;
- ensuring rational using of resources;
- allocation of benefits inside the company in the area of cost accounting of the product/service, what will allow avoiding strategic mistakes in the politics of the product/service and to gain the inspection of indirect costs.

Considering the process-based approach accounting of logistics costs takes place with the help of the activity-based costing (ABC). This account, thanks to assigning costs of performed actions to individual customers and products of the company, eliminates the averaging and the arbitrariness in allocating of indirect costs. This arbitrariness takes place in traditional concepts and financial and accounting systems. The activity-based costing provides larger amount of information, than traditional systems. However, using it in the company requires the determined financial outlays (software, consulting), employing the senior staff and services of accountants [24].

Problems with effective implementation of ABC can also lie both in the very concept and in the way of its implementation. There is a fact that the majority of literature concerning activity based costing describes general assumptions and applications of this account, rather than specific instructions and pointers of its application.

### Inventory and measurement of logistics costs in practice

In literature examinations about identification and measurement of logistics costs often appear. However, they are often narrowed to the chosen system of costs (type, cost centres) or they are led on the great level of generalization. It is connected with issues of registering logistics costs, what is has been indicated in the following article.

Examination of logistics costs on the base of the costs classification inventory were executed by B. Milaszewicz and K. Krypczyk [25], whose studies included the analysis of logistics cost in the chosen commercial micro-company; as well as E. Szymanska and A. Melasa [26], who presented a case study of the ICT company. Costs classification arrangement was also a leading motive for deliberations of S. Skiba, who just on its base made an attempt to build the utilitarian model of logistics costs register. His proposal was based at detailed inventory of prime costs according to phases of materials flows in the company. However, it was not verified in practice, and the author claims, that «...assessing the proposed model, it is not possible to claim that it gives the possibility of complete information about logistics costs obtaining, because much more extended model of the register would be needed, which, however, instead of additional advantages, would cause many organizational problems» [27].

A. Karmanska (2007) presented results of the questionnaire survey concerning the acquaintance, inventory and reporting of logistics costs, conducted on the basis of 33 questionnaires analysis [28]. Answers were given mainly by the respondents, directly or indirectly associated with accounting, what in the opinion of the author made its results reliable. In part concerning the usefulness of recording costs of the company for getting to know about logistics costs, information was received that in 33% of studied subjects it is impossible to specify them. It is connected with recording costs exclusively in costs classification without taking into account the deepened division into the costs, associated with logistics. Identification of chosen costs of logistics only was possible for 67% of the respondents. Grouping costs of logistics in 64% of examined companies was impossible to the realization due to the lack of formalized classification system and description of costs source in the documents. For 21% of respondents, logistics cost grouping in their organizations was possible thanks to the functioning of the formalized classification system, assisted by the source documents, among which were mentioned: the decree, appendix to the decree, the instruction about the circulation of documents, special combination of connected with the transaction codes.

B. Slusarczyk and S. Kot (2013) also made an attempt to identify and measure logistics costs in their case study, which included 90 small and medium companies. Direct participation of authors in the data collection confirmed the immense problem in logistics costs and their components identification in the companies due to the manner of costs recording, which makes the far-reaching analysis of logistics costs impossible [29]. Nevertheless, one should notice that a part of companies conduct logistics costs analysis for own purposes, not including it in the formal register. It constitutes an interesting source of knowledge in the carried out examination, although quite often the way of logistics costs registering for the needs of the companies is not free of methodological mistakes.

Analysis of researches' results confirmed that, as it was expected, majority of companies (58) applied only costs recording, 28 enterprises pointed out using calculations of direct and indirect costs, and 26 examined business kept the register of costs on the level of specific products and services. The greatest five companies included in the research kept activity-based costing (ABC). Some of companies pointed at more than one manner of logistics costs recording, because more complex method of logistics costs recording was required only for chosen products and services in order to better control crucial areas of business or of danger zones in the context of activity effectiveness.

More and more popular tool of logistics costs measurement is a costing of activity-based costs. Many authors in their studies [30; 31] present possibilities which application of the ABC method gives. These are certainly useful examples for practitioners. One should, however, remember that using the activity-based costing not always and not for every entity will be a sufficient alternative.

There is one more main measurement approach. It is statistics-based with the usage of various types of national accounts or industrial statistics to create an estimate for logistics costs as a share of GDP [32; 33]. Rodrigues et al. (2005) applied econometric modelling based on this kind of data in order to estimate the GDP share of logistics costs worldwide [34]. The so-called «Top 100» report on European logistics markets estimates the size of logistics expenditures, and ultimate logistics costs in Europe, based at statistical data on transport volumes, employment in logistics, and demand for logistics services [15].

**Conclusion.** The register and the measurement of logistics costs could certainly be simpler, if formal provisions, imposing the need and way of specifying costs, associated with logistic activity, out of the entire costs, generated by the company, would exist. Many theoreticians and practitioners point to the need of creating the bill of logistics costs. However, on the highest, legislative rank, this action is unusually difficult, not to say unfeasible. Taking into consideration the abundance of activity areas in the company (logistics, quality, innovations, environmental protection etc.), to specify thoroughly the structure and amount of costs, which they generate, one should create the separate bill of costs for every of these activities. And, including the scope of the activity of the company or the industry, in which it functions, to formulate detailed principles of costs recording on the legislative level is simply impossible.

Therefore, the biggest possibilities, as well as responsibility, are in hands of the companies. They are aware receivers of the information, generated by systems of costs recording. The managers should actively cooperate in creation and implementation of new systems of the costing, including recording of logistics costs.

To explore the issue of logistics costs measurement, it is necessary to lead cross-sectional observations in various industries, similarly to USA researches, where Establish INC carries out logistics cost benchmarking studies for more than thirty years. They indicate, in addition, the most popular ways of these costs reducing used by the US companies. Constant monitoring of logistics costs within specific industries will have a positive influence on the competitiveness of businesses operations.

In my opinion, introduction of detailed accounting procedures will optimize the level of logistics costs at Polish enterprises, which is now estimated at about 17% of income, while it is 7.5% in USA and 10.2% in Finland. I think that right logistics costs analysis allows more effective costs management and logistics costs decrease to the level of above mentioned countries.

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