

A decision-making approach for investigating the potential effects of near sourcing on supply chain

Original

A decision-making approach for investigating the potential effects of near sourcing on supply chain / Cagliano, ANNA CORINNA; DE MARCO, Alberto; Rafele, Carlo; Arese, M.. - In: STRATEGIC OUTSOURCING. - ISSN 1753-8297. - STAMPA. - 5:2(2012), pp. 100-120. [10.1108/17538291211257574]

Availability:

This version is available at: 11583/2495834 since: 2016-11-11T17:39:35Z

Publisher:

Emerald

Published

DOI:10.1108/17538291211257574

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

A decision-making approach for investigating the potential effects of near sourcing on supply chain

Anna Corinna Cagliano, Alberto De Marco, Carlo Rafele, Marco Arese

Department of Management and Production Engineering

Politecnico di Torino, Torino, Italy.

Abstract

Purpose: Near sourcing is starting being regarded as a valid alternative to global sourcing in order to leverage supply chain (SC) responsiveness and economic efficiency. The present work proposes a decision-making approach developed in collaboration with a leading Italian retailer that was willing to turn the global store furniture procurement process into near sourcing.

Design/methodology/approach: Action research is employed. The limitations of the traditional SC organisation and purchasing process of the company are first identified. On such basis, an inventory management model is applied to run spreadsheet estimates where different purchasing and SC management strategies are adopted to determine the solution providing the lowest cost performance. Finally, a risk analysis of the selected best SC arrangement is conducted and results are discussed.

Findings: Switching from East Asian suppliers to continental vendors enables a SC reengineering that increases flexibility and responsiveness to demand uncertainty which, together with decreased transportation costs, assures economic viability, thus proving the benefits of near sourcing.

Research implications: The decision-making framework provides a methodological roadmap to address the comparison between near and global sourcing policies and to calculate the savings of the former against the latter. The approach could include additional organisational aspects and cost categories impacting on near sourcing and could be adapted to investigate different products, services, and business sectors.

Originality/value: The work provides SC researchers and practitioners with a structured approach for understanding what drives companies to adopt near sourcing and for quantitatively assessing its advantages.

Keywords: supply chain management; purchasing; near sourcing; store furniture; decision-making

Introduction

In recent decades, companies have viewed global sourcing as a way to focus on their core business activities and enhance their competitive positions. Global sourcing can be generally defined as proactively integrating and coordinating materials, processes, technologies, and suppliers across worldwide purchasing, engineering, and operating locations (Trent and Monczka, 2003). This definition indicates that global sourcing is more than simply buying from international suppliers; it is a strategic effort aimed at integrating requirements and developing global purchasing synergies (Quintens *et al.*, 2006). Sourcing materials and finished products from foreign vendors, who are typically based in emerging countries, is driven by a number of potential benefits. The lower cost of operations offered by low-wage countries may not be the crucial reason for building an international supplier base (Oke *et al.*, 2009). Other advantages can also be identified (Kotabe and Murray, 2004; Quintens *et al.*, 2005). Foreign products may incorporate the benefits of more advanced technologies. Moreover, global sourcing may increase the availability of specific items by offering a wider

range of potential vendors, and it may provide access to distinctive resources. Finally, global sourcing may be a way to enhance domestic competition, enter new markets, and seize fiscal opportunities.

However, recent social and economic changes, such as the rising cost of labour in emerging countries, the rising cost of oil, the volatility of currency exchange rates, and an increased awareness of the inflexibility, non-responsiveness, and hidden costs often associated with offshore suppliers (Lowson, 2002; Jones, 2009; Sinha *et al.*, 2011) have led researchers to reconsider the implications of such events on outsourcing developments (Busi and McIvor, 2008). These changes have also led companies to replace global sourcing, or at least to combine it with the domestic purchasing or near sourcing strategies they had followed in the past.

Near sourcing is defined as manufacturing or procuring products and services from foreign suppliers located in continental regions rather close to the company's own facilities and customers for the purpose of ensuring more responsiveness at what are still relatively low prices (Mitchell, 2009; Raiborn *et al.*, 2009; Christopher and Holweg, 2011). Despite the potential benefits of near sourcing, there is still little analysis of the advantages this approach can offer to the supply chain (SC). Additionally, global sourcing requires the development of SC configurations to meet the associated transportation and lead-time requirements so that decreasing the geographical distance from the supplier base demands substantial efforts in business process reengineering. For these reasons, companies are just beginning to take the first steps toward near sourcing, particularly in those industries where the increased price of oil exacerbates the already high salience of transportation costs, such as furniture, apparel, footwear, and steel (Shelton and Wachter, 2005; Lynch, 2008; Allon and Van Mieghem, 2010). Additionally, American-based multinational companies like Caterpillar and Ford have recently moved their production facilities back to the United States and Mexico due to the

combined effects of rising labour costs, currency strengthening in Far East countries, and incentives offered by governments to invest in local manufacturing activities as a way to alleviate periods of economic crisis (Cappellini, 2011).

Many studies have focused on the benefits and drawbacks of sourcing and manufacturing globally, but only a few studies address the purposes and outcomes of near sourcing policies. It is, therefore, important for researchers to investigate the factors that cause companies to purchase from suppliers who are in less-distant locations in order to achieve a better understanding of the impact of near sourcing on SC reorganisation and efficiency.

As a contribution to the analysis of the near sourcing business trend, this study explores the process and motivations that led a leading Italian mass-fashion vertical retailer to shift from an East Asian purchasing strategy to near sourcing for the furniture in flagship retail stores. A decision-making approach is developed to analyse alternative scenarios and to demonstrate the advantages of near sourcing in a period when the costs and the time required for transportation are rising. This study shows the opportunities that near sourcing can bring to SC reengineering and efficiency.

The paper is organised as follows: pertinent literature is presented in the next section, and the third section describes the development of the decision-making approach and the results of applying that approach in the subject company. Finally, implications, limitations, and future research directions are discussed in the fourth section.

Review of literature

Purchasing products and outsourcing manufacturing and service activities worldwide are crucial components of an SC strategy that focuses on core competencies and on achieving improvements in profitability, efficiency, and flexibility, with the ultimate goal of securing a competitive advantage (Kang *et al.*, 2009). The following sections highlight the benefits of

global sourcing. They also extensively discuss the related limitations and costs of global sourcing and present near sourcing as a way to overcome these limitations. Models for sourcing decisions are also reviewed in order to frame our approach in the context of the existing literature.

Benefits and limitations of global sourcing

Global sourcing is widely recognised as having the potential to bring many benefits such as the following: cost reduction through purchasing or producing in low-cost markets, decreased capital expenditure, organisational flexibility, access to better skills and talent, access to the most advanced technologies and infrastructure, access to new markets, an increase in the number of available sources, enhanced competition for the domestic supply base, better control over quality, and improved efficiency. In addition, relying on an international SC may be a way to take advantage of legal and economic conditions in foreign countries and to offset government regulations and local restrictions, such as requirements that companies must buy a predefined amount of products and services from local companies, or that they must rely on the national market for a given percentage of the labour force (Handfield, 1994; Bozarth *et al.*, 1998; Cho and Kang, 2001; Trent and Monczka, 2003; Kremic *et al.*, 2006; Quintens *et al.*, 2006; Christopher *et al.*, 2011). However, the impact of a global SC is not all positive.

Cost, quality, and technological performance are important competitive variables, but in recent years companies have had to compete increasingly on the basis of time because success often depends on a company's ability to meet the changing needs of customers more quickly than the competition (Jiang, 2003; Christopher *et al.*, 2006). The greater geographical distances that characterise worldwide supplier networks bring long order-cycle times along with inherent consequential disadvantages. Long lead times affect inventory availability (Meixell and Gargeya, 2005) and may result either in products being out of stock or in huge

surpluses. In particular, the substantial variability that sometimes results from unreliable transportation systems may compromise delivery performance. In this way, the long cycle times undermine flexibility and responsiveness to demand swings, and they often damage the company reputation and ultimately lower sales (Cho and Kang, 2001; Christopher *et al.*, 2006; Christopher *et al.*, 2011).

Quality issues may also turn out to be a disadvantage of global sourcing if suppliers do not meet the agreed-upon standards (Flynn *et al.*, 2007; Berman and Swani, 2010). Poor quality may relate not only to the quality of the products but also to the quality of services relating to the delivery of products or the handling of returned goods.

The lack of buyer-supplier proximity also makes it difficult to integrate a just in time (JIT) philosophy with global sourcing. On the one hand, JIT is applied through practices such as single sourcing, suppliers based in a close location, long-term relationships, buyer-supplier coordination, frequent deliveries of small orders, and stable SC pipelines. On the other hand, global sourcing is associated with large distances, long and variable lead times, quality variance, use of multiple suppliers, shipments in huge volumes in order to achieve economies of scale, and communication difficulties that obstruct rapid problem solving (Das and Handfield, 1997; Humphreys *et al.*, 1998). Global purchasing with a focus on price has proven to be minimally compatible with JIT and lean supply systems. Because suppliers may be suddenly replaced with cheaper ones, there is little certainty about long-term relationships. Vendors are therefore reluctant to invest in developing technology and in aligning their operations with their customer's requirements. Furthermore, the long time it takes to select global suppliers prevents companies from involving the suppliers in the early stages of product development. Finally, when costs are emphasised over all other terms of the contracts, suppliers tend to initially hide factors that might lead to higher costs and to subsequently ask for increases (Nellore *et al.*, 2001).

The application of JIT principles in conjunction with global sourcing is not widely practiced because it is difficult and expensive. On the other hand, it may still be an interesting possibility, especially in relation to products that represent a company's main business (Handfield, 1994; Levy, 1997). Strategies for implementing JIT in international sourcing can be found in both literature and practice (Handfield, 1994; Das and Handfield, 1997; Humphreys *et al.*, 1998). To make frequent deliveries from foreign suppliers more feasible, inbound logistics strategies may be applied such as consolidating freight from different origins, planning deliveries from intermediate stocking locations near customers, buyer warehousing on a consignment basis, selecting reliable carriers, establishing long-term relationships with carriers, and adopting overnight delivery. Improving production plans and setting precise dates of dispatch can help to reduce schedule changes and the expense of expedited deliveries. Frequent and rapid communication between suppliers and buyers facilitates easy sharing of forecasts and production plans. Decreasing SC volatility in this way, and developing a reliable partnership with even a single offshore vendor, can contribute to an effective solution for quality issues.

The substantial risks that the aspects of global sourcing described above add to buyer-supplier relationships are exacerbated by different languages, time zones, currencies, and business practices. Additional problems result from the heterogeneous economic, political, cultural, and legal environments, and from the negative impact of excessive CO₂ emissions and a large carbon footprint on sustainability (Rao, 2004; Wilkinson *et al.*, 2005; Christopher *et al.*, 2011). Finally, outsourcing corporate functions may lead to a loss of knowledge, skills, and corporate memory, and may cause power to shift. The result may be an inherent proclivity towards opportunistic behaviour (Kremic *et al.*, 2006).

Costs of global sourcing

Global SCs are complex dynamic systems, and disruptions that interact with the extended lead times may result in costs that are large enough to offset any price benefits (Levy, 1997).

According to the classification scheme developed by Holweg and others (2011), global sourcing costs may be grouped into three categories: static, dynamic, and hidden costs. Static costs, which are incurred on a regular basis in a global sourcing agreement, include the purchase price, transportation costs, order-processing costs, custom-clearance and brokerage expenses, insurance costs, packaging and handling charges, costs of loss and damages, disposal expenses, and costs of quality control and compliance with safety and environmental standards (Handfield, 1994; Zeng, 2003; Holweg *et al.*, 2011).

Dynamic costs relate to the effects of demand fluctuation on the SC, and they comprise inventory-holding costs, costs of lost sales and stock-outs due to inflexibility and failure to respond to demand shifts, and costs of urgent shipments to avoid supply interruptions. Warehousing and other dynamic costs become particularly important in JIT global sourcing because of the necessity of meeting customer delivery and lot-size needs (Das and Handfield, 1997; Holweg *et al.*, 2011).

Hidden costs are not directly connected to SC operations, but they influence the profitability of global sourcing policies and are quite difficult to predict. The following costs belong to this group: currency fluctuations, labour cost inflation, changing energy costs, costs associated with the risk of political and economic instability, potential costs of losing intellectual property rights, social costs associated with low morale such as high absenteeism and low productivity of personnel, and costs of managing the international supply base. The last item includes travel and communication expenses, costs for coordinating shipments from multiple vendors, indirect costs for contract generation and monitoring, and transaction costs (Christopher *et al.*, 2006; Kremic *et al.*, 2006; Quintens *et al.*, 2006; Holweg *et al.*, 2011).

Hidden costs often originate from economic and financial events that put high cost pressure on offshore suppliers, which is in turn transferred to their customers. Some examples are the recent reductions in the value added tax (VAT) rebate that had been provided to companies that produce in China and export to other countries, the appreciation of the Chinese Yuan (RMB) when it was unpegged from the US Dollar in 2005, and the enforcement of minimum wage standards in order to address human rights issues (Kumar *et al.*, 2009).

However, companies tend to underestimate the costs of global sourcing, especially the dynamic and hidden costs (Lowson, 2001; Weidenbaum, 2005; Lampel and Bhalla, 2008). Researchers have demonstrated that additional sourcing costs are on average 50% of the total cost of purchasing the product even though they are often perceived to be just 25% (Platts and Song, 2010). Thus, on the one hand, it is necessary to go beyond the estimation of the purchase price and other direct expenses and to calculate the total cost of ownership (Ellram and Siferd, 1998) out of global sourcing strategies in order to determine whether the policy that was intended to be economically viable actually achieves the expected savings. On the other hand, effective SC strategies need to be developed for those situations where global sourcing proves not to be successful.

Near sourcing strategies

Whenever the disadvantages of global sourcing and related costs exceed the advantages and price savings, near sourcing strategies can be adopted to optimise labour, material, and fully landed costs when risk, speed to market, and flexibility have all been taken into account (Shister, 2008). Near sourcing provides SC agility to cope with uncertainty. The benefits that follow from the reduced geographical distance between buyers and suppliers include shorter lead times, reduced logistics costs, and easier coordination because of closer cultural compatibility. In particular, the short lead times associated with near sourcing allow

companies to overcome the limitations that are inherent to global sourcing and to achieve the flexibility they need to address demand variability. These characteristics make near sourcing suitable for application in cases of high operations risk (Aron and Singh, 2005), and they allow it to be integrated with JIT policies. Furthermore, near sourcing may be an interesting alternative to global sourcing for small firms because it usually involves limited set-up costs. Finally, near sourcing policies can contribute to a reduced carbon footprint because they require less fuel consumption (Mitchell, 2009). Canada and Mexico are the most popular near sourcing locations for US firms, followed by other countries in Latin America, while eastern European countries play the same role for companies located in western Europe (Fielding, 2006; Gonzales *et al.*, 2006; Edgell *et al.*, 2008; Lacity *et al.*, 2008; Thelen *et al.*, 2010). Central and eastern European countries offer the benefit of lower labour costs than western Europe. Labour in such nations is more expensive than in traditional Far East locations. However, geographical and cultural ties, a partially common language, and the availability of trained professionals make suppliers in central and eastern Europe very attractive to western companies (Meyer, 2006; Lacity *et al.*, 2008).

To take advantage of the full potential of near sourcing strategies, the choice between global and near sourcing options should be supported by an adequate decision-making model that addresses the elements that have the greatest impact on the relevant business. Several frameworks that are available in the existing literature focus primarily on the contrast between make and buy policies and between local and global sourcing options. The literature also makes a particular reference to the outsourcing of processes. The frameworks will be discussed in the following section by highlighting the elements that could also be useful for decisions about near sourcing.

Decision-making models for outsourcing

The decision-making models for choosing among alternative sourcing strategies can generally be described on the basis of the nature of the approach (i.e., qualitative or quantitative) and the selection criteria that are taken into account.

A number of publications offer conceptual frameworks suggesting the factors that should be taken into account in considering whether to outsource (Quinn and Hilmer, 1994; Fill and Visser, 2000; Tayles and Drury, 2001; Gottfredson *et al.*, 2005; Graf and Mudambi, 2005; Dobrzykowski *et al.*, 2010; Holweg *et al.*, 2011). Some of the contextual criteria most frequently mentioned in such works are the following: the geographic distance between the buyer and the supplier; the quality of the infrastructure in the foreign country; the social, economic and political risks of the foreign country; government policy in the foreign country as it relates, for example, to tax rates and investment incentives; and human capital considerations such as workforce availability, experience, and technical and cultural skills. Some authors stress the need to include strategic and structural issues relating to the firm that is undertaking a global sourcing initiative, the particular product or process that will be involved, and the market. To this end, the issues that may be addressed in the assessment framework include the goals that a company wants to achieve through outsourcing; its experience in an international context; the strategic importance of the product or process that is to be outsourced in terms of its specificity, its ability to create value, and its complexity; and the impact of outsourcing on the company's customers. Other addressed issues include lead time, demand uncertainty, flexibility, quality, and the importance of the service level. Finally, in relation to the economic dimension of the decision, the focus may be on the size of the required capital investment and on the production and management costs of global sourcing in comparison to local sourcing or in-house manufacturing.

Many quantitative decision-making approaches (Udo, 2000; Işıklar *et al.*, 2007; Yang *et al.*, 2007) rely on tools that are able to evaluate "soft" aspects of the relevant factors and to

address uncertain and imprecise situations because these characteristics are quite common when companies approach “make or buy” decisions. Analytic Hierarchy Process and Fuzzy logic are two of the most frequently applied techniques in this context. The selection criteria when these techniques are employed are similar to those considered by qualitative models.

A review of the literature shows extensive debate about the positive and negative implications of global sourcing and its impact on various costs. Near sourcing and its distinctive features are also presented in the literature as a way to improve SC efficiency when there is a need for agility to hedge against uncertainty. Despite the extensive literature, however, the considerations that drive companies to review their global sourcing strategies and move towards near sourcing deserve further attention both by researchers and by practitioners. In particular, although numerous structured approaches relating to “make or buy globally” decisions have been developed, models are needed to help organisations make an informed choice between near and global sourcing. These decision-making frameworks should take into account the economic and operational consequences of global sourcing suggested by the existing literature to create decision criteria that clearly indicate the viability of near sourcing strategies. The application of such approaches to real cases should not neglect an appropriate consideration of the peculiarities and the priorities of individual companies.

As a contribution designed to address this gap in the existing literature, the present study develops a decision-making approach based on cost evaluation and risk assessment that can be used to compare near sourcing and global sourcing options and to highlight the SC implications and advantages of near sourcing.

A decision-making approach for adopting near sourcing policies

Research method

The present work can be regarded as an action research project (Susman, 1983). Due to the inefficiencies experienced in its store furniture SC, a major Italian company asked the authors to conduct a state analysis in order to understand the root causes of the cost increase and to assist the management in developing a decision-making tool that would allow it to select new procurement policies and thereby optimise operating costs and secure a viable improvement.

This process was undertaken through close collaboration between the authors and personnel from the client organisation, in particular personnel from the engineering and design department, the purchasing department, and the logistics department. The workgroup, consisting of researchers and company personnel, jointly performed action planning, action taking, and results evaluation. Through this process, significant mutual learning was achieved.

After reaching a satisfactory outcome for the subject company, possible implications of the decision-making approach for advancing the knowledge in the field of global sourcing were identified.

The subject company

Miroglio Fast Fashion Division (Miroglio), part of the Miroglio group of companies, is headquartered in Alba, northern Italy. It sells women's garments and accessories at accessible prices through Motivi, Oltre, and Fiorella Rubino brand chains. By the end of the year 2010, the company was operating more than 2,000 mall and flagship stores all around the world; it had a total annual turnover of approximately one billion euro; and it produced approximately 20 million clothing items (Cagliano *et al.*, 2011).

In a way that is similar to other vertical competitors in the mass fashion industry, Miroglio directly manages the product lifecycle from design to distribution. Clothes are sold in retail stores owned or leased by the company that are outfitted with finishes and furniture that comply with a design suitable for facilitating sales and enhancing the customers' brand loyalty. The objective of the SC for retail store furniture is to equip the brand stores with customised pieces of furniture, such as counters, shelves, drawers, dummies, and signs. This furniture is purchased from suppliers located in eastern China, then transported and stored at a centralised warehouse in Italy, and finally shipped for installation in various European retail store locations. The SC has numerous players who cooperate to frequently refurbish the shop floors and the associated finished equipment. Revamping of retail stores usually takes place every three to six years.

Recently, several inefficiencies have arisen in the management system of the company-owned retail stores in Europe due to the exponential growth recorded in the centralised furniture inventory and the increasing transportation cost from the facilities of the Chinese suppliers.

These factors, which appeared in conjunction with the contraction of the European market due to the credit crunch crisis, led Miroglio to look for assistance in late 2010 in improving its decision-making process in order to review its global sourcing policies.

The current purchasing process

When a new retail store is opened or an existing store is renovated, the activities of several corporate-line functions, including marketing, image, procurement, engineering and design, and logistics, all come into play.

The procurement tasks unfold as follows: first, based on basic design guidelines provided by the image office, a store template layout is issued by the engineering and design department to allow the procurement office to release a standard order for furniture. A standard order

contains a preset number of pieces of furniture whatever the actual layout of the floor area in a specific shop may be. In fact, the actual layout will only be disclosed at a later time. The standard order based on the template layout is necessary to accommodate the three-month lead time that is required for the furniture to be manufactured and transported from eastern China to Europe. That is a longer time than the two-month period that elapses from the time when the actual material bill of materials (BOM) is available to the date of store opening. Usually, the detailed design drawings and the BOM are 80% compliant with the quantities in the template layout, so that the remaining 20% of the furniture can be purchased after the actual layout has been released. Because only approximately two months are left until the date the store is scheduled to open, the procurement department purchases the rest of the necessary equipment from a European vendor with manufacturing facilities located in Lithuania who offers assurances of a lead time of only one-and-a-half months from the date the order is released.

The purchasing department plays a key role in the SC. On the one hand, it places monthly “buy-to-stock” (BTS) orders with four Chinese suppliers based on the projected store openings that are issued by the marketing department. On the other hand, it releases detailed orders to the Lithuanian vendor whenever it is necessary to integrate the standard supply with those missing pieces of furniture intended to fit the needs of a specific shop layout. This second type of order is termed “buy-to-order” (BTO) because it is driven by the requirements listed by the engineering and design department to specifically fit a particular retail store.

After that, the logistics department tracks shipping to the Italian warehouse and the distribution of furniture at the various shop floors.

Development of the approach

The decision-making approach unfolded through the following four steps:

First step: Source information was gathered and the current SC organisation and purchasing process was mapped in order to identify the existing problems. Past data about store furniture demand, ordered quantities, shipped quantities, inventory levels, and associated lead times and costs were collected during the period of time spanning the date orders were placed in October 2008 to the date final deliveries were completed no later than June 2010. All the data required by the study were basically obtained from the information system of the subject company.

Second step: First, the criticalities of the current process were analysed and all constraints and system variables were identified. Then, an inventory management model was created to run spreadsheet estimates where alternative purchasing strategies (namely global or near sourcing) and SC management options are adopted to determine which solution provides the lowest-cost performance under either current conditions or future status. This model is characterised by one-and-a-half year holding period, and it takes into account the following assumptions regarding the three main procurement elements, namely demand planning, lead time, and transportation policy.

The quantities of material to be ordered from the Chinese suppliers are strictly related to the demand forecast, which equals the projected store openings schedule multiplied by the average unit quantity of furniture to be procured for the template store, which is approximately 35 cubic meters.

The three-month-long average procurement lead time period results from the summation of all the lead times required for executing the various successive operations from the point in time when the order is placed to the date when the furniture is received at the store location for installation in anticipation of the store opening.

The material is normally shipped from the vendors to the centralised warehouse, and also from the warehouse to the final destinations, by way of high-cube forty-foot equivalent unit containers that are optimally saturated.

In relation to the economics of the stock model, the following five cost components were calculated: purchasing, ordering, transportation, inventory carrying, and backup supply costs. The model used in the decision-making approach simply sums all these costs and evaluates all the potential case scenarios in order to identify the minimum-cost configuration (Silver *et al.*, 1998; Zeng and Rossetti, 2003).

The purchasing costs depend primarily on the prices of products charged by the suppliers: approximately 750.00€ per cubic meter for the Chinese vendors and 825.00€ per cubic meter for the Lithuanian vendor.

The company's unit cost per order, which includes the cost of order-release activities, insurance coverage, communications, and conducting quality checks, is approximately 1,000.00€.

The transportation cost from China, which includes shipping and custom border expenses, is on average 51.00€ per cubic meter for shipment to the centralised warehouse; and the corresponding transportation cost from Lithuania is on average 20.00€ per cubic meter. The cost of transporting shipments from the warehouse to retail store locations is 32.70€ per cubic meter.

Inventory carrying costs include human resource costs and various overhead expenses relating to occupancy, interest on working capital, and shrinkage due to product obsolescence. In total, inventory holding costs amount to a fixed sum of 140,000.00€ per year plus approximately 12% of the average inventory value per year for interest and obsolescence.

Finally, the model considers backup supply costs as they relate to the expenditure for orders placed with the Lithuanian supplier for the remainder material that is needed to integrate the standard store template layout and the detailed furniture requirements of specific stores, as well as the costs of orders to the Lithuanian vendor to replace supplies and fill in for late Chinese deliveries.

Third step: A risk analysis of the specific policy that had been selected as the best SC arrangement was conducted in order to make an indicative assessment of the macro factors that might affect the future viability of a change in strategy from global to near sourcing. The two-year time horizon used for the analysis is consistent with the forward-outlook time span that the company uses in its business planning process. The assessment was structured according to relevant social, economic, and political drivers of uncertainty that could have an impact on global sourcing decisions (Zsidisin, 2003). To this end, potential sources of economic risks, inflationary risks, monetary risks, and country risks were investigated from a comparative perspective in relation to the countries where the alternate suppliers are located.

Fourth step: The outcomes of the application of the approach were examined and then compared with first implementation results to validate the analysis and disclose potential ramifications.

As-is case scenario

The as-is scenario was analysed first. The inventory control model was set to reproduce the monthly orders issued according to a BTS approach with 80% of furniture for a new store sourced from China and the remaining 20% from Lithuania. In addition, a lot-for-lot order policy (Boyer and Verma, 2010) was applied.

Details of the main outputs of the as-is case scenario are presented in the first column of Table 1 based on past data collected from the company Material Resource Planning (MRP) system.

The current SC process has been experiencing increased costs mainly due to rising inventory. In fact, the growth of the centralised inventory is due to the current structure of the SC organisation and the way orders are released. In particular, inaccurate orders, which are based on the standard store template layout, lead to the procurement of pieces of furniture that may not be actually used in equipping a store. This policy requires a continuous adjustment of the quantities ordered, and it results in an increase in inventory and associated costs. In addition, the rapid material obsolescence caused by high store-specificity, and the increased reliance on safety stocks to avoid potential stock-outs due to the long shipping time from Chinese suppliers, have caused a substantial rise in the inventory holding costs.

To-be case scenarios

With the aim of overcoming the most critical problems facing the Miroglio store furniture sourcing system, several alternative scenarios were studied. Table 1 illustrates the way various management policies, including the currently used lot-for-lot order review model, a fixed period order review model, an economic order quantity (EOQ) order review model, and the Wagner-Within (W-W) order review model (Silver *et al.*, 1998), compare with the associated inventory level records and economic evaluations computed over a one and half year inventory holding period. In particular, inventory-related data report, down from first line, the quantity of required materials, the resulting average inventory, the highest fluctuation in level of inventory, the number of order released (which are monthly based save in the EOQ policy), and equal safety stock in all options. Purchasing costs are calculated by multiplying the material quantity times the associated unit cost. Inventory carrying costs sum up variable unit cost and fixed inventory holding costs. Order costs equal the number of orders times the unit order cost. Similarly, shipping costs is given by the number of shipments times the unit shipping fee. Backup supply costs are then computed based on

actual furniture consumed plus recorded late supplies from China less the materials shipped from the centralised warehouse.

Insert Table 1 about here

The fixed period policy is the most expensive, and it has the highest average inventory. The average inventory level decreases significantly under an EOQ policy because of the frequent orders, but this scenario brings other disadvantages including the largest difference between the maximum and the minimum inventory thresholds during the holding period and a 3.28% increase in total costs. Therefore, this approach proves not to be efficient. The W-W approach turns out to be the most viable from both an economic (lowest total cost) and an operational (lowest average inventory level and min-max inventory level) point of view. However, the W-W method requires a time-consuming iterative procedure to find the optimal order quantity, so Miroglio preferred to keep its current easily administered lot-for-lot policy. The costs of the current policy are just 4.67% higher than the cost of the W-W policy because the average inventory level and the min-max inventory level are nearly the same.

After considering all the estimates, it did not appear that any substantial cost reduction could be achieved by changing the inventory management policy. It thus appeared that the thing that could make a difference was likely to be related to changes in the SC structure. In particular, the BTS policy could be changed into a BTO policy that would make it possible for furniture to be ordered on the basis of the detailed needs of the plans for one specific new store. This could happen only if information related to the store layout was available on time, which could occur in two possible situations. The time required for the engineering and design department to issue the detailed material take-off could be shortened, or the supply lead time period could be reduced to meet the engineering and design office timeline.

Two different case scenarios were considered. The first one, named BTO China, still involves purchasing from Chinese suppliers, while the second one, named BTO Lithuania, involves

sourcing from a geographically closer supplier located on the continent to reduce the lead time. Table 2, which compares the SC cost of both scenarios versus the as-is situation, shows that BTO is the dominant strategy. In fact, whatever the sourcing location, the two mentioned BTO scenarios create cost savings up to about 20%, which is in the order of 570 thousand euro, with a relevant contribution of backup supply expenses and minor contribution of either reduced purchase price in China or reduced shipping costs in Lithuania. Because a major increase in purchase price and shipping cost for up to the total estimated savings would be very improbable, it can be concluded that BTO is the far by more best SC strategy than the current policy.

Insert Table 2 about here

It is difficult in practice for Miroglio to shorten the time required to issue detailed layouts, so the BTO China scenario was not considered technically viable.

Near sourcing, by contrast, is feasible because the shorter SC lead-time period makes it unnecessary for Miroglio to reduce the lead time associated with the release of information about the new store layout. Moreover, the relatively short distance between the manufacturing facility and the European retail stores makes it possible for the products to be shipped directly to the stores with no need for intermediate storage in the distribution warehouse. In addition, the E.U. location makes it possible to skip customs duties and delays, and the high quality of the Lithuanian products means that little inspection is required.

It is worth noting that the advantages of BTO policies are not inherent with savings in storage costs; while the comparison of BTO China versus the BTO Lithuania scenarios suggests that savings are inherent with shipping costs because of the shorter distances travelled in continental sourcing.

Therefore, the previous BTO Lithuania case scenario with direct shipments was analysed. The results from this analysis are presented in the last column of Table 2. The estimated

shipping costs are reduced, and the inventory-carrying costs are avoided. In summary, the cost savings may be as high as 28% compared to the as-is scenario, and the savings may be 10.28% compared to the BTO Lithuania scenario with centralised warehouse. Therefore, the BTO Lithuania without warehouse approach is the best solution.

However, some considerations are necessary with regard to the sensitiveness of results to potential increase and fluctuation in purchase price and transport fares. In fact, the expected savings that the BTO without warehouse near sourcing policy might bring are in the order of 240 thousands euro compared to the BTO Lithuania scenario. Thus, that policy may result to be inappropriate whenever the Chinese supplies would experience a downturn in combined purchase prices and shipping costs greater than 12%, which seems to be hard to reach in recent trends so that estimates ground on a rather sufficient level of managerial confidence.

Risk analysis

So far, this study has dealt with the improvement in SC management that near sourcing can bring to Miroglio in the short term. However, it is also important to analyse and understand the benefits and robustness that are likely to follow from this approach when it faces potential changes and transitions in the future.

To this end, according to the approach that is adopted in this study, the following risk analysis is provided. The parameters that serve as indicators of the economic, inflationary, monetary, and country risks considered in the study were collected from official sources [1] [2]. Each percentage in Table 3 represents the increase or decrease of the value of the relevant indicator relative to its value in the previous year. Since the study was performed in 2010, the following two years were assumed to be the time horizon for the risk analysis.

Insert Table 3 about here

Several considerations stem from the risk analysis. From an economic point of view, Lithuania's outlook suggests the SC costs are likely to grow more slowly than in China, partly because of the European conjuncture that significantly affects the Lithuanian economy. In contrast to the Chinese production and labour costs which are likely to increase in response to internal demand (Quer *et al.*, 2010), Lithuanian labour costs may actually become lower. Lithuania has entered a fixed currency exchange rate with the euro, so no monetary risk is expected. However, Lithuania has a higher country risk than China, where the country risk is outstandingly low.

In brief, sourcing in Europe appears to be a cost-saving, but risky, approach.

Based on the prospective indicators for the two countries, the total yearly sourcing costs under the as-is scenario and the BTO Lithuania without warehouse scenario were estimated in quantitative terms by considering the new store openings in 2011 and 2012 planned at the time the analysis was performed. The results are presented in Table 4.

Insert Table 4 about here

On the one hand, the total sourcing costs in the as-is scenario are very likely to increase in the future due to increases in the purchasing and shipping expenses that follow from the rising Production price index (PPI) and Labour cost index (LCI) in 2011 and 2012. On the other hand, the total estimated costs in the BTO Lithuania without warehouse scenario are still significantly lower than in the as-is scenario, and they are likely to remain steady because of the moderate increase in PPI and LCI. Additionally, the fixed exchange rate between the Lithuanian litas and the euro avoids the currency risk that can be expected on the basis of the forecasted appreciation of the Chinese RMB in the near future. Thus, the strategic choice of switching to the Lithuanian supplier and arranging direct delivery to stores seems to be envisaged in the medium-term.

Policy analysis

The lead time advantage that a near sourcing strategy might bring suggested Miroglio to introduce major changes in its purchasing approach and to make its furniture SC more agile and responsive to uncertainty.

Although the current scenario is rather convenient if it is considered only from the perspective of pure purchasing costs, it is insufficiently flexible because of the long lead time required by Chinese suppliers. In fact, this approach requires the company to resort to an additional arrangement for material sourcing from another vendor in order to hedge against demand variability. In addition, it may cause the level of inventory to increase because pieces of furniture that were already purchased but that do not fit the detailed store layouts remain in stock. The relevant supplier lead time that necessitates a two-step sourcing process also creates a need for an in-house warehouse because it prevents direct delivery of furniture to store locations. All these aspects bring inflexibility costs. As a result, the disadvantages of this strategy greatly exceed the advantage of the price premium offered by the Chinese suppliers.

At the other end of the spectrum, the BTO Lithuania without warehouse scenario relies on a company whose manufacturing facilities are located within the continental boundaries. Because this approach allows short order-cycle times, it offers the possibility of SC reengineering that brings the heightened level of flexibility that is necessary to respond effectively to demand uncertainty. The entire quantity of furniture that is needed can be sourced after the detailed store layout has been released, so this approach brings an additional advantage in terms of decreased inventory levels and obsolescence. Additionally, the one-step sourcing process makes a leaner SC possible because it eliminates the central warehouse and facilitates delivering directly to new stores. The savings in inventory-carrying costs and backup supply costs that result from this strategy, as well as the reduced shipping expenses

due to the decreased geographical distance, counterbalance the higher price charged by the near supplier in comparison to the price that is charged by global vendors.

An overview of the advantages and disadvantages of these two alternative scenarios makes it clear that the benefits of a near sourcing strategy do not come in the form of cost advantages, per se, but in the ability to allow changes to the SC organisation. In fact, the estimated savings of near sourcing in comparison to global sourcing would not be significant if structural changes to the SC were not made. Of course, the viability of the near sourcing option is not independent of the social, political, and economic risks associated with the vendors' countries of origin. Because such risks are extremely volatile in the current global environment, the feasibility of any near sourcing strategy should be periodically checked against changing conditions.

The consideration of these issues led Miroglio's management to conclude that near sourcing would be an effective business solution.

Evaluation of first implemented results

Based on the described estimates and policy analyses, starting in the beginning of 2011 Miroglio's managers decided to begin implementing the BTO Lithuania without warehouse scenario for purchasing store furniture for the majority of the corporate brands.

Several actions were undertaken to implement the process, such as verification of production capacity from the Lithuanian vendor and subsequent extension and changes to the supply contract; gradual reduction of orders from China and associated continued shipment of remaining inventory from the centralized warehouse; replacement with BTO orders to the near supplier with direct shipment to the stores; organisational changes to shift material receiving, quality check and administration directly from local stores.

First approximate actual cost data related to the first semester 2011 are reported in Table 5. Data prove alignment with estimated results. In fact, the total expenditure results to be just a

little greater than half the expected annual costs, if the remaining decreasing inventory of the centralised warehouse is neglected.

Insert Table 5 about here

The actual data, though partial and recorded from a still ongoing implementation process, are a proof of validity of the suggested approach.

Also, it is worth mentioning that near sourcing proved to remain profitable although a vessel stow overcapacity, which was recorded from the year 2009, contributed to reduce maritime transportation fees, thus counterbalancing the rising oil prices and increased costs due to the slight recovery of world economy during the year 2011.

Discussion

The proposed decision-making approach applies operational and economic criteria taken from decisional models in the existing literature about outsourcing to the choice between global and near sourcing policies. In particular, compared to the taxonomy of global sourcing costs presented by Holweg and others (2011), the framework presented in this study explicitly addresses the relevant static and dynamic costs including purchasing, transportation, ordering, inventory holding, and stock-out expenses. The main hidden costs, such as currency fluctuation, labour cost inflation, and the costs related to the risk of political and economic instability of a country, are indirectly taken into account in the risk analysis.

Unlike several other quantitative methods (e.g., Işıklar *et al.*, 2007; Yang *et al.*, 2007), the method developed in this study benefits from user-friendly tools such as spreadsheets, so it can be easily applied without any specific mathematical or decision-making skills. Additionally, the approach presented here is not intended to be a strict prescriptive tool. Instead, it is a sort of “working guideline” that can be easily adapted to the requirements of different organisations.

Also, the fact that the authors built the approach in collaboration with a company that was experiencing a need for alternatives to global sourcing ensures that the most important facets of the problem are addressed, and enhances the validity of the recommended approach.

Finally, the comparison of the consequences of global sourcing and near sourcing options for the subject company helps to clarify the hierarchy of benefits of near sourcing that are usually mentioned in literature (Gonzales *et al.*, 2006; Lacity *et al.*, 2008; Mitchell, 2009). The key advantage of decreased geographical distances is a reduced lead time, which in turn triggers SC responsiveness, flexibility, and an increased ability to cope with uncertainty. These features are also facilitated by other consequences of the shorter distance such as cultural compatibility, common language skills, and similar time zones. Ultimately, the reduced time requirements, and the consequential augmentation of SC efficiency, translate into economic benefits such as decreased costs for logistics, and reduced transaction costs and coordination costs. The authors believe that this is the order of priority of the factors that motivate companies to consider near sourcing.

Both academic and professional implications can be derived from this work. From an academic point of view, the study fosters discussion about ways to overcome the limitations of global sourcing by systematically addressing the organisational and economic consequences of preferring near suppliers over low price global vendors. Furthermore, it encourages the development of decision-making models that go beyond the traditional “make or buy” and “local or global” dilemmas and specifically focus on emerging purchasing forms. Finally, the study may support a demonstration of the appropriateness of near sourcing in conjunction with JIT strategies, and it may help to reconcile JIT with foreign sourcing (Humphreys *et al.*, 1998).

From a professional point of view the decision-making approach developed in this study provides SC practitioners with a reference roadmap for quantitatively assessing alternatives

to global sourcing. It may be applied purposefully by purchasing and SC management departments of both manufacturing and service companies in order to monitor the profitability of their current sourcing and outsourcing policies. To this end, this study may provide a structured method to uncover dynamic and hidden costs that may challenge the supposed effectiveness of buying and producing globally. In addition, the approach presented here can be part of feasibility assessments aimed at analysing the implications and estimating the savings of potential SC strategies.

Two main limitations apply to this work. First, the present research concentrates on a non-core supply in one specific industry. Second, it does not address various static, dynamic, and hidden costs of global sourcing that were not considered relevant for the subject company, such as the cost of quality control and compliance with safety and environmental standards, urgent shipments expenses, communication and coordination costs, and indirect costs for generating and monitoring contracts. For the same reason, some of the selection criteria that are included in the decision-making models in other studies were not addressed in this study. Examples include the quality of infrastructure, local government tax rates and investment incentives, workforce availability and experience, and technical and cultural skills (Fill and Visser, 2000; Graf and Mudambi, 2005).

Several future research streams can be envisaged. On the one hand, studies that focus on strategic supplies would be desirable because they could help to advance knowledge about sourcing by demonstrating the need to reaffirm the concept and advantages of continental near sourcing versus global sourcing in diverse manufacturing and service sectors. On the other hand, the decision-making approach proposed in this study should be validated in multiple SC settings, and it should be extended to include more costs and selection criteria to better reflect the different factors that are involved in the choice between global and near sourcing.

Conclusions

The current economic, social, and political trends have drastically decreased the potential of global sourcing, especially when time represents a crucial competitive factor. Near sourcing offers important advantages because it allows companies to enact strategies for making an SC more agile and responsive to demand variation and uncertainty. These advantages, together with lower transportation costs, help to reduce the static, dynamic, and hidden costs of sourcing, and thus offset a major portion of the higher product prices that are paid to near suppliers.

With the goal of helping to alleviate the lack of decision-making models that focus specifically on the choice of near sourcing, the present work develops an approach based on cost calculation and risk assessment to assist in identifying the benefits of near sourcing policies and the associated economic commitment.

The framework presented in this study should be extended to address more of the organisational issues and cost categories affected by near sourcing, and it should be validated in relation to SCs in different manufacturing and service companies.

References

- Allon, G. and Van Mieghem, J.A. (2010), "Global Dual Sourcing: Tailored Base-Surge Allocation to Near- and Offshore Production", *Management Science*, Vol. 56 No.2, pp.110-124.
- Aron, R. and Singh, J.V. (2005), "Getting Offshoring Right", *Harvard Business Review*, December, pp.135-143.
- Berman, B. and Swani, K. (2010), "Managing product safety of imported Chinese goods", *Business Horizons*, Vol. 53 No.1, pp. 39-48.
- Boyer, K. and Verma, R. (2010), *Operations & Supply Chain Management for the 21st Century*, Cengage Learning, Mason, OH.

Bozarth, C., Handfield, R. and Das, A. (1998), "Stages of global sourcing strategy evolution: an exploratory study", *Journal of Operations Management*, Vol. 16, pp. 241-255.

Busi, M. and McIvor, R. (2008), "Setting the outsourcing research agenda: the top-10 most urgent outsourcing areas", *Strategic Outsourcing: An International Journal*, Vol. 1 No.3, pp.185-197.

Cagliano, A. C., De Marco, A., Rafele, C. and Volpe, S. (2011), "Using system dynamics in warehouse management: a fast-fashion case study", *Journal of Manufacturing Technology Management*, Vol. 22 No.2, pp.171-188.

Cappellini, M. (2011), "Incentivi e flessibilità, produrre in Occidente ritorna vantaggioso", *Il Sole 24 Ore*, 6 June, pp. 23.

Cho, J. and Kang, J. (2001), "Benefits and challenges of global sourcing: perceptions of US apparel retail firms", *International Marketing Review*, Vol. 18 No.5, pp. 542-561.

Christopher, M. and Holweg, M. (2011), "Supply Chain 2.0": managing supply chains in the era of turbulence", *International Journal of Physical Distribution & Logistics Management*, Vol. 4 No.1, pp. 63-82.

Christopher, M., Mena, C., Khan, O. and Yurt, O. (2011), "Approaches to managing global sourcing risk", *Supply Chain Management: An International Journal*, Vol. 16 No.2, pp. 67-81.

Christopher, M., Peck, H. and Towill, D. (2006), "A taxonomy for selecting global supply chain strategies", *The International Journal of Logistics Management*, Vol. 17 No.2, pp. 277-287.

Das, A. and Handfield, R.B. (1997), "Just-in-time and logistics in global sourcing: an empirical study", *International Journal of Physical Distribution & Logistics Management*, Vol. 27 No.3/4, pp. 244-259.

- Dobrzykowski, D.D., Tran, O. and Tarafdar, M. (2010), "Value co-creation and resource based perspectives for strategic sourcing ", *Strategic Outsourcing: An International Journal*, Vol. 3 No.2, pp. 106-127.
- Edgell, J., Meister, G.E. and Stamp, N. (2008), "Global sourcing trends in 2008", *Strategic Outsourcing: An International Journal*, Vol. 1 No.2, pp. 173-180.
- Ellram, L.M. and Siferd, S.P. (1998), "Total cost of ownership: a key concept in strategic cost management decisions", *Journal of Business Logistics*, Vol. 19 No.1, pp. 55-84.
- Fielding, M. (2006), "Stay close to home. Nearshoring to Latin America eases ROI measurement", *Marketing News*, 15April, pp.29-30.
- Fill, C. and Visser, E. (2000), "The outsourcing dilemma: a composite approach to make or buy decision", *Management Decision*, Vol.38 No.1, pp.43-50.
- Flynn, B. B., Zhao, X. and Roth, A. (2007), "The myth of the dragon: Operations management in today's China", *Business Horizons*, Vol.50 No.3, pp.177-183.
- Gonzales, R., Gasco, J. and Llopis, J. (2006), "Information systems offshore outsourcing. A descriptive analysis", *Industrial Management & Data Systems*, Vol. 106 No.9, pp.1233-1248.
- Gottfredson, M., Puryear, R. and Phillips, S. (2005), "Strategic sourcing: from periphery to the core", *Harvard Business Review*, Vol. 83 No.2, pp.132-139.
- Graf, M. and Mudambi, S.M. (2005), "The outsourcing of IT-enabled business processes: A conceptual model of the location decision", *Journal of International Management*, Vol. 11, pp.253-268.
- Handfield, R.B. (1994), "US Global Sourcing: Patterns of Development", *International Journal of Operations & Production Management*, Vol. 14 No.6, pp.40-51.
- Holweg, M., Reichhart, A. and Hong, E. (2011), "On risk and cost in global sourcing", *International Journal Production of Economics*, Vol. 131, pp. 333-341.

- Humphreys, P., Mak, K.L. and Yeung, C.M. (1998), "A just-in-time evaluation strategy for international procurement", *Supply Chain Management: An International Journal*, Vol. 3 No.4, pp. 175-186.
- Işıklar, G., Alptekin, E. and Büyüközkan, G. (2007), "Application of a hybrid intelligent decision support model in logistics outsourcing", *Computers & Operations Research*, Vol. 34, pp. 3701-3714.
- Jiang, B. (2003), "What Pulled Sony out of China?", *Supply Chain Management Review*, January/February, pp.22-27.
- Jones, W.O. (2009), "Outsourcing in China: opportunities, challenges and lessons learned", *Strategic Outsourcing: An International Journal*, Vol. 2 No.2, pp.187-203.
- Kang, M., Wu, X. and Hong, P. (2009), "Strategic outsourcing practices of multi-national corporations (MNCs) in China", *Strategic Outsourcing: An International Journal*, Vol. 2 No.3, pp. 240-256.
- Kotabe, M. and Murray, J. Y. (2004), "Global sourcing strategy and sustainable competitive advantage", *Industrial Marketing Management*, Vol. 33, pp. 7-14.
- Kremic, T., Tukul, O.I. and Rom, W. O. (2006), "Outsourcing decision support: a survey of benefits, risks, and decision factors", *Supply Chain Management: An International Journal*, Vol. 11 No.6, pp. 467-482.
- Kumar, S., Medina, J. and Nelson, M.T. (2009), "Is the offshore outsourcing landscape for US manufacturers migrating away from China?", *Supply Chain Management: An International Journal*, Vol. 14 No.5, pp. 342-348.
- Lacity, M.C., Willcocks, L.P. and Rottman, J.W. (2008), "Global outsourcing of back office services: lessons, trends, and enduring challenges", *Strategic Outsourcing: An International Journal*, Vol. 1 No.1, pp.13-34.

- Lampel, J. and Bhalla, A. (2008), "Embracing realism and recognizing choice in IT offshoring initiatives", *Business Horizons*, Vol. 51 No.5, pp.429-440.
- Levy, D.L. (1997), "Lean Production in an International Supply Chain", *Sloan Management Review*, Winter, pp.94-102.
- Lowson, R. H. (2001), "Offshore Sourcing: An Optimal Operational Strategy", *Business Horizons*, Vol. 44 No. 6, pp.61-66.
- Lowson, R. H. (2002), "Assessing the Operational Cost of Offshore Sourcing Strategies", *The International Journal of Logistics Management*, Vol. 13 No.2, pp.79-89.
- Lynch, D. J. (2008), "Transport costs could alter world trade", *USA TODAY*, 13 August, available at: http://www.usatoday.com/money/industries/manufacturing/2008-08-11-cargo-costs-oil_N.htm (accessed 21 September 2011).
- Meixell, M.J. and Gargeya, V.B. (2005), "Global supply chain design: a literature review and critique", *Transportation Research Part E*, Vol.41, pp. 531-550.
- Meyer, T. (2006), "Nearshoring to Central and Eastern Europe", *Deutsche Bank Research, Economics*, No.58, available at: http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD//PROD0000000000201757.pdf (accessed 21 September 2011).
- Mitchell, B. (2009), "The Sourcing Dilemma: Should You Go Near or Far", *World Trade Magazine*, 27 March, available at: <http://www.worldtradewt100.com/articles/near-sourcing-the-way-forward> (accessed 21 September 2011).
- Nellore, R., Chanaron, J-J. and Söderquist, K.E. (2001), "Lean supply and price-based global sourcing – the interconnection", *European Journal of Purchasing & Supply Management*, Vol. 7, pp. 101-110.
- Oke, A., Maltz, A. and Christiansen, P.E. (2009), "Criteria for sourcing from developing countries", *Strategic Outsourcing: An International Journal*, Vol. 2 No.2, pp. 145-164.

- Platts, K.W. and Song, N. (2010), "Overseas sourcing decisions-the total cost of sourcing from China", *Supply Chain Management: An International Journal*, Vol.15 No.4, pp. 320-331.
- Quer, D., Claver, E. and Rienda, L. (2010), "Doing business in China and India: a comparative approach", *Asia-Pacific Journal of Business Administration*, Vol. 2 No.2, pp.153-166.
- Quinn, J. and Hilmer, F. (1994), "Strategic outsourcing", *Sloan Management Review*, Vol. 35 No.4, pp. 43-55.
- Quintens, L., Matthyssens, P. and Faes, W. (2005), "Purchasing internationalisation on both sides of the Atlantic", *Journal of Purchasing & Supply Management*, Vol.11, pp. 57-71.
- Quintens, L., Pauwels, P. and Matthyssens, P. (2006), "Global purchasing: State of the art and research directions", *Journal of Purchasing & Supply Management*, Vol.12, pp. 170-181.
- Raiborn, C. A., Butler, J.B. and Massoud, M. F. (2009), "Outsourcing support functions: Identifying and managing the good, the bad, and the ugly", *Business Horizons*, Vol. 52 No. 4, pp. 347-356.
- Rao, M.T. (2004), "Key issues for global IT sourcing: country and individual factors", *Information Systems Management*, Vol. 21 No.3, pp.16-21.
- Shelton, R. K. and Wachter, K. (2005), "Effects of global sourcing on textiles and apparel", *Journal of Fashion Marketing and Management*, Vol. 9 No.3, pp.318-329.
- Shister, N. (2008), "Executive Overview: Near-sourcing", *World Trade Magazine*, 3 January, available at: http://www.worldtrademag.com/Articles/Column/BNP_GUID_9-5-2006_A_10000000000000226880 (accessed 5 July 2011).
- Silver, E.A., Pyke, D. F. and Peterson, R. (1998), *Inventory Management and Production Planning and Scheduling*, 3rd ed., John Wiley & Sons.

Sinha, P., Akoorie, M. E.M., Ding, Q. and Wu, Q. (2011), "What motivates manufacturing SMEs to outsource offshore in China?", *Strategic Outsourcing: An International Journal*, Vol. 4 No.1, pp.67-88.

Susman, G.I. (1983), *Action Research: A Sociotechnical Systems Perspective*, Sage Publications, London, UK.

Tayles, M. and Drury, C. (2001), "Moving from Make/Buy to Strategic Sourcing: The Outsource Decision Process", *Long Range Planning*, Vol. 34, pp.605-622.

Thelen, S.T., Honeycutt Jr., E.D. and Murphy, T.P. (2010), "Service offshoring. Does perceived service quality affect country-of-service origin preference?", *Managing Service Quality*, Vol. 20 No.3, pp.196-212.

Trent, R.J. and Monczka, R.M. (2003), "Understanding integrated global sourcing", *International Journal of Physical Distribution & Logistics Management*, Vol. 33 No.7, pp. 607-629.

Udo, G.G. (2000), "Using analytic hierarchy process to analyze the information technology outsourcing decision", *Industrial Management & Data Systems*, Vol. 100 No.9, pp. 421-429.

Weidenbaum, M. (2005), "Outsourcing: Pros and cons", *Business Horizons*, Vol. 48 No. 4, pp. 311-315.

Wilkinson, B., Eberhardt, M., McLaren, J. and Millington, A. (2005), "Human resource barriers to partnership sourcing in China", *The International Journal of Human Resource Management*, Vol. 16 No.10, pp. 1886-1990.

Yang, D-H., Kim, S., Nam, C. and Min, J-W. (2007), "Developing a decision model for business process outsourcing", *Computers & Operations Research*, Vol. 34, pp. 3769-3778.

Zeng, A.Z. (2003), "Global sourcing: process and design for efficient management", *Supply Chain Management: An International Journal*, Vol. 8 No.4, pp.367-379.

Zeng, A.Z. and Rossetti, C. (2003), "Developing a framework for evaluating the logistics costs in global sourcing processes", *International Journal of Physical Distribution & Logistics Management*, Vol. 33 No.9, pp.785-803.

Zsidisin, G.A. (2003), "Managerial Perceptions of Supply Risk", *Journal of Supply Chain Management*, Vol. 39 No.1, pp.14-25.

Notes:

[1] <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home> (accessed 30 November 2010).

[2] <http://www.oecd.org/> (accessed 30 November 2010).

	Inventory management policy	Lot-for-lot (as-is)	Fixed period	EOQ	W-W
INDICES	Quantity [m ³]	2,552	3,008	2,618	2,552
	Average inventory [m ³]	208	570	292	208
	Min-Max inventory [m ³]	539	573	631	539
	Number of orders released [units]	18	18	24	18
	Safety stock [m ³]	80	80	80	80
COSTS [€]	Purchasing	1,914,000	2,256,000	1,963,500	1,914,000
	Inventory carrying	244,567	317,984	162,764	115,846
	Order	18,000	18,000	24,000	18,000
	Shipping	217,533	255,615	222,800	217,533
	Backup supply	492,500	492,500	608,391	492,500
	Total costs	2,886,550	3,340,050	2,981,386	2,757,830

Table 1 – Inventory performance indices and costs over the 1.5-year holding period by changing inventory policy

	As-is	BTO China	BTO Lithuania	BTO Lithuania w/o warehouse
Average inventory [m ³]	208	218	119	-
Number of orders released [units]	18	18	18	18
Purchasing costs [€]	1,914,000	1,836,750	1,947,994	1,947,990
Inventory carrying costs [€]	244,567	246,239	229,860	-
Order costs [€]	18,000	18,000	18,000	18,000
Shipping costs [€]	217,533	208,295	122,189	113,671
Backup supply costs [€]	492,500	-	-	-
Total costs [€]	2,886,500	2,309,283	2,318,044	2,079,661
Savings [€]		577,216	568,506	806,840
% relative savings [%]		19.99	19.70	28.00

Table 2 – Inventory performance indices and costs over the 1.5-year holding period by changing SC structure

Risk source	Indicator	China		Lithuania	
		2011	2012	2011	2012
Economy	Gross domestic product growth rate [%]	8.5	9.0	3.2	3.2
	Labour cost index [%]	7.0	7.0	-3.0	2.0
Inflation	Consumer price index [%]	3.5	3.5	1.1	2.4
	Production price index [%]	6.0	6.0	3.0	4.0
Monetary	Currency exchange rate [1 euro = x RMB/LTL]	7.87	7.47	3.45 (Fixed)	
Country	OECD Ranking (best rating 1/7)	2/7	2/7	4/7	4/7

Table 3 – Comparative risk analysis

	As-is		BTO Lithuania w/o Warehouse	
	2011	2012	2011	2012
Purchasing costs [€]	1,943,440	2,314,491	1,273,005	1,349,386
Inventory carrying costs [€]	163,045	163,045	-	-
Order costs [€]	12,000	12,000	12,000	12,000
Shipping costs [€]	220,879	263,050	74,284	78,741
Backup supply costs [€]	323,610	323,610	-	-
Total costs [€]	2,662,974	3,076,196	1,359,289	1,440,127

Table 4 – Assessment of future yearly costs based on risk analysis

Jan-Jun 2011	
Purchasing costs [€]	650,000
Remaining inventory carrying costs [€]	80,000
Order costs [€]	6,000
Shipping costs [€]	40,000
Backup supply costs [€]	-
Total costs [€]	776,000

Table 5 – First implementation approximate data