



# The impact of supply chain management practices on performance of SMEs

Impact of SCM practices

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## Abstract

**Purpose** – The purpose of this study is to determine the underlying dimensions of supply chain management (SCM) practices and to empirically test a framework identifying the relationships among SCM practices, operational performance and SCM-related organizational performance with special emphasis on small and medium size enterprises (SMEs) in Turkey.

**Design/methodology/approach** – Data for the study were collected from a sample of 203 manufacturing SMEs operating in the manufacture of fabricated metal products and general purpose machinery (NACE codes 28 and 29) within the city of Istanbul in Turkey. The research framework was tested using partial least squares method, which is a variance-based structural equation modeling approach.

**Findings** – Based on exploratory factor analysis (EFA), SCM practices were grouped in two factors: outsourcing and multi-suppliers (OMS), and strategic collaboration and lean practices (SCLP). The results indicate that both factors of SCLP and OMS have direct positive and significant impact on operational performance. In contrast, both SCLP and OMS do not have a significant and direct impact on SCM-related organizational performance. Also, as the direct relationship between the two performance-constructs was found significant, both factors of SCM practices have an indirect and significant positive effect on ORG through OPER.

**Research limitations/implications** – Perhaps, the most serious limitation of this study was its narrow focus on Turkish manufacturing SMEs, thus precluding the generalization of findings to other emerging countries as well as other sectors such as service and government sectors that may benefit from a sound SCM strategy.

**Practical implications** – By developing and validating a multi-dimensional construct of SCM practices and by exhibiting its value in improving operational performance of SMEs, it provides SCM managers with useful tool for evaluating the efficiency of their current SCM practices. Second, the analysis of the relationship between SCM practices and operational performance indicates that SCM practices might directly influence operational performance of SMEs.

**Originality/value** – This paper adds to the body of knowledge by providing new data and empirical insights into the relationship between SCM practices and performance of SMEs operating in Turkey.

**Keywords** Supply chain management, Organizational performance, Small to medium-sized enterprises, Turkey

**Paper type** Research paper



## 1. Introduction

Globalization and intensive world-wide competition along with the technological advancements create an entirely new business environment for the manufacturing organizations. Initially, manufacturing companies have accomplished massive productivity gains through the implementation of lean production in response to this intensifying competition. The “waste” has eliminated from many different local operations for the sake of better productivity. Currently such type of massive productivity improvements for many manufacturing organizations is very limited. Instead, there is a huge improvement potential to reduce the inefficiencies caused by the poor performance of the suppliers, unpredictable customer demands, and uncertain business environment. An integrated supply chain has a clear advantage on the competitiveness of the individual companies. As a result, the chain-chain competition has started to take over the enterprise-enterprise competition, although many enterprise-enterprise competitions do exist particularly in the less developed economies (Koh *et al.*, 2006). The forward-looking enterprises today are dynamic; they collaborate with suppliers, customers and even with competitors; share information and knowledge aiming to create a collaborative supply chain that is capable of competing if not leading the particular industry. Hence, gaining competitive edge under such a cut-throat environment becomes increasingly difficult, if not impossible.

The supply chain concept is theorized from the formation of a value chain network consisting of individual functional entities committed to providing resources and information to achieve the objectives of efficient management of suppliers as well as the flow of parts (Lau and Lee, 2000). Supply chain management (SCM) includes a set of approaches and practices to effectively integrate suppliers, manufacturers, distributors and customers for improving the long-term performance of the individual firms and the supply chain as a whole in a cohesive and high-performing business model (Chopra and Meindl, 2001). As defined by the Council of Supply Chain Management Professionals (CSCMP), SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities as well as coordination and collaboration with channel partners.

SCM and related strategies are crucially important to the success of a manufacturing firm. This is because the cost and quality of goods and services sold are directly related to the cost and quality of goods and services purchased. Therefore, supply chain policies such as procurement and supplier selection have an important role in the SCM (Hartley and Choi, 1996; Degraeve *et al.*, 2000). Lean practices to improve the internal processes of an organization in line with the principles of just in time (JIT) supply are other highly recognized practices in SCM (Burgess *et al.*, 2006; Cigolini *et al.*, 2004). Integration of internal processes of the organization with the suppliers and customers forms the essence of the whole idea behind SCM. With the widespread use of internet, web-based systems enable organizations to form strong customer and supplier integration for inventory management, demand forecasting, customer and supplier relationship management (Frohlich and Westbrook, 2002). The importance of better tracking of products logistics, improved efficiency in information processing, improved security, reduced counterfeit, fast-tracked quotation and ordering, improved customer relationships, better control of supplies on the SCM performance has been repeatedly reported by the cases such as Frankfurt Airport in Germany and Wal-Mart in the USA, even though these cases often are from more

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developed countries where appropriate infrastructure is in place. In all of these efforts, strategic planning for the manufacturing organizations has an integral role.

Regarding the implementation of SCM practices by manufacturing firms in Turkey, Ulusoy (2002, 2003) provides an excellent overview of the manufacturing firms with special emphasis on machinery and equipment industry. Predominantly, Turkish manufacturing industry relies on low cost strategy with respect to supply (Ulusoy, 2003) and uses “low cost” as a main supplier selection criterion in machinery and equipment industry (Ulusoy, 2002). This is not particularly surprising as far as the share of material costs within the total manufacturing costs are concerned (ranging from 56 per cent in machinery and equipment to 87 per cent in automotive). Quality appears to be order qualifier where the price is order-winner from the suppliers’ perspective (Ulusoy, 2003).

The purpose of this study is to determine the underlying dimensions of SCM practices and to empirically test a framework identifying the relationships among SCM practices, operational performance and SCM-related organizational performance with special emphasis on small and medium size enterprises (SMEs) in Turkey. Although the needs and operating environment of SMEs are very different from those of large firms, there is a dearth of literature regarding the use of SCM practices and its effect on performance of SMEs in emerging market economies such as Turkey. SMEs have significant impacts on supply chain performance, where they may serve the roles of suppliers, distributors, producers and customers (Hong and Jeong, 2006). In several emerging countries, SMEs form the largest group of manufacturing firms which essentially provide specialty manufacturing and support services to large firms (Huin *et al.*, 2002). SMEs also play a very crucial role to the economies of most emerging nations from the viewpoint of generating employment and economic growth. They account for more than half of the employment and added value in most countries (UNCTAD, 1993). Similar trend is also observed in Turkey where SMEs constitute 99.5 per cent of all business establishments and employ 61.1 per cent of the workforce (Yilmaz, 2004). In view of the fact that the success of small business has a direct impact on the national economy, this paper seeks to add to the body of knowledge by providing new data and empirical insights into the relationship between SCM practices and performance of SMEs operating in Turkey.

The remainder of this paper is organized as follows. The next section presents the literature review that helps to underpin the research framework and sets out the study’s hypotheses. The research methodology is presented in the third section. Results and discussion are in section four followed by conclusion and implications.

## 2. Literature review and hypotheses

The SCM framework developed in this study is shown in Figure 1. The framework proposes that SCM practices implemented in SMEs will influence SCM-related organizational performance both directly and also indirectly through operational performance. A detailed description of the SCM practices construct along with both operational and SCM-related organizational performance constructs is provided in the following subsections. Based on the extant literature, the proposed relationships among SCM practices, operational performance and SCM-related organizational performance of SMEs are discussed and hypotheses related to these variables are developed.

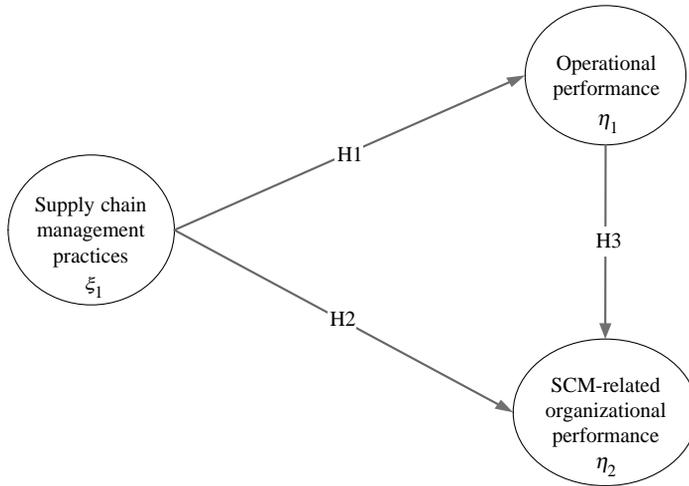


Figure 1.  
Path model

### 2.1 SCM practices

SCM practices involve a set of activities undertaken in an organization to promote effective management of its supply chain. The literature is replete on the dimensions of SCM practices from variety of perspectives. In a more recent study, Li *et al.* (2005) attempted to develop and validate a measurement instrument for SCM practices. Their instrument has six empirically validated and reliable dimensions which include strategic supplier partnership, customer relationship, information sharing, information quality, internal lean practices and postponement. Strategic supplier partnership represents the long-term relationship between the organization and suppliers. Customer relationship covers the practices on complaint handling, customer satisfaction, and long-term relationship establishment. Information sharing means the information communicated between partners where the accuracy, adequacy, and timeliness refer to the quality of information. Lean practices are represented by the elimination of waste, low inventory, small lot sizes and JIT delivery. Postponement is the delayed differentiation of products on the supply chain.

A list of SCM dimensions used in previous literature regarding the SCM practices is provided in Table I. Relying on the extant literature, this study identifies a set of 12 SCM practices. A detailed description of these practices is provided in Appendix 1.

### 2.2 Operational performance

A central objective of effective SCM is to create a major source of competitive advantage for the enterprise to differentiate itself in the eyes of the customers from its competitors by operating at a lower cost and hence at a greater profit (Christopher, 1992). Recently, Gunasekaran *et al.* (2004) developed a framework for SCM performance measures and metrics listed for supply chain process (plan, source, make and deliver) and level of management (strategic, tactical and operational levels). The empirical literature provides various dimensions of operational performance which may also be applicable to SME context. The measures of the operational performance construct used in this study are flexibility, reduced lead time in

<i>Donlon (1996)</i> Supplier partnership Outsourcing Cycle time compression Continuous process flow Information technology sharing	<i>Tan et al. (1998)</i> Purchasing Quality Customer relations	<i>Alvarado and Kotzab (2001)</i> Concentration on core competencies Use of inter-organizational systems (e.g. EDI) Elimination of excess inventory levels
<i>Tan et al. (2001)</i> Supply chain integration Information sharing Supply chain characteristics Customer service management Geographical proximity JIT capability	<i>Ulusoy (2003)</i> Logistics Supplier relations Customer relations Production	<i>Chen and Paulraj (2004)</i> Supplier base reduction Long-term relationship Communication Cross-functional teams Supplier involvement
<i>Min and Mentzer (2004)</i> Agreed vision and goals Information sharing Risk and award sharing Cooperation Process integration Long term relationship Agreed supply chain leadership	<i>Li et al. (2005)</i> Strategic supplier partnership Customer relationship Information sharing Information quality Internal lean practices Postponement	<i>Burgess et al. (2006)</i> Leadership Intra-organizational relationships Inter-organizational relationships Logistics Process improvement orientation Information systems Business results and outcomes

**Table I.**  
Dimensions of SCM practices in the literature

production, forecasting, resource planning, cost saving and reduced inventory level. These measures are identified in the following paragraphs.

*2.2.1 Flexibility.* SCM practices may enhance a firm's flexibility, which could be defined as the firm's ability to adapt to the changes in its business environment. The adaptation of the "many suppliers" practice could increase flexibility generating alternative sourcing for procurement by reducing supply chain risks. Building long-term partnership relations with suppliers and customers also helps to improve the flexibility of the supply chain by creating a mutual understanding among the members (Chang *et al.*, 2005). Holding safety stock and sub-contracting could dampen down supply and demand chains uncertainties through delivering from inventory and/or purchasing sub-contracted resources. Outsourcing and 3PL are two of the frequently used SCM practices by firms to provide flexibility to internal capacity to ring fence their resources for the core activities.

*2.2.2 Reduced lead time in production.* E-procurement, delivery from stock, single sourcing and JIT delivery practices may help reduce delivery lead time as well as increase responsiveness, and thus provide competitive advantage to the firm.

*2.2.3 Forecasting.* Forecasting accuracy is the most important feature in the performance of supply chains. It is a joint performance of a combination of resources such as supply of material, manufacturing, production planning and customer demand prediction. Wickramatillake *et al.* (2006) applied the baseline forecast to consider the major milestones of a large-scale project in order to measure the performance of the supply chain with respect to meeting the delivery targets. Through closer partnerships

with suppliers and customers, it is anticipated that information could be shared, and thus, fed into demand forecasts to improve the accuracy of predictions. This forecast will in turn enable the firm to deliver the order more confidently.

*2.2.4 Resource planning and cost saving.* With appropriate strategic planning, it may be anticipated that the utilization of resources will be optimized leading to cost savings. For example, reduced cycle time in production could be materialized through reducing set-up time and/or eliminating non value-added activities. With a shortened cycle time, more orders could be processed, which would then result in improved efficiency and reduced production cost per unit. In addition, the use of an e-procurement tool could also shorten order lead time and reduce ordering cost.

*2.2.5 Reduced inventory level.* JIT supply allows minimum inventory holding through supplies delivered when they are needed. This SCM practice will not only reduce inventory level, but will also free up warehouse space and untighten cash flow (Mistry, 2006). This is particularly important for SMEs which are in constant need for cash to run the business.

### *2.3 SCM-related organizational performance*

Previous studies have measured organizational performance relying on both financial and non-financial criteria. Although financial performance is the ultimate aim of any business organization, other indicators such as innovation performance (Llorens *et al.*, 2003), market share and other non-financial performance indicators may also be equally important in evaluating the impact of SCM practices on SME performance (Demirbag *et al.*, 2006). The short-term objectives of SCM are essentially to enhance productivity and reduce inventory and lead time, while long-term objectives are to increase market share and integration of supply chain for all members of the supply chain (Li *et al.*, 2006; Lyons *et al.*, 2004; Tan *et al.*, 1998). Based on this discussion, the following items are adopted to measure SCM-related organizational performance in this study.

*2.3.1 Increase in sales.* A competitive supply chain in the market might be characterized by efficient use of chain resources which would lead to lower product cost, better product quality, faster response and therefore eventually higher market share. Through practice of supply chain benchmarking, emerging as a leader in the industry would provide a firm with the opportunity of increased sales. If an industry leader position is still far reaching, benchmarking the supply chain performance against the best practice in the industry would provide incentives for further improvement that will eventually lead to increased sales.

*2.3.2 More accurate costing.* The use of an e-procurement tool would assist the company to provide a more accurate costing for the product and service produced. This can be achieved through real-time evaluation and the updated information in key accounts of buyers and suppliers. (Rao, 2006). Working with “few suppliers” helps reduce the number of transactions for procurement. “JIT supply” reduces the holding cost, which is hard to predict. The cost of goods and services outsourced to subcontractors and 3PL companies may be calculated more accurately than producing them in-house.

*2.3.3 Increase in coordination between departments.* Strategic planning could increase integration between various departments of an organization through information retrieval and sharing. This SCM practice helps to reduce the departmental

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barriers and generate an organization-wide plan. “JIT supply” and “few suppliers” practices are the consequences of JIT philosophy which traditionally relies on tight collaboration in every levels of organization. The benefits of close relationship with suppliers and customers are only realized in a well coordinated organization.

*2.3.4 Increase in coordination with suppliers.* The use of few suppliers, forming close partnerships with suppliers and practice of e-procurement could increase coordination with suppliers. The practice of using few suppliers helps to build more effective supplier relationships. Through establishing close partnerships with suppliers, product, process and technology innovations could be better achieved, e.g. joint development of a new product, joint effort in reducing purchased lead-time, cross training workforce, etc. This partnership will not only benefit the supplier and the customer, but will also improve the coordination with the suppliers due to a closer “control” of the supply chain (Helo and Szekely, 2005). With an e-procurement practice, the ordering process could be streamlined and automated. Transactions could be managed more centrally and hence it is clear that the increase in coordination with suppliers in this context is via information technology (Rahman, 2004).

*2.3.5 Increase in coordination with customers.* Increase in coordination with customers could be achieved through forming close partnerships with customers. For example, potential customer orders could be negotiated and clarified jointly (Wu *et al.*, 2004). This may help to reduce late design changes and/or order changes, which subsequently affect the delivery performance of the company.

#### *2.4 Hypotheses*

The SCM framework developed in this study proposes that SCM practices have a direct impact on the operational performance of SMEs. SCM practices are expected to increase an organization’s operational performance through flexibility, reduced lead time, cost saving, resource planning, reduced inventory level and forecasting. As noted earlier, various SCM practices have an impact on various aspects of operational performance. This leads to the following hypothesis:

- H1.* SMEs with higher levels of SCM practices will have higher levels of operational performance.

SCM practices influence not only operational performance, but also SCM-related organizational performance of SMEs. They are expected to enhance an SME’s sales, integration between its departments and coordination with its suppliers and customers. Thus, we expect that:

- H2.* SMEs with higher levels of SCM practices will have higher levels of SCM-related organizational performance.

The relationship between financial and non-financial measures of organizational performance has long been discussed in organization and strategy literature. York and Miree (2004) argue that non-financial performance such as improved quality, innovativeness and resource planning should actually reduce costs, and thus have a positive effect on measures of financial performance. Increased quality helps SMEs to retain current customers and create greater customer loyalty, which in return may increase market share and organizational performance (Rust *et al.*, 1994). A number of prior studies demonstrate positive relationship between operational performance

dimensions such as product quality, (Larson and Sinha, 1995) innovation and R&D (Prajogo and Sohal, 2001; Singh and Smith, 2004) employee performance (Fuentes-Fuentes *et al.*, 2004). Increase in operational performance may lead to high levels of organizational performance related to SCM in terms of increased sales, organization-wide coordination and supply chain integration. Hence, a positive relationship between operational performance and SCM-related organizational performance can be proposed.

- H3.* The higher the level of operational performance, the higher the level of SCM-related organizational performance.

### **3. Research methodology**

#### *3.1 Sample and data collection*

A survey instrument was developed to investigate the impact of SCM practices on the performance of SMEs. The questionnaire was pre-tested several times to ensure that the wording, format, and sequencing of questions were appropriate. Occasional missing data on variables was handled by replacing them with the mean value. The percentage of missing data across all data were calculated to be relatively small.

There is no consensus on the definition of SME, as variations exist between countries, sectors and even different governmental agencies within the same country (Yusof and Aspinwall, 2000). In line with small business research, this study adopted the number of employees as the base for the definition of SME. An SME is identified as one that employs fewer than 250 staff. The minimum of at least ten employees was also chosen in order to exclude micro firms that would not be suitable for the purposes of this study. This range is consistent with the definition of an SME adopted by both the Turkish State Institute of Statistics (SIS) and Turkish Small Business Administration and also by a number of European countries such as Norway and Northern Ireland (Sun and Cheng, 2002; McAdam and McKeown, 1999).

Data for this study was collected using a self-administered questionnaire that was distributed to 800 SMEs operating in the manufacture of fabricated metal products and general purpose machinery (NACE codes 28 and 29) within the city of Istanbul in Turkey. For centuries as being the largest city of Turkey, Istanbul has been undisputedly the main industrial and trade centre. The city of Istanbul accounts for nearly 75 per cent of total capital investment generating nearly 23 per cent of Turkish GNP (Berkoz and Eyuboglu, 2005). The sample was selected randomly from the database of Turkish Small Business Administration (KOSGEB). The KOSGEB database includes a total of 12,270 SMEs in Istanbul, which accounts for nearly 28 percent of all SMEs registered throughout Turkey. The sampling frame consists of 1,917 SMEs operating in both industries in Istanbul.

It was requested that the questionnaire be completed by a senior officer/executive in charge of SCM practices. The responses indicated that a majority of the respondents completing the questionnaire were in fact members of the top management. Of the 800 questionnaires posted, a total of 229 questionnaires were returned after one follow-up. A total of 26 questionnaires were eliminated due to largely missing values. The overall response rate was thus 25.4 percent (203/800), which was considered satisfactory for subsequent analysis. A comparison of the annual sales volume, number of employees and sub-industry variation revealed no significant differences

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between the responding and non-responding firms ( $p > 0.1$ ). Thus, the responses adequately represented the total sample group.

### 3.2 Measurement of variables

Based on the literature, a set of twelve SCM practices that are applicable to SME context were identified. These practices included “close partnership with suppliers” “close partnership with customers” “just in time supply” “e-procurement” “outsourcing” “subcontracting” “3PL” “strategic planning” “supply chain benchmarking” “few suppliers” “many suppliers” and “holding safety stock”. Respondents were asked to what extent the following SCM practices were implemented in their organizations relying on five-point scales ranging from 1 = “not at all implemented” to 5 = “fully implemented”.

It is generally recognized that it is difficult to select a single measure of firm performance. The literature lists several quantitative objectives that can be set to guide performance over a period of time, as well as qualitative objectives (Hunger and Wheelen, 1993; Thompson, 1993). It has been argued that as there are obvious difficulties in obtaining quantitative measures, there is a strong a priori case that qualitative measures should be included in assessments of performance (Chakravarthy, 1986). Therefore, the subjective approach has been used extensively in empirical studies, based on executives’ perceptions of performance, having been justified by several writers.

SME performance in this study was measured at two levels. A list of six operational (OPER) and five SCM-related organizational performance (ORG) measures were identified. The former group of performance indicators includes “reduced lead time in production” “cost saving” “forecasting” “resource planning” “reduced inventory level” and “flexibility” while the latter group includes “increase in sales” “more accurate costing” “increase in coordination between departments” “increase in coordination with suppliers” and “increase in coordination with customers”. Respondents were asked to indicate on a five-point scale, ranging from “definitely better” through “about the same” to “definitely worse” or “don’t know” how their business had performed over the last three years relative to their major competitors on each of the operational and SCM-related organizational performance criteria.

The items used to measure SCM practices, operational and SCM-related organizational performance of SMEs are reproduced in the Appendix 2.

## 4. Results and discussion

The frequency distribution of the sample firms with respect to the use of SCM practices is shown in Table II. The SCM practices with the highest level of usage by the sample firms included “JIT supply” “many suppliers” and “holding safety stock”. The finding that both “JIT supply” and “holding safety stock” were the two most cited SCM practices in terms of the level of usage appears to be somewhat surprising. This might be explained largely by the market conditions facing SMEs. Especially, financial difficulties push them to follow principles of JIT supply while unstable economic conditions and unreliable suppliers as well as dominant suppliers operating in highly concentrated industries such as steel and aluminum mandate SMEs to hold inventory. Ironically, the same conditions may also dictate to deal with several suppliers to respond to the customers properly.

**Table II.**  
Frequency distribution of  
SCM practices

SCM practices	N	Percentages
JIT supply	103	50.74
Many suppliers	91	44.83
Holding safety stock	87	42.86
Subcontracting	76	37.44
Few suppliers	72	35.47
Close partnership with suppliers	66	32.51
Strategic planning	66	32.51
Outsourcing	56	27.59
3PL	55	27.09
Close partnership with customers	53	26.11
E-procurement	45	22.17
Supply chain benchmarking	39	19.21

It is however, surprising to note that some popular SCM practices such as “outsourcing” “3PL” and “e-procurement” in SMEs were relatively less used. In his survey of e-business strategies in Turkish machinery and equipment industry Ulusoy (2002) observed a relatively widespread use of electronic business practices. Our findings, however, did not corroborate this finding within the context of SMEs.

The data analysis testing the proposed relationships shown in Figure 1 was conducted at three stages: First, an exploratory factor analysis (EFA) with varimax rotation was employed to produce a parsimonious set of SCM practices from a large set of SCM practices. Second, the internal consistency of constructs in the path model was measured. Finally, we evaluated the effect of SCM factors on both operational and SCM-related organizational performance. These stages are discussed in more detail in the following subsections.

#### 4.1 Exploratory factor analysis

Exploratory factor analysis with varimax rotation was performed on the SCM practices in order to extract the dimensions underlying each construct. The EFA of the 12 variables has yielded two factors explaining 44.5 percent of the total variance. A total of 12 items were loaded on two factors. Based on the item loadings on each factor, the first factor was labeled as strategic collaboration and lean practices (SCLP), while the second factor was labeled as outsourcing and multi-suppliers (OMS). Table III shows the results of EFA.

The Cronbach’s  $\alpha$  measures of reliability for SCLP and OMS were 0.80 and 0.63, respectively. Although an  $\alpha$  value of 0.70 and higher is often considered the criterion for internally consistent established factors (Hair *et al.*, 1998), Nunnally (1978) suggests that the  $\alpha$  value of 0.50 and 0.60 is acceptable in the early stages of research. Since, Cronbach’s  $\alpha$  value for each factor is above 0.50, both factors are accepted as being reliable for the research.

#### 4.2 Unidimensionality tests

The validity and reliability of path constructs can be assessed by checking unidimensionality of each construct using three tools: principal component analysis, Cronbach’s  $\alpha$  and Dillon-Goldstein’s  $\rho$ . As shown in Table IV, all of the Cronbach’s  $\alpha$  values met the threshold  $\alpha$  value of 0.50 (Hair *et al.*, 1998). According to the principal

Factors	Factor loads	Eigen-value	Percentage of variance explained	Cum. per cent	Cronbach $\alpha$
<i>Factor 1</i>		4.07	33.94	33.94	0.80
<i>Strategic collaboration and lean practices</i>					
Close partnership with suppliers	0.78				
Close partnership with customers	0.77				
JIT supply	0.64				
Supply chain benchmarking	0.63				
Strategic planning	0.57				
Holding safety stock	0.56				
Few suppliers	0.47				
<i>Factor 2</i>					
<i>Outsourcing and multi-suppliers</i>		1.26	10.53	44.47	0.63
Outsourcing	0.78				
E-procurement	0.64				
3PL	0.62				
Subcontracting	0.53				
Many suppliers	0.41				

Table III.

Notes: K-M-O Measure of sampling adequacy = 0.836; Bartlett test of sphericity = 582.65;  $p < 0.000$  EFA of the SCM practices

Constructs	Number of indicators	Cronbach $\alpha$	Dillon-Goldstein's $\rho$	First Eigenvalue	Second Eigenvalue
Strategic collaboration and lean practices	7	0.80	0.85	3.22	0.83
Outsourcing and multi-suppliers	5	0.63	0.77	2.02	0.99
Operational performance	6	0.77	0.84	2.82	0.91
SCM-related organizational performance	5	0.87	0.90	3.33	0.57

Table IV.

Unidimensionality tests

component analysis, since the first eigenvalue score of the correlation matrix of the manifest variables of each construct is larger than one, and the second one is smaller than one, each construct was considered as unidimensional. Similarly,  $\rho$  value in Dillon-Goldstein's  $\rho$  analysis is also above 0.70 for each construct. All three tests support unidimensionality.

#### 4.3 4.3. Path model

4.3.1 *Structural equation modeling.* In order to avoid the multi-collinearity and measurement errors, while addressing the cause-effect relationships among the research constructs, we utilized partial least squares (PLS) method, which is a variance-based structural equation modeling approach. The PLS procedure, developed

by Wold (1985), uses two stage estimation algorithms to obtain weights, loadings and path estimates. In the first stage, an iterative scheme of simple and/or multiple regressions contingent on the particular model was performed until a solution converges on a set of weights used for estimating the latent variables scores. The second stage involves the non-iterative application of PLS regression for obtaining loadings, path coefficients, mean scores and location parameters for the latent and manifest variables. For calculating the PLS procedure Spad Decisia V56 statistical data analysis software was employed (Fornell and Cha, 1994; Tenenhaus *et al.*, 2005).

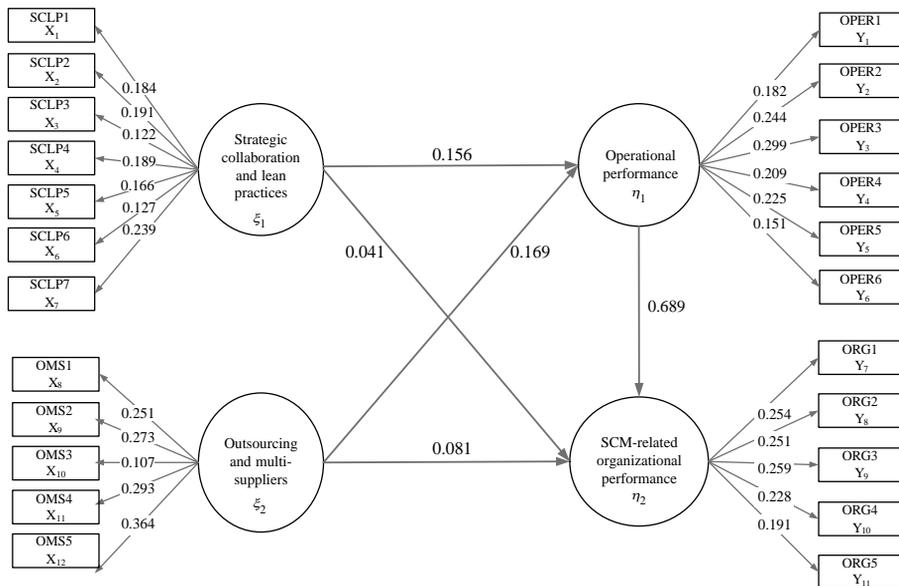
*4.3.2 Outer and inner model estimations.* The relationships between the path constructs as shown in Figure 1 were tested. The estimation results for both outer and inner models were shown in Table V and Figure 2. Following the parameter estimation, bootstrapping was also undertaken to confirm the robustness of the findings. To do this, 1000 Bootstrap samples were built by re-sampling with replacement from the original sample. The summary results for bootstrapping were provided in the last column of Table V. The bootstrap estimated coefficients of inner model were very close to those estimated by PLS.

Outer model, also known as measurement model, links the manifest variables to their latent variables. The regression weights between the manifest variables and their

Constructs	Standardized regression weights	Bootstrapping
SCLP1 – SCLP	0.184 **	0.187
SCLP2 – SCLP	0.191 **	0.194
SCLP3 – SCLP	0.111 **	0.114
SCLP4 – SCLP	0.189 **	0.187
SCLP5 – SCLP	0.166 **	0.165
SCLP6 – SCLP	0.126 **	0.133
SCLP7 – SCLP	0.239 **	0.238
OMS1 – OMS	0.251 **	0.257
OMS2 – OMS	0.273 **	0.283
OMS3 – OMS	0.106 **	0.115
OMS4 – OMS	0.293 **	0.300
OMS5 – OMS	0.363 **	0.373
OPER1 – OPER	0.182 **	0.181
OPER2 – OPER	0.244 **	0.243
OPER3 – OPER	0.299 **	0.298
OPER4 – OPER	0.209 **	0.209
OPER5 – OPER	0.225 **	0.224
OPER6 – OPER	0.151 **	0.153
ORG1 – ORG	0.254 **	0.254
ORG2 – ORG	0.251 **	0.251
ORG3 – ORG	0.259 **	0.256
ORG4 – ORG	0.228 **	0.228
ORG5 – ORG	0.191 **	0.189
OPER – SCLP	0.156 **	0.144
OPER – OMS	0.169 **	0.158
ORG – SCLP	0.041 *	0.041
ORG – OMS	0.081 *	0.081
ORG – OPER	0.689 **	0.689

**Table V.**  
Inner and outer  
regression weights for the  
path model

**Notes:** \* $p < 0.1$ ; \*\* $p < 0.01$



**Figure 2.**  
Results of the path model

related latent variables were found to be significant at  $p < 0.01$  level, as shown in Figure 2 and Table V.

Of the individual SCM practices constituting SCLP factor, “holding safety stock” ( $\beta = 0.24$ ;  $p < 0.001$ ), “close partnership with customers” ( $\beta = 0.19$ ;  $p < 0.001$ ) and “strategic planning” ( $\beta = 0.19$ ;  $p < 0.001$ ) featured as the most important SCM practices, while “just in time supply” ( $\beta = 0.11$ ;  $p < 0.01$ ) and “few suppliers” ( $\beta = 0.12$ ;  $p < 0.01$ ) were relatively less important SCM practices constituting SCLP factor.

This finding is not particularly surprising in an environment characterized by a relatively high degree of turbulence and instability. As compared to large size companies, SMEs are more susceptible to severe economic and financial crises due to lack of physical and financial resources. While Turkish Government’s decisive implementation of macroeconomic stabilization program since November 2002 have contributed to the economic growth and macroeconomic stability, the economic situation has still been marked by erratic economic growth and serious imbalances. This situation enforces Turkish SMEs to become more prudent and risk averse which obviously has an impact on their SCM strategies. Within the machinery and equipment industry, material and production management is poor (Ulusoy, 2002 p. 43). Safety stock is unavoidable in order to guarantee the availability of raw materials which have long lead times and unstable custom regulations for imported materials. There are also few suppliers for main raw materials such as steel and aluminum is few and they dictate the market conditions (e.g. prices, minimum order quantity and delivery conditions). Some of the stock keeping units in the industry are heavily procured (Ulusoy, 2002, p. 39). This also explains why the individual SCM practice of “JIT supply” was found to have relatively less weight within the SCLP factor. Unreliable performance of the suppliers leads to SMEs to deal with a large pool of

suppliers rather than a few. Without having a clear sense of customers, it is highly difficult to survive in the local market for manufacturing SMEs. Therefore, forging close relationships with customers is a natural consequence of doing business in seemingly turbulent Turkish market.

As for OMS factor, “many suppliers” ( $\beta = 0.36; p < 0.001$ ) appeared to be the leading SCM practice. Similarly, “3PL” ( $\beta = 0.29; p < 0.001$ ) was found to be the second most critical SCM practice comprising the OMS factor, whereas “subcontracting” ( $\beta = 0.10; p < 0.01$ ) was noted as the least important SCM practice constituting OMS. The finding that the use of “many suppliers” was found to be the most critical SCM practice is not particularly surprising in that it has been a highly common classical approach for procurement. If the share of commodity materials within the materials procured is high as in machinery and equipment industry, it is not unreasonable to argue why this classical approach has been widely implemented. This also tends to confirm the finding of Ulusoy (2002) that the most important criterion for the supplier selection in the machinery and equipment industry is low cost, thus the SCM practice of using “many suppliers” is a practice to get lower prices. Given the fact that the nature of the industry makes the SMEs sensitive to their “know-how” the size of the companies is rather small, and many of them are subcontractor to the bigger companies, it is also understandable why subcontracting may not be too important for SMEs in machinery and equipment industry.

The first two most important performance measures comprising operational performance (OPER) factor were found to be “cost saving” ( $\beta = 0.29; p < 0.001$ ) and “reduced lead time in production” ( $\beta = 0.24; p < 0.001$ ), while “reduced inventory level” ( $\beta = 0.15; p < 0.01$ ) had relatively less impact on OPER. On the contrary, there is much less variation between the SCM-related organizational performance (ORG) factor and its constituent variables in terms of the impact of each measure on ORG. Most SMEs in manufacturing industry needs to improve their production and material management systems (Ulusoy, 2002). In addition, dominant few suppliers of raw materials and long procurement lead times for imported materials are some other barriers to keep SMEs away from concentrating on their inventory levels.

Figure 2 shows the results of the inner model. The first equation in the path model has one endogenous variable (dependent variable), which is operational performance (OPER) and two exogenous variables (independent variables), which are SCLP and OMS. This model evaluates the impact of SCLP and OMS on OPER. Both factors of SCLP and OMS were found to have direct positive and significant impact on operational performance ( $p < 0.01$ ). This result supports *H1*, which states that SMEs with higher levels of SCM practices will have higher levels of operational performance.

The second equation in the path model has one endogenous variable, which is SCM-related organizational performance (ORG) and three exogenous variables, which include SCLP, OMS and OPER. This model examines the impact of SCLP, OMS and OPER on ORG. In contrast, to the causal relationship in the first equation, both SCLP and OMS did not have a significant and direct impact on ORG ( $p > 0.1$ ), though the sign on the coefficient was positive. This finding does not provide support for *H2*. This might be explained by the fact that organizational performance could be usually influenced by several factors and therefore it would be difficult to state directly whether a single factor, such as SCM practice, will alone influence the SCM-related organizational performance of SMEs. The direct relationship between the two

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performance constructs were found significant ( $p < 0.000$ ). This result provides a good deal of support for *H3* indicating that the higher level of operational performance may lead to improved SCM-related organizational performance. It should also be noted that both factors of SCM practices have an indirect and significant positive effect ( $p < 0.01$ ) on ORG through OPER. This indicates that SCM practices increase operational performance of SMEs in the first place, and operational performance will in turn lead to improved organizational performance related to SCM. The findings of this study, then, specify the presence of a mediating impact of operational performance between SCM practices and SCM-related organizational performance of SMEs.

## 5. Conclusion and implications

This paper has provided empirical justification for a framework that identifies two groups of SCM practices and describes the relationship among SCM practices, operational performance and SCM-related organizational performance within the context of manufacturing SMEs. It sought answers to three main research questions:

- RQ1.* Do SMEs with high level of SCM practices have a high level of operational performance.
- RQ2.* Do SMEs with high level of SCM practices have high level of SCM-related organizational performance.
- RQ3.* Do SMEs with high level of operational performance have a high level of SCM-related organizational performance?

Data for the study were collected from a sample of 203 manufacturing SMEs in Turkey and the research framework was tested using partial least squares method, which is a variance-based structural equation modeling approach. Based on exploratory factor analysis (EFA), SCM practices were grouped in two factors: OMS, and SCLP. The results indicate that both factors of SCLP and OMS have direct positive and significant impact on operational performance. In contrast, both SCLP and OMS do not have a significant and direct impact on SCM-related organizational performance. Also, as the direct relationship between the two performance-constructs was found significant, both factors of SCM practices have an indirect and significant positive effect on ORG through OPER.

This study offers a number of managerial implications. First, by developing and validating a multi-dimensional construct of SCM practices and by exhibiting its value in improving operational performance of SMEs, it provides SCM managers with a useful tool for evaluating the efficiency of their current SCM practices. Second, the analysis of the relationship between SCM practices and operational performance indicates that SCM practices might directly influence operational performance of SMEs. The SCM managers should also be cognizant of the intermediating effect of operational performance that SCM-related organizational performance could only be enhanced by improving operational performance in the first place. Third, the findings of this study tend to support the view that the implementation of SCM practices has a significant impact on the operational efficiency of SMEs in an emerging country context. Researchers can use the findings herein to generate ideas for future studies, and top managers can glean important knowledge about how effective SCM impacts organizational performance.

It should also be acknowledged that the present study is subject to some limitations. Perhaps, the most serious limitation of this study was its narrow focus on Turkish manufacturing SMEs, thus precluding the generalization of findings to other emerging countries as well as other sectors such as service and government sectors that may benefit from a sound SCM strategy. The data were collected from single respondents in an organization which might be a cause for possible response bias. A caution should, therefore, be exercised when interpreting the results. Future research should endeavor to collect data from organizations across the supply chain. Future studies may also investigate the proposed relationships by integrating some contextual variables into the model including the type of industry, supply chain structure, country of origin and supply chain length.

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### Appendix 1

#### *Close partnership with suppliers*

Cooperation between buyer and supplier is the starting point to establish a successful SCM and a necessary, but insufficient condition. The next level requires coordination and collaboration

between buyer and suppliers. This includes specified work-flow, sharing information through electronic data interchange (EDI) and the internet, and joint planning and other mechanisms that permit to undertake the Just in time (JIT) system and total quality management (TQM) in the company (Spekman *et al.*, 1998, Mistry, 2006).

*Close partnership with customers*

Downstream SCM can be deemed by demand chain management (Frohlich and Westbrook, 2002, Hsu, 2005). Building a close partnership with customers is equally important as establishing a close partnership with suppliers, though the existing literature focuses on the latter rather than the former. More research is definitely called for to uncover the importance of partnering with customers. It must be noted that the partnering with customer is slightly different from building customer relationship in that the latter focuses on relationships management while the former focuses on either joint venture and/or long-term supply agreement.

*Just in time supply*

JIT is an integrated set of activities designed to achieve high volume production using minimal inventories of raw materials, work in process and finished goods. Therefore, JIT purchasing requires the suppliers to produce and deliver to the manufacturer the right quantity at the right time with the objective of continuous and consistent conformance to performance specifications (Canel *et al.*, 2000; Mistry, 2006; Kros *et al.*, 2006).

*Strategic planning*

Conventionally, strategic planning focuses on the manufacturing process, technical innovation, financial considerations and market penetration. Firms integrate strategies in each of these areas to produce and sell high-quality products at a low price. Given the state of technology at present, a competitor often can match any single firm's advantage in these areas. Thus, firms have begun to explore ways to create competencies in the supply chain through more efficient distribution networks (Lin and Tseng, 2006) improved quality and reduced total cycle time, better post-sale service and higher responsiveness to customer needs (Carter *et al.*, 1997).

*Supply chain benchmarking*

Benchmarking of supply chain performance enables comparison between peer's supply chain and competitor's supply chain. This stimulates continuous improvement and hence allowing key performance indicators such as delivery speed, enhanced service quality and experience to be re-positioned and re-valued over time subject to market forces and dynamics.

*Few suppliers*

In contemporary business, many firms prefer a strategy of using few suppliers (Chandra and Kumar, 2000). The strategy of few suppliers implies that a buyer wants to secure a long-term relationship and the cooperation of a few dedicated suppliers. Using few suppliers can create value to the buyer and yield lower transaction and production costs.

*Holding safety stock and sub-contracting*

Buffering and dampening approaches including safety stock and sub-contracting have been widely adopted SCM practices to cope with uncertainties in a supply chain (Koh and Tan, 2006). Although holding safety stock could be considered as a type of SCM practice for dealing with supply chain uncertainty, not every company has the capacity and resources to produce the goods and services required. Then, in this case, sub-contracting becomes a typical SCM practice for dealing with supply chain uncertainties under resource constraints.

*E-procurement*

Electronic procurement (e-procurement) as a virtual purchasing application also enhances visibility of data by leveraging supplier negotiations. It allows a company to control their suppliers, hence reducing purchasing cost (Rahman, 2004). Very often, an e-procurement tool also interfaces with an ERP to automate many purchasing and payment tasks (Koh *et al.*, 2006).

*Outsourcing and 3PL*

Many firms in our contemporary business have been revising their priorities and focusing their resources on a limited number of selected activities and processes to gain more competitive advantages. The outcome of this trend is that firms increasingly outsource some selected activities and processes (Sink and Langley, 1997). As competition becomes more intense, many firms are considering the option of logistics outsourcing in order to streamline their value chains (Franceschini *et al.*, 2003). Boyson *et al.* (1999) noted that outsourcing relationships historically are based on routine functions, such as warehousing operations and freight payment, whereas today they are based on logistics activities that require more strategic knowledge and expertise, such as information systems, inventory management and customer order fulfillment. A third-party logistics (3PL) is a type of services of multiple distribution activities provided by an external party (assuming no ownership of inventory) to accomplish related functions that are not desired to be rendered and/or managed by the purchasing enterprise (Sink *et al.*, 1996). The use of a third-party provider for all or part of an enterprise's logistics operations (Coyle *et al.*, 1996) is increasingly popular (Lambert *et al.*, 1999). Coyle *et al.* (1996) identified several key benefits of logistics outsourcing, namely operating cost reduction, service level improvement, core competence prioritization, employee based reduction and capital cost reduction.

*Many suppliers*

Traditionally, vendors are selected from among many suppliers on their ability to meet the quality requirements, delivery schedule and the price offered. In this approach, suppliers aggressively compete with each other. The relationship between buyer and seller is usually adversarial. The main purchasing objective in this approach is to obtain the lowest possible price by creating strong competition between suppliers, and negotiating with them.

**Appendix 2***SCM practices*

To what extent the following SCM practices were implemented in your organization? (Five-point scales ranging from 1 = "not at all implemented" to 5 = "fully implemented").

Q no.	Variables	Measurement
SCLP1	Close partnership with suppliers	1 to 5
SCLP2	Close partnership with customers	1 to 5
SCLP3	Just in time supply	1 to 5
SCLP4	Strategic planning	1 to 5
SCLP5	Supply chain benchmarking	1 to 5
SCLP6	Few suppliers	1 to 5
SCLP7	Holding safety stock	1 to 5
OMS1	E-procurement	1 to 5
OMS2	Outsourcing	1 to 5
OMS3	Subcontracting	1 to 5
OMS4	3PL	1 to 5
OMS5	Many suppliers	1 to 5

**Table AI.**

*Operational performance (OPER)*

How did your business perform over the last three years relative to their major competitors on each of the operational performance criteria? (Five-point scales ranging from “definitely better” to “definitely worse”).

*SCM-related organizational performance (ORG)*

How did your business perform over the last three years relative to their major competitors on each of the SCM-related organizational performance criteria? (Five-point scales ranging from “definitely better” to “definitely worse”).

**Table AII.**

	Variables	Measurement
OPER1	Flexibility	1 to 5
OPER2	Reduced lead time in production	1 to 5
OPER3	Cost saving	1 to 5
OPER4	Forecasting	1 to 5
OPER5	Resource planning	1 to 5
OPER6	Reduced inventory level	1 to 5

**Table AIII.**

Q no.	Variables	Measurement
ORG1	More accurate costing	1 to 5
ORG2	Increase in coordination between departments	1 to 5
ORG3	Increase in coordination with suppliers	1 to 5
ORG4	Increase in coordination with customers	1 to 5
ORG5	Increase in sales	1 to 5

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