



Low cost country sourcing and its effects on the total cost of ownership structure for a medical devices manufacturer

Matthias Weber^{a,*}, Michael Hiete^b, Lars Lauer^c, Otto Rentz^b

^a Universität Magdeburg, Emdener Str. 40, 10551 Berlin, Germany

^b Institute for Industrial Production, Universität Karlsruhe (TH), Hertzstraße 16, 76187 Karlsruhe, Germany

^c Siemens AG, Medical Solutions, Henkestraße 127, 91052 Erlangen, Germany

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ABSTRACT

In this paper, we describe a total cost of ownership (TCO) method as an activity-based costing (ABC) application along the value chain to measure and analyse the costs of international sourcing activities. We further describe the method's implementation for a manufacturer of high-tech medical devices. For this case study, we analyse the effects of shifting purchasing volume from traditional procurement market suppliers to low cost country suppliers on the cost structure of purchasing projects. We find that particularly costs at component and supplier level gain importance over traditionally dominating unit level costs. Furthermore, we identify low cost country sourcing as a decision with extensive impact on value chain entities other than purchasing. Finally, a considerable part of costs in low cost country sourcing accrue at the beginning of a purchasing project due to problems stemming from unsatisfactory initial quality, language barriers and intercultural communication.

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1. Introduction and purpose

Since purchasing is a central dimension in determining the competitive cost position of a company, many companies have sought for opportunities to further improve their purchasing performance. The approaches developed in academia and through practice have several starting points. Supplier selection methods (e.g., Aissaoui et al., 2007; de Boer et al., 2001; Degraeve et al., 2000; Snijders et al., 2003) aim at supporting the selection of the best supplier from a known set of suppliers by means of known selection criteria. Furthermore, there are authors who have worked on supplier selection criteria (cf. Bevilacqua et al., 2006; McIvor et al., 1997; Plank and Ferrin, 2002; Weber et al., 1991).

In many cases the main criterion for supplier selection is purchase price. However, other direct or indirect costs are related to the purchase of goods and should also be taken into account. This includes, e.g., opportunity costs as well as volatile costs, but also non-monetary criteria such as risk (e.g., Schoenherr et al., 2008; Smytko and Clemens, 1993; Song et al., 2007; Weber et al., 1991). For a better consideration of the hidden costs associated with the purchasing decision, several approaches have been developed, including life cycle costing, zero-based pricing, total

cost of ownership (TCO), total acquisition cost (TAC), transaction cost analysis (TCA), etc. Each approach has its own focus, advantages and disadvantages depending on the area of application (cf. Andersen and Buvik, 2001; Ellram, 1995b; Ellram and Zsidisin, 2002; Ferrin and Plank, 2002; Lindholm and Suomala, 2004; McIvor et al., 1997; Wagner, 2008).

With purchasing accounting for 60–70 percent of total expenditures in manufacturing (Herberling, 1993), international sourcing is considered a very attractive way to reduce a company's cost base by taking advantage of generally lower location factors in low cost countries. Several scholars have worked on supplier selection in international or global sourcing (Camuffo et al., 2006; Trent and Monczka, 2003a), where the set of suppliers is extended by suppliers from other countries. Determining the success of international sourcing however has been the central focus of many research endeavours (e.g., Kotabe and Murray, 2004). While advocates of international sourcing report of significant savings after suppliers' qualification, critics frequently argue that savings accrue predominantly in purchase price. They argue that on the other hand benefits in purchase price by cost-consciously choosing suppliers often can be offset by additional (hidden) costs which are not always considered in the equation (Chen and Yang, 2002; Levy, 1995; Min, 1994).

Hence, the contribution of the paper is twofold:

First, the paper aims at contributing to the controversial discussion on the benefit of international sourcing by developing and providing an example of a total cost of ownership method based on activity-based costing (ABC). This method allows

* Corresponding author. Tel.: +49 175 3182310; fax: +49 30 8845 2311.

E-mail addresses: Matthias.Weber@gmx.net (M. Weber),

Michael.Hiete@wiwi.uni-karlsruhe.de (M. Hiete), Lars.Lauer@siemens.com (L. Lauer), Otto.Rentz@wiwi.uni-karlsruhe.de (O. Rentz).

identifying and comparing direct and hidden costs of sourcing projects. Additionally, this method determines where these costs accrue in the sourcing company.

Secondly, we use this method to analyse two samples of purchasing projects for a manufacturer of medical devices in Germany: one sample includes purchasing projects from traditional procurement markets (TPM), the second one from low cost countries (LCC). We analyse differences in total cost, cost structure, sourcing-related activities and value chain. Particularly, we focus on the shift from sourcing in traditional procurement countries to sourcing in low cost countries.

Since one may expect international sourcing to be associated with additional effort for some purchasing activities (e.g., supplier development, negotiating, testing, etc.), costs along the internal value chain are taken into account.

The analyses are performed ex-post for a division of the medical devices manufacturer Siemens Healthcare, making use of real sourcing data. In this paper, low cost countries are understood as countries with relatively low wages like Eastern European Countries, China and India.

Consequently, the main questions addressed in the case study part of this paper are:

- What are the advantages and limitations of the suggested structured approach in determining direct and hidden costs of TPM and LCC sourcing? Can the proposed method be generalised to settings other than found in the case study?
- What are the major differences found in total costs and cost structure between TPM and LCC sourcing when the proposed method is applied?
- What implications can be derived for practitioners from the results of the case study? Are there potential implications for a company's purchasing function and other organisational entities?

The remainder of the paper is organised as follows: In the next section we will describe the general framework used for the analyses consisting of the total cost of ownership concept, activity-based costing and value chain analysis (VCA). Section 3 deals with the development, description and implementation of the ABC-based TCO model, the collection of data and the analyses performed on the cost data. In Section 4 we discuss the results of the TCO analysis and subsequent analysis steps. The paper ends with a conclusion, including a critical appraisal of limitations and an outline of potential areas for further research in Section 5.

2. Framework

When planning for successful international sourcing, a company's opportunities to conduct detailed ex-ante analysis of its purchasing strategy's effects are limited. Purchase price comparison is often the method of choice when it comes to planning, monitoring and measuring the success of international sourcing activities (Bozarth et al., 1998; Trent and Monczka, 2005). However, a low purchase price might be offset by lower quality and delivery reliability (Degraeve and Roodhooft, 1999a). Additional expenses might occur, e.g., for negotiating and contracting in a foreign language, supplier qualification, travel and transportation costs to more distant places, etc. Furthermore, uncertainties and risks might increase, e.g., the risk of supply chain interruptions. In a brief literature review, Song et al. (2007) illustrate that from the late 1980s a total cost perspective began to emerge, starting with a distinction between purchase price and non-performance costs, followed by the introduction of the TCO concept in the early 1990s. For the given problem, TCO shows advantages in comparison with life-cycle costing (LCC), zero-base

pricing, and cost-based supplier performance since pre-transaction costs as well as internal and external costs may be considered whereas no detailed understanding of the supplier's price structure is necessary (Ellram, 1995a).

In the following subsection, the total cost of ownership concept will be introduced as a more holistic approach to measuring international sourcing costs.

2.1. Total cost of ownership

The TCO concept was originally developed in 1987 to assess IT investments and has since been discussed and adapted by several authors for their specific needs (cf. Bremen et al., 2007). We define the TCO concept as of Ellram and Siferd (1993): "To evaluate a sourcing decision, all costs associated with the acquisition, use and maintenance of a product are taken into consideration". In their "cost wheel" Ellram and Siferd (1993) distinguish a large number of purchasing activities which contribute to TCO. Costs for activities in several departments and entities need to be considered to accurately measure the TCO of a sourced component. In their literature review, Bremen et al. (2007) describe the barriers of using TCO in practice. They refer to problems in determining relevant cost data for TCO. Traditional accounting systems, which many companies still rely on (Roztocki and Weistroffer, 2004), make it difficult to assign indirect costs to certain sourcing activities, and eventually to sourced products. Furthermore, Ferrin and Plank (2002) report problems in identifying underlying cost drivers when determining TCO. All of this brought Ellram and Maltz (1995) to conclude that "...TCO analysis is reserved for relatively large/important decisions, due to the amount of work required to conduct a thorough analysis."

Combining TCO and activity-based costing allows overcoming these problems at least to some extent, as described in the next section.

2.2. Activity based costing and TCO

The ABC accounting approach focuses on costs for activities rather than using structures like cost centres or (final) products (Kaplan and Andersen, 2007). It was Ellram (1995b) and Roodhooft and Konings (1996) who proposed ABC to determine total costs in order to support vendor selection. In activity-based costing, cost drivers can be identified at various cost hierarchy levels (Kaplan and Burns, 1987). For the purpose of assigning costs to sourced products, ABC therefore offers distinct advantages over traditional cost accounting since it provides information about the relationship between accruing costs and the underlying cost drivers. Limited ABC literature, however, is available on how to assign indirect costs to cost drivers (cf. Agndal and Nilsson (2007) who give also an overview over recent ABC literature with respect to TCO; Degraeve et al., 2000). For hierarchy levels of activities, Degraeve et al. (2005a) distinguish between unit level, product order level, order level, product level and supplier level (cf. also Degraeve et al., 2000; Degraeve and Roodhooft, 1999a, 2000). They argue that, using hierarchy levels, it is possible to monetise selection criteria which so far have only been considered qualitatively. However, for the sourcing company it is not only important to gain knowledge about the costs and their activity and cost drivers, but also where in the company and hence where in the internal value chain these costs accrue.

2.3. Value chain analysis of sourcing

In strategic management accounting, detailed knowledge about the costs accruing throughout the value chain is considered

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