# Purchasing Competence and Its Relationship with Manufacturing Performance

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SUMMARY

**This article develops purchasing competence as a valid construct and explores its relationship with different manufacturing priorities. An empirical study is conducted among purchasing professionals in manufacturing firms. The results of the research indicate that purchasing competence can be operationalized, developed, and estimated in a firm. Further, purchasing competence is found to have a positive impact on manufacturing cost, quality, and delivery, as well as new product introduction and customization performance. Purchasing integration, a component of purchasing competence, is found to relate to all dimensions of manufacturing performance.**

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## INTRODUCTION

Quality, cost, delivery, innovation, and responsiveness underlie most manufacturing strategic agendas today (Neely, Mills, Platts, Gregory, and Richards 1994). Firms have traditionally pursued these goals through adoption of advanced technologies and manufacturing practices such as concurrent engineering, JIT, and worker empowerment (Snell and Dean 1992). Recent developments in industry suggest the emergence of another route to manufacturing excellence — the acquisition and effective management of supply chain capabilities to achieve cost, quality, technology, delivery, and responsiveness objectives. These developments have provided purchasing with the opportunity to become a key contributor to manufacturing and business goals. The strategic reach of purchasing, its role in developing sustainable competitive advantage, and its emergence as a core competence of firms have been documented in the literature (Carter and Narasimhan 1995; Tully 1995). Manufacturing firms are increasingly obtaining volume, design, and technology capabilities through strategic supply chain management (Tully 1994). However, such benefits cannot be obtained as a matter of course. Supply chain management competence enables and facilitates such gains. Faced with strikes in its own stamping plants in 1998, GM moved to obtain critical stampings and other parts from its suppliers. Industry analysts reported that this strategy might not be successful for a variety of reasons. One is that GM has not developed enough supply chain competence to obtain such emergent, empathetic responses from its suppliers. In contrast, Ford, Volkswagen, and Chrysler are pioneering such supply chain management techniques as building modular plants in Brazil that house suppliers under the same roof (*CNN News* 1998). The need for supply chain management competence is also found in other industries. Pitney Bowes predicates its manufacturing performance, future growth, and new product introduction strategy on developing a core group of technologically capable suppliers with manufacturing expertise (Minahan 1997). Evidence in the literature thus suggests that the basis of competition in many industries in the future may revolve around the development of supply chain competence by organizations.

Supply chain competence can be conceived as comprising three distinct competencies: purchasing competence, production competence, and logistics/marketing competence. Past research has examined production competence, logistics and marketing competence, and their strategic relationships to competitive positioning (Avlonitis and Gounaris 1997; Vickery, Droge, and Markland 1993). However, despite its importance, purchasing competence remains largely unexplored in the literature. There is a conspicuous absence of rigorous conceptualizations or examinations of this construct. Investigations of the relationship between purchasing competence and manufacturing performance are also lacking in the literature. This article addresses these gaps in the literature. Its objective is to examine purchasing competence and investigate its relationship to manufacturing performance.

The article is organized as follows. First, the concept of purchasing competence is defined. Next, a measurement model of purchasing competence is developed from empirical data. This is followed by a discussion of the statistical relationships between purchasing competence and manufacturing competitive priorities. The article concludes with a discussion of the results and their implications for theory and practice.

## PURCHASING COMPETENCE — THE CONSTRUCT

Purchasing competence is the capability to structure, develop, and manage the supply base in alignment with the manufacturing and business priorities of a firm. When fully developed, purchasing competence enables purchasing to become a participant in the strategic planning processes of a firm and impact key policies at the functional and corporate levels. Developing purchasing competence requires the selection and use of purchasing practices that can be directly related to the achievement of business-level goals. However, from a theoretical and statistical standpoint, purchasing competence is quite distinct from purchasing practices. Purchasing competence is the *latent* capability to structure, develop, and manage the supply base in alignment with manufacturing (and business) priorities. Purchasing practices represent internal, *observable* activities that can be measured directly in a firm. Purchasing competence is similar to the notions of "world-class purchasing," "integrative purchasing," and "strategic purchasing management," by virtue of its focus on purchasing integration with business goals (Freeman and Cavinato 1990; Bhote 1989; Reck and Long 1988). But it differs from these concepts in that it represents a domain-specific construct that can be operationalized and measured. Literature suggests an evolutionary process in the development of purchasing competence. The process culminates with the integration of purchasing practices in a firm's competitive strategic processes — the "phase IV" strategic management stage of Freeman and Cavinato (1990) and the "integrative" phase of Reck and Long (1988).

Purchasing competence could encompass a portfolio of purchasing practices, ranging from supply base optimization to early supplier design involvement to worldwide purchasing (Monczka and Trent 1991). This research considers four purchasing practices that might be encountered in many purchasing environments — *supply base optimization, buyer-supplier relationship development practices, supplier capability audit, and purchasing integration.* While other purchasing practices such as global purchasing and green purchasing exist, past research has observed the importance of the preceding four purchasing practices in a variety of purchasing situations.

Robertson (1995), in an in-depth study of the strategic evolution of the purchasing function at Rover Motors, U.K., observed that supply base rationalization formed the first step in the company's strategic purchasing initiative. Rover then engaged in information sharing and several other buyer-supplier relationship development activities with its supply base, followed by systematic and regular assessments of supplier performance. These actions were coordinated through cross-functional teams, integrating purchasing with manufacturing, engineering, and finance. Purchasing integration played a key role in convincing management of the strategic value of purchasing actions. The tangible value added to business goals led management to recognize the strategic importance of purchasing and invest in its development.

Other studies have documented the fundamental nature of these four purchasing practices in the purchasing plans of companies (Gadde and Hakansson 1994; Monczka and Trent 1991). These practices often support and subsume other, more disaggregate, purchasing actions. For example, companies engaged in buyer-supplier relationship development may employ supplier quality and technical assistance programs, build long-term supplier relationships, form buyer-supplier councils, and deploy a total cost focus (Dyer and Ouchi 1993). Such practices have been labeled as supplier development, total quality management (TQM), and total cost of ownership purchasing practices (Monczka and Trent 1991), all of which can be included within the larger rubric of buyer-supplier relationship development.

Supply base optimization is often perceived as a prerequisite for other purchasing initiatives and constitutes a distinct purchasing strategy. It generally precedes other purchasing activities (Bhote 1989) and reduces transaction and supplier production costs (Dyer and Ouchi 1993). Supply base optimization consists of supplier reduction, reorganization, and volume leveraging actions that may facilitate more sophisticated purchasing practices such as buyer-supplier relationship development and early supplier involvement in product and process design.

Supplier capability audits are associated with supplier performance expectations. Purchasing contributes to strategic objectives by selecting, developing, and monitoring a capable supply base (Fitzpatrick 1996). Increased reliance on the supply base for obtaining current and future competitive success has focused management attention on supplier performance. Such attention has increased in recent years, particularly since buyers perceive supplier performance as less than satisfactory — escalating management expectations of purchasing have created similar purchasing expectations of supplier performance (Monczka and Trent 1995). Supplier performance evaluation and capability audits have become a critical part of purchasing strategies in supply chains in the United States and abroad (Hahn, Watts, and Kim 1990).

Purchasing integration represents the fourth purchasing practice examined in this research and underlies the strategic impact of the other three purchasing practices. Purchasing integration enables fit and alignment between purchasing practices and the business objectives of a firm. It links purchasing plans, policies, and actions to corporate and cross-functional priorities and is a key influence on top management perceptions of the strategic importance of purchasing. For these reasons, during the 1990s, purchasing research focused on the integration of and purchasing participation in the business goals of an enterprise (Fitzpatrick 1996; Ellram and Carr 1994). Purchasing integration requires the active involvement of purchasing in the business of a firm, achieved through mechanisms such as cross-functional teaming, participation in strategy formulation, and a focus on activities that are perceived as adding value to strategic business goals (Robertson 1995; Gadde and Hakansson 1994).

These four purchasing practices — supply base optimization, buyer-supplier relationship development, supplier capability auditing, and purchasing integration — provide a platform for the evolutionary development of purchasing competence in a firm.

## PURCHASING COMPETENCE — AN OPERATIONALIZATION

The purchasing competence construct was conceptualized as a latent construct, with four first-order dimensions: supply base optimization, buyer-supplier relationship development, supplier capability auditing, and purchasing integration. Although the literature lacks a validated scale for purchasing competence, several studies have discussed and developed item measures for individual sourcing domains. The following studies were used in developing measures for supply base optimization: Robertson (1995); Gadde and Hakansson (1994); Handfield (1993); Monczka, Trent, and Callahan (1993). Measures for buyer-supplier relationship practices were derived from the relationship and alliance literature: Dyer, Cho, and Chu (1998); Kamath and Liker (1994); Ring and Van De Ven (1992), (1994); Landeros and Monczka (1989). Measures for supplier capability auditing were based in part on the supplier development and performance literature: Watts and Hahn (1993); Monczka et al. (1993); Watts, Kim, and Hahn (1992); Lascelles and Dale (1990). Specific measures were also developed in this research for evaluating supplier responsiveness and design capabilities that are related to the competitive priorities of customization and responsiveness. Items for purchasing integration were based on the integration and strategic sourcing literature: Robertson (1995); Ellram and Carr (1994); Gadde and Hakansson (1994); Monczka and Trent (1991); Freeman and Cavinato (1990); Reck and Long (1988). Item measures for the competitive performance dimensions were adopted from the manufacturing strategy literature: Roth and Miller (1990); Dean and Snell (1991); Miller and Roth (1994). Each dimension of manufacturing performance was measured in terms of internal and competitive performance standards. The item pool generated for the four dimensions of purchasing competence and manufacturing competitive priorities was pilot-tested on three academics and 10 purchasing practitioners. The final list of item measures that emerged from the pilot test is shown in Table I.

A survey instrument was developed based on the above item measures and administered to a cross-section of purchasing professionals. Comparisons of initial interviews with purchasing and manufacturing managers did not reveal any substantial inconsistencies among their responses on manufacturing-related questions. Further, a random subsample of firms was selected from the respondent sample to obtain manufacturing's perspective on the manufacturing-related items in the questionnaire. Responses were obtained for manufacturing-related questions from the manufacturing managers of these firms. Paired comparisons were made between the purchasing and manufacturing scores for these questions, and the inter-rater reliability for each of the firms was calculated (James, Demaree, and Wolf 1984). The average inter-rater reliability was 0.96, evidencing a high degree of agreement between purchasing and manufacturing perspectives on manufacturing-related issues.

## DATA COLLECTION AND ANALYSIS

The sample frame was drawn from the manufacturing sector of the National Association of Purchasing Management (NAPM) Title 1 member list. The range of industries covered in the sample frame included the following Standard Industrial Classification (SIC) codes:

*SIC 34* — Fabricated Metal Products, except Machinery and Transportation Equipment

*SIC 35* — Industrial and Commercial Machinery and Computing Equipment

**Table I**

LIST OF MEASURES FOR THE PURCHASING COMPETENCE CFA

| Factor | Item Measures |
|---|---|
| Supply Base Optimization | Average number of suppliers per part |
| | Is current number of suppliers high/low/right |
| | Tiering of supply base into primary and secondary suppliers |
| | Extent of volume consolidation |
| | Extent of parts bundling |
| Buyer-Supplier Relationship Development | Nature of contractual relationship with supplier (short-term/long-term/partnership) |
| | Trust building |
| | Top management commitment to relationship |
| | Joint problem solving |
| | Joint investments in specialized machinery/materials/assets |
| | Financial assistance to supplier |
| | Technological assistance to supplier |
| | Quality training to supplier |
| | Use of buyer-supplier similar mechanisms |
| | Timely production information sharing with supplier |
| | Direct communication between production schedulers at buyer and supplier plants |
| | Cost information sharing with supplier |
| | Cost information sharing by supplier |
| | Use of total cost concept |
| | Use of formal supplier evaluation and feedback procedures |
| | Granting supplier performance rewards and awards |
| | Buyer concern for supplier earning a fair profit |
| | Supplier concern for buyer earning a fair profit |
| Supplier Capability Auditing | Quality performance |
| | Cost performance |
| | Ability for complex manufacturing |
| | Ability to modify product to meet customer needs |
| | Responsiveness to schedule delivery changes |
| | Ability to accept late "mix" changes in orders |
| | Product modularization |
| | Responsiveness to schedule volume changes |
| | Assistance in buyer product/process design |
| | Ability to design and supply new products |
| Purchasing Integration | Extent to which purchasing and manufacturing jointly establish goals |
| | Purchasing regularly attends strategy meetings |
| | Purchasing recommends and impacts changes in end products and inputs |
| | Participates in cross-functional teams |
| | Proportion of purchasing personnel who spend time in routine tasks (expediting, order generation) |
| | Proportion of purchasing personnel who spend time in supplier development and certification |
| | Proportion of purchasing personnel who spend time in market and price/cost analysis |
| | Purchasing participation in product design |
| | Purchasing participation in process design |
| | Purchasing participation in developing sales bids |
| | Purchasing is rewarded on strategic contributions (new products/technologies) to the company |
| Manufacturing Competitive Priorities | The extent to which the company has been able to meet its cost reduction goals |
| | The extent to which the company has been able to meet its quality improvement goals |
| | The extent to which the company has been able to meet its manufacturing cycle time reduction goals |
| | The extent to which the company has been able to meet its product introduction time goals |
| | The extent to which the company has been able to meet its delivery goals in terms of delivery speed and dependability |
| | The extent to which the company has been able to meet its customization responsiveness goals |

**Table II**

RESPONDENT PROFILE

| | | | | | | |
|---|---|---|---|---|---|---|
| Respondent Titles | Vice President/Director Purchasing/Materials | 50 | | | | |
| | Purchasing/Commodity/Materials Manager | 179 | | | | |
| | Senior Buyer/Buyer | 7 | | | | |
| | Other Titles (Operations Manager, Purchasing Engineer) | 6 | | | | |
| | No Response | 80 | | | | |
| Company Sales ($ million) | <1 | >1-10 | >10-50 | >50-100 | >100-500 | >500 |
| # of respondents | 2 | 31 | 72 | 41 | 74 | 94 |
| | No Response: 8 | | | | | |
| Plant Sales ($ million) | <1 | >1-10 | >10-50 | >50-100 | >100-500 | >500 |
| # of respondents | 2 | 32 | 108 | 66 | 72 | 38 |
| | No Response: 4 | | | | | |
| Number of Employees in Plant | ≤100 | >100-200 | >200-500 | >500-1,000 | >1,000 | |
| # of respondents 59 80 | 81 | 43 | 55 | | | |
| No Response: 4 | | | | | | |
| Product Characteristics | Made-To-Stock | Eng.-To-Order (TO) | Make-T-O | Assy.-T-O | | |
| # of respondents | 76 | 53 | 130 | 62 | | |
| | No Response: 1 | | | | | |
| Process Characteristics | Job Shop | Batch | Repetitive | Continuous | | |
| # of respondents | 109 | 71 | 117 | 24 | | |
| | No Response: 1 | | | | | |
| Product Life Cycle | Growth | Maturity | Decline | | | |
| # of respondents 148 | 160 | 13 | | | | |
| No Response: 1 | | | | | | |

*SIC 36* — Electronic and Other Electrical Equipment and Components

*SIC 37* — Transportation Machinery and Items

*SIC 38* — Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods

Data collection was conducted in two phases. Phase one involved site visits and interviews with executive management in the sourcing and manufacturing areas across different industries. Phase two, following Dillman's (1978) guidelines, involved mailing the survey to senior-level NAPM members selected at random from the NAPM member list. The mailing package consisted of a cover letter, the survey, and a reply paid return envelope. Assuming a conservative 15-20 percent response rate, the mailing was made to approximately 1,700 potential respondents. Written follow-ups (with duplicate questionnaires) were mailed to all non-respondents approximately three weeks after the initial mailing.

A total of 322 usable responses were received. The response rate was 19 percent, which compares well with past studies in the purchasing literature (Fawcett and Scully 1998; Germain and Droge 1998). A profile of the respondents is presented in Table II.

ANOVA tests failed to reveal any statistically significant differences among different SIC group means for company sales, plant sales, number of employees, product characteristics, process characteristics, and product life cycle.

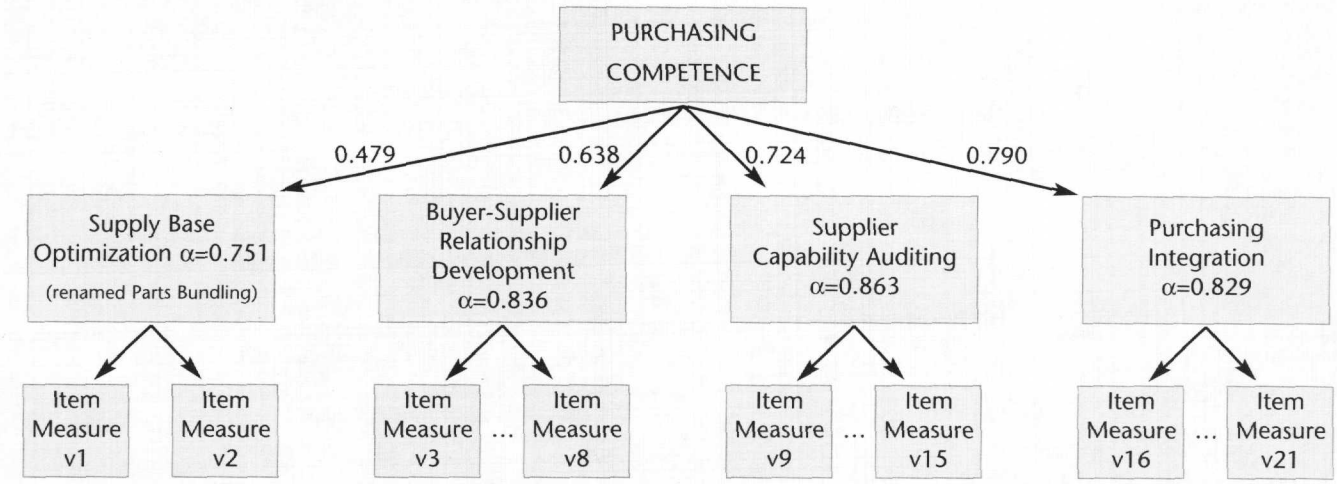
## Measurement Analysis

Structural equation modeling was employed to develop a second-order confirmatory model for estimating purchasing competence. Figure 1 shows the operationalization of the purchasing competence construct (error terms not shown).

Initially, a first-order confirmatory factor analysis (CFA) with four factors was developed and validated, followed by a second-order CFA. Only two item measures relating to volume consolidation and parts bundling loaded on the first-order "supply base optimization" factor. Considering the limited domain of these item measures, it was deemed appropriate to rename the "supply base optimization" factor as "parts bundling." Table III presents the results of the CFA.

The global fit indices (CFI: 0.982; NNFI: 0.977; and NFI: 0.926) provided strong support of model fit. The absence of negative error variances provided further evidence of good model fit (Bagozzi and Yi 1988). Convergent validity was indicated by the strong and significant ($p<0.05$) item loadings. All loadings (with the exception of one item, 0.41) were at 0.50 or above. Reliabilities for the factors (coefficient alpha) ranged from 0.751 to 0.863. All inter-factor correlations were

Figure 1




found significantly different from 1.00, affirming the discriminant validity of the model.

A multi-group analysis of the second-order CFA model was conducted to validate the model and to undertake a simultaneous test for non-response bias. The sample was split into early (n=200) and late (n=122) respondents. Respondents to the follow-up letter were assumed to be equivalent to non-respondents, since a post-survey stimulus was required to elicit their response (Narasimhan and Das 1999; Armstrong and Overton 1977). The objective was to test for measurement invariance across the first and second waves of respondents. The global indices of the "stacked model" represent an excellent fit (CFI: 0.969; NNFI: 0.963; NFI: 0.867). The results serve as a stringent indicator of the absence of non-response bias and cross-validate the model.

The item measures for individual manufacturing competitive priorities were single indicators, albeit benchmarked against internal and external (competitive) goals. A CFA would have been redundant in view of this and was not deemed necessary. Each manufacturing performance dimension was measured by summating respondent scores on the internal and external item measures. The reliabilities (Cronbach's alpha) of these summed scores are indicated below:

| | |
|---|---|
| *Manufacturing Cost Reduction Performance* | *- α: 0.783* |
| *Quality Performance* | *- α: 0.826* |
| *New Product Introduction Time Reduction Performance* | *- α: 0.791* |
| *Delivery Performance* | *- α: 0.896* |
| *Customization Responsiveness Performance* | *- α: 0.822* |

The individual manufacturing performance dimension reliabilities well exceeded the minimum limit (0.60) suggested for new scales (Nunnally 1978). In summary, the results of the data analysis established the validity of the measurement models for estimating purchasing competence and the manufacturing competitive priorities.

### Investigation of Relationships

Regression analysis was used to explore the relationship between purchasing competence and manufacturing performance. An aggregate manufacturing performance measure was constructed by combining the scores on each competitive priority. Business strategies may involve the simultaneous pursuit of multiple performance objectives. As such, a firm may be interested in aggregate manufacturing performance, encompassing multiple performance outcomes. Table IV shows the correlations among the individual manufacturing performance dimensions.

The strength of these correlations implies that actions taken for a particular individual performance objective should concurrently affect related performance dimensions, supporting the notion of an aggregate approach to assessing manufacturing performance. A three-stage approach was followed in the analysis of the data. The central research theme of this study is the examination of purchasing competence and its implications for manufacturing performance. Accordingly, aggregate manufacturing performance was first regressed against purchasing competence. Next, multiple regressions were run, employing the components of purchasing competence as independent variables and aggregate manufacturing performance as the dependent variable. In order to enhance interpretability, a final set of multiple regressions was conducted, regressing the four purchasing competence factors on individual aspects of manufacturing performance.

Table V shows the results of the first regression analysis, with manufacturing performance as the dependent variable and purchasing competence as the independent variable.

The results show that purchasing competence explained 12 percent of the variance in aggregate manufacturing performance. The "F" test and "T" statistics indicate a statistically valid relationship.

Table VI presents the results of the second set of regression analysis with aggregate manufacturing performance and the individual purchasing competence factors.

The individual dimensions of purchasing competence explained approximately 14 percent of the variance in aggregate manufacturing performance. The significant "F" statistic evidences the statistical validity of the regression model. The significant betas ($p<0.05$ and $p<0.10$) indicate the positive effects of buyer-supplier relationship development, supplier capability auditing, and purchasing integration on aggregate manufacturing performance.

Table VII shows the summary results of the final set of regression analysis, with individual components of manufacturing performance constituting the dependent variables, and purchasing competence factors constituting the independent variables.

Significant relationships were found between supplier capability auditing and the dependent variables: new product introduction time performance, manufacturing cost performance, and customization responsiveness performance, respectively. Statistically significant relationships were also found between purchasing integration and the dependent variables of new product introduction performance, manufacturing cost performance, quality performance, delivery performance, and customization responsiveness performance. A significant relationship was also found between parts bundling and delivery performance. The regression models were statistically significant and explained from 4 percent to 7.6 percent of the variance in the dependent variable(s). The next section discusses the implications of the relationships.

## IMPLICATIONS

The findings have implications for theory and practice. The operationalization and estimation of "purchasing competence" as a valid construct fulfills past research calls (Hines 1996). The purchasing competence construct can be used as a fundamental building block in sourcing theory development. The relationships between purchasing competence and manufacturing performance provide a framework for identifying and exploiting opportunities in a firm's supply chain.

### Developing Purchasing Competence

The results of the CFA show that one way to develop purchasing competence is through investments in the distinct purchasing practices of parts bundling, buyer-supplier relationship development practices, supplier capability auditing, and purchasing integration. The item factor loadings (see Table III) indicate the practices that purchasing must pursue to develop purchasing competence. Volume consolidation and parts bundling are

**Table III**

ITEM MEASURES AND GOODNESS-OF-FIT INDICES FOR THE PURCHASING COMPETENCE CFA

| | |
|---|---|
| n | 289 |
| $\chi^2$ | 215.14 |
| Degrees of Freedom | 166 |
| p-Value | 0.006 |
| CFI | 0.981 |
| NNFI | 0.976 |
| NFI | 0.924 |

| Factor | Item Measure | Loading |
|---|---|---|
| **Buyer-Supplier Relationship Development (F1)** | | |
| | Contractual Relationship with Supplier | 0.570 |
| | Degree of Mutual Trust | 0.639 |
| | Top Management Commitment | 0.763 |
| | Joint Problem Solving | 0.810 |
| | Product Information Sharing with Supplier | 0.626 |
| | Product Information Sharing by Supplier | 0.582 |
| **Parts Bundling (F2)** | | |
| | Volume Consolidation | 0.865 |
| | Parts Bundling | 0.703 |
| **Supplier Capability Auditing (F3)** | | |
| | Supplier Ability to Modify Product | 0.523 |
| | Supplier Responsiveness to Delivery Changes | 0.510 |
| | Supplier Ability to Accept Late "Mix Changes" in Orders | 0.416 |
| | Modularization of Supplier Products | 0.507 |
| | Supplier Responsiveness to Volume Changes | 0.536 |
| | Supplier Assistance in Product Design | 0.859 |
| | Supplier Ability in New Product Design | 0.826 |
| **Purchasing Integration (F4)** | | |
| | Purchasing Attends Corporate Meetings | 0.613 |
| | Purchasing Impacts End-Product Changes | 0.740 |
| | Purchasing Focus on Market/Price Analysis | 0.543 |
| | Purchasing Participates in New Product Development | 0.695 |
| | Purchasing Participates in Process Design | 0.733 |
| | Purchasing Measured on Strategic Metrics | 0.595 |
| **First-Order Factor Loadings on Purchasing Competence Construct (F5)** | | |
| | Buyer-Supplier Relationship Development | 0.638 |
| | Parts Bundling | 0.479 |
| | Supplier Capability Auditing | 0.724 |
| | Purchasing Integration | 0.790 |

**Table IV**

CORRELATIONS AMONG MANUFACTURING PERFORMANCE PRIORITIES

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| | Manufacturing Cost Performance | Quality Performance | New Product Introduction Time Performance | Customization Responsiveness | Delivery Performance |
| 1 | 1.000 | | | | |
| 2 | 0.548 | 1.000 | | | |
| 3 | 0.497 | 0.426 | 1.000 | | |
| 4 | 0.402 | 0.422 | 0.453 | 1.000 | |
| 5 | 0.534 | 0.496 | 0.432 | 0.649 | 1.000 |

All correlations are significant at $p<0.01$.

practices that could facilitate supply base rationalization. The loadings for buyer-supplier relationship practices reaffirm the importance of top management commitment for successful functional initiatives. Joint problem solving with suppliers is another practice that appears to strongly impact relational programs. Other practices involve production information sharing by buyers and suppliers. When implemented, these practices should aid the development of mutual trust among firms in a supply chain relationship. Purchasing practices that are relevant for a supplier capability auditing strategy include supplier participation and assistance in product design. Supplier involvement in design is predicated on strong supplier capabilities in design, a criterion for consideration during supplier selection, and supply base rationalization. Supplier responsiveness to changes in product specifications, order mix, order volume, and delivery schedules is also a factor that impacts supplier capability auditing. Product modularization is another supplier competence that buyers should include in their evaluation criteria. Together, these supplier capabilities can provide strong support for the development of strategic purchasing programs. The item loadings also suggest specific purchasing practices that could enable purchasing integration with business goals. Purchasing participation in business strategy meetings, a reorientation of purchasing's functional focus and evaluation programs toward customers and markets, and purchasing involvement in new product development are some practices that merit attention. For this purpose, purchasing may be required to retrain or hire personnel; measure and reward personnel on strategic metrics such as technology development, new product development success, and customer responsiveness; and become proactive in recommending product and business goal changes based on careful analysis of the supply market. Purchasing integration links purchasing to strategic business goals and forms an essential component of purchasing competence.

**Table V**

REGRESSION RESULTS
PURCHASING COMPETENCE AGAINST AGGREGATE MANUFACTURING PERFORMANCE

n=289

| | |
|---|---|
| Dependent Variable: | Manufacturing Performance |
| Independent Variable: | Purchasing Competence |
| Multiple R | 0.35 |
| R-square | 0.12 |
| Adjusted R-square | 0.11 |
| Standard Error | 0.56 |

**Analysis of Variance**

| | d.f. | Sum of Squares | Mean Square | F | p |
|---|---|---|---|---|---|
| Regression | 1 | 11.39 | 11.39 | 35.93 | 0.0000 |
| Residual | 287 | 90.95 | 0.32 | | |

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Purchasing Competence | 0.443 | 0.074 | 0.334 | 5.994 | 0.000 |
| Constant | 2.169 | 0.197 | | 11.027 | 0.000 |

Implemented independently, the four purchasing competence factors might not lead to best results. The significant inter-correlations among these factors suggest a synergistic interrelationship among the factors (Table VIII).

In brief, the results suggest that purchasing competence is a capability that:

- Derives from a synergistic combination of specific purchasing strategies
- Can be developed through the implementation of specific purchasing practices and programs
- Can be measured through a factor scale

### Purchasing Competence and Manufacturing Performance

The results show that purchasing competence has a significant and positive impact ($b=0.443$; $p<0.01$) on

aggregate manufacturing performance. This is a critical finding for purchasing. Clearly, purchasing can gain in status and strategic importance when a demonstrable relationship can be shown to exist between investments in developing purchasing competence and performance outcomes. Manufacturing performance is potentially subject to multiple influence factors, including variables (omitted in this study) such as worker morale, pay systems, manufacturing technology, and plant age. Considered in this light, the obtained R-square values of 0.12-0.14 for the purchasing competence-aggregate manufacturing performance regression models are not insubstantial. The regression with decomposed purchasing competence offers additional insights. Supplier auditing capability and purchasing integration were found to have a positive influence on aggregate manufacturing performance ($p<0.01$). Buyer-supplier relationship development was found to benefit aggregate manufacturing performance ($p=0.057$). While the latter result is consistent with previous research, the findings tying purchasing integration and supplier capability auditing to manufacturing outcomes are new and interesting. Evidence of a direct relationship between purchasing integration and manufacturing performance confirms the earlier conceptualizations in the literature (Gadde and Hakansson 1994; Watts et al. 1992). Similarly, the linkage between supplier capability auditing and manufacturing performance supports previous research theories (Fitzpatrick 1996; Monczka and Trent 1995).

The third set of regression analyses provided insights into the relationships between the constituent factors of purchasing competence and individual manufacturing priorities (see Table VII). Specific purchasing practices were found to impact the operational-level priorities of cost, quality, and delivery, as well as strategic performance metrics such as new product introduction time and customization responsiveness. The results suggest that purchasing competence should be developed by differently weighting the component factors to suit individual priorities. For example, a cost-focused business and manufacturing strategy would require increased emphasis on purchasing integration and supplier capability auditing, both of which have a positive impact on manufacturing cost reduction ($p<0.05$ and $p<0.10$). Attention to parts bundling appears to improve delivery performance ($p<0.05$), and supplier capability auditing could enhance new product development and customization goals ($p<0.03$ and $p<0.07$). Interestingly, purchasing integration is a significant common denominator in all of these relationships, lending credence to recent observations about the increasingly critical role of this factor in strategic sourcing programs (Fitzpatrick 1996; Ellram and Carr 1994). The results suggest that purchasing may benefit from improving and aligning internal relationships before attempting to initiate external programs. Table VII shows that all of the purchasing factors, except "buyer-supplier relationship development" (BSRD),

**Table VI**

REGRESSION RESULTS
PURCHASING COMPETENCE FACTORS WITH
AGGREGATE MANUFACTURING PERFORMANCE

n=289

| | |
|---|---|
| Dependent Variable: | Manufacturing Performance |
| Independent Variables: | Parts Bundling; Buyer-Supplier Relationship Development Practices; Supplier Capability Auditing; Purchasing Integration |
| Multiple R | 0.37 |
| R-square | 0.14 |
| Adjusted R-square | 0.13 |
| Standard Error | 0.56 |

**Analysis of Variance**

| | d.f. | Sum of Squares | Mean Square | F | p |
|---|---|---|---|---|---|
| Regression | 4 | 14.07 | 3.52 | 11.32 | 0.0000 |
| Residual | 284 | 88.26 | 0.31 | | |

| Variable | B | SE B | Beta | T | Sig T |
|---|---|---|---|---|---|
| Parts Bundling | 0.045 | 0.033 | 0.078 | 1.370 | 0.172 |
| Buyer-Supplier Relationship Development | 0.104 | 0.055 | 0.118 | 1.913 | 0.057 |
| Supplier Capability Auditing | 0.128 | 0.051 | 0.147 | 2.488 | 0.013 |
| Purchasing Integration | 0.352 | 0.110 | 0.197 | 3.189 | 0.002 |
| Constant | 2.102 | 0.210 | | 9.995 | 0.000 |

influenced different aspects of manufacturing performance. A plausible reason for the failure to find a significant relationship between BSRD and disaggregated manufacturing performance could be an extended time lag between BSRD initiatives and impact. It has been noticed that organizational interventions involving human or relational factors are likely to suffer from lagged outcomes, relative to investments in "hard" structural areas. Companies implementing TQM programs, for instance, had to wait for 5-8 years on average before experiencing anticipated gains (Dusseau 1996). BSRD could be the most time-consuming initiative among the four purchasing competence factors, given its dyadic nature and focus on relational issues. A longitudinal study would clarify the time lags associated with BSRD implementation and its outcomes.

## CONCLUSION

This research defined and developed measures for estimating purchasing competence. It also conducted an

**Table VII**

REGRESSION RESULTS
PURCHASING COMPETENCE WITH DISAGGREGATE MANUFACTURING PERFORMANCE

n=289

| Dependent Variable | R-square | F | p | Independent Variable | Beta | T | Sig T |
|---|---|---|---|---|---|---|---|
| New Product Introduction Time Performance | 0.071 | 5.446 | 0.000 | Parts Bundling | 0.075 | 1.28 | 0.204 |
| | | | | BSRD | 0.049 | 0.76 | 0.447 |
| | | | | SCA | 0.127 | 2.07 | **0.039** |
| | | | | PI | 0.141 | 2.21 | **0.028** |
| Manufacturing Cost Performance | 0.071 | 5.439 | 0.000 | Parts Bundling | 0.006 | 0.11 | 0.914 |
| | | | | BSRD | 0.099 | 1.55 | 0.123 |
| | | | | SCA | 0.114 | 1.86 | **0.065** |
| | | | | PI | 0.143 | 2.22 | **0.027** |
| Quality Performance | 0.040 | 2.966 | 0.020 | Parts Bundling | 0.014 | 0.24 | 0.813 |
| | | | | BSRD | 0.051 | 0.77 | 0.433 |
| | | | | SCA | 0.085 | 1.36 | 0.175 |
| | | | | PI | 0.123 | 1.89 | **0.059** |
| Delivery Performance | 0.074 | 5.655 | 0.000 | Parts Bundling | 0.129 | 2.18 | **0.029** |
| | | | | BSRD | 0.065 | 1.10 | 0.311 |
| | | | | SCA | 0.084 | 1.37 | 0.171 |
| | | | | PI | 0.133 | 2.07 | **0.039** |
| Customization Responsiveness Performance | 0.076 | 5.845 | 0.000 | Parts Bundling | 0.067 | 1.14 | 0.255 |
| | | | | BSRD | 0.102 | 1.60 | 0.111 |
| | | | | SCA | 0.110 | 1.80 | **0.071** |
| | | | | PI | 0.128 | 2.00 | **0.047** |

BSRD: Buyer-Supplier Relationship Development
SCA: Supplier Capability Auditing
PI: Purchasing Integration

**Table VIII**

CORRELATIONS AMONG PURCHASING COMPETENCE FACTORS

| | 1 Parts Bundling | 2 Buyer-Supplier Relationship Development | 3 Supplier Capability Auditing | 4 Purchasing Integration |
|---|---|---|---|---|
| 1 | 1.0000 | | | |
| 2 | 0.1905** | 1.0000 | | |
| 3 | 0.0951 | 0.2971** | 1.0000 | |
| 4 | 0.1957** | 0.3904** | 0.2993** | 1.0000 |

** Significance ≤0.01 (two-tailed test).

exploratory investigation of the relationship between purchasing competence and various manufacturing priorities, finding several significant influence relationships. The results of the study provide useful insights into the development and use of purchasing competence as a strategic competitive capability.

The results provide evidence of the performance implications of developing purchasing competence in a firm. The results also suggest that purchasing competence could be tailored to meet specific manufacturing priorities, by placing differential emphasis on the four purchasing competence factors. Purchasing integration and supplier capability auditing together impact both internal (cost, quality, delivery) and external (new product introduction time, customization responsiveness) performance goals. Purchasing thus has the capability to

address issues at the operational and the strategic level. It is necessary for purchasing to recognize and exploit this capability in order to position itself in a strategic role.

The four purchasing competence factors may not constitute the full domain of this construct. Global sourcing, environmental issues, and logistics are some additional areas that could be included in future studies. It also may be useful to investigate issues of order and sequence among the component factors of purchasing competence.

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