

METHODS FOR DETERMINATION AND OPTIMIZATION OF LOGISTICS COSTS

Theoretical Articles

Keywords

Costs,
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Abstract

The paper is dealing with the problems of logistics costs, highlighting some methods for estimation and determination of specific costs for different transport modes in freight distribution. There are highlighted, besides costs of transports, the other costs in supply chain, as well as costing methods used in logistics activities. In this context, there are also revealed some optimization means of transport costs in logistics chain.

INTRODUCTION

For costs calculation there are known and used a number of methods. Some of them are applicable to undertakings providing logistics activities along the logistics channel.

The paper deals with the issue of logistics costs, highlighting some estimation methods and determination of the specific costs of the various transport modes involved in the distribution of goods.

CATEGORIES OF COSTS IN TRANSPORT ACTIVITIES

There are a large number of papers in the field of management accounting for addressing problems of cost calculation. Most of them deal with the costs of industrial enterprises, from where the relatively important number of cost calculation methods applicable in the field of industrial production.

As regards the transport sector, the number of studies on cost calculation is significantly lower, although there are a large number of companies operating in this sector. Relative to the cost calculation problems in other logistics activities, the number of these studies is even lower.

A study in this field identifies distinctive characteristics that must have the systems of accounting management to quantify costs in railway transport companies, revealing important results useful for companies in network infrastructure, namely transport, services and utilities companies [Cugini et al., 2013]

Meyr [2014] presents a method for internal management accounting and reporting externalities. A study conducted in 2004 reveals a simplified approach to determine the marginal costs of infrastructure use [van Essen et al., 2004].

A methodology developed in 2007 [Access economics, RRIDC] in order to measure the effectiveness of logistics channels relied on identifying and quantifying the monetary, market and socio-economic costs for the variants based on the use of road and rail.

In logistics activities the most commonly found cost indicators are:

- Short-run marginal costs, including cost components that vary in the short term, except the capital costs from these elements. In this category we can mention costs generated by the transport of additional cargo unit, such as vehicle maintenance costs, energy costs, for drivers, or costs for storage an additional ton of freight;
- Long-term marginal costs that bring together short-run marginal costs and costs that vary in periods longer than 12 months, respectively capital costs [ESCAP 2014]. They may be considered costs of this type the costs with the

purchase of vehicles for the transport of an additional amount of extra transport costs or investments costs in new storage unit for storing additional physical unit.

- Fully distributed or allocated costs resulting by adding indirect expenses, as those with energy consumed in other activities than those productive or expenses with indirectly productive personnel. There are several ways of recovering these indirect costs. In transportation field, it can be considered, for example, the option of allocation proportional to the number of ton-kilometers. For transport companies that hold also the transport infrastructure, there are included in these costs, those that are generated by infrastructure maintenance (v. Table 1).

As cost bearers in logistics activities, useful in costing, there can be considered, for example, the number of traveled kilometers, ton-kilometers, ton of stored product.

Besides the costs for delivery of services there can be highlighted the following types of costs:

- quality costs, which include costs of preventing nonconformities, verification and those with non-conformity;
- outsourced costs, i.e. costs incurred by third parties, other social partners;
- hidden costs in other costs;
- unavoidable costs;
- opportunity costs [Briciu 2006].

Some of these costs are not reflected in the accounting of the entity, such as social, green costs affecting the cost of other entities.

But decisions making to optimize logistics channels should also cover costs such as those generated by air pollution, noise, risks of accidents, traffic congestion, effects on health and population mobility.

METHODS OF COST CALCULATION IN LOGISTICS ACTIVITIES

In cost calculation, the used methods are based on delimitation of responsibility centers. These can be grouped, in economic terms, in profit centers and cost centers [Briciu et al., 2003].

One of the methods used in transportation is the global method, also known as the method of simple division and method of direct calculation. The method involves the collection of all expenditures for a reporting period which contribute to the service delivery in a global manner at the level of expenditures sector [Briciu 2006].

This method has two versions:

- global calculation per kinds of costs;
- global calculation per places or sectors of expenditures.

Standard cost method is based on predetermined costs using different ways of determination:

- theoretical standard cost which is based on the best use of resources;
- the standard cost based on use of a competitive price, depending on market conditions;
- historical cost or realized cost of the economic entity in the previous period;
- normal cost standard based on forecasting of conditions considered normal for future periods;
- standard cost determined on the basis of current prices, used in periods of high inflation [Briciu 2006].

In determining standard cost there are considered both fixed costs and variable expenses. This method is a way to control costs, which eliminates operational inefficiencies. But the method knows also some limitations due to the necessity of regular updating of standard costs and technical skills for the determination of them as accurately is possible. For these reasons, it can be considered an expensive method.

As opposed to this method, Marginal Standard Costing method uses only variable costs to determine the marginal cost. The method is used in combination with other methods of costing, being useful in short-term decisions.

THM method (Taux - Heur - Machine) is another method applicable in logistics activities, especially in the transportation. Responsibility centers, in the case of transport, there can be considered vehicles or groups of vehicles. The method is suitable for entities in which the quantification of service can be achieved based on the number of hours of operation of vehicles.

Direct-costing method takes into consideration only variable expenses, which are being amended with the volume of activity, treating the other expenses as expenses of the period. It is focused on determination and analysis of the all results of economic entities and not on the determination of unit cost for service.

In rail, air and road transport it is encountered the method for calculation of operating costs (Operating Costing). It involves summation of the operating costs, dividing them to the number of considered benefit units and obtaining the unit costs.

The method of cost calculation service (Service Costing) is a method used in services and applicable for transport, service costs being periodically collected.

Transport Costing Method is one of the categories of costing methods based on unit costs. Collection of costs is based on daily reports completed for each vehicle [ICSI 2013]. The number of units cost is calculated as:

Number of vehicles x traveled distance x number of days x transported quantity

ABC Method (Activity - Based Costing) is a method that is based on the essential activities performed for the service. In a first stage, costs are

allocated to activities, and in the second stage, they are distributed on the provided services according to the percentage of contribution of these activities to the delivery of services.

The method is effective in controlling costs and reductions of them, but involves a complex system of data calculation, which makes it quite expensive. In order to optimize logistics costs there can be used several techniques. Global optimization of supply chain is the main objective. But real situations allow most often only partial optimization.

Mathematical modeling and computer software can be used to solve optimization problems, respectively to reduce logistics costs. Also, Monte Carlo simulation is useful in selecting the most appropriate solutions in terms of cost and effectiveness.

Such a model of costs calculation used in railway transport is OSCAR (Operational Simplified Costing Analysis for Railways) developed in Canada, used to set tariffs and reduce costs [<http://www.railwaycosting.com>]. The costs are classified, according to this model, into four categories:

- direct variable costs proportional to traffic volumes which include fuel cost, driving personnel, rolling stock, maintenance of infrastructure;
- variable costs of operation comprising direct variable costs with depreciation attributable to expeditions;
- total long-term variable costs comprising variable operating costs and capital costs;
- total costs that are derived from the sum of the long term variable costs and fixed costs.

For example, in the case of Canada, there is a uniform classification of accounts for railway companies [<https://www.otc-cta.gc.ca/>], providing also a set of instructions and the framework for registration of railway operations. Expenses are recorded on geographic cost centers. Not all costs can be attributed, however, reasonably, to a geographic cost center. Therefore, costs with a regional incidence or at the system level should be recorded as such.

It is a very detailed and exhaustive system of accounts, being found in all types of asset components which are specific for railway. In addition to accounting data, there are recorded also statistics relating to carried out operations.

In Romania there is no such a system of accounts, being used only the general chart of accounts.

Introduction of such a system would be extremely useful for more efficient management of railway activities.

CONCLUSIONS

A first step in optimizing logistics activities consists in fair identification of costs. This requires detailed knowledge of the processes that contribute to logistics activities. At this stage an important role is played by the managerial accounting.

But identification of the most suitable costing method is not enough. It is only basis of next stage, that of mathematical modeling and simulation of the possible options for selecting the optimal solution.

In all these stages, the role of information and communication technologies is essential at this time. But more than that, this stage should be the basis for decisions related to the technologies used to optimize logistics activities.

Collection of accounting and statistical data, conducting analyzes of processes and simplification of their logistics networks, use of modern technologies can help to reduce costs, but optimization of logistic activities is only possible if they are exploited intelligently together.

REFERENCE LIST

- [1] Access Economics, (2007). The Costs of Road and Rail Freight – Neutrality and efficiency in the farm-to-port logistics chain. *Publication No. 07/185 Project No. AEC-4A Rural Industries Research and Development Corporation RIRDC*
- [2] Briciu, S., Jaradat, M.H., & Socol, A., (2003). *Managementul prin costuri*. [Management by costs]. [171]. Cluj Napoca: Risoprint
- [3] Briciu, S., (2006). *Contabilitatea managerială, Aspecte teoretice și practice*. [Managerial accounting. Theoretical and practical aspects]. București: Editura Economica
- [4] Cugini, A., Michelon, G., & Pilonato, S., (2013), Innovating cost accounting practices in rail transport companies, *Journal of Applied Accounting Research*, (pp. 147 – 164). 14 (2),
- [5] ESCAP Economic and Social Commission for Asia and Pacific, (2014). “*Traincost*”, *Point-to-Point Railway Traffic Costing Model – Users’ Manual*. Retrieved from <http://www.unescap.org>
- [6] van Essen, H., Boon, B., den Boer, E., Faber, J., (CE), (Marten) van den Bossche, M., Vervoort, K., & Rochez, C., (2004). *Marginal costs of infrastructure use - towards a simplified approach*, First interim report, Delft, CE. Retrieved from www.ce.nl
- [7] Meyr, D., (2014). From effective accounting and reporting to efficient outsourcing. *Logistics & Sustainable Transport* (pp. 15–22). 5(1)
- [8] The Institute of Company Secretaries of India ICSI, (2013). *Cost and Management Accounting*, New Delhi: ICSI House Retrieved from <http://www.icsi.edu>
- [9] <https://www.otc-cta.gc.ca/eng/publication/uniform-classification-accounts-and-related-railway-records-2014#S1000> accesat la 2.2.2016
- [10] <http://www.railwaycosting.com> accesat la 1.2.2016

ANNEXES

Table No.1 *Categories of transport costs*

Types of costs / Transport mode	Infrastructure costs	Operating costs	General costs	Capital costs	Depreciation costs
Rail transport	Maintenance and operation of rails, buildings signaling, communications and energy system	Maintenance and operation of vehicles, intermodal equipment, train operation	General administrative costs	For made investments	Depreciation and amortization expenses
Road transport	Maintenance and operation of buildings	Expenses for maintenance and operation of vehicles	General administrative costs	For made investments	Depreciation and amortization expenses
Air transport	Maintenance and operation of airport infrastructure	Maintenance and operation of vehicles, intermodal equipment, operation of aircraft	General administrative costs	For made investments	Depreciation and amortization expenses
Naval transport	Maintenance and operation of port infrastructure	Expenses for the crew, maintenance, insurance of vessels, port charges, taxes	General administrative costs	For made investments	Depreciation and amortization expenses