



# **ABC IN METAL INDUSTRY: A TOOL FOR GAINING A COMPETITIVE ADVANTAGE**

**IOANNIS KAFETZIDAKIS,**

Hellenic Open University, School of Social Sciences, Greece

**ATHANASSIOS MIHIOTIS**

Hellenic Open University, School of Social Sciences, Greece

## **ABSTRACT**

In today's global competition environment, supply chain management (SCM) is considered to be a really crucial tool for managers helping them to optimize performance of enterprises. This paper examines the level of adoption of SCM strategies and particularly the activity based costing strategy in a large Greek metal industry. Metal industries have special characteristics that differentiate them strongly from the other type of industries especially due to the big life cycle of the products they produce, the fact that the companies are high capital-intensive and finally due to their global excess production. This means that the low cost of SCM is without doubt a basic prerequisite for a company aiming to acquire a competitive advantage..

Current study first identifies the level of adoption of activity based costing in a big exporting greek metal industry, then evaluates the contribution of the strategy to the supply chain management and the performance of the organization and finally focuses on the weaknesses of the Activity Based Costing (ABC) model suggesting specific strategic choices for the gain of competitive advantage which is proved to be a key component to enhance productivity, performance and profitability.

**Keywords:** competitive advantage, activity based costing, metal industry, supply chain

## **Introduction**

According to Peter Drucker year by year logistics turn from a "dark continent" of the economy into a sector that not only has become one of the most vital and interesting but also into a sector that has to present awesome challenges for the modern managers, preoccupying simultaneously some of the best minds in the field of operation and strategic management. Lalonde and Masters (1994) and also Mentzer (1993) have aptly pointed out that supply chain management is a dominant managerial function in which companies must focus in order to reduce their costs and increase their profitability. In the same scope the perceptiveness that the competition between the enterprises will not anymore take place between the companies itself but through their supply chains management (Christopher, 2005) seems to be totally correct. The last view clearly suggests the supply chain management as the most basic tool for the gain of competitive advantage. In addition, many researchers including Ellram and Liu (2002) and more recently Hofmann and Locker (2009), consider as granted that the right supply chain management contributes decisively in the increased performance of a company. At the same time more and more researches as the one of Singhal and Hendricks (2002) are coming to prove the direct correlation between the stock exchange share of a company with the performance of the supply chain management. Another research of D'Avanzo, Von Lewinski, and Van Wassenhove (2003) has also come to identify the close relationship between the efficient supply chain integration and economic performance of enterprises showing clearly that the growth rates of the capitalization of the companies' market with excellent SCM function is 7-26% higher than the average. Thus, it is evident that supply chain management (SCM) is definitely a key component of competitive strategy to enhance organizational productivity, performance and profitability (Gunasekaran et al., 2004). Many companies and especially industries try to make better use of SCM by implementing a variety of different techniques such as just-in-time (JIT), total quality management (TQM), lean production (LP), computer generated enterprise resource planning schedule (ERP), and Activity-Based Costing (ABC). The last is considered as one of the most talked about techniques for improving SCM and performance in organisations (Baykasoglu and Kaplanoglu, 2008; Ben-Arieh and Qian, 2003; Gunasekaran and Sarhadi, 1998; Kee, 2008; Qian and Ben-Arieh, 2008; Singer and Donoso, 2008; Tornberg et al., 2002; Tsai et al., 2008).

Due to the current competitive environment in metal industry, which is the field we are going to investigate, and product diversity as well, there should be no doubt that accurate product-cost information is critical for decision makers. In

line with the above argument, Charles and Hansen (2008b) recommend ABC as true product-cost assignments approach. According to their findings, ABC is a more accurate product-costing system than traditional volume-based costing systems especially when organisations are facing higher product diversity something that exists absolutely in the case of metal industries. On the other hand Comelli et al. (2008) in order to highlight the importance and the contribution of ABC to supply chain management, support strongly that ABC is the best costing model for diverse and complex manufacturing systems.

The current research approach focuses on the level of adoption of SCM strategies and particularly the possibilities that are created by implementing activity based costing strategy in a large Greek metal industry. The purpose of the study is to examine the possible use of ABC method in this company, to provide a tool to support work and to reach a conclusion on the real advantages and disadvantages of implementing this method. This study will help leaders and managers of the company to make decisions about the implementation of the method, as well as helping them to increase knowledge of the matter, providing a useful tool to the company. This forms the basis for a single case study conducted at HALCOR S.A. Eventually, through this research we examine how the company is able to respond in their supply chain management strategy, in order to remain successful in a global competitive environment, focusing on the activity-based costing within this supply chain environment. Hence the research questions are shaped as below: a) how can activity-based costing in a supply chain environment of a big metal industry be conceptualized in line with typical aims of an efficient configuration and operation of the supply chain? and b) what ideas can be emerged towards the validity of such an activity-based costing application in a supply chain management strategy based on a single case study? Thus the structure of the paper is shaped as follows. In general, the paper consists of two parts. The first section describes the competitive advantages that can be created through efficient SCM strategies focusing in the ABC method. This approach is based on previous researches summarizing the existing scientific knowledge on this important issue. The second part of the paper could easily be classified under the title: theory into practice. Within this part a conceptual activity-based costing model for the context of supply chain management is developed in a single case study contacted at a big Greek metal industry. The data needed for the case study was gathered by a personal interview that took place with the logistics manager of the company.

## **Supply chain management and competitive advantage**

In today's global marketplace, sustaining a competitive position is a supreme concern. Technological innovations and economic uncertainties have literally changed the face of the competitive arena (Esper, Fugate and Sramek, 2007). Many industries have progressed from slow moving, stable oligopolies to hypercompetitive environments characterized by intense and rapid competitive moves, in which competitors strike quickly, unexpectedly, and unconventionally and advantages are rapidly created and eroded (D'Aveni 1994, 1998). Recent research has gone further and indicates that, in general, periods of sustained competitive advantage have grown shorter over time (Wiggins and Ruefli 2005, McNamara, Vaaler, and Devers 2003). This new reality, therefore, challenges most industries (Wiggins and Ruefli 2005) and even the most seasoned executives (D'Aveni 1998).

Since the dynamics of the global marketplace have changed dramatically, the concept of supply chain management has become a critical part of the business environment. The lexicon of many firms has been enriched, including the term supply chain management and also all the related to that concept, issues. Linking the Supply Chain to the Business Strategy is one of the most critical issues that can lead the company to increase its competitiveness and also its share in the market (Patramanis, 2012). In doing so, SCM requires more accurate cost data regarding all activities and processes within the organizations. Given the above, activity based costing (ABC) can significantly contribute to global supply chain management as it is suggested to fulfill the above requirements by providing more accurate, detailed and up-to date information on all activities and processes in organizations (Askarany et al.,2010). It is more than 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 (Schulze et al.,2012). As a result, 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). Efficient cost management tools lead invariably to more efficient SCM and in the sequel to lower operational costs which is the required activity to gain a competitive advantage. Intra-firm cost accounting tools indisputably produce such information which is crucial for the evaluation of the profitability (Askarany and Yazdifar, 2011). The success of a supply chain management strategy calls for an inter-firm accounting tool to secure the effective and efficient coordination of the value chain (LaLonde and Pohlen, 1996). If managing directors want to achieve a competitive advantage in their market taking right and profitable decisions, cost accounting tools are needed

(Seuring, 2002a; Cooper and Slagmulder, 2004). It is true that 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 (Schulze et al.,2012). Within this scope, ABC can help a company gain a competitive advantage in a supply chain environment in many ways.

First of all it can improve the organization process by providing decision making support data. Secondly it may offer costing services of the transportation and facilitate optimal joint product mix decisions. It can also help in pricing control, in making capacity expansion decisions, in constructing cost-estimation model, in providing more accurate product-cost information in order to improve decision quality, in accurate costing of holding inventory, in estimating cash flow created by supply chain tactical production planning, in improving efficiency by identifying and eliminating areas of non-value added activity in supply chain processes, in offering supporting decision-making concerning product modularity method for evaluating the cost consequences of modularization, in designing and development of activities for production, in profitability modeling, enterprise modeling and business process reengineering and of course in cost reduction. Moreover it may be used as a tool for improving simulation models, identifying areas of waste and non-value added activities, improving productivity, quality and effectiveness of manufacturing and performance measuring systems, optimizing competitiveness, reducing the production time, contributing to the decision support for designers, production managers and manufacturers. In addition, it is a vital tool for improving the planning procedure and the quality of the products' profitability information while it can be very helpful for predicting the economic consequences of production and processes actions.

### **Research methodology**

Our research methodology has been carefully selected to be a case study as it is considered the most suitable approach for our survey representing the intersection of theory, structures and events (Gubrium, 1988) and attempting to ground theoretical frameworks with reality at the same time (Stuart et al.,2002). The research process was based on a five-stage procedure with summarized criteria (Seuring,2008) and the exact method followed in order to fulfill the theoretical aim of the research was exploratory research which is the most appropriate tool for relatively unexplored fields like the activity-based costing in supply chain management of metal industries (Voss et al, 2002). Although case studies usually are blamed for not being reliable, in our case the semi-structured interview with the logistics manager confined in the description of the general framework of supply chain strategy of the company and as a result there was any reason for the manager to give us false information. Since from the interview came of that the company

doesn't officially use the ABC method, then our aim was to shape a proposed potential ABC model according to the data we collected from the interview in the scope of gaining a serious competitive advantage in the global marketplace.

The case's study research process five stages were the following. In stage 1 the research question was formed according to our theoretical aim after exploration while in the second stage the instrument development was set determining the type of research and concluding in the case selection which was clearly the ABC's model contribution as a tool to a supply chain environment in metal industry. After that the data gathering step was followed which was mainly done through the interview, while in stage 4 the data analysis was presented thoroughly and the proposed ABC model was constructed. The proposed model was presented through process diagram with transaction analysis and data was transcribed in flow charts backed up with a detailed description of procedures, documents and information for each proposed process, activity. Finally an overall process evaluation was done regarding the case study quality and reliability.

### **Our survey-implementation of ABC in a Greek metal industry**

The HALCOR Group represents the copper product manufacturing and trading part of VIOHALCO. Through its strong production base which includes plants in Greece, Bulgaria and Romania, the HALCOR Group produces and distributes copper and copper-alloy rolled and extruded products and cables while being the sole producer of copper tubes and zinc rolled products in Greece. With its business presence spanning over 70 years in the copper processing and trade sector, the HALCOR Group is a strong entity comprising 18 companies, 8 production plants and having a significant commercial presence in European, Asian, American and African countries. The production base of the HALCOR Group companies is perfectly vertical and uses copper cathodes, zinc ingots and copper scrap as raw material to manufacture a wide range of products, from copper tubes, sheets and strips to brass circles and bars, as well as from zinc sheets and strips to special alloy products and cables. The relevant part of the supply chain examined through our case study includes the following stages: a) Import of primary cast metal, turtles, alloy elements, pre-alloys, pure metal, b) Melting in the furnace and mixing the pure metal with the alloys, c) Casting (plates or billetes), d) Production (Tubes, Rolled, Extruded) (hot rolled, cold rolled, extruding, reflation, annealing and other thermal treatments, e) Quality Control in the final product, f) Packaging and g) distribution. (fig.1). The required data needed for our survey, was gathered through a personal interview with the logistics manager of the company who is an economist.

Our survey reveals that ABC technique is not a practice at the moment that is applied in the scope of allocating costs in the industry. There is a segmental

confrontation of the SCM and it is really difficult to measure any change in the financial results. Two different departments are responsible for the supply chain management (Logistics department & Purchase Department) and co-operate with each other. The logistics department mainly deals with inventory issues and demand forecasting while the purchase department controls the purchasing procedures. Of course, costs are calculated individually in the supply chain but due to the fact that the group has 18 companies and 8 production plants to manage, it is more than difficult to create an industrial accounting gathering information regarding the transformation of production factors accompanying the value creation process. Costing systems are the most important source of information and a very serious supporting system for the decision making process. There are many ways and various methods to determine costs and amongst them the ABC is considered as the most accurate. Let us now look into a suggested activity-based costing model that we have shaped for the case of the copper industry we investigate. Our main purpose is to determine the way in which costs are allocated to the final products. The model development is based on the Seuring's simplified product-relationship matrix of supply chain management (fig.2).

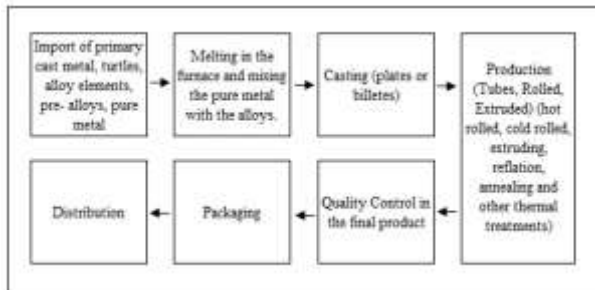


Fig.1 The relevant part of supply chain

<b>Relationship dimension</b>			
Configuration	I. Strategic configuration of product and network	III. Formation of the production network	
	II. Product design in the supply chain	IV. Process-optimization in the supply chain	
Operation	Product design	Production and Logistics	<b>Product dimension</b>

Fig.2 The product-relationship-matrix of SCM (Seuring, 2009 )

The model consists of two stages. The first stage reflects requirements of the product design phase of the product-relationship matrix, while the second stage results give the necessary input for the production phase. In figure 3, the model is thoroughly presented and described as well. In the product design phase the company must already be able to decide the SCM strategy that it is going to follow. However, product design and business relationship may not already be totally defined and in such a confusing environment a tool that is able to convert cost considerations into specific results (even qualitative in the beginning) is really needed. Thus, in the first stage the company should map the supply chain and define possible cost drivers. After that, in the second stage, calculation of the rates of the defined cost drivers is strongly suggested. By calculating the specific cost of each sub-process, all supply chain members are aware of the costs of carrying out each one activity. These type of information gives us the chance to evaluate the reallocation of activities if it is necessary, to see in depth the possibility of a potential automation of some activities and generally to take corrective actions in our supply chain management having located exactly the nature and the dimensions of the costing problem.



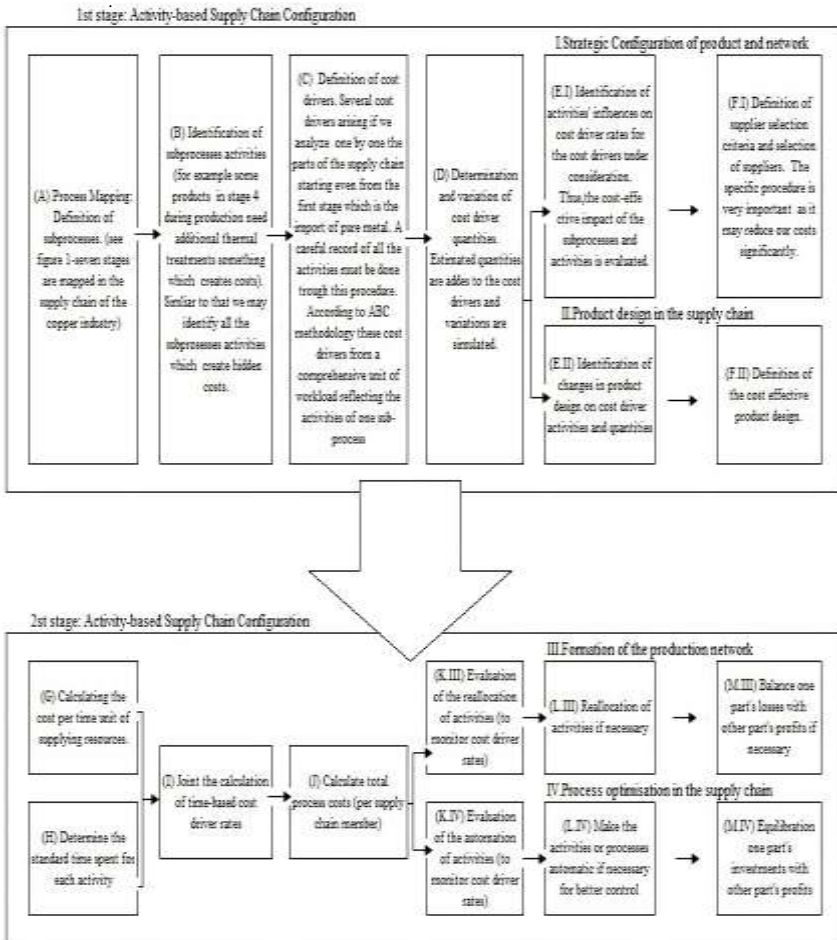


Fig.3 Developed Activity-based costing model for supply chain management

### Conclusions-Discussion

Despite the indisputable critical role of ABC in terms of improving the organizations' performance and their SCM, the adoption of the method is still relative low. Our current survey in the biggest greek metal industry comes to confirm this assumption. Manufacturing organizations like the one examined are looking to produce high-quality products more quickly and with the lowest

possible cost. To achieve that, it is required to be more productive, integrated, highly flexible and mainly to have a realistic and precise cost estimation approach. Managers need to fully understand the cost, time and quality of activities performed by employees or machines throughout the entire enterprise. ABC is the cost accounting method that can overcome most of the limitations of the traditional cost accounting methods like variable costing, absorption costing, order cost, process cost or standard cost. In fact, the strategy to be implemented depends absolutely on what the company finally wants to achieve. With the implementation of the ABC the activities are the focus. Of course before identifying the activities someone should first make a careful analysis of the company's chain of value, in order to search for relevant data associated with the strategy to be implemented. Then the output is measured by each activity in order to better describe the necessary activities' rates, for the calculation of the products' cost. A cost system based on activities can improve costs quality, content, importance and information. Furthermore, the precision of cost attributions from the raw material to the final product. ABC implementation requires a thorough analysis of the company's internal control system like for example a full definition of function and process flow. This paper actually revealed that the management of companies focus only on certain aspects of supply chain management, implementing partially the activity-based costing method even if they declare that officially they still don't use the method. The case study conducted, presented a conceptual activity-based costing model for the copper industry revealing that standardized cost information i.e. an activity based costing tool implemented at all SCM members can support related supply chain decisions, creating thus, a serious competitive advantage for the strategy of the industry.

On the other hand, several disadvantages are listed through our survey and the interview concerning the implementation of ABC in the metal industry. Among others we could say that the method is complex, time consuming, and costly while high implementation costs are created. Furthermore there is a constant need for revision and it takes too many data into account creating great difficulties in the extraction of information. At the same time it is really difficult for the company's workers to get involved something which is crucial for the correct information flow and moreover there is a definite need for company's reorganization before the implementation. Still, there is great difficulty on information integration between departments and it is highly required the existence of qualified and experienced staff for the implementation and follow-up. Additionally it may sometimes create greater concern to generate strategic information rather than for using it and beside that, the process of data collection and data entry requires substantial resources and remains costly to maintain. Substantial enough is that ABC reports do not conform to generally accepted accounting principles (GAAP) and as such, firms following ABC need to maintain two cost systems and accounting books, one for internal use

and another for external reports, filings, and statutory compliance. The above is considered a cumbersome duplication of efforts resulting in more time consuming procedures. One last but not least disadvantage of ABC is that it is not possible to divide some overhead costs such as the chief executive's salary on a per-product usage basis. Similarly, employees rarely devote 100% of their working hours to productive activities, and not all productive activities add value to the product or process of the firm. For instance, the ABC method fails to account for the time employee takes part in a first aid awareness campaign, leading to substantial 'cost leaks.' There is no meaningful way to assign such 'business sustaining' costs to products on a proportionate basis, and products and services share such costs equally.

Despite its disadvantages ABC still maintains its major advantage which is the ability to estimate the cost of individual products and services precisely especially within a complex industrial environment with many engineering processes. By transferring overhead costs to individual units of products or services, ABC helps identify inefficient or non-profitable products or activities that eat into the profitability of efficient processes or highly profitable products. Regarding the drawbacks that we highlighted above, the use of a special ERP module will probably solve most of the problems.

## References

- Ascarany,D.,Yazdifar,H.,Askary,S.,2010, Supply chain management, activity-based costing and organisational factors, *International Journal Production Economics* 127 : 238–248
- Askarany,D.,Yazdifar,H., 2011, An investigation into the mixed reported adoption rates for ABC: evidence from Australia, NewZealand and the UK, *International Journal of Production Economics*: doi:10.1016/j.ijpe.2011.08.017.
- Baykasoglu, A., Kaplanoglu, V., 2008, Application of activity-based costing to a land transportation company: a case study, *International Journal of Production Economics* 116: 308–324.
- Ben-Arieh, D., Qian, L., 2003, Activity-based cost management for design and development stage, *International Journal of Production Economics* 83: 169–183.
- Charles, S.L., Hansen, D.R., 2008b, An evaluation of activity-based costing and functional-based costing: a game-theoretic approach, *International Journal of Production Economics* 113: 480–494.
- Christopher,M., 2005,*Logistics and Supply Chain Management: Creating value-Adding Networks*, 3rd ed., Prentice Hall
- Comelli, M.,Fenie` s, P.,Tchernev,N.,2008,A combined financial and physical flows evaluation for logistic process and tactical production planning: application

in a company supply chain, *International Journal of Production Economics* 112:77–95.

Cooper, R., Slagmulder, R., 2004, Interorganizational cost management and relational context, *Accounting, Organizations and Society* 29 (1): 1–26.

D'Avanzo, R., Lewinski, H., and Van Wassenhove, L., 2003, The Link between Supply Chain and Financial Performance, *Supply Chain Management Review* 7 (6): 40–47.

D'Aveni, R., 1994, *Hypercompetition: Managing the Dynamics of Strategic Maneuvering*, New York: The Free Press.

D'Aveni, R., 1998, Waking up to the New Era of Hypercompetition, *Washington Quarterly Winter* 21 (1): 183–185.

Drucker, P., 1962, The Economy's Dark Continent, *Fortune*: 103–4.

Ellram, L., Baohong, L., 2002, The Financial Impact of Supply Management, *Supply Chain Management Review* 6 (6): 30–37.

Esper, T., Fugate, B., Sramek, D., 2007, Logistics learning capability: sustaining the competitive advantage gained through logistics leverage, *Journal of Business Logistics* 28 (2): 57–88

Gubrium, J., 1988, *Analyzing Field Reality: Qualitative Research Methods*, Sage: Newbury Park.

Gunasekaran, A., Patel, C., McGaughey, R.E., 2004, A framework for supply chain performance measurement, *International Journal of Production Economics* 87: 333–347.

Gunasekaran, A., Sarhadi, M., 1998, Implementation of activity-based costing in manufacturing, *International Journal of Production Economics* 56–57: 231–242.

Hofmann, E., and Alwin L., 2009, Value-based Performance Measurement in Supply Chains: A Case Study from the Packaging Industry, *Production Planning & Control* 20 (1): 68–81

Kee, R., 2008, The sufficiency of product and variable costs for production-related decisions when economies of scope are present, *International Journal of Production Economics* 114: 682–696.

LaLonde, B.J., Pohlen, T.L., 1996, Issues in supply chain costing, *The International Journal of Logistics Management* 7 (1): 1–12.

Lalonde, B., Masters, J., 1994, Emerging Logistics Strategies: Blueprints for the Next Century, *International Journal of physical distribution and Logistics Management* 24 (7): 35–47.

McNamara, G., Vaaler, P., and Devers, C., 2003, Same as it Ever Was: The Search for Evidence of Increasing Hypercompetition, *Strategic Management Journal* 24 (3): 261–278.

Mentzer, J., 1993, Managing Channel Relations in the 21st Century, *Journal of business Logistics* 14 (1): 27–42.

Patramanis E., 2012, *Supply Chain strategies and their contribution to the competitiveness of business organizations. The importance of partnerships*, Master Thesis, Hellenic Open University, Patras.

Qian, L., Ben-Arieh, D., 2008, Parametric cost estimation based on activity-based costing: a case study for design and development of rotational parts, *International Journal of Production Economics* 113: 805–818.

Schulze, M., Seuring, S., Ewering, C., 2012, Applying activity-based costing in a supply chain environment, *International Journal Production Economics* 135: 716–725.

Seuring, S., 2009, The product-relationship-matrix as framework for strategic supply chain design based on operations theory, *International Journal of Production Economics* 1–12: doi:10.1016/j.ijpe.2008.07.021.

Seuring, S., 2002a, Supply chain costing—a conceptual framework. In: *Cost Management in Supply Chains* (Seuring, S., Goldbach, M.), Physica-Verlag : Heidelberg, pp 16–30.

Seuring, S., 2008, Assessing the rigor of case study research in supply chain management, *Supply Chain Management—An International Journal* 13(2): 128–137.

Simatupang, T.M., Wright, A.C., Sridharan, R., 2002, The knowledge of coordination for supply chain integration, *Business Process Management Journal* 8 (3): 289–308.

Singer, M., Donoso, P., 2008, Empirical validation of an activity-based optimization system, *International Journal of Production Economics* 113: 335–345.

Singhal, V., Hendricks, K., 2002, How Supply Chain Glitches Torpedo Shareholder Value, *Supply Chain Management Review* 6 (1/2) : 18–24.

Stuart, I., McCutcheon, D., Handfield, R., McLachlin, R., Samson, D., 2002, Effective case research in operations management: a process perspective, *Journal of Operations Management* 20 (5): 419–433.

Tornberg, K., Jansen, M., Paranko, J., 2002, Activity-based costing and process modelling for cost-conscious product design: a case study in a manufacturing company, *International Journal of Production Economics* 79: 75–82.

Tsai, W.-H., Lai, C.-W., Tseng, L.-J., Chou, W.-C., 2008, Embedding management discretionary power into an ABC model for a joint products mix decision, *International Journal of Production Economics* 115: 210–220.

Voss, C., Tsikriktsis, N., Frohlich, M., 2002, Case research in operations management, *International Journal of Operations & Production Management* 22 (2): 195–219.