

Logistics cost management models and their usability for purchasing

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Summary

This paper deepens the understanding regarding the practical usability of CM models for purchasing decisions, and provides a framework for determining a desired complexity of cost management in different purchasing environments.

Keywords: Cost Management, supply chain, accounting, purchasing, Kraljic's matrix

Introduction

The connection between the expenses of a company and the service provided is seldom made intuitively. Without a structured method for dealing with this, companies are left to the experience and good judgment of their employees when dealing with cost management (CM). Activity-based costing (ABC) introduced by Robin Coope in the 1980's and later activity-based cost management (ABC/M) was supposed to be the answers to these problems. The basic principle of activity-based costing is that costs are allocated to the various activities performed in a company. The cost objects studied primarily use up activities instead of costs (Cooper and Kaplan, 1991). The logistics/supply chain literature provides several examples of cost objects, such as products (No and Kleiner, 1997), warehouses (Abrahamsson and Aronsson, 1999), or customers (Braithwaite and Samakh, 1998). The selection of cost objective depends on what the user want to evaluate the profitability of. Activity-based costing is the origin of many other cost management models. Total cost of ownership (TCO), has for example sprung out of ABC, but is designed uniquely for purchasing or sourcing decisions.

However, many companies has abandoned both ABC (Braithwaite and Samakh, 1998; Geri and Ronen, 2005) and TCO (Ellram, 1995) because the methods are perceived as being too complex. This complexity can be a result of the strive to cover as many aspects and taking in too many perspectives at the same time. As a result of the decreasing practical use in these methods many researchers have also lost interest in these methods as well.

The purpose of this paper is to deepen the understanding regarding the practical usability of CM models for purchasing decisions. A framework for determining the level of complexity needed in the cost management in different purchasing environments is suggested. The deepen understanding can provide practical guidance in how to overcome the complexity issue in the cost management and find a balance between complexity and reliability, leading to a renaissance in cost management use.

Cost management can be applied to a very wide range of different areas. The development of ABC was originally intended for manufacturing environments and the implementation of the technique in logistic, purchasing and other environments followed later.

The development and use of CM

The formalized system of financial accounting in USA emerged after the stock market crash in 1929 and during this time the still used Generally Accepted Accounting Principles (GAAP) were written. But the advent of scientific management led to the need for a complementary accounting system – management accounting – for tracking costs throughout the firm (Lowder, 2006). Absorption costing was introduced, where all indirect and overhead costs were assigned proportionally to all products produced based on their direct labour costs. During the 70s and 80s however, when the direct labour costs were decreasing in many firms, the reliability of absorption costing followed. Thus, in the early 80s, the concept of activity-based costing was introduced (Lowder, 2006).

The actual usage of various costing methods in the industry is interesting, but different researchers indicate different extent of usage. The studied surveys dealing with how frequently different cost management methods are used (Pohlen and La Londe, 1994; van Damme and van der Zon, 1999) date to the 90s, when many companies were implementing activity-based costing and a lot has happened since. The general impression gained from the literature review however, is that the industry's interest in CM is diminishing. With the attention to concepts that are aimed at reducing cost in production and supply chains, such as lean (Womack, Jones and Roos, 1990) and supply chain management (Cooper, Lambert and Pagh, 1997) it is surprising that general CM methods appear to be used to a lesser and lesser extent. One explanation could be that the focus of CM is theoretically aimed towards the concept of supply chain, meaning that individual companies find little help in their own cost analysis. Conversely, when more and more companies adopt the supply chain management thinking and work with lean techniques, CM models that handle individual companies can be obsolete.

Perspectives in cost management models

The literature review has found a number of different models for dealing with costs, namely *activity-based costing, total cost of ownership, supply chain costing, total cost of relationship, total cost/ value analysis, the cost-to-serve method and global decision-making*. An important area of investigation is the various problems and decisions the cost management method is designed for.

The purpose of cost management is to cover all affected costs areas, but depending on what challenges/decisions/environments the model is intended for, the affected cost areas will differ. *Therefore, a crucial factor to study* in cost management is the scope of costs, or what kinds of costs that are considered in the model. Another decision that has to be made is how to account for and measure the costs. In general terms the contradiction in cost management can be described as not making the model too complex while avoiding sub-optimizations that

is not profitable for the entire company. Here, a number of dimensions of complexity are described. An organisation implementing a CM model has to determine where on these dimensions of complexity to place their model.

According to Fernie et al. (2001) there are two main objectives of ABC, either as a tool to measure performance in general or to measure impact of proposed changes in activities. Changes can, to name a few, concern supplier selection (Ellram, 1993; 1995), product pricing (Geri and Ronen, 2005), usage of central warehousing (Abrahamsson and Aronsson, 1999), or relocation of functions between companies (Dekker and Van Goor, 2000).

For the integrated supply chain models, the targeted problem can be rather undefined concerning the supply chain structure. A commonality for these papers is also that they are not primarily intended for decision support but instead for performance measurement and because of this the targeted problems are not the main concern in these papers.

Some models are designed for making specific decisions while others have a more general design, enabling them to be used as support for different kinds of decisions as well a general performance measurement. The negative aspect of a general design is of course the increased complexity required for creating a solid decision support.

Van Damme and Van Der Zon (1999), for example, address only decisions regarding the physical distribution of products in their ABC model and can therefore keep a rather narrow scope of costs. La Londe and Pohlen on the other hand, suggest that their model, among other things, can be used to “determine the overall effectiveness of the supply chain... evaluate alternative supply chain structures or select supply chain partners” (La Londe and Pohlen, 1996, p5).

For the purpose of this paper we discern three different perspectives on costing, namely: *purchasing perspective*, i.e. the costing that is conducted to evaluate different sourcing alternatives (including outsourcing); *supply chain perspective*, or costing to evaluate the efficiency of one supply-chain or competing supply-chains, and finally; *supplier perspective*, to evaluate suppliers' costs (see table 1)

Table 1 Different cost perspectives and corresponding CM-methods

	Method	Focus
Purchasing perspective	TCO	Supplier selection
	TCR	Logistics outsourcing
Supply chain perspective	SCC	Including logistics costs and information costs
	Traditional ABC	Product cost focusing production
	SCC+value	The same as SCC, value is also calculated
Supplier perspective	Supplier costing	Not focus on one product but on supplier

The review that follows aims to increase the understanding of this complexity by structuring the methods with regard to their different focuses/perspectives instead of describing each method explicitly.

The purchasing perspective

When talking about CM models for purchasing total cost of ownership (TCO) and its founder Lisa Ellram is often mentioned. Total cost of ownership is a model developed for supplier selection and evaluation and it is "determined on the grounds of ABC" (Degraeve and Roodhooft, 1999, p6). Analytical hierarchy process (AHP) is also used as a model for supplier selection (Bhutta and Huq, 2002).

Total cost of relationship (TCR) is a model designed with the involvement of Lisa Ellram as well, but here the purpose is to create a decision support for logistics outsourcing decisions instead of making a supplier selection for a component purchase (Maltz and Ellram, 1997). The model focuses on distribution to customers and since the outcome of this service is more difficult to define than when a component is purchased from a supplier, they propose some major modifications to the TCO model and hence rename it total cost of relationship.

Geri and Ronen (2005) proposes a global decision making (GDM) theory consisting of both a measurements profile, comparing financial and non-financial aspects between two alternatives, as well as a cost/utilization diagram, showing the resource utilization of different resources and finding constraints and excess capacities. This method, according to the authors, enables a 'light ABC' where focus remains on the relevant measurements,

complemented by the short term resource utilization mapping that ABC is criticised for lacking.

Bhutta and Huq (2002) compares the total cost of ownership method with the analytical hierarchy process (AHP) for supplier selection decisions, and judging by their conclusions they find AHP better suited for this purpose. In their adaptation of AHP different suppliers are qualitatively rated on selected criteria and based on these ratings the most favourable supplier is proposed. Depending on what evaluation criteria are chosen the complexity of the method can vary, but this method enables the inclusion of both strictly cost related as well as value-creating criteria.

Cost management is often carried out using quantitative methods and expressing the actual cost in a monetary form. There are however exceptions to this. In the “analytical hierarchy process” alternative actions are compared qualitatively using selected criteria. In Bhutta and Huq’s (2002) paper, the alternate actions concern supplier selection, but AHP can be used for other situations when alternatives should be prioritized as well (Bhutta and Huq, 2002). The second exception to expressing costs monetarily is the global decision making methodology, where factors as resource utilization and lead-time are proposed to be supporting the decision-making.

The Supply Chain perspective

ABC is criticised by La Londe and Pohlen (1996) for lacking a supply chain perspective. Instead they present the similar model ‘supply chain costing’ for dealing with costs involving multiple firms along a supply chain. Dekker and Van Goor (2000) on the other hand, defends ABC against the critique, explaining that it is merely the existing applications of ABC that lacks a supply chain perspective. Because of this, they outline an ABC model for supply chains that resembles La Londe and Pohlen (1996), though named differently. La Londe and Pohlen (1996) also claim that supply chain costing differs from other costing techniques by including transaction costs, information costs, physical flow costs and inventory carrying costs. In our view though, there is nothing saying that this could not be done in ABC or other costing techniques as well. Therefore supply chain costing might be considered a sub-category of ABC. This is also confirmed by Lin, Collins and Su (2001), who wrote a paper about supply chain costing which “specifically focuses on ABC as the preferred costing technique” (Lin et al., 2001, p705).

Supply chains can be managed in an integrated or disintegrated manner (Brewer and Speh, 2000) and the models studied present a varying adaptation to supply chain thinking. Most literature on cost management considers disintegrated individual firms and their cost management, even if research exists where an integrated approach is used, including multiple firms in a supply chain (Cavinato, 1992; Dekker and Van Goor, 2000; La Londe and Pohlen, 1996). Two models targeting an integrated supply chain (Cavinato, 1992; La Londe and Pohlen, 1996) are presented in a rather conceptual manner. Even if Cavinato (1992) provides a case where the described cost model is being used, the extent of actual interfirm cooperation is not given any attention. A reasonable explanation for the lack of thoroughly explained integrated supply chain cost models is the difficulty of making them practically

implementable. Dekker and Van Goor (2000) proposes an activity-based costing model for the entire supply chain, but stresses the need to keep it simple enough.

Joseph Cavinato wrote an article in 1992, just before the introduction of TCO and the peak of activity-based costing. In this article he criticised existing cost management for focusing on distribution only and identified a problem of “functional chimneys” where the cost of a product running through a firm is difficult to measure. Because of this, he created a total cost/value model that apart from including the emerged costs would require detection of the added function in every step, thus calculating the value created in a supply chain. The model *resembles an accounting method* and is constituted by 20 basic cost and value elements, reaching from basic price of materials to marketability and ultimate customer cost/value (Cavinato, 1992). Apart from being rather conceptual and avoiding a reasoning about the difficulties of carrying out such a model, it also distinguishes itself by the introduction of the value concept.

The customer perspective / supplier perspective

A general problem in logistics costing is the customer related factors indirectly influencing the costs of a firm. *ABC systems focus too much on costs related to products, services or departments and the customer related costs are often forgotten* (Degraeve and Roodhooft, 1999), which makes the companies lean towards cost minimization rather than customer centricity. The benefit of reducing stock levels is much easier to evaluate than the drawback of possible stock-outs and annoyed customers. *As mentioned*, it is much harder to define the output in logistics costing systems as compared to manufacturing dittos and this also makes it a lot harder to include the output in the calculated costs.

In the global decision making methodology a number of measures are used in a measurements profile. Geri and Ronen (2005) recommends using for example lead time and due-date performance, which are typical customer service related measures for logistics. Other models suggest rather straight-forward cost calculations based in the traditional division of logistics activities and excluding customer service related costs that are indirectly influenced by the logistic activities (e.g. Abrahamsson and Aronsson, 1999; Dekker and Van Goor, 2000; Lin et al., 2001). Some papers do not specifically explain what kind of cost areas to include and therefore leave it up to the user of the model to determine if costs of customer service should be included (e.g. La Londe and Pohlen, 1996; No and Kleiner, 1997).

CM applicability to different purchasing situations

The Kraljic (1983) purchasing matrix has been criticised for its lack of dynamism and movement of products and suppliers within the matrix (Geelderman & van Weele, 2002; Rehme et al. 2005). However, because of the models simplicity it is used by many corporations as one of the most important purchasing strategies (Rehme et. al 2005). The matrix divides four different types of purchases based on the supply risk (complexity of the supply market) on the one hand, and the financial impact (importance of purchasing) on the other, as depicted in figure 1 (Kraljic 1983).

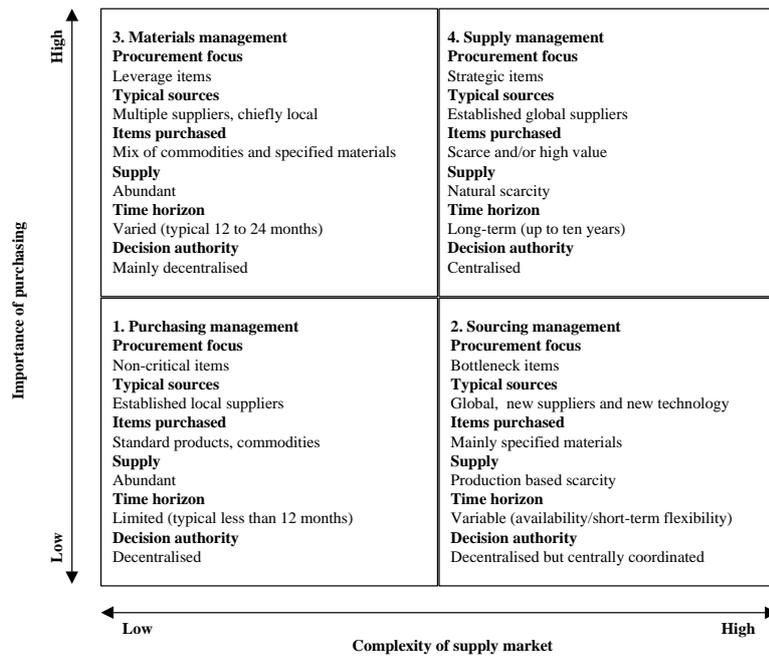


Figure 1 The Purchasing Matrix (Kraljic 1983, p 111)

For the purpose of this article we set out to define different CM-strategies and their usability for different purchasing situations, using the Kraljic classification matrix with some adjustments. Particularly within the group materials management there are companies that have opted for closer relationships and to develop supply chain management instead of using their buying clout on an open market, see figure 2 (see also Rehme et al 2005).

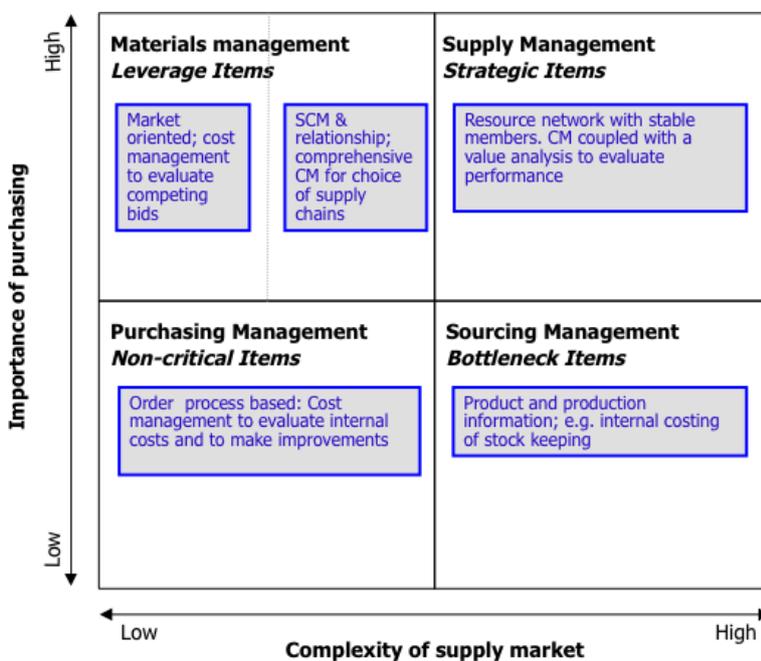


Figure 2 The adapted purchasing Matrix (Kraljic 1983, p 111, Rehme et al 2005 p 138)

The constant dilemma of CM is the degree of complexity to aim for in the model. Depending on what scope of cost is used, the complexity as well as the reliability of the model will

increase. This literature review has found several dimensions of complexity, or considerations that has to be considered:

- Internal, external or supply chain focus
- General performance measures or support for specific decisions
- Qualitative or quantitative model

In addition to this it is important to understand the degree of integration of customer service objectives as well as if one should consider both long and short term effects or if it suffice with one time horizon. From a purchasing perspective, it is also important to understand under what circumstances or purchasing characteristics different CM-models are applicable.

Table 2. Purchasing situations and corresponding CM-models

Purchasing Situation	Focus	General or specific measure	Model	Method
Purchasing Management	Internal Costing	Specific purchasing decisions	Predominantly quantitative	Traditional ABC
Sourcing Management	Internal & External Costing,	Continuous improvement	Quantitative	TCR TCO
Market Management	External	Purchasing decision	Quantitative	TCO
SC Management	Supply Chain	Supply Chain Decisions Continuous Improvements	Quantitative + Qualitative	SCC + TCR
Supply Management	Relationship	Continuous Improvements	Qualitative	SCC+value

These complexities are not a reason for avoiding CM models. Critical decisions still have to be made and measuring what is a successful way of doing business still has to be done in a more nuanced fashion than looking at the bottom line. A conclusion is however that a CM model giving exact answers is practically impossible to realise, it can only be used as a guideline that has to be combined with the experience and good judgement of the people involved in the decision making. It is also crucial that decision-makers understand the CM model and knows how to interpret the guidelines given by it.

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