Contents lists available at ScienceDirect

Int. J. Production Economics

journal homepage: www.elsevier.com/locate/ijpe

A Framework for Strategic Supply Chain Management

Soo Wook Kim [a]

[a] Seoul, 599 Kwanak Ro, Kwanak-gu, 151-742, Korea

a r t i c l e i n f o

Keywords:
Supply Chain Integration, Supply Chain Management Practices, Supply Chain Performance, Firm Performance, DEA, Migration Path

a b s t r a c t

This research examines the causal linkages among supply chain management practices, supply chain integration, supply chain performance, and firm performance. The results of our analyses carried out on data from Korean and Japanese manufacturing firms, lead us to posit that firms evolve from *Starters* through *Practice focusers* or *Integration focusers* to *Stars*. These migration strategies are associated with specific supply chain management practices, supply chain integration initiatives, and the ensuing performance. We discuss the theoretical and practical implications of these migration paths and offer suggestions for future research.

1. Introduction

In a highly competitive environment, a major concern of business management in general, and supply chain management (SCM) in particular, is the strategic use of a firm's capabilities and distinctive competencies for competitive advantage. While businesses spend a lot of time and thought on strategic issues in manufacturing, finance and marketing, the focus on supply is rarely strategic. If issues pertaining to the supply chain are excluded from the strategic debate, there is imbalance, exploitable opportunities are missed and the impact of the competitive threat increased (Stevens 1989, 1990; Tan et al 2002; Ketchen and Giunipero 2004). It is essential for firms to manage their supply chains effectively to improve customer service, achieve a balance between costs and services, and gain competitive advantage.

Supply chain management (SCM) deals with the control of material and information flows, the structural and infra-structural processes relating to the transformation of the materials into value added products and the delivery of the finished products through appropriate channels to customers and markets so as to maximize customer value and satisfaction. It seeks to enhance competitive performance by closely integrating the internal functions within a company (e.g., marketing, product design and development, manufacturing) and effectively linking them with the external operations of suppliers, customers, and other channel members. As John Gossman, vice-president of materials management at AlliedSignal, has observed: "competition is no longer company to company, but supply chain to supply chain," emphasizes the strategic importance of supply chain management (Vickery *et al.*, 1999). The benefit of such supply chain management can be attained through efficient linkage among various supply chain activities, and the linkage should be subject to the effective construction and utilization of various supply chain initiatives for integrated supply chain. Viewed in this perspective, the utilization of SCM practices and supply chain integration should be key strategic SCM decisions.

The literature on SCM (Carter and Narasimhan 1996; Schonberger and Ansari 1984; Waller 1993; Chin-Fu and Yen-Ping et al. 2005; Swink and Narasimhan 2007) and manufacturing strategy (Roth et al. 1989; Skinner, 1985; Swink et al 2005) stress that SCM decisions should be strategic and must be aligned with the principal aims of manufacturing strategy - cost, quality, dependability, and flexibility- and a firm's business strategy. This means that the discussion of and inquiry into supply chain management should focus on causal linkages that exist among key strategic decisions along the supply chain. That is, the key strategic SCM decisions should be identified in the form of constructs and the structural relationships among these constructs must be presented as a conceptual model. However, few empirical studies have attempted to examine the linkages among key strategic SCM decisions (Narasimhan and Jayaram 1998; Ketchen and Giunipero 2004).

Conceptually, firms can be positioned on a grid with “SCM practice efficiency” characterizing the effectiveness with which firms utilize

SCM practices as one axis and "SC integration efficiency" characterizing the effectiveness with which firms utilize SC integration methods to achieve integration across the SC as the other axis. Measuring these two dimensions on a low/high scale defines a 2x2 grid.

The objectives of this research are (1) to investigate the differences in SCM practice, SC integration, SCM performance, and firm performance among the subgroups formed by the "practice-integration" grid, and on the basis of such investigation, (2) to suggest migration strategies for firms by utilizing the results of the difference tests and linking it to the evolution path of firms. These migration strategies would be helpful in developing a framework for linking a firm's key strategic SCM decisions to organizational performance, and in identifying how such linkage can improve performance. Such effort should prove useful for refining the conceptual foundations of strategic SCM.

The remainder of the paper is organized as follows. The next section discusses the literature leading to the development of a research model to be tested. The following section discusses the sampling frame, measures and data collection. This is followed by a discussion of the results of model testing. In the final section we present implications and conclusions.

2. Literature Review

Narasimhan and Carter (1998) stress that purchasing strategies and practices vary depending on the nature of the business and the competitive environment. Actually, their study showed that there is an associative relationship between supply chain strategies and competitive priorities of the firm, and different competitive priorities can lead to different supply chain strategies. In an earlier work, Narasimhan and Carter (1996) show that, depending on advertising, level of competition, product pricing and positioning, and degree of innovation in product lines, the influence of SCM practices on the overall performance and success of the firm can be different. This implies that there are strategic "levers" that SCM can use to enhance the chances for firm success, and thus SCM decisions should be made from a strategic perspective.

A similar view is expressed by Stevens (1990), who defined an integrated supply chain as a method for managing material flow from strategic, tactical, and operational perspectives by achieving a high degree of functional, internal, and external integration. Functional integration connotes the knitting together of the various departments across the supply chain; while internal integration is viewed as the coordinated deployment of strategic goals down the levels of an organization to the supply chain, and external integration is viewed as the strategic use of suppliers to achieve the goals of the integrated supply chain (Narasimhan and Jayaram, 1998; Cagliano 2006; Lau and Yam 2007). As the stage of integration moves from independent operation and functional integration to internal and external integration, the focus of SC integration would shift from operational and tactical to strategic aspects. These issues are inextricably linked to balancing supply and demand management considerations such that supply chain strategy is consistent with corporate strategy and the environment (Morash and Clinton 1998; Swink and Narasimhan 2007). We examine these issues in the following discussion followed by the development of the proposed conceptual model and construct variables for strategic SCM.

2.1 The Relationship between SCM Practices and Performance

Narasimhan and Carter (1996) suggest that efficient SCM and purchasing practices may have a significant effect on firm performance. Their study showed that, although sales, market share, and market position are influenced by advertising, level of competition, product pricing and positioning, and degree of innovation in product lines, purchasing factors can also influence the overall performance and success of the firm, thus emphasizing purchasing's strategic impact on the firm. Lambert and Stock (1993) define supply chain management as all "logistics" activities needed for satisfying customer demands. McGinnis and Kohn (1993) emphasize that the characteristics and utilization focus of supply chain management practices can be different depending on whether the purpose is to fulfill various customer demands or to improve the efficiency of a firm itself. Based on the evidence in the literature, a positive relationship between SCM practice and performance is presumed in our DEA analysis.

2.2 The Relationship between SC Integration and Performance

Most SC integration studies hold the same view in that the level of supply chain integration has a positive influence on performance outcomes. Armistead and Mapes (1993) in a study of 38 firms in the U.K. indicate that the level of integration along the supply chain improves quality and operating performance. Narasimhan and Jayaram (1998) and Frohlich (2002) and Ganesan, K. and B. Saumen (2005) propose that supply chain integration impacts customer responsiveness and manufacturing performance via the key linkage between sourcing and degree of manufacturing goal achievement. Johnson (1999) in a study of industrial equipment distributors concluded that strategic integration results in enhanced economic reward for the firm.

Stevens (1990) suggests four developmental stages of the supply chain -i.e., independent operation, functional integration, internal integration, external integration. He contends that depending on the developmental stage, integration can remove the barriers between functions or organizations, thus leading to efficient linkages in a supply chain and strengthening supply chain competitiveness. Stevens (1990) also asserts that as the stage of integration moves from functional integration through internal integration to external integration, the focus on performance improvement would move from cost reduction to differentiation. That is, functional integration and early stages of internal integration stage are characterized by emphasis on cost reduction rather than competitive performance improvement. Later stages of internal integration and external integration are characterized by full systems-visibility from Distribution to Purchasing and the supply of high quality products shipped direct to the line on time. Seger and

Best (1986) and Halley and Nollet (2002) also express a similar view to Stevens by suggesting that cost reduction would be emphasized in the reactive stage and productivity improvement in the integrative stage in their study on developmental stages in logistics. Based on this evidence from the literature, a positive relationship is presumed between SC integration and SC performance in our DEA analysis.

2.3 The Interaction between SCM Practice and SC Integration

SCM influences the entire supply chain processes within a firm including procurement, production, and sales. Dawe (1994) asserted that, for effective SCM, improvement in all of the supply chain functions within a firm should be made. Supply chain activities individually cannot significantly improve performance, because performance improvement is achieved through the synergy of various supply chain activities. Consequently, the focus of supply chain activities should shift from a functional and independent, to a general and integrative perspective. This implies that the usefulness of each supply chain activity should be evaluated depending on how the activity affects efficient integration of supply chain processes, and, conversely, the successful achievement of SC integration depends on the system-wide utilization of various supply chain activities. In particular, efficient interaction of various supply chain activities requires internal integration. SCM practices implemented to achieve superior supply chain performance (cost, quality, flexibility, and time performance) also require internal integration to be successful (Narasimhan 1997). Thus, it is reasonable to argue that the level and effectiveness of "internal integration" may influence how successful firms are in achieving the intended results of various supply chain activities.

Managing the supply chain effectively requires successfully linking the various supply chain activities to SCM performance through cross-functional integration and managing external interactions with suppliers and customers. The linkage between SCM practices and SC integration is necessary for using the supply chain strategically to obtain a sustainable competitive advantage (Stevens 1989; Freeman and Cavinato 1990; Lummus et al. 1998). The above argument implies that the direction and effect of strategic supply chain management can be different depending on the level and effectiveness of linkage between SCM practice and SC integration. Therefore, a central issue of interest in this research is the synergistic interaction between SCM practice and SC integration which can be expected to lead better performance than the utilization of either one by itself.

3. Methodology

3.1 Development of the Conceptual Framework

The central research issue of interest in this paper is to suggest a taxonomy of migrations that a firm could consider for achieving strategic SCM by studying the relationships among SCM practice, SC integration, SCM performance, and firm performance. SCM strategic migrations are derived from the construction of SCM practice-integration grid. Since both SCM practices and SC integration either singly or in combination are hypothesized to influence performance, we first address the issue of classifying firms on the 2x2 grid defined by these dimensions. To address these issues, we use the research framework, shown in Figure 1.

As can be seen in figure 1, first we analyzed the efficiencies of each sample firm's SCM practices utilization and SC integration for improving SCM performance. Then, in the next step, firms were classified into the SCM practice-integration grid depending on their efficiencies from the first stage analysis. In the third stage, in order to verify our prior expectation that there will be performance differences among the four subgroups classified by SCM practice-integration grid, we analyzed the subsamples by comparing them pairwise on all measures for SCM practice, SC integration, SCM performance, and firm performance. Migration strategies in SCM were inferred from the analyses carried out in these three stages. These analyses also allowed us to identify strategic levers, which a firm should embark for achieving strategic SCM.

We operationalize SCM practice-integration grid presented in our framework by initially evaluating the SCM practice and integration based efficiencies of sample firms by using a nonparametric linear programming methodology, Data Envelopment Analysis (DEA). DEA is a multi-factor productivity analysis technique proposed by Charnes et al. (1978). It has been successfully applied to assess the performance of schools, bank branches, hospitals, production plants, and a variety of other decision making units (Chatzoglu and Soteriou 1999, Charnes et al. 1994, Norman and Stocker 1992, Basso and Funari 2001, Cook and Zhu 2006, Wu 2006). This paper utilizes the ratio model proposed by Charnes et al. (1978).

3.2 Sampling

Consistent with the purpose of this study, target corporations to be sampled were manufacturing corporations carrying out all the value chain activities in a supply chain. The data were collected through questionnaires sent to supply chain managers or top-level executives in 590 large manufacturing corporations among Korea's listed and registered corporations and 900 Japan's major national logistics professional association members. The questionnaires were administered by individual visit, or sent by fax and mail, for the Korean firms, and by fax and mail using the countrywide mailing list rosters of the association, for Japanese firms. The respondents were either supply chain managers, or in cases where the firm did not have a SCM function, a top-level executive of sales, production, or planning department who was well acquainted with supply chain policies and corporate strategy of the firm was selected. In order to increase the reliability of measurement, respondents were requested to consult with others in SCM department or functional executives as appropriate when answering questions. The reliability of responses on objective measures such as cost, sales, and market share was confirmed through comparison with data collected from annual reports of the companies and annual industry report. A total of 668 completed responses (Korea-265, Japan-403) were returned, and of these 668

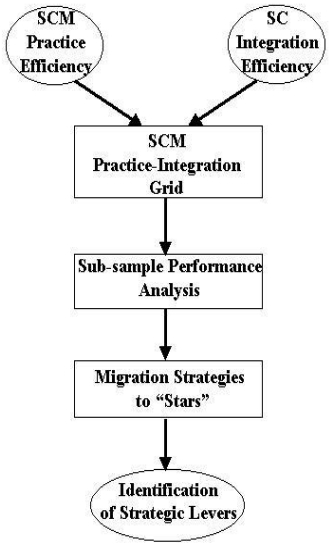


Figure 1: Research Framework

responses, 45 incomplete responses (Korea-21, Japan-24) were discarded. Accordingly, the analysis that follows and all reported statistics were based on a sample of 623 manufacturing organizations (Korea-244, Japan-379).

The sample firms in this study encompass a diversity of industry types. The results of difference test between Korean firms and Japanese firms showed that there is no difference between two countries for industry type ($\chi^2 = 4.204$, $p > .05$). This suggested that the external validity of this study's results is not influenced by industry type. For the sake of brevity, we omit presentation of the result of these statistical analyses.

3.3 Research Variables and Measurements

Level of Supply Chain Integration: We consider three integration levels-a company's integration with suppliers (IS), cross functional integration within a company (CFI), and a company's integration with customers (IC)-for classifying the type of SC integration pursued by a firm. That is, a firm could pursue one or more of these integration aspects as part of its SC integration strategy.

To measure these three integration levels, a total of 21 items were used (See Table 1) including 6 items for a company's integration with suppliers (Stevens 1989; Monczka and Morgan 1996; Narasimhan and Carter 1996, 1998; Zaheer et al. 1998; Tan et al. 1998; Carr and Pearson 1999; Frohlich and Westbrook 2001; Narasimhan and Das 2001; Shah et al. 2002; Swink et al. 2005), 8 items for cross functional integration within a company (Stevens 1989; Narasimhan and Carter 1996, 1998; Birou et al. 1998; Wisner and Stanley 1999; Cua et al. 2001; Frohlich and Westbrook 2001; Swink et al. 2005), and 7 items for a company's integration with customers (Champa and Long 1989; Stevens 1989; Morash et al. 1996, 1997; Feitzinger and Lee 1997; Moore 1998; Zaheer et al. 1998; Tan et al. 1998; Wisner and Stanley 1999; Cua et al. 2001; Frohlich and Westbrook 2001; Swink et al. 2005). The measurement scales in the survey used a seven point Likert scales, with "Extremely Low" and "Extremely High" representing the end points of the scales.

SCM Practice: In order to select the measures for the utilization focus of supply chain activity, we identified 54 variables from previous research (Handfield and Withers 1993; McGinnis and Kohn 1993; Rao et al. 1994; Dawe 1994; Day 1994; Menor et al. 2001; Wagner 2003; Ibeh 2005). Through preliminary interview survey with 30 supply chain executives and experts, variables with low explanatory value were removed and those items having similar characteristics among items with high explanatory value were grouped together. This process yielded seven broad areas of supply chain initiatives; *close location to suppliers and customers (CL)* by the establishment of a logistics center and automated warehouse with advanced technology, *the establishment of nation-wide information network (NIN)* through integrated supply chain information systems, *the setup of logistics infrastrucutre (LI)* such as unit-load system, digital-picking system, and automatic waste disposal system, *the utilization of advanced management and manufacturing technology (AMT)*, *formalization of SCM function (FSCO)* through exclusive organization, and *the implementation of executive programs (SCMEP)* for the administration of SCM including reward system depending on performance, the computation criteria of logistics cost, and *human resource management (HRM)* including the procurement and training of supply chain executives and experts. The level of emphasis on each of these seven variables was measured by a subjective rating relative to major industry competitors on a seven-point scale.

SCM Performance: Multi-dimensional indices ranging from financial factors reflecting cost reduction level to non-financial factors reflecting differentiation level (Lummus et al. 1998; Birou et al. 1998; Tan et al. 1998; Zaheer et al. 1998; Chin-Fu and Yen-Ping 2005) were used to comprehensively capture SCM performance (See Table 1). This approach to measuring SCM performance by dividing it into financial and non-financial measures has been used by previous researchers (Shapiro 1984; Sterling and Lambert 1985; Bowersox 1989; Germain 1989; Mentzer and Konrad 1991).

Cost reduction performance was derived by comparing the costs-*purchasing cost, operation cost, inventory cost, warehouse cost, sales cost, distribution/transportation cost*-three years ago to the current level, according to actual data from respondents and data collected from annual reports of the sample firms. Nonfinancial performance of sample firms were measured by a subjective rating relative to their major industry competitors on a seven-point scale.

Firm Performance: Overall firm performance was evaluated using the following three measures: *sales growth, market share growth,* and *profitability*.

Table 1 : Measurement Items and Method

Research Variable		Measurement Items	Reference	Scale
Level of Supply Chain Inte-gration	Company's Integration with Suppliers	-Information exchange with suppliers through information technology -The level of strategic partnership with suppliers -The participation level of suppliers in the design stage -The participation level of suppliers in the process of procurement & production -The establishment of quick ordering system -Stable procurement through network	Stevens 1989; Champa and Long 1989; Monczka and Morgan 1996; Narasimhan and Carter 1996, 1998; Morash et al. 1996, 1997; Feitzinger and Lee 1997; Zaheer et al. 1998; Tan et al. 1998; Carr and Pearson 1999 Birou et al. 1998; Wisner and Stanley 1999; Moore 1998; Frohlich and Westbrook 2001; Narasimhan and Das 2001; Cua et al. 2001; Shah et al. 2002; Swink et al. 2005	Seven point Likert scales (Extremely Low-Extremely High)
	Cross Functional Integration within a Company	-Data integration among internal functions through information network -Systemical information system integration among internal functions -Real-time searching of the level of Inventory -Real-time searching of Logistics-related Operating Data -Data Integration in Production Process -Integrative Inventory Management -The Construction of Systemical Interaction System between Production and Sales -The Utilization of Periodic Interdepartmental meetings among internal function		
	Company's Integration with Customers	-Follow-up with customers for feedback -The level of computerization for customer ordering -The level of organic linkage with customers through information network -The level of sharing on market information -The Agility of Ordering Process -The Frequency of Periodical Contacts with Customers -The level of Communication with Customers		
Level of SCM Practice		-Close Location to suppliers and customers -Nation-wide Information Network -Logistics Infrastructure -Advanced Management and Manufacturing Technology -Formalization of Supply Chain Organization -Executive Program for Supply Chain Management -Human Resource Management	Handfield and Withers 1993; McGinnis and Kohn 1993; Rao et al. 1994; Dawe 1994; Day 1994; Menor et al. 2001; Wagner 2003; Ibeh 2005	Seven point Likert scales (Extremely Low-Extremely High),
SCM Perfor-mance	Cost Reduction	-Purchasing cost -Operation cost -Inventory cost -Warehouse cost -Sales cost -Distribution/transportation cost	Shapiro 1984; Sterling and Lambert 1985; Bowersox 1989; Germain 1989; Mentzer and Konrad 1991 Lummus et al. 1998; Birou et al. 1998; Tan et al. 1998; Zaheer et al. 1998; Chin-Fu and Yen-Ping 2005	Actual Data
	Differen-tiation	-On-time delivery of materials from suppliers -Percent of acceptable materials -The speed of suppliers' order processing -The reduction of response time in processing requests for materials returns -Product innovation level -Process innovation level -Volume flexibility -The accuracy of order processing for customers -The reduction degree of product return ratio -The speed of order handling -The reduction of response time in processing requests for product returns or after-service		Seven point Likert scales (Worst in Industry-Best in Industry)
Firm Perfor-mance	Sales Growth Mkt. share Growth	-The growth ratio of the current level to three years ago		Actual Data
	Profitability	-Return on investment -Return on assets -Revenue growth -Financial liquidity -Net profit	Chan et al. 1997 Kaynak 2005	Seven point Likert scales

For sales growth and market share growth, two key business goals for every company, we used actual data from respondents and data collected from annual reports of the sample firms and national industry reports. Profitability of each sample firm was measured in terms of *return on investment, return on assets, revenue growth, financial liquidity,* and *net profit* by a subjective rating relative to its major industry competitors on a seven-point scale (Chan et al. 1997; Frohlich 2002; Rosenzweig 2003). The use of profitability measures with sales and market share makes it possible to analyze trade-off relationships among various types of strategies; for example, strategies that sacrifice profitability for market share by offering significant price discounts.

4. Data Analysis and Discussion

4.1 Reliability and Validity Test

As mentioned in methodology section, three levels of SC integration and non-financial SCM performance were measured by multiple subjective rated items, unlike each of seven SCM practice variables which is measured by a subjective rating under the support on conceptual definition of each practice variable. To identify the validity of such measurement construction of SC integration and SCM performance, principal components factor analyses by Varimax rotation were implemented. In the case of SCM performance, six items relating to cost reduction were excluded from factor analysis because these were actual ratios from respondents and annual reports unlike non-financial measures. Appendix 1 and 2 show the results of factor analysis with reliability test results by Cronbach's alpha.

In the case of SC integration level, the eigenvalues for the three factors initially extracted exceeded 1.0 and the percentage of variance explained ranged from 11.643% to 37.421%. The factors have theoretical validity in the light of previous studies on the three SCI levels. Also, the items comprising the factors have high factor loadings, reflecting high construct validity. Cronbach α values for the three factors exceed 0.8, indicating high reliability. In the case of SCM performance, the eigenvalues for the three factors exceeded 1.0 and the percentage of variance explained ranged from 12.155% to 29.152%. The validity measures and factor loadings are similarly high. The factor analysis yielded *quality, flexibility,* and *dependability*, as measurement variables for SCM performance. This accords well with previous studies on 'manufacturing capability based competition' (Wheelwright 1984, Nakane 1986, Ferdows and DeMeyer 1990, Roth 1996) that identify cost, quality, flexibility, and delivery as performance measures.

Also, even though not indicated here, in the cases of both SC integration and SCM performance, the results of item/total correlations showed a higher correlation among items and the scales they are related with than the correlation with the remaining scales. The Cronbach alpha values were higher than the average interscale correlation. These suggest high convergent validity. Further, as can be seen in Appendix 1 and 2, the vast majority of off-factor loadings for the items comprising each factor were low (i.e., less than 0.3), providing evidence of discriminant validity for the items.

In order to examine more precisely unidimensionality, and convergent and discriminant validity, confirmatory factor analyses using EQS were conducted. The overall fits of the CFA were judged to be satisfactory. The results for SC integration were: χ^2 = 174.323, df = 186, CFI = .939, NFI =.925, NNFI = .908, the results for SCM performance were: χ^2 = 29.135, df = 41, CFI = .955, NFI =.936, NNFI = .929 (Byrne 1994; Hair et al. 1995). In the above two CFA results, all the standardized estimates of the observed variables exceeded .500 and all the corresponding t-values were statistically significant at the 5% significance level. Together these indicate convergent validity. The Lagrange Multiplier Tests (Bentler 1995) revealed no parameters that could be released to significantly improve model fit. This reflects high discriminant validity. For evaluating more precisely discriminant validity, the criterion Fornell and Larcker (1981) suggested was applied. That is, first, the average variance extracted was calculated and then compared with the squared correlation between the constructs. To fully satisfy the requirements for discriminat validity, the average variance extracted should be greater than the squared correlation. For both SC integration and SCM performance measures, application of Fornell and Larcker's criterion confirmed discriminant validity of the measures.

4.2 Synergy between SCM Practice and SC Integration

Two DEA evaluations were used to carry out an objective assessment of SCM practice and SC integration capabilities of sample firms. First DEA evaluation focused on SCM practice efficiency, i.e., how efficiently SCM practices are translated into SCM performance. In this evaluation, seven SCM practices - *AMT, NIN, FSCO, SCMEP, HRM, LI,* and *CL* - were considered as inputs, and four SCM performance measures - *Cost*, *Quality*, *Flexibility*, and *Dependability* - were considered as outputs. The second DEA evaluation focused on SC integration efficiency, i.e., how efficiently the level of SC integration is translated into SCM performance. This analysis utilized three levels of SC integration: *Integration with Suppliers*, *Cross-Functional Integration within a firm*, and *Integration with Customers* as inputs, and the same four SCM performance measures as in the first DEA analysis as outputs.

Firms with an efficiency score of 1 are deemed efficient and those that have efficiency scores of less than 1 are deemed inefficient. Based on this assessment, the 623 firms in the sample can be profiled on the grid shown in figure 2, with *practice efficiency* as one axis and *integration efficiency* on the other axis. Based on this practice/integration efficiency grid, the firms in the study are classified into four types labeled: *Starters (n=294)* with efficiency scores less than 1.0 on both dimensions, *Practice focusers (n=177)* with an efficiency score of 1.0 on the practice dimension, *Integration focusers (n=80)* with an integration efficiency score of 1.0, and *Stars (n=72)* with efficiency scores of 1.0 on both dimensions.

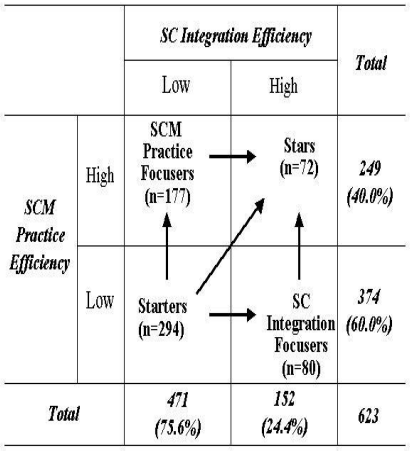


Figure 2: SCM Practice-Integration Grid

4.3 Migration Strategies for Performance Improvement

The transitions in each stage associated with this progression could in turn be associated with evolutionary patterns of SCM practices and SC integration. In order to understand clearly the operational capabilities that characterize the four groups and evaluate patterns of capability gains across the four groups, we examined differences across group means for all the variables. Table 2 shows the results of ANOVA and Duncan multiple comparison tests on the group means.

Table 2 indicates that *Starters* do not outperform the other three groups in any of capability measures. *Practice focusers* outperform *Integration Focusers* and *Starters* with respect to all SCM practice variables except nation-wide information network, while *Integration focusers* are significantly higher than *Practice focusers* and *Starters* in all three SC integration measures. These results are as expected. *Stars* dominate the other three groups with respect to the vast majority of SCM practice and SC integration measures.

Table 2 also shows that there is a significant difference in performance between *Practice focusers* and *Integration focusers* in SCM and firm performance measures except quality and cost reduction. Overall, *Starters* rank at the bottom in performance, *Stars* rank at the top, and *Practice focusers* and *Integration focusers* rank in between them. This initial performance comparison led us to posit that firms move along a transition from *Starters* through *Practice focusers* and *Integration focusers* to *Stars*, all the while reaping associated, specific performance gains. The suggested transition can be inferred from the results on logical grounds. First, it is obvious that firms cannot be in *Starters* and *Stars* simultaneously since the *Stars* group dominates *Starters* on all the practice, integration, and performance dimensions. Second, it can be argued that it takes time, effort, and investments to rise to the level of *Stars* in the implementation of the SCM practices and SC integration. It also takes time to realize the performance levels of the *Stars* group. This transition could be associated with a migration strategy, thus reinforcing our view of SCM strategy, i.e., *the dynamic positioning of a firm's SCM resources and capabilities relative to competition*.

In order to examine the notion of such *migration strategy*, we conducted pair-wise comparisons of all capability measures across the four groups using independent *t*-tests. The *t*-tests offer the dual benefits of directly contrasting one group with another, and increasing the statistical power over that of multiple comparison tests. Table 3 shows the results of the *t*-tests across practices for the four groups, and Figure 3 reorganizes the results into a transition diagram of capability progression.

In the case of *Starters*, there is no significant differences with respect to formalization of SCM function (FSCO), the implementation of SCM executive programs (SCMEP), and Quality relative to other three groups. This indicates that FSCO, SCMEP, and quality can be the key competitive capabilities of *Starters*. In other words, FSCO, SCMEP, and quality are foundational, and don't serve to differentiate among the four groups. The comparison of *Starters* and *Practice focusers* indicates that the scores for five SCM practice capabilities except FSCO and SCMEP, Cross-functional integration within a firm (CFI), dependability, and profitability are significantly higher for *Practice focusers* than for *Starters*. *Starters* do not outperform *Practice focusers* in any of the capability measures. The comparison of *Practice focusers* and *Stars* indicates that the scores for integration with suppliers and customers, flexibility, cost reduction, sales growth, and market share growth are significantly higher for *Stars* than for *Practice focusers*, with advanced manufacturing technologies (AMT), nation-wide information network (NIN), CFI, dependability, and profitability which indicate significant differences between *Starters* and *Practice focusers*. *Practice focusers* do not outperform *Stars* in any of the capability measures. These results imply that capability gains might be cumulative or incremental depending on the migration of strategic focus from *Starters* through *Practice focusers* to *Stars*.

Such migration of strategic focus can be also found in a transition from *Starters* through *Integration focusers* to *Stars*. That is, in comparing *Starters* and *Integration focusers*, the scores for human resource management (HRM), AMT, logistics infrastructure (LI), NIN, all three integration levels, dependability, flexibility, and all three firm performance measures are significantly higher for *Integration focusers* than for *Starters*. And, the comparison of *Integration focusers* and *Stars* shows that the scores for close location (CL) and cost reduction with AMT, LI, IC, flexibility, and all three performance measures are significantly higher for *Stars* than for *Integration focusers*. Of course, *Starters* and *Integration focusers* do not outperform respectively *Integration focusers* and *Stars* in any of capability measures. The above cumulative capability viewpoint is validated from the result that *Stars* outperform significantly *Starters* in all of capability measures, as can be seen in Figure 3.

Table 2. : ANOVA and Duncan multiple comparison tests

		1. Starters *(N = 294)*	2. Practice Focusers *(N = 177)*	3. Integration Focusers *(N = 80)*	4. Stars *(N = 72)*	F (Sig.)
SCM Practice	**FSCO**	4.96	5.11	4.99	5.22	1.613 (.201)
	SCMEP	3.47	3.69	3.58	3.75	1.590 (.212)
	HRM	2.72 (2,3,4)	3.88 (1)	3.74 (1)	3.93 (1)	22.051 (.000)
	CL	2.80 (2,4)	3.85 (1,3)	3.10 (2,4)	3.75 (1,3)	17.554 (.000)
	AMT	1.29 (2,3,4)	2.54 (1,3,4)	1.65 (1,2,4)	2.80 (1,2,3)	41.413 (.000)
	LI	1.27 (2,3,4)	2.00 (1,3)	1.74 (1,2,4)	2.13 (1,3)	17.093 (.000)
	NIN	2.70 (2,3,4)	4.47 (1,3,4)	5.54 (1,2)	5.77 (1,2)	60.949 (.000)
SC Integration	**CFI**	3.17 (2,3,4)	3.98 (1,3,4)	6.18 (1,2)	6.44 (1,2)	71.949 (.000)
	IS	2.90 (3,4)	3.03 (3,4)	5.78 (1,2)	5.83 (1,2)	78.835 (.000)
	IC	2.14 (3,4)	2.36 (3,4)	4.84 (1,2,4)	5.84 (1,2,3)	47.942 (.000)
SCM Performance	**Quality**	5.19	5.26	5.30	5.36	1.446 (.289)
	Dep	5.37 (2,3,4)	5.73 (1,3,4)	6.33 (1,2)	6.51 (1,2)	30.696 (.000)
	FLX	4.92 (3,4)	4.93 (3,4)	5.27 (1,2,4)	5.72 (1,2,3)	20.000 (.000)
	Cost	3.78 (4)	5.13 (4)	8.58 (4)	15.79 (1,2,3)	6.894 (.000)
Firm Performance	**SG**	47.07 (3,4)	47.56 (3,4)	63.03 (1,2,4)	127.88 (1,2,3)	14.155 (.000)
	MSG	5.38 (3,4)	7.84 (3,4)	18.17 (1,2,4)	28.63 (1,2,3)	9.346 (.000)
	Prof.	4.41 (2,3,4)	4.80 (1,3,4)	5.19 (1,2,4)	5.90 (1,2,3)	7.735 (.000)

* **FSCO:** formalization of SCM function, **SCMEP**: the implementation of SCM executive programs, **HRM**: human resource management, **CL**: close location to suppliers and customers, **LI:** logistics infrastructure, **AMT**: advanced management and manufacturing technology, **NIN**: nation-wide information network, **IS**: integration with suppliers, **CFI**: cross-functional integration, **IC**: integration with customers, **Dep.**: dependability, **FLX**: flexibility, **SG**: sales growth, **MSG**: market share growth, **Prof.**: profitability

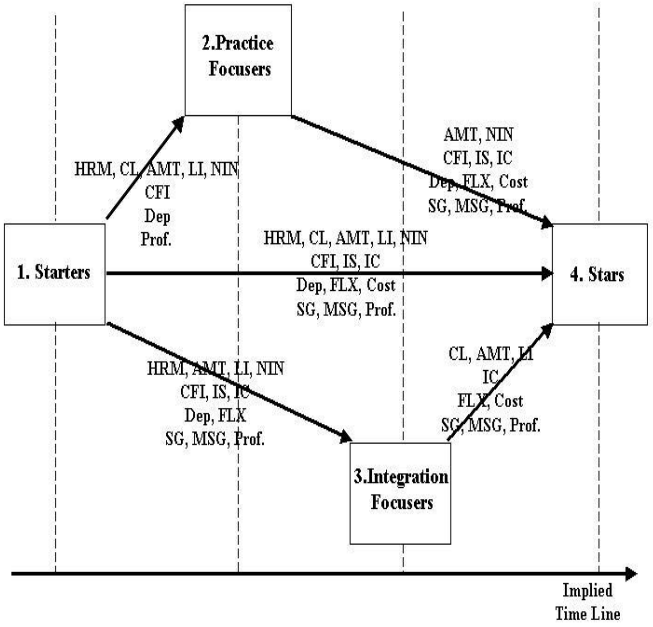
( ) : Duncan Multiple Comparison Test Results

Table 3: Independent t-tests

		1 vs. 2	*1 vs. 3*	*1 vs. 4*	*2 vs. 4*	*3 vs. 4*
SCM Practice	FSCO	-.878 (.402)	-.038 (.970)	-1.159 (.254)	-.202 (.841)	-1.087 (.270)
	SCMEP	-.739 (.577)	-.597 (.558)	-1.052 (.307)	-.076 (.940)	-.985 (.389)
	HRM	**-2.469 (.019)**	**-2.332 (.026)**	**-2.612 (.017)**	-.111 (.901)	-1.492 (.147)
	CL	**-2.485 (.024)**	-.702 (.491)	**-2.467 (.019)**	.569 (.574)	**-2.088 (.047)**
	AMT	**-2.716 (.014)**	**-1.887 (.079)**	**-3.597 (.001)**	**-1.729 (.093)**	**-2.727 (.014)**
	LI	**-2.504 (.019)**	**-1.944 (.063)**	**-2.335 (.025)**	-1.457 (.161)	**-1.777 (.093)**
	NIN	**-3.575 (.001)**	**-4.485 (.000)**	**-4.973 (.000)**	**-2.997 (.011)**	-1.234 (.259)
SC Integration	CFI	**-2.097 (.044)**	**-5.038 (.000)**	**-5.275 (.000)**	**-4.002 (.000)**	-1.376 (.199)
	IS	-.476 (.642)	**-5.271 (.000)**	**-5.510 (.000)**	**-5.300 (.000)**	-.076 (.940)
	IC	-.338 (.741)	**-3.973 (.000)**	**-4.848 (.000)**	**-4.956 (.000)**	**-2.464 (.022)**
SCM Performance	Quality	-.375 (.717)	-.450 (.655)	-.855 (.402)	-.505 (.619)	-.087 (.923)
	Dep	**-1.788 (.090)**	**-2.716 (.014)**	**-3.033 (.008)**	**-2.533 (.018)**	-.578 (.602)
	FLX	-.001 (.999)	**-2.001 (.050)**	**-3.332 (.003)**	**-3.329 (.003)**	**-2.505 (.019)**
	Cost	-.479 (.640)	-1.457 (.161)	**-7.122 (.000)**	**-5.959 (.000)**	**-4.012 (.000)**
Firm Performance	SG	-.133 (.896)	**-2.075 (.048)**	**-7.243 (.000)**	**-7.099 (.000)**	**-5.345 (.000)**
	MSG	-1.170 (.270)	**-3.881 (.000)**	**-6.930 (.000)**	**-5.114 (.000)**	**-2.221 (039)**
	Prof.	**-1.979 (.056)**	**-3.200 (.004)**	**-3.911 (.000)**	**-3.339 (.002)**	**-2.804 (012)**

* **FSCO:** formalization of SCM function, **SCMEP**: the implementation of SCM executive programs, **HRM**: human resource management, **CL**: close location to suppliers and customers, **LI:** logistics infrastructure, **AMT**: advanced management and manufacturing technology, **NIN**: nation-wide information network, **IS**: integration with suppliers, **CFI**: cross-functional integration, **IC**: integration with customers, **Dep.**: dependability, **FLX**: flexibility, **SG**: sales growth, **MSG**: market share growth, **Prof.**: profitability

*1: Starters, 2: Practice Focusers, 3: Integration Focusers, 4: Stars



*__Note__: In case of Starters, FSCO, SCMEP, and quality are foundational and don't serve to differentiate among the clusters.

*** FSCO:** formalization of SCM function, **SCMEP**: the implementation of SCM executive programs, **HRM**: human resource management, **CL**: close location to suppliers and customers, **LI:** logistics infrastructure, **AMT**: advanced management and manufacturing technology, **NIN**: nation-wide information network, **IS**: integration with suppliers, **CFI**: cross-functional integration, **IC**: integration with customers, **Dep.**: dependability, **FLX**: flexibility, **SG**: sales growth, **MSG**: market share growth, **Prof.**: profitability

Figure 3 : Migration Strategies in Strategic Supply Chain Management

As mentioned previously, performance comparison in Table 2 led us to posit that firms move along a transition from *Starters* through *Practice focusers* and *Integration focusers* to *Stars*. As can be seen in Figure 3, we can suggest three migration strategies in strategic SCM: pursuing first practice efficiency, followed by integration efficiency; the strategy of establishing first systematic SC integration and subsequently pursuing practice efficiency; and the strategy of simultaneously pursuing simultaneously practice and integration efficiencies. Also, in Figure 3, we have identified strategic levers for implementing the above three migration strategies.

Although a firm can choose to move from *Starters* to *Stars* in one move by pursuing simultaneously practice and integration efficiencies, such a strategy would entail simultaneous improvement in all capabilities. However, implementation costs coupled with resource constraints and the complexity of managing the myriad attendant changes would make this strategy a risky one. In contrast, the cumulative capability viewpoint is more manageable in that the capability progression calls for emphasis on fewer performance gain and integration objective or a related and cohesive set of practices. Strategically, it may be more efficacious to move step by step from *Starters* through *Practice focusers* or *Integration focusers* to *Stars* in order to ensure the success of capability progression.

One thing to be noted is that, as can be seen in Figure 3, the rectangle corresponding to *Integration focusers* is positioned to a little right of that of *Practice focusers* along the implied time line. This means that *Integration focusers* are closer to *Stars* than *Practice focusers* from the perspective of capabilities gained. *Integration focusers* have more significantly different capabilities compared to *Starters*, and less significantly different capabilities compared to *Stars*, than *Practice focusers*. Also, as can be seen in Table 2, the performance of Integration focusers is significantly higher than that of Practice focusers in all of SCM and firm performance measures except quality and cost reduction. These support the above argument.

5. Implications and Conclusion

The discussion in this paper focuses on the development of a conceptual model that firms can be construed to go through in migrating from an "operational" orientation to a "strategic SCM" orientation. This framework of strategic SCM is a step in stimulating research and understanding fully the active role of SCM in developing and implementing corporate competitive strategy and improving performance. The results of DEA and statistical analyses discussed in the preceding section, lead us to hypothesize that firms move from *Starters* through *Practice focusers* or *Integration focusers* to *Stars*. Such SCM strategic migration makes it possible for firms to gain distinctive supply chain competence in different stages of migration as can be seen in figure 3. This important insight bears on several significant implications relating to strategic SCM.

1. The Importance of Strategic Inter-firm Network

SCM practice-integration grid in figure 2 suggests that the sample size of SCM practice efficiency group is larger than that of SC integration efficiency group by almost 16%. This means that many of the sample firms do not efficiently utilize SC integration initiatives. The importance of SC integration efficiency is identified in multi-group comparison test results for firm performance measures, as shown in Table 3, indicating Integration focusers have significantly higher performance relative to Practice focusers. These results imply that in future, SCM should focus on strengthening market competitiveness not through the individual capability of each company, but through efficient management of inter-firm relationships, thus emphasizing the need for *'strategic inter-firm network'*. The studies of Hines (1996) stressing the integrative optimization of entire SCM functions and Lamming's (1993) observation that supply chain competitiveness is not capability or strategy of an individual firm, but the construction of reciprocal relationships with suppliers, support the above argument.

2. Cost Leadership from Cumulative Capability View

The diagram of strategic migration in Figure 3 reflects the "cumulative capability" view. Particularly, cost reduction capability can be found just in the paths straightly connecting to *Stars*.

The validity of this result indicating *Cost Leadership* is the final step of strategic migration, is supported by the study of Ferdows and De Meyer (1990) proposing the so-called "sand cone model," as a modification to the tradeoff perspective. Ferdows and De Meyer formally proposed a cumulative model, suggesting that for lasting improvements, manufacturers should build one capability upon another sequentially in the following order: first, quality; then

dependability, flexibility (speed), and lastly, cost efficiency. The theory underlying the "sand cone" model is that the manner and the order in which capabilities are addressed can change the nature of manufacturing trade-offs so that the focus on one need not necessarily be at the expense of another. The model is cumulative in that quality is addressed first, which is then followed by dependability (along with quality); next, flexibility (along with dependability and quality); and so forth. That is, to address one capability, it is necessary to build up all of the underlying capabilities as well. Viewed in this light, in order to improve cost capability, the ultimate dimension of market competition, the systematization of basic manufacturing capabilities such as quality and dependability is essential.

The diagram in Figure 3 reflects precisely such cumulative capability view. As can be seen in the figure, in *Starters*, quality was extracted as a key competitive and foundational capability, while, in *Practice focusers*, dependability with quality was found to be a crucial competitive capability. Similarly, in *Integration focusers* and in *Stars*, flexibility and cost reduction in addition to quality and dependability were sequentially added as core capabilities.

Cost leadership can be derived from the achievement of flexibility in pricing through the reduction of manufacturing and logistics costs. It should be recognized that cost reduction is not a competitive capability that can be attained easily. It is a capability which should be pursued based on the systematization of other manufacturing capabilities, because cost leadership requires sufficient consideration of the entire manufacturing processes and total costs related to quality, dependability, and flexibility.

3. Cross-functional Integration, Integration with Suppliers, and Integration with Customers

Previous research (Bowersox 1989; Stevens 1989, 1990; Byrne and Markham 1991; Hewitt 1994; Lau and Yam 2007) on supply chain integration emphasizes that cross-functional integration within a firm should be ahead of external integration with suppliers and customers. However, none of these authors comment on whether integration with suppliers or integration with customers should be pursued first. Accomplishment of these two is not a trivial task and is actually difficult to achieve simultaneously. Prioritizing these two integrations is relevant and important.

The empirical results of this paper show that strategic transition from *Starters* to ultimately *Stars*, is compatible with cross-functional integration within a firm, integration with suppliers, and integration with customers, added cumulatively. This implies that integration with suppliers should be pursued as a prerequisite for integration with customers. Narasimhan (1997) provides additional arguments for supporting the above perspective. In the discussion of four stages in an evolutionary model of SCM, this study suggests that greater supply base and internal value chain integration should be pursued first, followed by full integration with customers. This means that integration's scope expands to include the entire supply chain, extending from the supply base to the customers, which accords well with our results.

4. The Formalization Level of Exclusive SCM Organization

From the empirical results of this paper, we can observe another interesting point. As mentioned previously, there is not any significant difference with respect to *formalization of SCM function* (FSCO) and *the implementation of SCM executive programs* (SCMEP) between *Starters* and other three groups. This indicates that FSCO and SCMEP can be the key competitive and foundational capabilities of *Starters*, thus implying that FSCO and SCMEP can have a crucial role for strategic SCM in early stage.

This argument is supported by the work of Fredrickson (1986). He argues that a high degree of formalization may eliminate the ambiguity of roles, and thus lead to systematic linkage among various functions within a firm. However, he also asserts that too high level of formalization restricts the organization members' discretionary rights in decision making and disturbs the pursuit of new opportunities and innovation. Webster (1970) also asserts that very strict and formalized mechanical organization structure disturbs the proper accommodation of innovation, thus holding the same view as Fredrickson. Such arguments stress that the most important point of organization design is striking a balance between *a thoroughly consistent control* enabling accommodation of new opportunities and innovation quickly and *the appropriate delegation of power* enabling flexibility in the pursuit of innovation.

5. Structural Initiatives, Logistical Initiatives, and Technological Initiatives

The above discussion on the formalization of SCM organization is associated with the evolutionary patterns of SCM practices. When considering the arguments of Fredrickson and Webster mentioned above, it is possible to posit that structural factor such as FSCO, SCMEP, and *human resource management* (HRM) may be more effective in highly formalized and centralized SCM organizations, while technological factors such as *the establishment of nation-wide information network* (NIN) and *the utilization of advanced management and manufacturing technology* (AMT) may be more acceptable in less formalized and decentralized SCM organizations. Actually, many studies on the relationship between organizational structure and competition initiatives have proposed that the degree of formalization and centralization of a logistics organization is positive in terms of managing organizational and behavioral factors, but is negative in terms of seeking innovation by accommodating new technology (Sapolsky 1967, Moch and Morse 1977, Ein-Dor and Segev 1978, Kennedy 1983, Raymond 1985).

The results of this paper confirm the above relationship between organizational structure and competition initiatives. As can be seen in Figure 3, in *Starters*, only structural initiatives such as FSCO and SCMEP were found as core factors. In *Practice focusers*, logistical initiatives such as *close location to suppliers and customers* (CL) and *logistics infrastructure* (LI) were identified as key practices with HRM, AMT, and NIN. And finally, in *Stars*, two technological initiatives NIN and AMT were emphasized more strongly as core capabilities, relative to *Practice focusers*. These results imply that as firms move from *Starters* to *Stars*, the focus of SCM practice also should shift from structural initiatives through logistical to technological initiatives.

6. Benchmarking for Strategic SCM

The empirical results of this paper have a practical implication for benchmarking for strategic SCM. As mentioned previously, SCM practice-integration grid in figure 2 suggests four stages of strategic migration in SCM. This means that a firm can identify its current stage of migration by using such SCM practice-integration grid after calculating efficiency scores for SCM practice and SC integration. Also, by calculating its actual values on all of capability variables including 7 SCM practices, 3 SC integration levels, 4 SCM performances, and 3 firm performances, and then by comparing those values with the mean value of each of four groups in Table 2, a firm can recognize more precisely its current migration stage. After confirming its current stage, the firm can identify its specific current position in terms of implied time line and strategic levers needed for becoming Stars. This benchmarking procedure would be very helpful in constructing the foundations of strategic SCM.

Strategic SCM is a viable strategy in transforming an organization to be more customer oriented. It is a high leverage strategy since strategic SCM can affect key competitive priorities of firms. Quality, customer satisfaction, costs, flexibility, customer responsiveness, and innovation are all affected by SCM. Although much has been written by practitioners on SCM, a strategic framework for SCM is lacking. This paper has discussed the trends that are shaping the future of manufacturing management and their strategic implications of SCM, and presented a conceptual model that can be a springboard for future work in this area.

Future research might examine more precise structural relationships among supply chain management practices, competitive priorities, the level of supply chain integration, and firm performance through more specific classification of SCM practice measures and competitive strategy. Also, another interesting extension may involve the effect of company size and/or other environmental variables on the causal linkages among the aforememtioned constructs.

Reference

Armistead, C.G. and J. Mapes, 1993, The Impact of Supply Chain Integration on Operating Performance, Logistics Information Management 6(4), 9-14.

Basso A. and S. Funari, 2001, A data envelopment anaysis approach to measure the mutual fund performance. European Journal of Operational Research 135(3), 477-492.

Bentler, P., 1995, EQS structural equations program manual, Encino, CA: Multivariate Software, Inc.

Birou, L.M., S.E. Fawcett, and G.M. Magnan, 1998, The Product Life Cycle: A Tool for Functional Strategic Alignment, International Journal of Purchasing and Materials Management 34(2), 37-51.

Bowersox, D.J., 1989, Logistics In The Integrated Enterprise, the Annual Conference of the Council of Logistics Management(St. Louis, MO).

Byrne, P.M. and W.J. Markham. 1991. *Improving Quality and Productivity in the Logistics Processes: Achieving Customer Satisfaction Breakthroughs*. Oak Brook, IL:Council of Logistics Management.

Byrne, B.M., 1994, Structural equation modeling with EQS and EQS/windows: Basic concepts, applications, and programming, Thousand Oaks, CA: Sage Publications.

Cagliano, R., F. Caniato, et al., 2006, The linkage between supply chain integration and manufacturing improvement programmes. International Journal of Operations & Production Management 26(3), 282-299.

Carr, A.S. and J.N. Pearson, 1999, Strategically managed buyer-supplier relationships and performance outcomes, Journal of Operations Management 17(5), 497-519.

Carter, J.R. and R. Narasimhan, 1996, Is Purchasing Really Strategic?, International Journal of Purchasing and Materials Management 32(1), 20-28.

Champa, D.J. and G.T. Long, 1989, The Supply Chain Perspectives: The Customer Service Mix, Council of Logistics Management Annual Conference Proceedings, October, 151-156.

Chan, Y.E., S.L. Huff, D.W. Barclay, and D.G. Copeland, 1997, Business Strategic Orientation, Information Systems Strategic Orientation, and Strategic Alignment, Information Systems Research 8(2), 125-150.

Charnes, A., Cooper, W. W., Lewin, A., and Seiford, L., 1994, Data envelopment analysis: Theory, methodology and applications. Boston, MA: Kluwer Academic Publishers.

Charnes A., Cooper W.W. and Rhodes, E., 1978, Measuring the Efficiency of Decision Making Units, European Journal of Operational Research 2, 429-444.

Chatzoglou, P.D. and A.C. Soteriou, 1999, A DEA Framework to Assess the Efficiency of the Software Requirements Capture and Analysis Process, Decision Sciences 30(2), 503-531.

Chin-Fu, H. and C. Yen-Ping, 2005, A Structural Approach to Measuring Uncertainty in Supply Chains. International Journal of Electronic Commerce 9(3), 91-114.

Cook, W. D. and J. Zhu, 2006, Incorporating Multiprocess Performance Standards into the DEA Famework. Operations Research 54(4), 656-665.

Cua, K.O., K.E. McKone, and R.G. Schroeder, 2001, Relationships between implementations of TQM, JIT, and TPM and manufacturing performance. Journal of Operations Management 19 (6), 675–694.

Day, G.S., 1994, The Capabilities of Market-Driven Organizations. Journal of Marketing 58(4), 37-42.

Dawe, R.L., 1994, An Investigation of the Pace and Determination of Information Technology Use in the Manufacturing Materials Logistics System, Journal of Business Logistics 15(1), 229-258.

Ein-Dor, P., and E. Segev, 1978, Organizational Context and the success of MIS, *Management Science* 24(10), 1064-1073.

Feitzinger, E. and H.L. Lee, 1997, Mass Customization at Hewlett-Packard: The Power of Postponement, Harvard Business Review 75(1), 116-121.

Ferdows, K. and DeMeyer, A., 1990. Lasting improvements in manufacturing performance in search of a new theory. Journal of Operations Management 9. 168-184.

Fornell, C., and D.F. Larcker, 1981, Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics, *Journal of Marketing Research* 18(3), 382-388.

Fredrickson, J.W., 1986, The Strategic Decision Process and Organizational Structure", *Academy of Management Review* 11(2), 280-297.

Freeman, V.T. and J.L. Cavinato, 1990, Fitting Purchasing to the Strategic Firm : Frameworks, Processes, and Values, Journal of Purchasing and Materials Management 26(1), 6-10.

Frohlich, M. T., 2002, e-Integration in the Supply Chain: Barriers and Performance. Decision Sciences 33(4), 537-556.

Frohlich, M.T. and R. Westbrook, 2001, Arcs of integration: an international study of supply chain strategies. Journal of Operation Management 19(2), 185-200.

Ganesan, K. and B. Saumen, 2005, Corporate turnaround through effective supply chain management: the case of a leading jewellery manufacturer in India. Supply Chain Management 10(5), 340-348.

Germain, R., 1989, The Effect of Output Standardizational on Logistical Structure, Strategy, and Performance, International Journal of Physical Distribution and Materials Management 19(1), 20-29.

Hair, J.F., Jr., R.E. Anderson, R.L. Tatham, and W.C. Black, 1995, Multivariate data analysis with readings (4th ed.), Englewood Cliffs, NJ: Prentice-Hall.

Halley, A. and J. Nollet, 2002, The Supply Chain: The Weak Link for Some Preferred Suppliers? Journal of Supply Chain Management: A Global Review of Purchasing & Supply 38(3), 39-47.

Handfield, R.B. and B. Withers, 1993, A Comparison of Logistics Management in Hungary, China, Korea and Japan, Journal of Business Logistics 14(1), 81-105.

Hewitt, F. 1994. Supply Chain Redesign. The International Journal of Logistics Management **5**(2), 1-8.

Hines, P., 1996, Network Sourcing: A Discussion of Causality within the Buyer-Supplier Relationship, European Journal of Purchasing and Supply Management 2(1), 7-20.

Ibeh, K.I.N, 2005, Toward a Greater Level of International Enterpreneurship among Smaller Agribusiness Firms: Resource Levers and Strategic Options. Management International Review 45, 59-81.

Johnson, J.L., 1999, Strategic Integration in Industrial Distribution Channels: Managing the Interfirm Relationship as a Strategic Asset, Journal of the Academy of Marketing Science 27(1), 4-18.

Kaynak, H., 2005, Implementing JIT Purchasing: Does the Level of Technical Complexity in the Production Process Make a Difference?, *Journal of Managerial Issues* 17(1), 76-100.

Kennedy, A.M., 1983, The Adoption and Diffusion of New Industrial Products: A Literature Review", *European Journal of Marketing* 17(3), 31-88.

Ketchen, D.J. and L.C. Giunipero, 2004, The intersection of strategic management and supply chain management. Industrial Marketing management 33(1), 51-56.

Lambert, D.M. and J.R. Stocks, 1993, Strategic Logistics Management. 3rd ed., Homewood I11 : Richard D. Irwin, Inc.

Lamming, R., 1993, Beyond Partnership: Strategies for Innovation and Lean Supply, Prentice-Hall, Hemel Hempstead.

Lau, A. K. W. and R. C. M. Yam, 2007, Supply chain product co-development, product modularity and product performance. Industrial Management & Data Systems 107(7), 1036-1065.

Lummus, R.R., R.J. Vokurka, and K.L. Alber, 1998, Strategic Supply Chain Planning, Production and Inventory Management Journal 39(3), 49-58.

McGinnis, M.A., and J.W. Kohn, 1993, Logistics Strategy, Organizational Environment, and Time Competitiveness, Journal of Business Logistics 14(2), 1-20.

Menor, L.J., A.V. Roth, and C.H. Mason, 2001, Agility in Retail Banking: A Numerical Taxonomy of Strategic Service Groups. Manufacturing and Service Operations Management 3(4), 273-292.

Mentzer, J.T. and B.P. Konrad, 1991, An Efficiency/Effectiveness Approach to Logistics Performance Analysis, Journal of Business Logistics 12(1), 33-62.

Moch, M.K., and E.V. Morse, 1977, Size, Centralization and Organizational Adoption of Innovations, *American Sociological Review*, Oct, 716-725.

Monczka, R.M. and J.P.Morgan, 1996, Supply base strategies to maximize supplier performance, International Journal of Physical Distribution and Logistics Management 23(4), 42-54.

Moore, K.R., 1998, Trust and Relationship Commitment in Logistics Alliances: A Buyer Perspective, International Journal of Purchasing and Materials Management 34(1), 24-37.

Morash, E.A. and S.R. Clinton, 1998, Supply Chain Integration:Customer Value Through Collaborative Closeness Versus Operational Excellence, Journal of Marketing Theory and Practice 6(4), 104-120.

Morash, E.A., C. Droge, and S. Vickery, 1996, Strategic Logistics Capabilities for Competitive Advantage and Firm Success, Journal of Business Logistics 17(1), 1-22.

Morash, E.A., C. Droge, and S. Vickery,1997, Boundary Spanning Interfaces Between Logistics, Production, Marketing, and New Product Development, International Journal of Physical Distribution and Logistics Management 27(5/6), 350-369.

Nakane, J., 1986. Manufacturing futures survey in Japan, a comparative survey 1983-1986. Tokyo: Waseda University, System Science Institute.

Narasimhan, R., 1997, Strategic Supply Management : A Total Quality Management Imperative, Advances in the Management of Organizational Quality 2, 39-86.

Narasimhan, R. and J. Jayaram, 1998, Causal Linkages in Supply Chain Management: An Exploratory Study of North American Manufacturing Firms, Decision Sciences 29(3), 579-605.

Narasimhan, R. and J.R. Carter, 1998, Linking Business Unit and Material Sourcing Strategies, Journal of Business Logistics 19(2), 155-171.

Narasimhan, R. and A. Das, 2001, The impact of purchasing integration and practices on manufacturing performances. Journal of Operations Management 19(5), 593-609.

Norman, M., and Stocker, R., 1992, Data envelopment analysis: The assessment of performance. Chichester: John Wiley & Sons Ltd.

Rao, K., A.J. Stenger, and H.J. Wu, 1994, Training Future Logistics Managers: Logistics Strategies Within the Corporate Planning Framework, Journal of Business Logistics 15(2), 249-272.

Raymond, L., 1985, Organizational Characteristics & MIS Success in the Context of Small Business, *MIS Quarterly* 9(1), 37-52.

Rosenzweig, E.D., A.V. Roth and J.W. Dean, 2003, The influence of an integration strategy on competitive capabilities and business performance: an exploratory study of consumer products manufacturers. Journal of Operations Management 21(4), 437-456.

Roth, A., De Meyer, A., and Amano, A., 1989, International manufacturing strategies: A comparative analysis. In K. Ferdows (Ed.), Managing international manufacturing. North-Holland: Elsevier Science Publishers.

Roth, A.V., 1996, Neo-Operations Strategy: Linking Capability based Competition to Experience with Technology, in Technology Handbook, McGraw-Hill, New York.

Sapolsky, H., 1967, Organizational Structure and Innovation, *Journal of Business* 40, 497-510.

Schonberger, R. G., and Ansari, A., 1984, Just in time purchasing can improve quality. Journal of Purchasing and Materials Management 20(2), 2-7.

Seger, R.E,. and W.J. Best, 1989, Distribution Synergies: Easy to See, Harder to Get, *Mergers and Acquisitions* 24(2) Sep/Oct, 48-53.

Shah, R., S.M. Goldstein, and P.T. Ward, 2002, Aligning supply chain management characteristics and interorganizational information system types: an exploratory study. IEEE Transactions on Engineering Management 49(3), 282-292.

Shapiro, R.D., 1984, Get Leverage From Logistics, Harvard Business Review 62(3), 119-126.

Skinner, W., 1985, Manufacturing: The formidable competitive weapon. New York: John Wiley and Sons.

Sterling,J.U. and D.M.Lambert, 1985, A Methodology for Identifying Potential Cost Reductions in Transportation and Warehousing, Journal of Business Logistics 5(2), 1-13.

Stevens, G., 1989, Integrating the Supply Chain, International Journal of Physical Distribution and Materials Management 19(8), 3-8.

Stevens, G., 1990, Successful Supply Chain Management, Management Decision 28(8), 25-30.

Swink, M., R. Narasimhan and S. W. Kim, 2005, Manufacturing Practices and Strategy Integration: Effects on Cost Efficiency, Flexibility, and Market-Based Performance. Decision Sciences 36(3), 427-457.

Swink, M., R. Narasimhan, et al., 2007, Managing beyond the factory walls: Effects of four types of strategic integration on manufacturing plant performance. Journal of Operations Management 25(1), 148-164.

Tan, K.C., Lyman, S.B. and Wisner, J.D., 2002, Supply chain management: a strategic perspective. International Journal of Operations & Production Management, 22(6), 614-631.

Tan, K.C., V.R. Kannan, and R.B. Handfield, 1998, Supply Chain Management: Supplier Performance and Firm Performance, International Journal of Purchasing and Materials Management 34(3), 2-9.

Vickery, S., R. Calantone, and C. Droge, 1999, Supply Chain Flexibility: An Empirical Study, The Journal of Supply Chain Management 35(3), 16-24.

Wagner, B.A., 2003, Learning and Knowledge Transfer in Partnering: An Empirical Case Study. Journal of Knowledge Management 7(2), 97-113.

Waller, M. A., 1993, The effects of supply management strategies on manufacturing quality: A covariance structure model. Unpublished doctoral dissertation, Pennsylvania State University, State Park, PA.

Webster, F.E. Jr., 1970, Informal Communication in Industrial Markets, *Journal of Marketing Research* 7(May), 186-189.

Wheelwright, S.C., 1984, Manufacturing Strategy: Defining the Missing Link, Strategic Management Journal 5, 77-91.

Wisner, J.D. and L.L. Stanley, 1999, Internal Relationships and Activities associated with High level of Purchasing Service Quality, The Journal of Supply Chain Management, 35(3), 25-32.

Wu, D., 2006, Detecting information technology impact on firm performance using DEA and decision tree. International Journal of Information Technology and Management 5(2-3), 162-174.

Zaheer, A., B. McEvily, and V. Perrone, 1998, The Strategic Value of Buyer-Supplier Relationships, International Journal of Purchasing and Materials Management 34(3), 20-26.