Levels of strategic purchasing: Impact on supply integration and performance

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Abstract

The growing importance of supply chain management has led to an increasing recognition of the strategic role of purchasing, which has recently evolved and expanded from "buying" to "procurement" and "supply management". In this study, we chart our sample firms' advance in strategic purchasing, characterized by the strategic focus, strategic involvement of the purchasing function and the status and visibility of the purchasing professionals, into three stages.

This study provides strong empirical support for the importance of strategic purchasing by showing that, by moving towards the more advanced stages, firms at the nascent stage of strategic purchasing can achieve better supply integration, a second-order construct composed of four facets of relational, process, information, and cross-organizational team integration. Our analyses further reveal that strategic purchasing can have a profound impact on supply chain performance for both buyer and supplier firms.
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1. Introduction

The growing importance of supply chain management has led to an increasing recognition of the strategic role of purchasing (Anderson and Rask, 2003). It has evolved from a mere buying function into a strategic function (Ellram and Carr, 1994), and has recently been recognized as a critical driving force in the strategic management of supply chains (Chen et al., 2004; Ellram and Liu, 2002). While purchasing is receiving increased attention in many firms, the purchasing function within these firms are at different stages of strategic development or evolution, with its role ranging from clerical to integrative (Cavinato, 1999; Reck and Long, 1988). Most extant research studying the strategic level of purchasing is either conceptual or based on a small number of case studies (e.g., Cavinato, 1999; Monczka, 1992; Reck and Long, 1988), and those that collect data from a large number of firms do not utilize any

statistical analysis to support their findings (e.g., Cavinato, 1999; Freeman and Cavinato, 1990; Van Weele, 1984). Therefore, in this study we expect to extend this stream of research by focusing on three important gaps in the literature.

First, extant literature has studied the strategic level of purchasing (Cavinato, 1999; Freeman and Cavinato, 1990). These studies, however, are limited in that they (1) are conceptual, (2) are based on a small number of case studies, or (3) do not use any statistical analysis to support their interpretation. To deepen our understanding of strategic purchasing, it is then essential to empirically characterize the current state of strategic purchasing practice in the field. Therefore, in this study we classify strategic purchasing into three levels based on its underlining dimensions of *strategic focus, strategic involvement,* and *visibility.* Secondly, one of the key roles of the purchasing function is to effectively integrate the supply activities between the external suppliers and internal organizational customers (Carr and Pearson, 1999; Narasimhan et al., 2001). Several studies have focused on linking strategic purchasing to one or two elements of supply integration (e.g., Carr and

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Smeltzer, 1999; Murphy and Heberling, 1996; Pearson, 1999). Since these studies are limited by the restrictive definition of strategic purchasing and the focus on just a few elements of supply integration, we set forth to empirically establish a more holistic and broader conceptualization of strategic purchasing and supply integration, along with the impact of strategic purchasing on supply integration.

Finally, although the consensus in purchasing and supply chain management literature is that strategic purchasing can enhance firms' performance, there have been only a few studies that explicitly examine the effect of strategic purchasing on the buying firm's performance, measured in terms of financial indicators (Carr and Smeltzer, 1999; Carter and Narasimhan, 1996; Chen et al., 2004). In this study, the effect of strategic purchasing on buyer performance will be examined based on not only financial but also operational measures. In addition, supply chain performance does not concern buyer firms alone. For collaborative buyer–supplier relationships to succeed, suppliers also expect to benefit from the "win–win" situation. Thus, it is also our goal to investigate whether or not strategic purchasing contributes to supplier firms performance as well.

The rest of the paper is structured as follows. In Section 2, we provide a synthesis of the literature to provide a conceptual foundation for our model. Then, drawing on related research, we develop the logic of the substantive relationships and state formal hypotheses. In Section 3, we explain our research methodology; including data collection procedure, construct operationalization and measurement, and hypothesis testing and results. In Section 4, strategic purchasing stages are explained. Section 5 presents discussion and implications of the study findings. In the conclusion section, we highlight some limitations of the study and offer suggestions for future research.

2. Conceptual development

2.1. Levels of strategic purchasing

Strategic purchasing represents the efforts taken by the purchasing function that may include a variety of roles ranging from supportive to strategic in nature (Cavinato, 1999; Cousins and Spekman, 2003). In this study, the level of strategic purchasing is characterized by its (1) strategic focus (Carr and Smeltzer, 1999; Cavinato, 1999; Pearson et al., 1996), (2) strategic involvement (Cavinato, 1999; Ferguson et al., 1996; Reck and Long, 1988; Rozemeijer et al., 2003), and (3) status and visibility of the purchasing professionals (Carr and Smeltzer, 1997; McGrath et al., 1992; McIvor et al., 1997). These three characteristics or dimensions of strategic purchasing are operationalized to determine the strategic level of the purchasing function (see Fig. 1). Additional support for the inclusion of these dimensions is provided below.
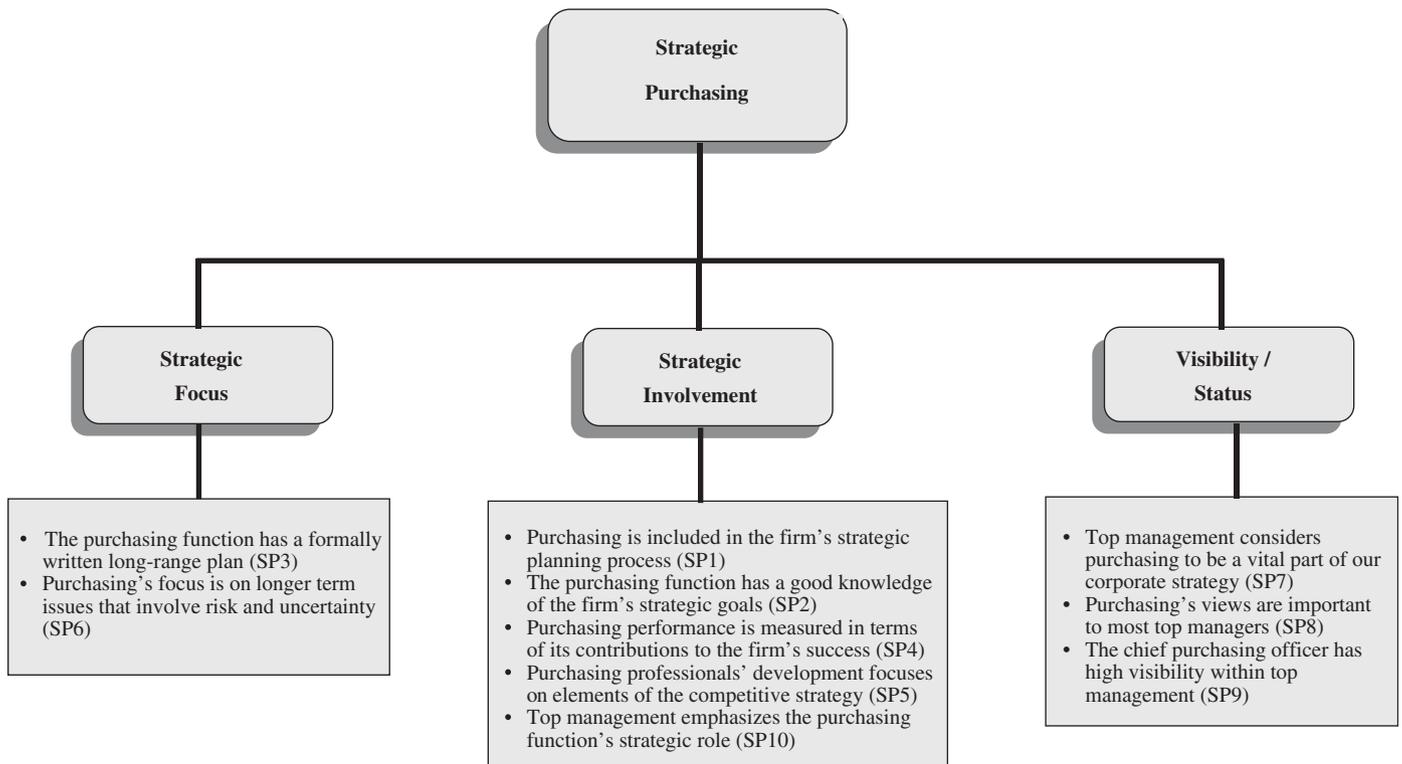

Fig. 1. Properties of strategic purchasing.

The strategic focus of purchasing is consistent with the general strategy literature (Carr and Smeltzer, 1999). The purchasing function's willingness to take risks indicates that it is constantly seeking long-term opportunities to extend support and expertise to the firm's strategic goals (Miller and Leiblein, 1996; Pearson et al., 1996). Moreover, it pursues strategic objectives relentlessly even though this action may be detrimental to the status of the department (Carr and Smeltzer, 1997; Sitkin and Pablo, 1992). These characteristics demonstrate that purchasing is aware of the firm's strategic plans and is also in a position to be proactive as opposed to reactive (Freeman and Cavinato, 1990; Gelderman and van Weele, 2005).

More and more evidence reveals that purchasing is increasingly seen as a strategic function. For example, more purchasing professionals are trained in cross-functional areas and elements of the competitive strategy, and purchasing performance is measured in terms of its contributions to the firm's success (Reck and Long, 1988). Studies have illustrated that an increased involvement of the purchasing department in the strategic planning process is indicative of purchasing being considered as a strategic function (Cavinato, 1999; Ferguson et al., 1996; Freeman and Cavinato, 1990).

The status of the purchasing professionals signifies how the purchasing function is viewed and treated by top management as well as other functions of the firm (Carr and Smeltzer, 1997). An emerging view is that purchasing should be considered within the organization as being equally important to other strategic functions including marketing, finance, and production (McIvor et al., 1997). Researchers note that only when the purchasing function is considered strategic will it be regarded highly by the top management (Carr and Smeltzer, 1997; Cavinato, 1999; Gelderman and van Weele, 2005) and will its input be considered vital to the functioning of other departments (Cavinato, 1999; McGrath et al., 1992).

2.2. Supply integration

As articulated by numerous researchers, supply chain management represents a critical integration of various functions (Ellram and Carr, 1994; Freeman and Cavinato, 1990; Gadde and Hakansson, 1994). With the buying firm in the center, a supply chain encompasses both the customer-side and supply-side links (Shapiro et al., 1993). The buyer–supplier dyad forms the core of the supply-side link and is of fundamental importance to the effective integration of supply chain activities (Anderson et al., 1994; Chen and Paulraj, 2004a). Thus, in this study, we direct our attention to supply integration that represents buyer–supplier dyadic integration and focuses specifically on the supply-side of the value chain. Supply integration can occur in terms of *processes* (e.g., Stock et al., 2000; Trent and Monczka, 1998), *information* (e.g., Handfield and Nichols, 1999; McIvor et al., 1997; Trent and Monczka, 1998), and *cross-organizational teams* (e.g., Burt, 1989; Ragatz et al., 1997), among others (see Fig. 2). In addition, we incorporate an additional facet of supply integration, termed *relational integration*. This concept personifies the strategic initiatives taken towards maintaining a long-term win–win relationship with a limited number of suppliers (Chen et al., 2004). The terms "partnership" and "partnership sourcing" have also been used to refer to these closer, long-term relationships with a limited number of suppliers (Johnston and Lawrence, 1990). The inclusion of these four facets of supply integration along with their underlying elements is analyzed in the following subsections.

2.2.1. Relational integration

In the past, firms commonly contracted with a large number of suppliers. Recently, a significant shift has occurred from the traditional adversarial buyer–seller relationships to the use of a limited number of qualified
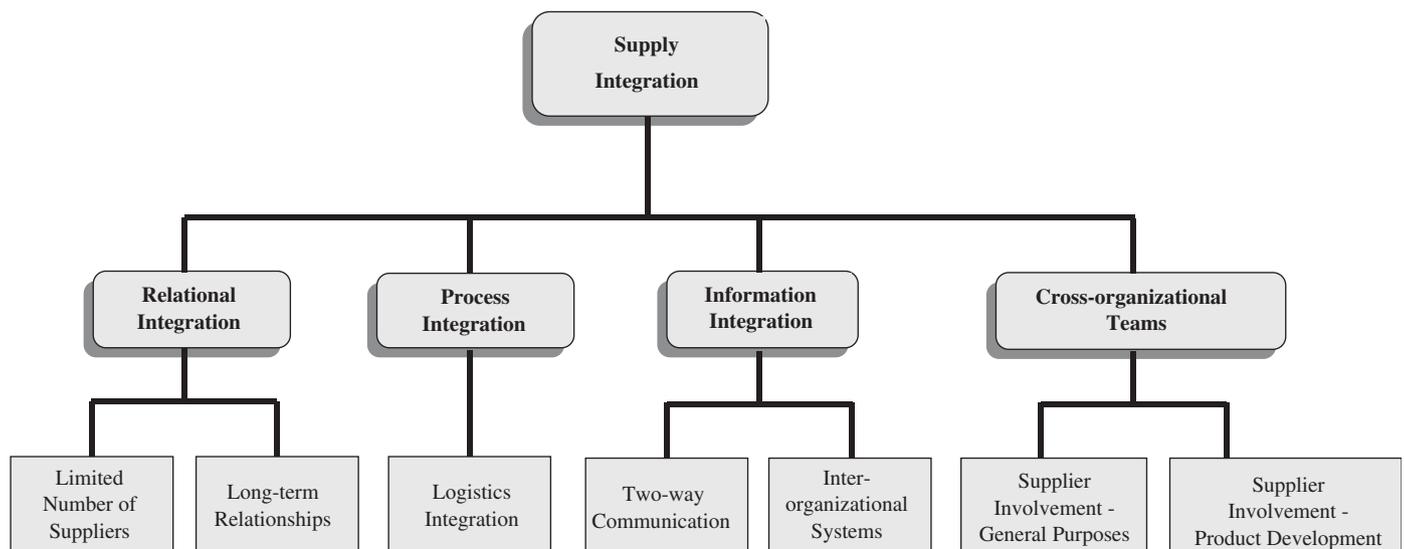
Fig. 2. Elements of supply integration.

suppliers (Burt, 1989; Guimaraes et al., 2002; Helper, 1991). Moreover, supplier contracts have increasingly become long term, and more and more suppliers provide customers with information regarding their processes, quality performance, and even cost structure (Helper, 1991; Helper and Sako, 1995). A closer relationship with a limited number of suppliers also means that channel participants share risks and rewards and are willing to maintain the relationship over the long term for mutual benefits (Cooper and Ellram, 1993). Studies have also revealed that through a long-term relationship, the suppliers become part of a well-managed chain and have a lasting effect on the competitiveness of the entire supply chain (e.g., De Toni and Nassimbeni, 1999; Kotabe et al., 2003). Thus, relational integration is operationalized to include "limited number of suppliers" and "long-term relationships".

2.2.2. Process integration

The reduction of organizational slack requires a close coordination of the supply chain partners (Vollman et al., 1997). The current trend in using strategic partnerships and cooperative agreements among firms forces the process integration to extend outside the boundaries of the individual firm (Langley and Holcomb, 1992). It reflects an extension of the manufacturing enterprise to encompass the entire supply chain, not just the focal firm, as the competitive unit (Greis and Kasarda, 1997). High levels of process integration across firms are characterized by greater coordination of the firm's logistics activities with those of its suppliers, and blurred organizational distinctions between the logistics activities of the firm and those of its suppliers (Stock et al., 2000). Thus, a single construct termed "logistics integration" is included to study the steps taken by firms towards process integration along the supply chain.

2.2.3. Information integration

Effective inter-organizational communication stimulates integration of information between buyer and supplier firms. In order to jointly find solutions to material problems or design issues, buyers and suppliers must commit a greater amount of information and be willing to share sensitive information (Carr and Pearson, 1999). Carter and Miller (1989) found that when information integration occurs among design, engineering, quality control and other functions between the buyer and supplier firms in addition to the purchasing–sales interface, the supplier's quality performance is far superior to that experienced when only the buying firm's purchasing department and supplier's sales department act as the inter-firm information conduit.

A more recent perspective on information integration in the supply chain highlights the role of inter-organizational systems, which are sophisticated information systems that connect separate organizations (Kumar and van Dissel, 1996). Information technology enhances supply chain efficiency by providing real-time information related to product availability, inventory level, shipment status, and production requirements (Radstaak and Ketelaar, 1998). It also has a vast potential to facilitate collaborative planning among supply chain partners through sharing information on the demand forecasts and production schedules that dictate supply chain activities (Karoway, 1997). In particular, these systems help to replace inventory with information. Therefore, the construct of information integration is denoted by (1) the extent of two-way communication and (2) the deployment of inter-organizational information systems for information sharing among the supply chain partners.

2.2.4. Cross-organizational teams

Integration of personnel using cross-organizational teams is becoming a common practice in supply chains (Helfert and Vith, 1999). Firms that are changing their value chain and supplier relationships anticipate major contributions through such teams. Teamwork, the crux of general-purpose cross-functional teams, has been a critical component of many organizational change efforts in the 1990s. The breadth of corporate objectives pursued through teamwork indicates that it is a central element for wide-ranging organizational transformations (Drew and Coulson-Thomas, 1997). Over the past several years, cross-functional teams have been identified as critical contributors to the success of efforts like supplier selection, product design, just-in-time manufacturing, cost reduction, total quality initiatives, and most of all, improved communication (Burt, 1989; Sherman et al., 2000).

A considerable amount has been written for promoting the involvement of suppliers in the new product development process (e.g., Helper, 1991; Krause et al., 2000). The involvement may range from giving minor design suggestions to being responsible for the complete development, design and engineering of a specific part of assembly (Wynstra and ten Pierick, 2000). Ragatz et al. (1997) contend that the effective involvement and integration of suppliers in new product development is a key factor in achieving improvements that are necessary for remaining competitive. Research has further documented the benefits of involving suppliers in the new product development process and strategic planning (e.g., Primo and Amundson, 2002). Thus, we include the sub-constructs of "supplier involvement—general purposes" and "supplier involvement—product development" to study the extent of usage of cross-organizational teams.

2.3. Research hypotheses

Many scholars have stressed the importance of strategic purchasing in the effective integration of supply activities (e.g., Carr and Pearson, 1999; Cousins, 1992; Ellram and Carr, 1994). Strategic purchasing is considered pertinent to the usage of a limited number of suppliers, since the latter compromises the leveraging ability of the buying firms and,

therefore requires an entirely different management style (Anderson and Rask, 2003; Cousins, 1992). Numerous firms with a strategic purchasing focus are reducing the number of primary suppliers and allocating a majority of purchased material to a single source (Guimaraes et al., 2002; Kekre et al., 1995). Firms that conduct long-term planning and consider purchasing to be strategic are more likely to build long-term cooperative relationships with their key suppliers (Carr and Pearson, 1999). Furthermore, the relational competency perspective suggests that having close ties with few suppliers and increasing investments in relationship-specific assets ultimately fosters trust, dependability, and cooperation among supply chain partners (Chen and Paulraj, 2004b; Dyer, 2000).

Carr and Smeltzer (1999) have shown that firms with strategic purchasing are more likely to be able to achieve information integration in addition to relational integration. Kraljic (1983) suggests that a strategic purchasing focus is conducive to communication and information sharing throughout the supply chain. More specifically, it has been found that information sources are closely related to the buyer's strategic behavior (Spekman et al., 1995). Furthermore, in his procurement model, Cox (1996) has emphasized the importance of strategic purchasing and relationship communication. Thus, the strategic nature of purchasing is beneficial for information integration between supply partners.

Researchers note that the strategic nature of purchasing reflects its integrative role (Ellram and Carr, 1994; Freeman and Cavinato, 1990). The conceptual re-description of purchasing as the integration of internal and external exchange functions suggests that it can engender enterprise-wide process integration. Purchasing can and does play a crucial role in the cross-organizational teams assigned to the concurrent design of the firm's products (Murphy and Heberling, 1996). It also helps orchestrate the participation and involvement of key suppliers in new product development (Pearson, 1999; Trent and Monczka, 1994). Due to purchasing's potential impact on all aspects of supply integration, we hypothesize the following:

H1a. The higher the strategic level of purchasing, the better the relational integration with its supply partners.

H1b. The higher the strategic level of purchasing, the better the integration of processes with its supply partners.

H1c. The higher the strategic level of purchasing, the better the integration of information with its supply partners.

H1d. The higher the strategic level of purchasing, the better the integration of cross-organizational teams.

In light of purchasing's potential impact on supply integration, the next step is to examine the extent to which strategic purchasing affects supply chain performance. Since supply chains are composed of interdependent relationships formed with the goal of deriving mutual

benefits (Chen and Paulraj, 2004b; Lado et al., 1997), supply chain performance must be measured across the various partners involved rather than based on buyer firms alone. Researchers have demonstrated that strategic purchasing adds value to the firm and is a significant predictor of a firm's performance (Narasimhan and Das, 2001), particularly financial performance (Carr and Smeltzer, 1999; Carter and Narasimhan, 1996; Vickery et al., 2003). Furthermore, since strategic purchasing can play a key role in leveraging the firm's competitive position as well as sustaining its competitive advantage (Carr and Smeltzer, 1999; Mol, 2003; Teece et al., 1997) and suppliers' performance is increasingly critical to the long-term success of the buyer firms (Krause et al., 2000), we hypothesize that the strategic status of a firm's purchasing function will have a positive effect on its own supply chain performance as well as that of its suppliers, measured in terms of operational and financial indicators.

H2. The higher the strategic level of purchasing, the better the firm's performance.

H3. The higher the strategic level of purchasing, the better the performance of its suppliers.

3. Research methodology

3.1. Data collection

The theoretical constructs are grounded on extant literature and are made up of four or more indicators. A 7-point Likert scale with end points of "strongly disagree" and "strongly agree" was used to measure the items. The respondents were instructed to answer the survey items based on their experience with top one or two key suppliers. Key suppliers were selected based on the dollar amount or the criticality of the materials purchased. The buyer and supplier performance were measured using a 7-point Likert scale with endpoints of "decreased significantly" and "increased significantly." When answering the survey items related to performance, the respondents were instructed to keep in mind the performance changes, along these indicators, in the past 2–3 years. Supplier performance indicators are related to the top one or two suppliers.

A cross-sectional mail survey in the United States was utilized for data collection. The target sample frame consisted of members of the Institute for Supply Management (ISM) drawn from firms covered under the two-digit SIC codes between 34 and 39 (34—Fabricated Metal Industries, 35—Industrial Machinery and Equipment, 36—Electronic & Other Electric Equipment, 37—Transportation Equipment, 38—Instruments and Related Products, 39—Miscellaneous Manufacturing Industries). The title of the specific respondent sought was primarily Vice President or Director of Purchasing, Supply Chain Management, and Materials Management. In an effort to increase the response rate, a modified version of Dillman's total design

method was followed (Dillman, 1978). All mailings, including a cover letter, the survey, and a postage-paid return envelope, were sent to the purchasing executives within the buying (focal) firm via first-class mail. Two weeks after the initial mailing, reminder postcards were sent to all potential respondents. For those who did not respond, a second mailing of surveys, cover letters, and postage-paid return envelopes were mailed approximately 28 days after the initial mailing.

Of the 1000 surveys mailed, 46 were returned due to address discrepancies. 232 responses were received from the resulting sample size of 954, resulting in a response rate of 24.3%. A total of 11 were discarded due to incomplete information, resulting in an effective response rate of 23.2% (221/954). Considering the length of the survey, this response rate is quite satisfactory. The final sample included 35 presidents/vice presidents (16%), 138 directors (62%), 33 purchasing managers (15%), and 15 others (7%). The respondents worked primarily for medium to large firms with nearly 36% working for firms employing more than 1000 employees. Nearly 60% of the firms had a gross income of greater than $100 million. In general, with respect to the annual sales volume, the respondents were evenly distributed among the different groups and among the six selected SIC codes.

Non-response bias was tested in two stages. First, the sample and the population means of demographic variables, namely, the number of employees and sales volume, were compared with each other to check for any significant differences. The *t*-tests performed yielded no statistically significant differences (at 99% confidence level) between the sample and population. This result demonstrates that non-response may not be a problem. Second, the responses of early and late waves of returned surveys were compared to provide additional support of non-response bias (Armstrong and Overton, 1977; Lambert and Harrington, 1990). In addition to the 10 demographic variables, we included another 30 randomly selected variables to test for non-response bias. The final sample was split into two, depending on the dates they were received; the early wave group consisted of 123 responses and the late wave group consisted of 98 responses. The *t*-tests were performed on the responses of these two groups and yielded no statistically significant differences (at 99% confidence level) for the 40 variables tested, further suggesting that non-response does not appear to be a problem.

Since we collected the information on purchasing, supply integration as well as performance constructs from a single respondent within a single firm, common method bias may present a problem. Methodologically, this potential problem can be tested by the Harman's single-factor test (Harman, 1967). According to this test, if common method bias exists, (1) a single factor will emerge from a factor analysis of all survey items (Podsakoff and Organ, 1986), or (2) one general factor accounting for most of the common variance existing in the data will emerge (Doty and Glick, 1998). An un-rotated factor analysis using the eigenvalue-greater-than-one criterion revealed 7 distinct factors that accounted for 70% of the variance. The first factor captured only 29% of the variance in the data. Since a single factor did not emerge and the first factor did not account for most of the variance, we can safely conclude that the results were not inflated due to the existence of common method variance in the data (Christmann, 2004; Frohlich and Westbrook, 2002).

3.2. Instrument development

The *content validity* of the instrument was established by grounding it in the existing literature. Pre-testing the measurement instrument before the collection of data further validated it. Researchers as well as purchasing executives affiliated with the ISM were involved in this process. These experts were asked to review the questionnaire for structure, readability, ambiguity, and completeness (Dillman, 1978). The final survey instrument incorporated minor changes to remove a few ambiguities that were discovered during this validation process. As indicated earlier, multi-item scales were developed to measure the theoretical constructs. Before conducting factor analysis, the scales were tested for normality and outliers using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity. For the theoretical constructs in this study, the KMO score was 0.895 and the Bartlett test of sphericity was 6498.76 with a significance level of $p < 0.0001$. These numbers suggest the data could be reliably tested using factor analysis.

Construct validity and unidimensionality were established by using confirmatory factor analysis (CFA). In addition, an exploratory factor analysis (EFA) utilizing the principal component procedure was also adopted to test for construct validity. The results of these analyses are provided in Appendix A. As anticipated, most of the indicators loaded onto their underlying constructs during EFA. The eigenvalues for these factors were above the 1.0 cut-off point, while the percentage of variation was around 68%. The factor loadings were also above the cut-off point of 0.40 (Hair et al., 1998). The CFA measurement model was used to further establish unidimensionality and construct validity. The values for the model fit indices given in Appendix A illustrate that the model fits the data well and hence establish unidimensionality. The standardized coefficients and t-values for the individual paths (Appendix A) show that all the indicators are significantly related to their underlying theoretical constructs and thus establish convergent validity. During these analyses, indicators that did not have good psychometric properties (i.e., factor loadings were too low) were deleted from further consideration.

Discriminant validity was established by using CFA. Measurement models were constructed for all possible pairs of strategic purchasing and supply integration constructs. These models were tested on each selected pair, (1) allowing for correlation between the two constructs and

Table 1
Assessment of discriminant validity

Factors	SP	LS	LR	LI	CO	IS	CT	SI
Strategic purchasing (SP)	—							
Limited number of suppliers (LS)	53.02	—						
	0.10, 0.42							
Long-term	440.93	41.61	—					
Relationship (LR)	0.27, 0.51	0.36, 0.64						
Logistics integration (LI)	1334.09	52.75	464.63	—				
	0.22, 0.46	0.13, 0.45	0.15, 0.43					
Communication (CO)	636.47	32.63	234.57	633.23	—			
	0.20, 0.48	0.46, 0.74	0.56, 0.76	0.21, 0.49				
Inter-organizational	692.84	50.45	466.21	535.06	540.66	—		
Information systems (IS)	0.11, 0.39	0.02, 0.38	0.12, 0.40	0.35, 0.59	0.31, 0.55			
Supplier involvement—general purposes (GP)	942.77	47.08	429.65	832.16	460.72	472.69	—	
	0.26, 0.50	0.07, 0.39	0.21, 0.49	0.24, 0.48	0.45, 0.65	0.40, 0.64		
Supplier involvement—production development (PD)	366.01	49.86	444.27	396.08	307.68	420.35	284.02	—
	0.37, 0.61	0.12, 0.48	0.28, 0.56	0.30, 0.54	0.50, 0.70	0.34, 0.58	0.54, 0.74	

First row: χ^2 differences between the fixed and free solution (significant at the 0.001 level [for 1 d.f.]).
Second row: Confidence interval $\phi \pm \sigma_e$ (None of them include 1.00).

(2) fixing the correlation between the constructs at 1.0. A significant difference in chi-square values for the fixed and free solutions indicates the distinctiveness of the two constructs (Bagozzi et al., 1991). In addition, the confidence interval for each pair of constructs was determined. The confidence interval is equal to plus or minus two standard errors of the respective correlation coefficient (Marcoulides, 1998). If this confidence interval does not include the value of 1, the constructs exhibit discriminant validity. As it can be seen in Table 1, all the differences between the fixed and free solutions in the χ^2 are quite significant. Furthermore, the table shows that none of the confidence intervals include the value of 1. These results collectively provide strong evidence of discriminant validity among the theoretical constructs. Reliability was operationalized using internal consistency method, which is estimated by using Cronbach's α (Cronbach, 1951; Nunnally, 1978). Although the constructs included in this study have a strong literature underpinning, due to their relative newness a cut-off value 0.60 was considered appropriate (Nunnally, 1978). Except for "limited number of suppliers," all other constructs had a Cronbach's α greater than 0.80 (Appendix A). This result establishes the reliability of all the theoretical constructs. Validity, reliability, and unidimensionality analyses suggest that the theoretical definitions of strategic purchasing and supply integration have good psychometric properties.

3.3. Classifying strategic purchasing

To chart the progress that firms have made in advancing their strategic purchasing, the summated average score for the strategic purchasing construct was used to classify each data point into either the upper, middle, or lower quartile. The grouping of data into quartiles is commonly utilized in applications ranging from student graduation rankings to benchmarking studies for identifying best-in-class (75th percentile), median (50th percentile) and worst-in-class (25th percentile) group membership (Frohlich and Westbrook, 2001; McClave and Benson, 1985). Moreover, using quartiles instead of other complex classification methods such as cluster analysis enables the study to be easily replicated in the future (Frohlich and Westbrook, 2001). Data points below the 25th percentile were classified to be in the first stage (Level 1) of strategic purchasing. Data points above the 75th percentile were classified as Stage 3 (Level 3). Other responses were classified to be in Stage 2 (Level 2).

To ensure that the classification of strategic purchasing by using quartiles was performed correctly, we further conducted three different examinations. First a hierarchical cluster analysis using the Ward's method with the squared Euclidean distance measure was adopted to group the 221 cases into three groups. The cluster membership of the cases was compared with the quartile grouping using the SPSS's Cross-tabulation procedure. This procedure was used to count the classifications that were similar or different across the two different approaches as well as to calculate the bivariate statistics (Table 2a). The Pearson's and Spearman's correlation between the two group memberships was 0.70 ($p < 0.0001$) and 0.71 ($p < 0.0001$), respectively. These high correlation coefficients between the data-driven hierarchical cluster analysis and the quartiles procedure strongly support the way we operationalized the levels of strategic purchasing.

Secondly, we used the K-means cluster analysis to group the data points into 3 groups, as this methodology is superior in identifying relatively homogeneous groups. Using similar steps to those indicated above, the Pearson's and Spearman's correlation (Table 2b) between the

K-means cluster analysis and quartiles was 0.80 ($p < 0.0001$). This result further validates as well as strengthens the methodology adopted in classifying the levels of strategic

Table 2

Quartiles	Cluster			
	Level 1	Level 2	Level3	Total
(a) Cross-tabulation for hierarchical cluster analysis				
Level 1	11	46		57
Level 2		67	45	112
Level 3		2	50	52
Total	11	115	95	221
(b) Cross-tabulation for K-means cluster analysis				
Level 1	38	19		57
Level 2		68	44	112
Level 3			52	52
Total	38	87	96	221
(c) Classification results for discriminant analysis				
	Discriminant			
	Level 1	Level 2	Level3	Total
Level 1	51 (89.5%)	6 (10.5%)		57
Level 2	1 (0.9%)	97 (86.6%)	14 (12.5%)	112
Level 3		2 (3.8%)	50 (96.2%)	52
Total	52	105	64	221

Note: Overall percent of original grouped cases correctly classified: 89.6%.

purchasing. As a final test, we classify strategic purchasing using discriminant analysis to further test the validity of our quartile method. All the indicators of strategic purchasing were introduced as independent variables while the group membership was included as the dependent variable. As shown in Table 2c, this analysis confirmed that 89.6% of the data points were classified correctly. Such a high percentage of correctly classified data points further substantiate the validity of grouping using the quartiles approach.

3.4. Results of analysis

The levels of strategic purchasing were evaluated using analysis of variance (ANOVA) and the Scheffe method to test for any significant differences in the mean levels of the various indicators within the construct of strategic purchasing. Similar methodology was adopted to test the differences in mean values of the various supply integration elements and performance indicators along the three levels of strategic purchasing. Table 3 demonstrates that all the indicators of strategic purchasing were statistically different across the three groups. From Table 4, it is further evident that all the supply integration elements were significantly different across the three levels at or above the 99.9% confidence level. Specifically, the hypotheses (H1a–H1d) linking the levels of strategic purchasing to supply integration elements (relational,

Table 3
Differences across strategic purchasing levels

Strategic purchasing indicators		Level 1 $n = 57$	Level 2 $n = 112$	Level 3 $n = 52$	*F*-value (probability)
SP1	Cluster mean	3.70 (2, 3)	5.61 (1, 3)	6.71 (1, 2)	103.10 ($p < 0.0001$)
	SE	0.22	0.09	0.07	
SP2	Cluster mean	4.37 (2, 3)	5.78 (1, 3)	6.77 (1, 2)	85.82 ($p < 0.0001$)
	SE	0.19	0.08	0.06	
SP3	Cluster mean	2.51 (2, 3)	4.04 (1, 3)	5.94 (1, 2)	78.70 ($p < 0.0001$)
	SE	0.19	0.15	0.17	
SP4	Cluster mean	3.60 (2, 3)	5.34 (1, 3)	6.69 (1, 2)	96.14 ($p < 0.0001$)
	SE	0.21	0.11	0.08	
SP5	Cluster mean	3.37 (2, 3)	4.97 (1, 3)	6.21 (1, 2)	84.82 ($p < 0.0001$)
	SE	0.19	0.10	0.13	
SP6	Cluster mean	3.75 (2, 3)	4.78 (1, 3)	5.77 (1, 2)	33.56 ($p < 0.0001$)
	SE	0.19	0.12	0.15	
SP7	Cluster mean	4.35 (2, 3)	5.91 (1, 3)	6.67 (1, 2)	84.58 ($p < 0.0001$)
	SE	0.19	0.07	0.10	
SP8	Cluster mean	3.93 (2, 3)	5.61 (1, 3)	6.44 (1, 2)	94.21 ($p < 0.0001$)
	SE	0.18	0.08	0.10	
SP9	Cluster mean	4.05 (2, 3)	6.02 (1, 3)	6.79 (1, 2)	93.45 ($p < 0.0001$)
	SE	0.22	0.09	0.06	
SP10	Cluster mean	3.58 (2, 3)	5.69 (1, 3)	6.60 (1, 2)	184.94 ($p < 0.0001$)
	SE	0.17	0.07	0.07	

The number in parentheses shows the group number(s) that are significantly different at the 0.05 level based on the Scheffe pairwise tests.

Table 4
Supply integration by strategic purchasing levels

Elements	Level 1 $n = 57$	Level 2 $n = 112$	Level 3 $n = 52$	F-value (probability)
Limited number of suppliers				
Cluster mean	5.09 (3)	5.29	5.72 (1)	4.94 ($p < 0.005$)
SE	0.15	0.10	0.16	
Long-term relationships				
Cluster mean	5.31 (3)	5.61 (3)	6.28 (1, 2)	17.68 ($p < 0.0001$)
SE	0.15	0.07	0.09	
Logistics integration				
Cluster mean	3.66 (2, 3)	4.20 (1, 3)	4.81 (1, 2)	14.28 ($p < 0.0001$)
SE	0.16	0.10	0.17	
Communication				
Cluster mean	4.66 (3)	5.00 (3)	5.73 (1, 2)	16.20 ($p < 0.0001$)
SE	0.16	0.08	0.14	
Inter-organizational information systems				
Cluster mean	3.97 (3)	4.24 (3)	5.07 (1, 2)	9.47 ($p < 0.0001$)
SE	0.18	0.13	0.18	
Supplier involvement—general purposes				
Cluster mean	3.46 (2, 3)	4.14 (1, 3)	5.08 (1, 2)	21.67 ($p < 0.0001$)
SE	0.15	0.12	0.20	
Supplier involvement—product development				
Cluster mean	3.78 (2, 3)	4.37 (1, 3)	5.29 (1, 2)	19.91 ($p < 0.0001$)
SE	0.17	0.12	0.16	

The number in parentheses shows the group number(s) that are significantly different at the 0.05 level based on the Scheffe pairwise tests.

process, information, and cross-organizational teams) were all strongly supported. Hypothesis H2 was supported by the underlying data. The indicators of performance measures are presented in Appendix B. Table 5 shows that buyer firms' financial performance improvement was found to be marginally significant. The improvements on various operational measures, except for cost and flexibility, were also significant. Thus, hypothesis H3 was also supported. From Table 6, it is evident that supplier performance improvements in terms of quality, flexibility, delivery and responsiveness are significant at or above the 90% confidence level, suggesting that, to a large extent, supply chain performance is significantly affected by the strategic nature of the purchasing function.

4. Strategic purchasing stages explained

Firms in *Stage* 1 (Level 1) are in the *nascent* stage of the strategic purchasing classification. In these firms, the purchasing personnel are cognizant of the firm's strategic goals to a certain extent (SP2), but the purchasing departments are not included or trained in the corporate strategic planning process (SP5). Moreover, they are considered to have a passive role in the business organization. Accordingly, they do not necessarily have a long-term strategic focus (SP3, SP6). In essence, the purchasing function is not considered *on par* with the other strategic

units of the firm such as marketing, finance and production (SP1, SP10). As Cavinato (1999) suggests, the purchasing function at this stage is less developed in comparison to the rest of the functions within the firm. Thus, though considered an important partner (SP7), they do not seem to have the support and power to pursue their strategic initiatives (SP3, SP6), and are riddled with cost-based priorities (SP4).

The purchasing function of firms in *Stage* 2 is more advanced when compared to the firms in the prior group. It is actively involved in the strategic planning process (SP1) and plays a very important role in formulating and executing corporate strategy (SP10). Since the purchasing function is seen as a key contributor to many corporate initiatives (SP4), the purchasing professionals are trained in elements of competitive strategy (SP5) and the upper echelons have high visibility among top management (SP9). In general, the mean values of the various indicators suggest that the purchasing departments in this group are highly evolved in the elements of strategic involvement, and visibility/status. Therefore, the purchasing function, at this stage, cannot be considered inferior to other functions within the firm. On the other hand, due to the absence of long-term proactive actions, it cannot be considered as highly strategic either. Therefore, in spite of its elevated stature, at this stage, the purchasing function could be considered only as *tactical* in nature.

Table 5
Buyer performance by strategic purchasing levels

Performance indicators	Level 1 $n = 57$	Level 2 $n = 112$	Level 3 $n = 52$	F-value (probability)
Quality				
Cluster mean	5.00 (3)	5.05 (3)	5.52 (1, 2)	5.62 ($p < 0.005$)
SE	0.13	0.08	0.14	
Cost				
Cluster mean	3.70	3.70	3.56	0.19
SE	0.15	0.13	0.22	
Flexibility				
Cluster mean	4.42	4.59	4.67	0.89
SE	0.13	0.10	0.15	
Delivery				
Cluster mean	4.31 (3)	4.36	4.60 (1)	3.25 ($p < 0.05$)
SE	0.07	0.07	0.10	
Customer responsiveness				
Cluster mean	4.66 (3)	4.80 (3)	5.28 (1, 2)	6.81 ($p < 0.005$)
SE	0.11	0.08	0.16	
Customer satisfaction				
Cluster mean	4.97 (3)	5.13 (3)	5.67 (1, 2)	7.39 ($p < 0.005$)
SE	0.14	0.09	0.16	
Financial performance				
Cluster mean	4.30	4.53	4.74	2.51 ($p < 0.10$)
SE	0.16	0.10	0.20	

The number in parentheses shows the group number(s) that are significantly different at the 0.05 level based on the Scheffe pairwise tests.

Table 6
Supplier performance by strategic purchasing levels

Performance indicators	Level 1 $n = 57$	Level 2 $n = 112$	Level 3 $n = 52$	F-value (probability)
Quality				
Cluster mean	4.86 (3)	4.96 (3)	5.58 (1, 2)	8.35 ($p < 0.0001$)
SE	0.13	0.10	0.14	
Cost				
Cluster mean	3.58	3.68	3.87	0.67
SE	0.17	0.12	0.19	
Flexibility				
Cluster mean	4.61	4.92	4.99	3.28 ($p < 0.05$)
SE	0.15	0.09	0.16	
Delivery				
Cluster mean	4.49	4.60	4.76	2.51 ($p < 0.10$)
SE	0.11	0.06	0.12	
Responsiveness				
Cluster mean	4.80 (3)	4.99	5.33 (1)	3.80 ($p < 0.05$)
SE	0.15	0.09	0.14	

The number in parentheses shows the group number(s) that are significantly different at the 0.05 level based on the Scheffe pairwise tests.

Stage 3 firms are the most evolved and advanced in the strategic nature of purchasing. In addition to having an elevated strategic status than those in Stage 2, firms in this group are the only ones that have a true long-term focus. At this stage, purchasing departments have evolved significantly in all dimensions of strategic purchasing. It is also evident that purchasing assumes more of a proactive role in working with other functional departments in formulating the competitive strategies for the firm (SP2, SP7). Moreover, rather than being cost-based, the purchasing strategy is linked directly to company-wide long-term strategies and goals (SP3, SP6). Thus, at this advanced stage, purchasing influences the competitive factors including quality, cost/price, timely and reliable delivery, and cycle time reduction by (1) strategically integrating the supply base and (2) fostering effective strategic collaboration with its supplier partners (Monczka, 1992).

5. Discussion

The results of this study offer several important implications for theory as well as practice. From a research perspective, it provides extensive empirical evidence for the ever-growing strategic nature of the purchasing function. It reemphasizes the instrumental role of the purchasing function's long-term focus in building strategic and collaborative supplier relationships. From a managerial viewpoint, our results illustrate that purchasing strategy needs to be aligned with business strategy and purchasing professionals need to be knowledgeable about

the strategic direction of the firm. On the whole, this study advocates that firms need to embrace advanced levels of strategic purchasing since purchasing can play an instrumental role in integrating various supply activities and delivering superior supply chain performance.

In general, the significance of the first four hypotheses supports the notion that the strategic level of the purchasing function plays a vital role in engendering supply initiatives for relational integration and the integration of process, information and cross-organizational teams. It also reveals that more advanced levels of strategic purchasing are generally associated with increased levels of supply integration and, in particular, improved cooperation and collaboration between the buying firm and its key suppliers. Compared to others, the relational integration construct had a very high mean value for Stage 1 firms. This supports H1a and clearly demonstrates that firms strive to build long-term relationships with a limited number of quality suppliers even when their purchasing functions are at the nascent stage of evolution. This offers strong support to the notion that long-term relationships are replacing adversarial relationships in the modern era of strategic purchasing (Ghoshal and Moran, 1996; Handfield and Nichols, 1999). More specifically, it illustrates more firms are adopting cooperative contractual agreements and strategic supplier retention policies.

In spite of the absence of a long-term focus in the nascent stage, our results suggest that purchasing is moving in the right direction and attempting to benefit from other initiatives in addition to seeking its prime goal of cost reduction. Moreover, by sharing their requirements with a limited number of suppliers, buying firms are better able to achieve discounts from suppliers who in turn are able to make more profit through added demand. Additionally, our results illustrate that relational integration works hand in hand with strategic purchasing even for firms at the lower end, and that purchasing managers are developing and using more effective procurement strategies (Cavinato, 1999; Freeman and Cavinato, 1990).

The significance of hypothesis H1b shows that the strategic nature of the purchasing function has a positive impact on process integration between the supply chain partners. The mean value for this construct was significantly different across all the three stages of purchasing evolution. Firms at more advanced stages of strategic purchasing appear to be in a better position to seamlessly integrate logistics activities including distribution, transportation and/or warehousing. This result provides additional empirical support for a growing consensus that firms with highly strategic purchasing functions are better able to work closely with their suppliers as well as to eliminate obstacles that may cause delays in obtaining materials and services from suppliers (Carr and Smeltzer, 1999). Moreover, it demonstrates that strategic purchasing is now responsible for effective integration of inbound materials or service needs of the organization (Cavinato, 1999).

The extent of inter-organizational communication between the buyer and supplier firms was significantly greater for the firms at more advanced stages of strategic purchasing. This support for hypothesis H1c demonstrates that as its strategic nature amplifies, the purchasing function is better able to (1) break most communication barriers, (2) eliminate obstacles and delays in obtaining materials, (3) foster strategic and sensitive two-way information exchanges with their supplier firms, and (4) ultimately prevent much opportunistic behavior. The adoption of inter-organizational information systems was found to be significantly prevalent for Stage 3 firms, especially when compared to firms in the first two stages of strategic purchasing. The elevated status of the purchasing function and the latitude it enjoys at this advanced stage facilitates the incorporation of advanced information systems to exchange critical information with the supplier firms. These results support the notion that as strategic purchasing level elevates, the exchange of information between the firms in terms of design, research, and financial is likely to be timelier and frequent (McIvor et al., 1997) as it is done through advanced information systems (Handfield and Nichols, 1999; Radstaak and Ketelaar, 1998).

Strategic purchasing was found to have a significant effect on the integration of cross-organizational teams (H1d). In contrast to those in Stage 3, firms in the first two stages had very low mean values for the construct of cross-organizational teams. This result suggests that in order to achieve better integration of cross-organizational teams, the purchasing function needs to advance to the highest strategic level. The underlying belief is that the elevated status of the purchasing function can promote collaborative relationships with suppliers through increased trust and commitment between internal customers and external suppliers. They may also be able to co-locate employees to form superior personnel integration, a trait not evident for firms in the first two stages of purchasing. Moreover, at this advanced stage, the purchasing function is positioned to provide strategic contributions during the new product design and development process by utilizing cross-organizational teams involving suppliers. As also noted by Monczka (1992), our results specifically illustrate that, at this level, purchasing can develop optimal material specifications, monitor and forecast changes in external source markets, share information with suppliers, identify key suppliers that can support product design, and develop plans to support new product development.

The support for the performance related hypotheses clearly shows that the further the firm is along the strategic purchasing stages, the better the supplier and buyer performance. Although Stage 1 firms could be expected to perform better in terms of cost-based performance due to their immediate and short-term focus on cost reduction, our results do not reveal that firms' cost performance was significantly different across the three groups.

This interesting result suggests that the short-term cost-oriented relationships characterizing firms in Stage 1 might not only inhibit the development of superior supply management capabilities, but also heighten the need for costly and complex governance mechanisms for curbing opportunistic behavior, which ultimately dissipates any imaginable cost benefits for the supply chain partners (Ghoshal and Moran, 1996). This clearly reflects the current trend that focuses more on developing supplier relationships that are rooted in non-cost-based competitive priorities.

It was also intriguing to find that supplier flexibility performance was not significantly different across the three strategic purchasing levels. In comparison to quality and delivery, researchers have suggested that firms might find it very difficult to accommodate a sudden increase in demand or frequent/rapid changes in schedules (e.g., Jayaram et al., 1999). Flexibility in fact has an internal focus and mostly is a function of the firm's internal capacity management. Moreover, in reality, suppliers use numerous options including slack production capacity, production equipment, layout, and/or inventory buffers to be flexible to the buyer's needs. Therefore, in a way the insignificance could be attributed to the shortcomings in our flexibility performance indicators, which did not specifically cover the richness and the inherent complexity of the notion of flexibility. Alternatively, as indicated by the infamous yet prevalent "bull-whip" effect within supply chains, firms might actually place low priority on flexibility since they tackle variability by maintaining higher inventory at the behest of the buying firm. This alternative inference is in line with current supply chain literature, where flexibility is either not mentioned or not emphasized as strongly as other priorities such as quality and delivery (Shin, et al., 2000).

In general, it was also found that firms at the third stage accomplish the highest performance improvements across the most dimensions while the firms at the nascent stages achieve the least. This indicates that strategic purchasing is a good indicator of supply chain performance. Collectively, these results support the notion that by fostering relational capabilities (Dyer, 2000; Teece et al., 1997) that engender sustainable competitive advantages, strategic purchasing can create a win–win situation for both supplier and buyer firms. Moreover, it suggests that when purchasing is strategically oriented, it can engender as well as protect the sustainable competitive advantages of both the buyer and supplier firms (Teece et al., 1997; Wernerfelt, 1984), thereby ultimately maximizing *transaction value* (Zajac and Olsen, 1993) instead of simply minimizing *transaction cost*.

6. Conclusions and directions for future research

As strategic purchasing is receiving increased attention, firms strive to implement strategic purchasing to its best potential. As such, firms' purchasing functions are at different stages of strategic evolution. Based on the firms' advances along the dimensions of strategic focus, strategic involvement, and visibility/status, we have dissected the strategic level of purchasing into three stages. The differences in supply integration and supply chain performance across these three stages have also been empirically evaluated using ANOVA. The results of this study are expected to help researchers and decision makers to better understand the effects of advances in strategic purchasing on supply integration and supply chain performance. Specifically, this study provides strong support for the importance of strategic purchasing by showing that (1) firms at the nascent stage of strategic purchasing need to realize that moving towards the more advanced stages engender a better supply integration, (2) practicing executives must understand that the purchasing function can play a key role in integrating the buyer–supplier dyad by focusing on diverse aspects such as process, relational, information, and cross-organizational teams, and (3) strategic purchasing can have a profound impact on supply chain performance that subsequently creates a win–win situation for both buyer and supplier firms.

At this juncture, we acknowledge some limitations of our study that would provide opportunities for further research. In this study, we have successfully identified three stages of the purchasing function. Earlier studies, though descriptive and anecdotal, have attempted to categorize strategic purchasing into 3–5 stages. Therefore, we encourage future studies to empirically refine the three stages identified in this study. Also, we believe that the strategic purchasing construct can be further enriched by including additional measurement indicators within current dimensions or by considering other strategic dimensions such as *knowledge, skills and resources* (Carr and Smeltzer, 1999; Van Weele, 1984). The construct of *limited number of suppliers* was operationalized to include the domain of reduced numbers of suppliers as well as the contractual agreements and supplier retention policies utilized by the buying firm. The final construct, however, included only the two indicators representing reduced number of suppliers. We encourage future research to focus on developing a more concrete measure for supply base reduction spanning the various intriguing facets of this theoretical construct. Given that supply chain management encompasses both the customer-side and supply-side (Shapiro et al., 1993), one of the limitations of this study is that it focuses specifically on the integration of the supply-side. While supply-side integration has attracted substantial attention in SCM research (Chen and Paulraj, 2004b), it is also important to assess the effect of strategic purchasing on the customer-side integration. Therefore, we propose that future studies evaluate the effect of the strategic nature of purchasing on customer-side integration, thereby covering the entire domain of supply chain integration.

Having drawn from a list of the ISM members, the results of this research can be generalized to the population of the firms represented by the ISM database. Though the final sample in this study spanned a wide range of firms based on demographics such as the number of employees and annual sales, we propose that future research endeavors attempt to include a mixed population of respondents from multiple sources to extend the external validity. It would also be interesting to see future research that includes service-oriented constructs and uses a sample of service firms. Another limitation of this study relates to the collection of supplier performance indicators. The purchasing, supply management, and material management executives of the buyer firms were considered to be the best candidates to answer the various questions posed in this study. Although the complexity of data collection increases when a researcher has to collect data from both the buyer and its supplier, this procedure allows the researcher to validate and crosscheck the information from both parties. Future research can also consider gathering data from multiple respondents within each firm to increase the validity of the data.

Acknowledgments

Appendix A

See Table A1 for details.

Table A1

Indicators (Cronbach's α, eigenvalue)	Principal component Factor loading	Measurement model	
		Std. coefficient	t-value
Strategic purchasing (α = 0.91; eigenvalue = 5.63)			
SP1. Purchasing is included in the firm's strategic planning process	0.78	0.70	12.14
SP2. The purchasing function has a good knowledge of the firm's strategic goals	0.70	0.69	11.81
SP3. The purchasing function has a formally written long-range plan	0.51	0.77	12.08
SP4. Purchasing performance is measured in terms of its contributions to the firm's success	0.63	0.60	10.24
SP5. Purchasing professionals' development focuses on elements of the competitive strategy	0.64	0.64	10.44
SP6. Purchasing's focus is on longer-term issues that involve risk and uncertainty	0.35	0.40	6.32
SP7. Top management considers purchasing to be a vital part of our corporate strategy	0.80	0.81	14.15
SP8. Purchasing's views are important to most top managers	0.82	0.81	14.29
SP9. The chief purchasing officer has high visibility within top management	0.82	0.82	14.40
SP10. Top management emphasizes the purchasing function's strategic role	0.88	0.92	17.63
SP11. Purchasing department plays an integrative role in the purchasing function[a]			
Limited number of suppliers (α = 0.65; eigenvalue = 1.23)			
LS1. We rely on a small number of high-quality suppliers	0.67	0.68	9.30
LS2. We maintain close relationship with a limited pool of suppliers	0.71	0.73	9.92
LS3. We get multiple price quotes from suppliers before ordering[a]			
LS4. We drop suppliers for price reasons[a]			
LS5. We use hedging contracts in selecting our suppliers[a]			
Long-term relationships (α = 0.85; eigenvalue = 3.22)			
LR1. We expect our relationship with key suppliers to last a long time	0.82	0.61	9.51
LR2. We work with key suppliers to improve their quality in the long run	0.65	0.83	12.46
LR3. The suppliers see our relationship as a long-term alliance	0.85	0.72	11.59
LR4. We view our suppliers as an extension of our company	0.71	0.95	15.76
LR5. We give a fair profit share to key suppliers[a]			
LR6. The relationship we have with key suppliers is essentially evergreen[a]			
Logistics integration (α = 0.92; eigenvalue = 4.54)			
LI1. Interorganizational logistic activities are closely coordinated	0.77	0.75	12.62
LI2. Our logistics activities are well integrated with the logistics activities of our suppliers	0.82	0.79	13.47
LI3. We have a seamless integration of logistics activities with our key suppliers	0.84	0.84	14.96
LI4. Our logistics integration is characterized by excellent distribution, transportation and/or warehousing facilities	0.83	0.84	15.41
LI5. The inbound and outbound distribution of goods with our suppliers is well integrated	0.85	0.86	15.43
LI6. Information and materials flow smoothly between our supplier firms and us	0.67	0.67	11.05
Two-way communication (α = 0.86; eigenvalue = 3.34)			
CO1. We share sensitive information (financial, production, design, research, and/or competition)	0.52	0.64	10.26
CO2. Suppliers are provided with any information that might help them	0.60	0.72	11.55

Table A1 (*continued*)

Indicators (Cronbach's α, eigenvalue)	Principal component Factor loading	Measurement model	
		Std. coefficient	*t*-value
CO3. Exchange of information takes place frequently, informally and/or in a timely manner	0.66	0.80	13.57
CO4. We keep each other informed about events or changes that may affect the other party	0.59	0.83	14.42
CO5. We have frequent face-to-face planning/communication	0.52	0.78	13.47
CO6. We exchange performance feedback[a]			
Inter-organizational information systems (α = 0.84; eigenvalue = 3.59)			
IT1. There are direct computer-to-computer links with key suppliers	0.74	0.71	11.57
IT2. Interorganizational coordination is achieved using electronic links	0.74	0.72	11.81
IT3. We use information technology enabled transaction processing	0.76	0.80	13.47
IT4. We have electronic mailing capabilities with our key suppliers	0.58	0.57	8.95
IT5. We use electronic transfer of purchase orders, invoices and/or funds	0.63	0.68	10.27
IT6. We use advanced information systems to track and/or expedite shipments	0.74	0.71	11.61
Supplier involvement—general purposes (α = 0.90; eigenvalue = 4.42)			
GP1. We collocate employees to facilitate cross-functional integration	0.57	0.56	8.89
GP2. We coordinate joint planning committees with our suppliers	0.79	0.82	14.68
GP3. We promote task force teams with our suppliers	0.82	0.92	17.82
GP4. We share ideas and information with our supplier through cross-functional teams	0.83	0.91	17.51
GP5. We use supplier involved ad hoc teams based on our strategic objectives	0.73	0.77	13.45
GP6. We encourage teamwork between our suppliers and us[a]			
Supplier involvement—product development (α = 0.86; eigenvalue = 2.78)			
PD1. We involve key suppliers in the product design and development stage	0.69	0.81	13.81
PD 2. We have key supplier membership/participation in our project teams	0.66	0.79	13.45
PD 3. Our key suppliers have major influence on the design of new products	0.77	0.70	11.56
PD 4. There is a strong consensus in our firm that supplier involvement is needed in product design/ development	0.75	0.77	12.30
PD 5. We involve our key suppliers in business and strategy planning[a]			
PD 6. We have joint planning committees/task forces on key issues with key suppliers[a]			

Model Fit indices: Normed χ^2 = 1.39 (<2.0); Adjusted Goodness of fit index = 0.81 (>0.80); Non-normed fit index = 0.94 (>0.90). Root mean-square residual = 0.07 (<0.10); Root mean-square error of approximation = 0.40 (<0.10).

[a]Indicators that were deleted during the instrument development process.

Appendix B

Supplier (procurement) performance
  Quality
    PP1. Quality
  Cost
    PP2. Cost
  Flexibility (α = 0.84)
    PP3. Volume flexibility
    PP4. Scheduling flexibility
  Delivery (α = 0.92)
    PP5. On-time delivery
    PP6. Delivery reliability/consistency
  Responsiveness
    PP7. Prompt response
Buyer performance
  Quality
    BP1 Product conformance to specifications
  Cost
    BP2. Production costs
  Flexibility
    BP3. Volume flexibility

Delivery (α = 0.71)
    BP4. Delivery speed
    BP5. Delivery reliability/dependability
Customer responsiveness (α = 0.82)
    BP6. Rapid confirmation of customer orders
    BP7. Rapid handling of customer complaints
Customer satisfaction
    BP8. Customer satisfaction
Financial (α = 0.95)
    BP9. Return on investment
    BP10. Profits as a percent of sales
    BP11. Firm's net income before tax
    BP12. Present value of the firm

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