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Applying activity-based costing in a supply chain environment

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ABSTRACT

Traditional intra-firm cost accounting tools are not appropriate in the context of supply chain management, as there are no standards for the definition and composition of costs. This prohibits exchange and comparison of cost data among different supply chain members. Against this background, several activity-based costing models for inter-firm cost accounting have been proposed. Evaluating these models, a conceptual framework for activity-based costing in a supply chain has been developed. This also forms the basis for a single case study conducted at Europe's largest company for façade components. This demonstrates how significant inter-firm cost saving opportunities can be identified and offers a first step in assessing the suitability of the proposed model.

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1. Introduction

In the course of the lean manufacturing movements in the early 1990s, optimisation programs were carried out, which mainly focussed on intra-firm specific processes (Jones et al., 1997). Besides concentrating on core competencies, one major reason was to reduce a company's own contribution to a product's value by outsourcing up to 70% of it to outside suppliers (McCarthy and Anagnostou, 2004). Such increased outsourcing of functions has put high demands on the coordination of activities within the supply chain. It is necessary to align inter-company material- and information-flows in order to meet market demands, e.g. to react flexibly in the sense of product functions, demand fluctuations or new delivery service requirements. Therefore, coordination is defined as a method to secure the effective and efficient combination of various firm-specific competencies with regard to manifold objects (information, actions, decisions, goals, etc.) (Simatupang et al., 2002). In line with this a debate on supply chain integration has emerged (see e.g. the review in Van der Vaart and van Donk, 2008).

Low total costs are frequently considered as a typical operational goal for supply chain management, asking for the application of cost management tools as "obvious" candidates (Mouritsen et al., 2001; Israelsen and Jørgensen, 2011). They are regarded as an impartial criterion for the evaluation of the profitability of strategic or operational action. Such information is usually available on an intra-company level, as it can be generated by intra-firm cost accounting tools (Askarany and Yazdifar, 2011). The coordination of a supply chain calls for an inter-firm accounting tool to secure the effective and efficient coordination of the value chain (LaLonde and Pohlen, 1996). This holds for the introduction of a completely new supply chain strategy as well as for the optimisation of certain processes (Seuring, 2009). Managers must be able to effectively assess in advance the cost consequences of any supply chain or process reconfiguration. Therefore, companies need inter-company cost accounting tools (Seuring, 2002a; Cooper and Slagmulder, 2004). These tools should enable them to assess costs based on a predetermined set of basic cost accounting standards in order to guarantee objective and rational decisions (LaLonde and Pohlen, 1996). Only a detailed assessment at every level of the supply chain allows distributing costs and benefits equally along the supply chain and leads, finally, to the "optimal" configuration of the supply chain network.

Due to the practical relevance of inter-firm cost accounting standards, some researchers have taken up these preconditions and have developed conceptual models for cost accounting in supply chains. Many of these considerations are based on activity-based costing as a related cost management technique (for a critical look at its status of implementation see Askarany and Yazdifar, 2011). However, such approaches concentrate on certain aspects of supply chain management and respective performance measures, only. Often, they concentrate just on efficiency increases in existing two-tier partnerships (see e.g. the literature review section in Zimmermann and Seuring, 2009). In doing so, such activity-based costing models leave considerations regarding an effective network set-up and spreading of production activities outside their scope, form a one of a kind approach and do not deal with how to integrate and compare different company accounting standards in one activity-based costing model (as discussed in the literature review).

Therefore this research approach focuses on the possibilities and limitations inherent in activity-based costing methodology for inter-firm cost accounting. The underlying inductive assumption is that

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by picking up theoretical insights existing models could be falsified, verified or modified by practical insights resulting in a new comprehensive framework.

Therefore the research questions can be formulated as follows: (1) How can activity-based costing in a supply chain be conceptualised in line with typical aims of an effective configuration and operation of the supply chain? (2) What (explorative) insights can be gained towards the validity of such an activity-based costing application in a supply chain based on a single case study?

This leads to the following structure of the paper, which comprises two major parts. The first section summarises previous research on inter-firm activity-based costing. Reflecting on these demands supply chain management places on inter-firm cost accounting, preliminary ideas about the design of such cost management systems are outlined. Based on this a conceptual activity-based costing model for the context of supply chain management is developed. Within the second part, these ideas are tested in a case study, which was conducted at a Germany based leading producer of façade components. This will be presented and discussed against the theoretical background developed in the first part. The paper concludes with a critical reflection on the findings by discussing the chances and limitations of inter-firm activity-based costing.

2. Literature review

2.1. Overview of activity-based costing models for supply chain management

Activity-based costing and its application in manufacturing environments have been widely discussed (e.g. Wouters, 1994; Gunasekaran and Sarhadi, 1998; Thyssen et al., 2006; Askarany and Yazdifar, 2011; Israelsen and Jørgensen, 2011). There are many examples in production management related decision, such as holding cost determination (Berling, 2008), decoupling point related decisions (Özbayrak et al., 2004), transport (Lin et al., 2001; Baykasoğlu and Kaplanoğlu, 2008) or distribution logistics (Pirttilä, Hautaniemi, 1995), product design (Tornberg et al., 2002; Ben-Arieh and Qian, 2003; Qian and Ben-Arieh, 2008), product modularity (Thyssen et al., 2006), product-mix decisions (Kee and Schmidt, 2000), production learing (Andrade et al., 1999) or process reengineering (Tatsiopoulos and Panayiotou, 2000) just naming a few ones. In the following paragraph, an overview of recent contributions regarding the development and application of activity-based costing models in the context of supply chain management is presented. Accordingly the contributions of LaLonde and Pohlen (1996); Dekker and van Goor (2000); Seuring (2002a, 2002b), Möller and Möller (2002), Bacher (2004) and Pohlen and Coleman (2005) are presented in the sequence of their publication. This list comprises all major contributions at the intersection of activity-based costing and supply chain management, but are limited to such ones, where emphasis is placed on the overall supply chain, not just a selected decision or issue within it. For the purpose of this paper, it seems more appropriate and relevant to discuss these contributions in detail than outlining a wider range of literature.

One of the early contributions that also coined the term "supply chain costing" is the paper by LaLonde and Pohlen (1996). In their paper, they point to the use of activity-based costing and outline a six step process for managing costs across a supply chain. Their approach stays on a normative level where it is neither discussed how it can be applied, nor is an example provided.

Dekker and van Goor (2000) present a case study conducted in the Dutch pharmaceutical industry. It describes the cost-effective optimisation of a three echelon supply chain (manufacturer—wholesaler—retailer). Their model focuses on logistical activities and the total supply chain costs are calculated by adding up the total activity-based costs of each company. The core principle of this model is a joint definition of activities and cost drivers in order to determine the cost-effective consequences of any process reconfiguration. Dekker and van Goor (2000) note that their model is only applicable for rough calculation of cost effects. Nevertheless, its power is described in a case study where the effect of inventory relocation from the manufacturer to the wholesaler is evaluated.

Reflecting thoughts on transaction cost economics, and based on the insights of LaLonde and Pohlen (1996); Seuring (2002a) presents a three step approach to activity-based costing in supply chains. The first step "inter-company integration of process modelling" describes a top-down process analysis based on the SCOR model (Stewart, 1997). Through a collaborative development of a unified process definition and, further, through a separation of costs into direct, process (activity-based), and transaction costs, it is possible to allocate costs to the different process steps and to model several process options. The second step "analysis of cost origins" of Seuring's model aims at assessing which of the identified process costs could be modified by the company on its own, and which of the transaction cost elements are influenced by inter-company decisions. Seuring (2002a) proposes a collaborative allocation of costs to the determined cost drivers, which forms a starting point for the third step "identification of cost modification opportunities". As the developed process scheme and underlying cost allocation is too complex to optimise all factors at once, the defined processes and cost drivers can be used to evaluate trade-offs. In doing so, it is possible to assess different supply chain design decisions regarding their cost effectiveness. Consequently, managers can assess the total costs of any supply chain modification. Seuring (2002b) explains the application of his model by a case study carried out in the apparel industry. It is shown how a reduction of colours of a textile producer leads to a significant reduction of supply chain costs, both for the textile producer and for the downstream apparel manufacturer.

Möller and Möller (2002) show how suppliers are integrated in the product development process based on an activity-based analysis of the total costs of supply. Activity-based costing information is used for pre-development budgeting purposes. This allows a determination of costs during product development and, finally, an evaluation of the performance of the suppliers. This is demonstrated in a case study conducted at ZF Friedrichshafen AG, a major supplier of the automotive industry. Möller and Möller (2002) calculate process costs using the standard activity-based costing methodology. Based on a three-staged process scheme, cost driver information is summed up to calculate product costs according to the necessary production processes (drilling, tempering, etc.). These costs serve as a target for determining a cost effective product structure and thus in selecting appropriate suppliers and supply chain structure.

Bacher (2004) picks up the conceptual model of Seuring (2002a) and criticises that it implicitly presumes the application of intra-company activity-based costing on an inter-company level. Moreover, he questions whether every company is willing to share sensitive cost information (Mouritsen et al., 2001). Against this background, he proposes a three-stage model in order to facilitate an inter-company quantification of cost information. Companies at the first stage jointly carry out process mapping initiatives and collaboratively identify cost drivers for every process activity. Based upon these definitions, process optimizations are elaborated and judged aiming to improve supply chain efficiency. On the second stage, companies assign cost information to the identified cost drivers in order to assess and optimise process performance. However, this is only carried out irregularly and based on a specific demand. In contrast, on the third stage, routines are developed to assign and exchange cost information continually.

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