Implementation of Activity-based Costing in Logistics

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Abstract: Logistics costing methods need continuous improvement. In this respect one of the potential development paths is activity-based costing. It is an effective tool for enhancing the accuracy of costing systems. To facilitate the adoption of activity-based costing in logistics a theoretical calculation model had been elaborated before. This paper intends to examine how this conceptual model and the new costing approach can be implemented in logistics practice. A general implementation model has been set up and adapted to the specific attributes demanded by logistics principles. Examples for concrete realisations and some empirical experiences have also been provided. The main conclusion of the study is that activity-based costing implementations in the logistics field have to be adjusted to the information needs that are influenced by several factors. The most important of these factors is the maturity of logistics competences and the complexity of cost structure.

Keywords: logistics management, activity based costing

1. Introduction

Activity-based costing (ABC) is a well known and often used cost calculation and management method in different industries, mainly in the manufacturing industry. After the necessary adaptations this methodology can be used in the field of logistics as well.

The theoretical model of logistics ABC has already been elaborated including also the mathematical formulas and equations. The operation of the theoretical logistics ABC model can be briefly described as follows. The production of logistics services uses different resources. Resources cause costs which can be divided – from the point of view of elementary logistics services (as profit objects) – into direct and indirect parts. The indirect costs shall first be assigned – based on resource cost drivers – to activities which take part in the production of performances. Activity costs can then be further allocated – based on activity cost drivers – to profit objects. Technology systems deliver performance indicators (cost drivers) for each resource and activity (or their pools). After allocating the costs of activities "consumed" by a certain profit object and adding

its direct costs the prime cost of a logistics service/product will turn out. If revenue data can be made available at this accounting level the margins of profit objects can be analysed, too [4].

Thus the model and the formulas can help practitioners establish their own cost calculation tool which takes into account the specific business and technology features of the given company or supply chain. Here one may face the operative problems of ABC implementation: several pre-conditions shall be ensured before launching the ABC procedure in practice. It is reasonable to apply a systematic implementation methodology which gives a structured framework for the introduction of the new costing mechanism. To support this management approach a general ABC implementation methodology based on the literature is established in the following chapter. After having built the general implementation framework more specific recommendations are elaborated for the case of logistics related issues. Here such questions have to be answered like:

- what are the profit objects in logistics?
- what types of resources are consumed in logistics or supply chains?
- what are the logistics related activities?
- what resource and activity cost drivers can be used in logistics?

As a preliminary remark it can be stated that no universally applicable tools can be developed to overcome the implementation problems and give exact answers to the questions arisen. Nevertheless, the methodology of ABC realisation adapted to logistics will probably give more concrete guidelines than the results of theoretical modelling. The modelling principles and the implementation methodology, however, shall be used in an integrated way to make success of ABC pilot projects.

2. General implementation methodology

Several authors offer implementation plans for ABC realisations. Most of them have already been tested even in case studies carried out for different business areas. The general methodology elaborated – illustrated in Figure 1 – synthesises also these theoretical and empirical findings that are published and accessible in the international literature [2, 3, 7, 8].

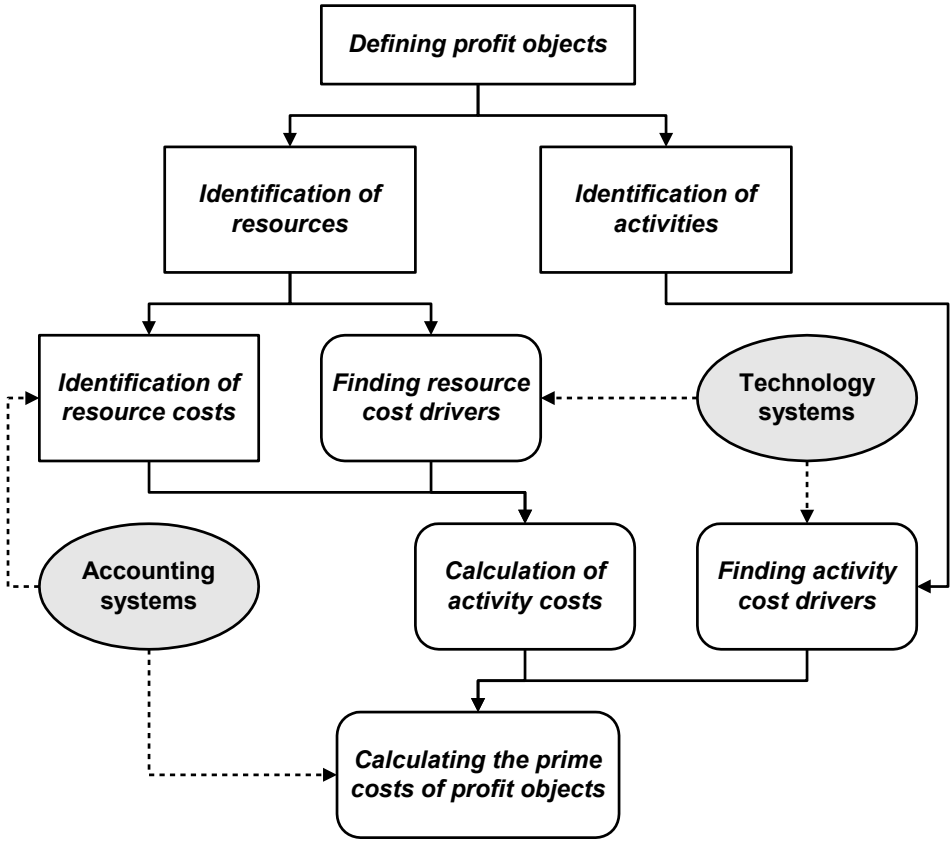

Figure 1. The methodology of ABC implementation

The first task is to define profit objects. These are the smallest entities in the service chain or product hierarchy whose prime costs shall be exactly calculated. The production of profit objects needs resources. So the next step is the identification of resources or resource pools (work forces, machinery, etc.) used for the examined business processes realising profit objects. Knowing the resources the identification of cost items associated with them can be carried out. These are indirect costs from the point of view of elementary products or services and can be obtained from the accounting systems (general ledger). Then cost drivers for resources or resource pools shall also be found (as the resources and their costs can – in general – not be allocated to activities directly).

The identification of activities participating in the examined processes and taking part in the production of products or services can be performed in a parallel way. But the calculation of activity costs requires the availability of resource costs and their drivers. The calculation of costs in the activity level is based on resource consumption measured by resource cost drivers. Another task is to find the activity cost drivers and measuring their values. Resource as well as activity cost drivers are delivered by technology

systems (inventory management, transport organisation, maintenance, etc.). At last it is possible to calculate the prime costs of profit objects based on the activities consumed and direct costs – coming from the accounting systems – allocated.

3. Methodology adaptation to logistics features

Here the ABC implementation steps identified before are explained in detail with special regards to the specific characteristics of logistics business and technology processes. The task is to give answers to the questions raised in chapter 1. The proposals reflect the ideas of the author but rely on the – not always logistics specific – experiences of corresponding case studies as well [1, 2, 3, 8].

The definition of profit objects is important as it determines the structure and specification of the ABC model. There are several possible entities which can be chosen as profit objects in logistics:

- products handled in supply chains;
- service elements of supply chains;
- customers or logistics services performed for them, etc.

Additionally, these entities can vary according to the level of sophistication: particular products or product groups consisting of homogenous products; whole supply chains or their certain building blocks; customers or client clusters; complex logistics services or their certain elements. It is advisable to select those logistics related entities for profit objects which are the main contributors to the long term (sustainable) profitability of the examined company. Of course, the activity area of the company also influences the definition of logistics profit objects: logistics service providers probably prefer services or customers while manufacturing or trading companies may chose products as costing objects.

The definition of logistics profit objects determines the resources and activities that are necessary for performing production related tasks. The resources or their pools represent the indirect costs which need special cause-effect based calculations (in contrast to direct costs). The first stage allocation is carried out to logistics activities. Table 1 gives an overview of the resources and their possible drivers applicable in logistics ABC systems. Note that this overview does not cover all relevant items so can be extended on the basis of further empirical studies. The aim here is to give initial ideas for practical implementations.

Table 1. Possible resources and their drivers in logistics ABC

Logistics resources	Logistics resource cost drivers
personnel (indirect cost items)	no. of personnel, working time
vehicle depreciation	distance
facility management and maintenance	area used
central administration	transaction duration
supporting functions (PR, HR, etc.)	transaction duration
information and communication services	no. of transactions, service hours

The second stage allocation of indirect costs is carried out between logistics activities and the selected profit objects. Thus proper activities and cost drivers shall be found to support this allocation procedure. Table 2 illustrates some of the potential logistics activities and their drivers. The situation is the same as in the case of Table 1: the list of activities and drivers is not comprehensive so companies shall adapt it to their own operation models.

Table 2. Possible activities and their drivers in logistics ABC

Logistics activities	Logistics activity cost drivers
planning and control	no. of interactions, transaction duration
disposition	no. of transactions or documents
dispatching	no. of. shipments
ordering	no. of demanded items
material handling	no. of items
inventory	material/product quantities
transport	tonne kilometre, vehicle kilometre
loading	no. of shipments
tracking and tracing	distance, transportation duration

In possession of logistics profit objects, resources, activities and cost drivers the logistics ABC implementation model can be created and realised for the case of any company operating logistics services. The examples described can be used as a basis for the concrete implementation models. Of course, additional considerations have to be made by the users to customise these approaches as far as it is needed by the decision makers taking advantages of the improved logistics cost management system. Nevertheless, the implementation procedure can not be finished yet: further requirements shall be met before the “official” start. The next chapter discusses these

practical conditions on the one hand and gives an impression about ABC experiences on the other hand.

4. Practical conditions and experiences of the implementation

The followings illustrate what additional practical considerations shall be taken into account when implementing the logistics ABC. The instructions and experiences are partly derived from case studies of non-logistics activity areas but can be useful for logistics applications as well.

An examination of international differences in ABC has concluded that there are no significant variances in the rates of ABC adoption in different countries. It was explained by the global homogenisation of management accounting practices. Some differences could, however, be identified regarding the implementations in various industries. The main operational and methodological problems could be connected to activity and driver selection issues [7]. That is why special attention shall be given to the methods supporting these procedures with special regard to the industry characteristics (see chapter 3).

Case studies have shown that ABC implementations are mainly completed by teams of professionals. So it is important to pay attention to the factors influencing these teams and so the success of the costing project. These factors can be the following: external environment (degree of competition), team size and heterogeneity, ABC knowledge and training, team dynamics. The team capacity shall be harmonised with ABC structural parameters reflecting model complexity: number of activities and first/second stage cost drivers [1].

Dedicated researches have investigated the association between ABC and financial performance (as one of the –indirect – aims of ABC implementations is to enhance the long term financial sustainability of the company). Confirmatory factor analysis and structural equation modelling were used to evaluate the relationship between ABC and financial performance. The results have justified that there is a positive association between ABC and the better values of financial performance indicators (like return on investment). It has, however, many pre-conditions, among others:

- ABC is implemented in complex and diverse companies;
- ABC is used in business environments where costs are relatively important;
- there are limited numbers of intra-company transactions [6].

These requirements apply to logistics, too, because (bigger) logistics companies operate complex supply chains with diverse services, running costs are of high importance (cost reduction is one of the business goals) and the number of inter-company transactions grows continuously due to global and expanded supply chains.

Several ABC implementations (in various business sectors) have resulted in more accurate costing information of activities and products/services. Another positive consequence of activity-based management is that it gives better insight into the operation cost structure by exploring the relationships between its components. The

strength of a detailed cost accounting system lies not only in the analysis of the actual situation but also in the possibility to run simulations on variations of resources or business strategies. At the same time ABC may have some disadvantages: the high model complexity requires high work load and some distortions may still remain in the costing system (as ABC is not a perfect solution either) [2, 8].

Logistics ABC implementations are company specific and so shall be adjusted to the "logistics development level" of the given company. This level determines the functionality and quantitative/qualitative parameters of the cost controlling system. The more sophisticated and comprehensive are the logistics functionalities the more complex logistics costing system shall be operated. The highest logistics development level (where physical processes are outsourced), however, may need a simplified cost management concentrating on some key performance indicators. Here most of the costing functions may also be "outsourced" [5].

5. Conclusions

During the former analysis it has turned out that ABC can be implemented for the case of logistics related business processes and for companies running such processes. The implementation, however, have several prerequisites. One of these conditions is to have a clear implementation strategy consisting of logical steps and milestones. To support this recognition an ABC realisation methodology adapted to logistics has been developed. The methodology has been supplemented by example parameters like applicable profit objects, resources, activities and (first and second stage) cost drivers. The sample tables are (far) not complete and intend to encourage logistics professionals to set up corresponding catalogues of logistics related ABC building blocks.

Pilot projects conducted in logistics and in other branches have proved the significance of improving costing systems along activity-based management principles. The new costing approaches have resulted in more precise and reliable cost information and at the same time have made the cost structures more transparent. These additional management information help decision makers to better establish capacity allocations and make accurate business plans. In logistics business ABC solutions shall be in line with the "logistics development phase" reached by the company. It means that no uniform logistics costing model exists although some general guidelines – like the ones in this study – can be proposed.

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