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An empirical investigation of supplier development: reactive and strategic processes

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Abstract

As firms continue to focus on core competencies and outsource non-core products and services to external suppliers, supply chain management is increasingly viewed as a source of competitive advantage. However, if the supply chain is to be a source of competitive advantage, suppliers' performance must be managed and developed to meet the needs of the buying firm. In an exploratory study based on data collected from 84 companies, the authors develop a process model for supplier development. Using this process model as a framework, the authors then compare two approaches buying firms use in supplier development: (1) reactive efforts to increase the performance of laggard suppliers, and (2) strategic efforts to increase the capabilities of the supply base to enhance the buying firm's long-term competitive advantage. Strategic efforts were found to significantly increase the buying company's involvement in suppliers' processes, and required greater dedication of resources, personnel and communication. © 1998 Elsevier Science B.V. All rights reserved.

Keywords: Empirical investigation; Supplier development; Reactive process; Strategic process

1. Introduction

The markets in which firms compete are increasingly influenced by international competitors, demanding customers, rapid technological change, and shorter product life cycles. Some firms have attempted to counter these competitive forces by downsizing their work forces in an effort to reduce costs and refocus on their core competencies. Companies have also increased their level of outsourcing, wherein firms purchase goods and services that were

previously provided in-house. Organizational efforts to focus on core competencies, downsize and outsource often result in increased dependence on suppliers for timely delivery of quality products and services at competitive prices.

This increased dependence on suppliers magnifies the need for buying firms to effectively manage and develop their supply chains. Buying firms' representatives have reported the need for supplier improvements in the areas of quality, delivery, cost reduction, new technology adoption, financial health and product design (Monczka and Trent, 1991; Morgan, 1993a,b). Further, and perhaps even more critical, purchasing firms' representatives have noted that if current trends continue, suppliers' future capabilities will not meet the future needs and expectations of

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buying firms that are competing in global markets (Monczka and Trent, 1995).

Buying firms that encounter shortcomings in supplier performance and/or capabilities have several alternatives: (1) invest time and resources to increase the performance and/or capabilities of their present suppliers; (2) manufacture the purchased item in-house; (3) search for an alternative supplier; or (4) choose some combinations of the previous three. This paper focuses on option one—supplier development. The exploratory survey research described in this paper is part of a long-term research initiative: the Global Procurement and Supply Chain Electronic Benchmarking Network (GEBN) at Michigan State University. The GEBN is an ongoing study that investigates best practices in a variety of critical procurement and supply chain management strategy areas. Each area of study represents a new data collection effort that is preceded by an exhaustive literature search and survey questionnaire development and pretesting.

For this study, supplier development was defined as any set of activities undertaken by a buying firm to identify, measure and improve supplier performance and facilitate the continuous improvement of the overall value of goods and services supplied to the buying company's business unit. These activities include, but are not limited to, goal setting, plant visits, supplier audits, supplier training, performance measurement, supplier certification, supplier recognition and efforts to instill a philosophy of continuous improvement in the supplier.

In recent years, researchers in operations management (OM) and related areas have decried the lack of empirical theory-building, and emphasized its importance for the field of OM (Flynn et al., 1990). These writers have argued that inductive research, which draws general conclusions from specific observations, can address complex questions in ways that deductive research cannot (Swamidass, 1991). In line with this call, we adopted an inductive approach in developing a process-based model of supplier development. The model was developed using two types of empirical data: in-depth qualitative responses to open-ended survey questions, and quantitative data in the form of Likert scale and categorical questions. The in-depth qualitative data were used to develop the process model and operationalize two distinct

approaches to supplier development: 'strategic' and 'reactive'.

Classification of the respondents into the strategic or reactive groups was made based on the evaluation of qualitative responses to questions asked of purchasing managers regarding in-depth details of their supplier development programs. After the responses were classified using the qualitative data, the two contrasting approaches were validated and differentiated statistically, using the quantitative responses to Likert-scale and categorical questions. In this manner, the research offers a validated model of the supplier development process that includes steps critical to the supplier development effort, explicates the relationships among those steps, and provides insights into how organizational approaches to supplier development vary.

Subsequent sections of the article review relevant literature and describe the methodology adopted. Next, results are presented under two sections. Section 4.1 describes an evolutionary set of stages that firms appear to follow prior to engaging in supplier development. Section 4.2 presents the inductively-generated supplier development process model, and draws distinctions between the strategic and reactive approaches to supplier development. Finally, we discuss the results of the research and provide recommendations for future research.

2. Review of literature

Over the past decade, increased competition has led to the adoption of total quality management (TQM) systems (Handfield and Ghosh, 1994), as well as the increased use of interorganizational relationships such as alliances and partnerships (Oliver, 1990; Heide and Miner, 1992; Ring and van de Ven, 1994). The adoption of TQM may be viewed as the first step towards establishing these cooperative relationships. For example, Hackman and Wageman (1995) identified five interventions that firms implement in establishing TQM: (1) identification of customer requirements; (2) *creation of supplier partnerships*; (3) cross-functional teams to identify and resolve problems; (4) use of scientific methods for performance measurement; and (5) use of tools such as flowcharts and cause-and-effect diagrams to iden-

tify ways to improve quality. They indicate that in practice, developing relationships with suppliers is one of the more common applications of TQM implementation. Moreover, if TQM is implemented as set forth by W. Edwards Deming, Joseph Juran and Kaoru Ishikawa, there should be an organizational emphasis on the creation of partnerships with suppliers (Hackman and Wageman, 1995).

Cooperative relationships between a buying firm and its industrial suppliers are characterized by information sharing, long-term contracts, and collaboration for mutual advantage (Heide and John, 1990; Tully, 1995). In contrast, the transactional buyer–supplier relationship is characterized by the purchasing from multiple suppliers, the use of competitive bidding, fully developed bidding specifications, and short-term contracts to achieve a low purchase price (Hahn et al., 1986). In certain situations, cooperative relationships appear to offer advantages over discrete market transactions and vertical integration (Gulati, 1995).

A major challenge facing managers involves deciding when and how to make the transition from transactional relationships to cooperative relationships, and once established, how to deploy these relationships within the supply chain to meet the buying firm's competitive needs. Recent studies on interorganizational relationships have identified the need for research that investigates the formation and development of cooperative relationships (Dwyer et al., 1987; Ring and van de Ven, 1994; Gulati, 1995).

While there is an increasing body of research relative to the need, development and benefits of cooperative buyer–supplier relationships (e.g., Gambetta, 1988; Nishiguchi, 1994; McAllister, 1995; Yoshino and Rangan, 1995), much of the extant literature specific to supplier development is anecdotal and case study-based (e.g., Leenders, 1966; Burt, 1989; Carter and Miller, 1989; Hahn et al., 1989; Lascelles and Dale, 1991; Hines, 1994; MacDuffie and Helper, 1997). The supplier development literature indicates that buying firms use a variety of activities to improve suppliers' performance and/or capabilities (Monczka and Trent, 1991; Krause, 1997). These activities include buying from alternative suppliers to provide competition for current suppliers (Hahn et al., 1986; Giunipero, 1990; Dyer and Ouchi, 1993), evaluation of supplier perfor-

mance (Hahn et al., 1989; Giunipero, 1990; Watts and Hahn, 1993); raising performance expectations (Monczka et al., 1993), recognition and awards for outstanding suppliers (Galt and Dale, 1991), promises of increased present and future business if supplier performance improves (Giunipero, 1990; Monczka et al., 1993; MacDuffie and Helper, 1997), training and education of a supplier's personnel, (Galt and Dale, 1991; Monczka et al., 1993), exchange of personnel between the two firms (Newman and Rhee, 1990), and direct investment in a supplier by the buying firm (Galt and Dale, 1991; Monczka et al., 1993). Krause and Ellram (1997) reported that the firms' success in supplier development varied and noted that firms that were satisfied with their supplier development efforts appeared to communicate more effectively with suppliers, and had the resources and willingness to invest in activities such as formal supplier evaluation, supplier training, and supplier award programs to a greater extent than their less-satisfied counterparts.

Hahn et al. (1990) defined supplier development as "any systematic organizational effort to create and maintain a network of competent suppliers" (p. 3). They further classified development activities into narrow and broad perspectives. The narrow perspective involved "the creation of new sources of supply when there are no adequate suppliers to meet the firm's requirements" (Hahn et al., 1990, p. 3), which is also referred to in the literature as reverse marketing (Blenkhorn and Leenders, 1988). The broader perspective involved "a long-term cooperative effort between a buying firm and its suppliers to upgrade the suppliers' technical, quality, delivery, and cost capabilities to foster ongoing improvements" (Watts and Hahn, 1993, p. 12).

When viewed from the broad perspective, supplier development can be a strategic weapon for the buying firm. This perspective becomes especially important in light of the fact that manufacturing firms spend approximately 55% of their sales dollars on purchased goods and services (Tully, 1995). Ideally, the purchasing function, as a boundary-spanning unit within the firm, interacts with manufacturing and corporate strategies internally, and with suppliers' capabilities externally (Watts et al., 1992). Thus, the purchasing function can play an important role in supporting the firm's operations strategy by

ensuring that suppliers' performance and capabilities are in alignment with the buying firm's competitive strategies, using supplier development as a tool to correct deficiencies, if they exist.

The broad perspective of Hahn et al. (1990) regarding supplier development was of interest in the present study. Hahn et al. (1990) presented a process model that depicted firms' singular approach to supplier development. This model was conceptual in nature and not tied to or tested by empirical data. While their model provided a good initial foundation, it provides few insights into specific activities and how they differ across organizations. The present study empirically examines firms' supplier development processes, and distinguishes between reactive and strategic approaches to supplier development. The methodological approach we used in this research effort is next described.

3. Methodology

This study was part of a larger research effort, the Global Procurement and Supply Chain Electronic Benchmarking Network (GEBN) initiative at Michigan State University (for more information, see Handfield et al., 1995). The goal of the GEBN is to conduct empirical research that contributes to practitioners' knowledge in the area of purchasing and supply chain management, yet is theoretically and methodologically rigorous. Approximately two hundred companies have agreed to participate in a long-term research initiative that involves responding to a series of benchmarking surveys. These survey efforts focus on critical procurement and supply chain management strategy areas, and on empirical data that can be used for theory building and benchmarking purposes. Not all firms respond to every questionnaire because of the significant dedication of personnel time required and because the topical content of a particular questionnaire may not be of interest. Thus, response rates vary for each survey.

The supplier development survey was ninth, out of twelve surveys, distributed to respondents over a period of several months. The questionnaires vary in length, but generally require between 10 and 20 h to complete. Survey questions are qualitative, requiring in-depth descriptions of company practices, and

quantitative, including Likert-type scales and categorical questions. To comprehensively address the survey questions, responding managers must consult with a variety of personnel, including design and production engineers, buyers, quality managers and inventory controllers.

Multiple methods of data collection were used for the supplier development study. Prior to survey distribution, an in-depth literature review was conducted to develop a set of propositions and measures of factors related to supplier development. In-depth interviews with selected companies also helped identify factors, leading to the development of the survey instrument. The questionnaire was developed and reviewed by five operations and purchasing management academicians, pretested with five industry executives, and revised as necessary. The survey instrument included extensive use of open-ended questions, as well Likert scale and categorical scales. This use of qualitative and quantitative data is critical to conducting rigorous empirical research, as it provides a more complete, holistic and contextual portrayal of a research issue (Jick, 1979).

The final survey questionnaire was mailed to the 210 members of the GEBN. A total of 84 companies responded to this survey (a response rate of 40%). As noted previously, not all GEBN firms respond to every questionnaire because of the significant dedication of personnel time required to complete the questionnaires, and because the research topic may not be of interest. The first section of the survey solicited business unit profile information. Section A.1 provided a definition of supplier development and asked respondents to provide detailed descriptions of the methods used to identify and prioritize supplier development opportunities. Section A.2 included open-ended questions to solicit detailed descriptions of the strategies and specific activities used to develop suppliers, and the results of the supplier development efforts. Section A.3 required respondents to complete a set of five-point Likert-scales to determine the extent to which specific supplier development tools and practices were used and their level of implementation. Also included was a question that asked what resources the supplier contributed to the supplier development effort. A brief outline of the survey instrument is provided in Appendix A.

The supplier development process model (presented later in this paper) was developed in the following manner. Two researchers independently reviewed the responses to open-ended survey questions that asked the following: (1) describe the process your business unit uses to select suppliers and commodities for supply base improvement and supplier development; (2) list the five most important drivers of supplier development; and (3) provide a detailed description of the strategies, practices, tools, and activities used by your business unit for supplier development. The responses to individual questions varied significantly in length from a few words to two pages of detailed descriptions.

A preliminary overview of the data provided familiarity with the content of the responses. During the analysis, two researchers examined the *qualitative* responses independently, using a blind review. After a preliminary evaluation of the responses, the two researchers met to compare their respective findings. During this stage of analysis, a general process model and two distinct approaches to supplier development began to emerge. These approaches were identified as ‘strategic’ and ‘reactive’ approaches to supplier development. Agreement was reached on these approaches, and each was operationalized. The researchers then reexamined the qualitative data independently and assigned each case to one of the two groups. There was significant agreement on assignment of the respondent groups (> 80%). The fact that any contrasting assignments had been made served as a basis to further define the two approaches to supplier development. Agreement was then reached on the final assignment of all respondents to one group or the other, based on further detailed reviews of the responses. Validation of the assignment of cases to groups where disagreement had previously existed was provided by a third researcher.

After the classification of respondents was made based on the qualitative data, the *quantitative* data were statistically analyzed. χ^2 , *t*-test, and Kolmogorov–Smirnov analyses were used to test for significant differences in the Likert-scale and quantitative responses of the strategic and reactive firms. A distinct set of quantitative questions was related to each specific step in the process model. This triangulated approach helped ensure the validity of the

conceptual framework developed herein. The qualitative data were used to build the process model and operationalize the two distinct approaches to supplier development: strategic and reactive. The quantitative data were used to statistically validate and differentiate between the strategic and reactive approaches to supplier development.

Throughout the multiple statistical analyses, the researchers interpreted the individual tests conservatively. The Bonferonni method for multiple pair-wise comparisons suggests that to hold the error rate to $\alpha = 0.05$ with *n* comparisons, the threshold *p*-value for individual comparisons should be $0.05/n$ (Flynn et al., 1990). This method holds the error rate to a desired level, such that only individual differences found to be significant at the more stringent level are considered significant. The Bonferonni method is used where appropriate.

4. Results

The following sections report the results of the statistical analysis and incorporate information gathered from the respondents’ feedback on open-ended questions.

4.1. Placing supplier development in context

Analysis of the qualitative responses indicated that companies generally follow an evolutionary path to supplier development and increased supply base performance. The first step is the adoption of TQM, followed by supply assessment and reduction, and culminating in supplier development strategies. This progression is shown in Fig. 1.

Respondents indicated that they had adopted many or all of the TQM interventions described earlier: a focus on customer requirements, supplier partnerships, cross-functional teams to resolve problems, use of scientific methods for performance measurement, and use of quality tools. A focus on external suppliers leads respondent companies to conduct detailed supply base assessment. Assessment was based on the recognition that to improve material quality, lower development costs, reduce purchase prices, and improve supplier responsiveness, a history of supplier performance measurement data is necessary.

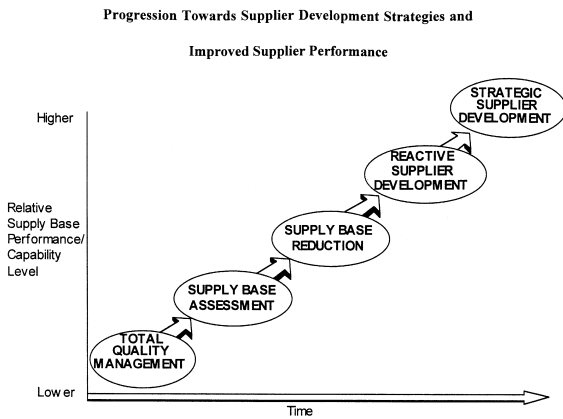


Fig. 1. Progression towards supplier development strategies and improved supplier performance.

Criteria used by respondents to measure supply base performance included parts per million defective, warranty percentages, reliability, process capability ratios, percent parts rejected and internal/external customer satisfaction.

Once supply base performance was assessed, respondent companies focused on the consolidation of purchased volumes with fewer suppliers in order to eliminate suppliers incapable of meeting expectations. Supplier performance databases identified those suppliers consistently unable to perform. To further improve the performance and capabilities of their supply bases, respondent firms engaged in supplier development.

4.2. Supplier development process model

As described in Section 3, a generic process model for supplier development was established by analyzing the qualitative survey responses, and validated through statistical analysis of quantitative data. The process model is shown in Fig. 2.

Although the latter parts of strategic supplier development process model were generally applicable to all respondent companies, examination of the qualitative data revealed that some firms used supplier development predominantly as a *strategic* tool, while others used supplier development predomi-

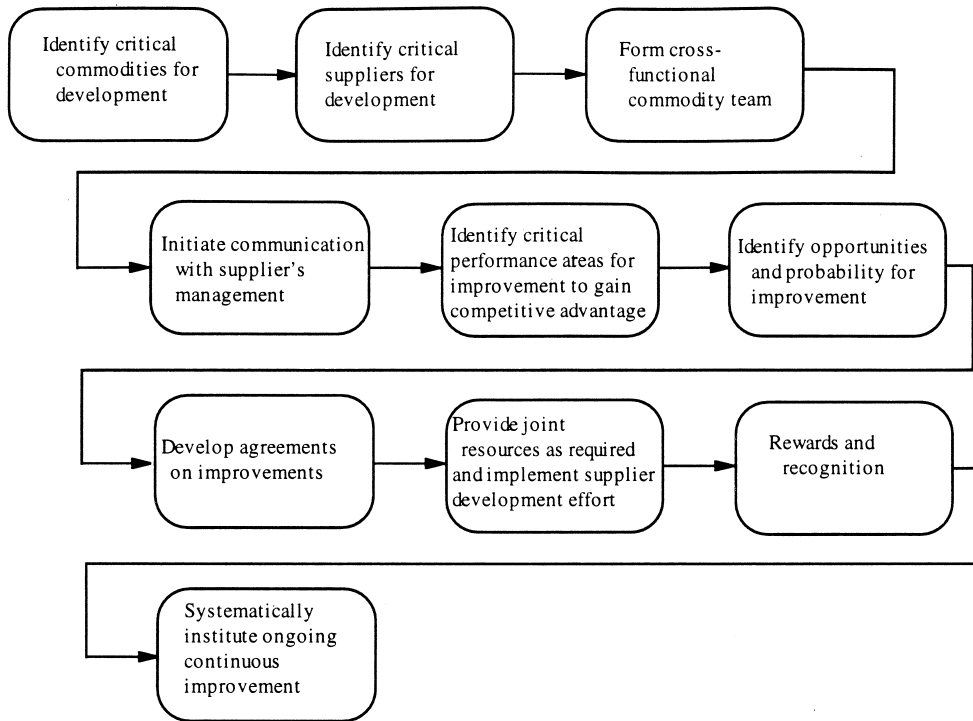


Fig. 2. Strategic supplier development process.

nantly as a *remedial* process to correct obvious supplier deficiencies. Thus, respondent firms were classified as either ‘strategic’ or ‘reactive’ in their supplier development approach. After this classification, responses to Likert-scale and categorical questions were analyzed to test for statistical differences between the two groups. The statistical analysis was used to corroborate the researchers’ analysis of the qualitative data. Specifically, statistical tests were used to substantiate whether the groupings made by the researchers based on the qualitative data were in fact valid.

4.2.1. Overview of strategic and reactive process differences

Although fundamental differences exist between the strategic and reactive approaches, the primary differences between the two processes are captured in the first few process steps. Firms approaching supplier development strategically focus on identifying critical commodities and suppliers requiring development, with the intent to create a world-class supply base capable of providing a sustainable competitive advantage. The initial steps in the strategic process were typically carried out by an executive-level team, with the implementation plan being formulated and carried out by a cross-functional commodity team.

In contrast, firms taking a reactive approach were motivated by supplier non-performance, which became apparent through the firms’ supplier performance evaluation systems. The need for supplier development resulted from supplier problems that threatened to delay, or even bring to a standstill, the buying firm’s production. In other cases, the effort occurred because of complaints from the buying firm’s customers or internal users of the supplier’s product or service. Reactive firms were less systematic in supplier performance evaluations, and identified suppliers as candidates for supplier development only after a problem actually occurred. Table 1 presents some of the major differences between strategic (systematic) and reactive (remedial) approaches to supplier development.

The respondents taking a strategic approach to supplier development actively concentrated and allocated their organizational resources to continuously improve the long-term capabilities of suppliers of the

most important purchased items or services. Pareto analysis and/or portfolio analysis, based on market-driven requirements, were used to identify critical suppliers and commodities for supplier development. The scope of strategic supplier development focuses on the entire *supply base*, which is improved through a supplier development *program*. In contrast, respondents whose companies took a reactive approach to supplier development adopted an ad hoc response to eliminating a specific supplier’s deficiencies. The supplier was typically self-selected for supplier development due to performance or capability deficiencies. Thus, the reactive firms focused on improving a *single supplier* through a supplier development *project*.

From the 84 responses, 50 companies were classified as strategic, while 34 were identified as reactive. It is important to note that the business profiles of companies in the strategic and reactive groups were very similar. Table 2 classifies the strategic and reactive groups by the primary product or service they provide. Table 3 classifies strategic and reactive firms relative to the nature of their primary output. Both tables reflect a high degree of similarity between the two groups. This result increases the generalizability of our findings and suggests that strategic approaches may be deployed in any industry, regardless of the level of supplier performance.

The majority of respondents represented firms in the United States (77%), while the rest of the sample consisted of firms from Western Europe (11%), Canada (6%), Australia (5%), and Hong Kong (1%). Average total sales for all firms in 1995 was US\$9.9 B (median of US\$3.3 B), while average total purchases from external sources averaged US\$3.6 B (median of US\$1.0 B). The average ratio of total purchase dollars from external sources to total sales dollars was 37.87% (median of 37.98%). There were no statistically significant differences in total sales dollars, total purchase dollars from external sources, or ratio of total purchase dollars from external sources to total sales dollars, between the strategic and reactive groups.

Further analysis of the strategic and reactive respondents’ characteristics involved the examination of their respective ranking of ten competitive priorities. The respondents were asked to rank the competitive priorities from the most important (10) to least

Table 1
Overview of differences between reactive and strategic supplier development

Factors	Reactive	Strategic
Primary question	A supplier performance problem has occurred—what is needed to correct the specific problem?	We have dedicated resources to develop the supply base—where should resources be allocated for the greatest benefit?
Primary objective	Correction of supplier deficiency Short-term improvements	Continuous improvement of supply base Long-term competitive advantages
Unit of analysis	Single supplier Supplier development project	Supply base Supplier development program
Selection/prioritization process	Supplier self-selects through performance or capability deficiency Problem-driven	Portfolio analysis Pareto analysis of commodity/suppliers Market-driven
Drivers (examples)	Delivery dates missed Quality defects Negative customer feedback Competitive threat for buying firm Production disruptions Change in make/buy decision	Supplier integration into the buying firm's operation Supply chain optimization Continuous improvement Value-added collaboration Technology development Seek competitive advantage

Table 2
Strategic and reactive firms classified according to product or service provided

Product or service provided by the company	Strategic firms (%) ($n = 50$)	Reactive firms (%) ($n = 34$)
Industrial products	41	35
Capital goods	4	0
Consumer-durable goods	12	15
Consumer-non-durable goods	10	6
Services	8	18
Others	25	26
Total	100	100

The 'other' category represents firms providing such diverse outputs that they could not be self-classified into one specific category. Kolmogorov–Smirnov significance value: $p = 0.955$.

important (1). These competitive dimensions included price, quality, customer service, product/service technology, speed in new product/process service development, delivery reliability, delivery speed, environmental friendliness, competing on a global scale, and supply chain competitive advantage.

The only competitive dimension that was significantly different in the distribution of the rankings was product/service technology (Mann–Whitney significance value: $p = 0.012$; Kolmogorov–Smirnov significance value: $p = 0.015$). Thus, despite the fact that there were no significant differences between industry representation and nature of output between the strategic and reactive groups (as shown in Tables 2 and 3), firms that took a strategic approach to supplier development placed a higher competitive priority on product/service technology than reactive-approach firms. This increased emphasis on product/service technology as a competitive priority

may help explain why some companies take a strategic approach to supplier development and others do not.

The following sections explain each step in the process model shown in Fig. 2, contrast strategic and reactive approaches to supplier development, and use statistical tests to support the conclusions where appropriate.

4.2.2. Identify critical commodities for development

Firms that had implemented the strategic approach to supplier development typically utilized a corporate-level executive committee to assess the relative importance of the goods and services purchased by the company or business unit. The result of this assessment was a 'portfolio' of commodities that were considered essential for success in the targeted industry segment. A number of different techniques were used by companies to create a commodity framework. Several companies utilized a

Table 3
Strategic and reactive firms classified according to nature of primary output

Nature of the company's primary output	Strategic (%) ($n = 50$)	Reactive (%) ($n = 34$)
Manufacturing—engineer to order	8	9
Manufacturing—make to order	15	9
Manufacturing—assemble to order	15	9
Manufacturing—make to stock	30	27
Service	15	23
Others	17	23
Total	100	100

The 'other' category represents firms providing such diverse outputs that they could not be self-classified into one specific category. Kolmogorov–Smirnov significance value: $p = 0.702$.

'purchasing portfolio analysis', which separates low-risk commodities from high-risk commodities, and low-volume purchases from high-volume purchases. After classifying all commodities into each category, the resulting portfolio discriminates among 'non-critical commodities', 'bottleneck commodities', 'leverage commodities', and 'strategic commodities'. This framework is similar to that advocated by Kraljic (1983), and is shown in Fig. 3. The set of commodities, which represent high-risk and high-volume/high-US\$ purchases, are considered strategically important, in that they may have few substitutes, are difficult to purchase from alternative suppliers, are often purchased in an oligopolistic market, and/or are important to the buying firm's final product. Other strategic-approach companies used similar classification methods, such as Pareto analysis, to identify high-value-added strategic materials and services purchases. High-risk, high-volume, and high-value-added commodities are typically the focus of strategic supplier development initiatives.

By contrast, the reactive-approach respondents essentially skipped this step in the supplier development process. Their supplier development efforts were driven at the individual supplier level, with supplier development investments taking place as needed to correct specific supplier deficiencies.

4.2.3. Identify critical suppliers of strategic commodities

A majority of the companies that employed a strategic approach to supply base development had

High Supply Risk	Bottleneck Commodities	Strategic Commodities
Low Supply Risk	Non-Critical Commodities	Leverage Commodities
	Low Volume/Low Dollar Purchase	High Volume/High Dollar Purchase

Fig. 3. Classification matrix for commodities.

formal processes for identifying suppliers requiring development. The qualitative data indicated that these companies had formal supplier performance measurement systems in place to formally assess suppliers' cost, quality, service, delivery, technology, and environmental performance. Strategic-approach respondents analyzed supplier performance data to identify suppliers requiring development, using a variety of different methods. Some respondent companies benchmarked supplier performance to world-class performance expectations. If any performance gaps were identified, these suppliers were identified as supplier development prospects. In contrast, reactive-approach companies identified suppliers as candidates for development only by their poor performance.

Table 4 provides the results of the statistical analysis, comparing the practices that the strategic and reactive firms used to identify suppliers for supplier development. Using the Bonferonni method for pair-wise comparisons, only those items with a p -value of 0.017 (0.05/3.0) are considered statistically significant. The results of the analysis indicate that strategic firms were more likely to have a formal process to identify suppliers for supplier development than firms taking a reactive approach to supplier development.

4.2.4. Form cross-functional commodity/supplier development team

Strategic-approach firms tended to utilize cross-functional teams to drive the supplier development effort to a greater extent than reactive firms. The qualitative data indicated greater use of cross-functional teams in supplier development by strategic firms. Moreover, the qualitative responses clearly indicated that firms using a strategic approach utilized cross-functional teams in a different manner than reactive firms. Strategic firms often used pre-established, dedicated and separately funded cross-functional teams to improve the overall performance of the supply base. Core team members were often assigned on a long-term or permanent basis, and included quality, procurement, operations and design personnel. In contrast, reactive firms formed ad hoc cross-functional teams to correct specific problems as they occurred. Such teams were dissolved after

Table 4
Tools/practices to identify suppliers for development efforts

Tool/practice description	Extent of use of tool/practice (mean score)		
	Strategic firms	Reactive firms	Statistical significance
Formal process to identify suppliers requiring development	3.18	2.21	0.001 *
Identification of high-performing critical suppliers for cost reduction and other improvement opportunities	3.94	3.36	0.015 *
Regular joint meetings with commodity managers and plant managers to identify key suppliers for cost/quality improvement projects	3.27	2.62	0.019

1 = Not employed.

2 = Some use.

3 = Moderate use.

4 = Somewhat extensive use.

5 = Very extensive use.

* Significant at $p = 0.05/3.0 = 0.017$ (Bonferonni method).

the specific issue was resolved. Core membership on such teams generally consisted of quality control and procurement personnel, with other functional representatives as needed.

However, the statistical analysis indicated no significant differences between the two groups. Companies using a strategic approach were no more likely to include a broader group of cross-functional managers, including purchasing executives, design, operations, process engineering, and senior management than firms that took the reactive approach to supplier development. This result would seem to imply that the use of cross-functional teams may be a necessary but insufficient ingredient for development of a world-class supply base. Table 5 presents the respec-

tive percentages of firms within each group that involved the various functions in supplier development.

4.2.5. Initiate communication with supplier's management

Respondents indicated that the next step in the supplier development process involved approaching suppliers and arranging a meeting of the buying firm's cross-functional team with top management at each of the suppliers in the strategic commodities category. In the strategic approach, the buying firm's representatives emphasized that the supplier development effort did not represent a demand for improved performance, but an agreement to work jointly to

Table 5
Cross-functional involvement in supplier development

Function	Percentage of companies within groups identifying the function as being involved in supplier development		
	Strategic (%) ($n = 50$)	Reactive (%) ($n = 34$)	χ^2 p -value
Operations	78	62	0.106
Production/process engineering	66	53	0.229
Senior management	50	38	0.288
Purchasing executive management	82	74	0.353
Design/engineering/R & D	78	71	0.441

improve the flow of materials, services and information between the supplier and buying firm for mutual benefit.

4.2.6. Identify critical performance areas for improvement to gain competitive advantage

At meetings with each supplier's top management team, areas for improvement were identified along with a specific measure for each area. The qualitative data indicated that companies adopting a strategic approach to supplier development identified a wide variety of objectives for improvement. In some cases, these objectives were driven by the buying firm's customers' expectations. In other cases, strategic-approach companies shared technology road maps to identify opportunities for joint development of new technologies and products. Other areas in need of improvement included increased standardization of parts and processes, process-mapping to identify quality problems, joint information system development, and improved supplier management of inventories at the buying firm's site.

Table 6 presents the results of the statistical analysis regarding the differences between the strategic and reactive firms. The statistical results indicate that companies pursuing strategic development approaches were significantly more likely than the reactive approach firms to have:

- established criteria about when to enter into a supplier development effort,
- developed improvement benchmarks for the firm's supply base, and
- developed supplier-focused total cost management programs to assist in identifying and eliminating non-value-added costs.

Although some practices are not implemented to a great extent, the results indicate that identifying critical performance areas for improvement is a key difference between strategic and reactive supplier development strategies. Using the Bonferonni method for pair-wise comparisons, only those items with a p -value of 0.010 (0.05/5.0) are considered statistically significant (Flynn et al., 1990).

4.2.7. Identify opportunities and probability for improvement

Respondents indicated that once potential supplier development opportunities had been identified, they were evaluated in terms of feasibility, resources and time required to carry-out the project, and potential return on investment. Some of the criteria used by respondent firms to evaluate opportunities included cost-benefit analysis, willingness and ability of supplier to implement changes, duration of product/service life, total cost of production related to potential savings, strategic importance of the product/

Table 6
Practices for identifying critical performance areas for improvement

Practice description	Implementation level of practice (mean score)		
	Strategic firms	Reactive firms	p -value
A supplier-focused total cost management program to assist in identifying and eliminating non-value-added costs	2.60	1.75	0.001 *
Development of targeted quality and other improvement benchmarks within the supply base	3.46	2.74	0.004 *
Criteria established about when to enter into supplier development	2.59	1.91	0.009 *
Formal process to identify supplier cost reduction targets	3.08	2.48	0.033
Coordination of supplier quality engineers worldwide (across facilities)	2.02	1.52	0.048

1 = Not implemented.

2 = Limited implementation.

3 = Somewhat implemented.

4 = Extensively implemented.

5 = Fully implemented.

* Significant at $p = 0.05/5.0 = 0.010$ (Bonferonni method).

service and its impact on the business, return on investment, impact analysis, and standardization.

A risk evaluation of the improvement project was a common tool employed by many strategic companies. Strategic companies used one or more of the following evaluative criteria: dollars spent with the supplier, criticality of the product to the buying firm's marketing success, the potential to influence the supplier's product development, the potential for the supplier to become a competitor, the supplier's technical expertise, and the potential of the supplier development effort to support corporate goals.

4.2.8. Develop agreement on improvements and performance metrics

As shown in the process model in Fig. 2, once a feasible supplier development initiative has been identified, the parties must come to an agreement on the specific metrics that will be employed to gauge the success of the agreement. The qualitative responses indicated that strategic-based firms typically used one or more of the following metrics: percent cost savings, percent quality improvement, percent delivery or cycle time improvement, key product or service performance targets, technology availability, or system implementation targets. Respondents indicated that the most critical portion of these agreements is that they contain specific time-phased milestones for improvement. The agreement should also specify the role of each party, who is responsible for the success of the project, and the manner and timing for deploying allocated resources.

The statistical analysis indicated that strategic firms were more likely to develop formal agreements on improvement goals than reactive firms, as shown in Table 7. Using the Bonferonni method for pair-wise comparisons, only those items with a p -value of 0.017 (0.05/3.0) are considered statistically significant.

4.2.9. Deploy resources and implement development effort

Once respondent companies reached agreement with their suppliers on performance metrics, the development effort was put into motion. Through their qualitative responses, strategic companies repeatedly emphasized that supplier development requires joint improvements by both parties, not just improvement on the part of the supplier. Moreover, there must be bilateral deployment of resources, whether in the form of facilities, training, personnel, information, capital, technology, or systems, in order to sustain a successful development effort.

Respondents indicated that a supplier is unlikely to fully embrace a set of changes required for improvement, unless there is tangible evidence that the purchasing organization will support their efforts with matched resources. For example, one respondent indicated that a supplier investing in equipment, such as tooling or CAD/CAM, should be supported by the buying firm's technical and engineering people, when appropriate. The qualitative data also indicated that there should be a clear agreement on the scope and level of investment prior to the beginning

Table 7
Agreement on performance improvement metrics

Practice description	Extent of use of practice (mean score)		
	Strategic firms	Reactive firms	p -value
Development of objective supplier quality metrics (percent reject, PPM, etc.)	3.76	3.06	0.008 *
A formal supplier assessment system to measure cost, quality, service, delivery performance, technology and environment	3.76	3.03	0.015 *
A formal supplier assessment system to determine capabilities	3.59	3.15	0.103

1 = Not employed.

2 = Some use.

3 = Moderate use.

4 = Somewhat extensive use.

5 = Very extensive use.

* Significant at $p = 0.05/3.0 = 0.017$ (Bonferonni method).

of the supplier development effort. In several strategic-approach firms, liaisons were appointed within the buying and supplying firms who were responsible for ensuring that the resources were being deployed according to plan. The liaisons helped prevent a situation where the parties agree to perform in principle, but then one or both parties fail to follow through.

Table 8 provides the results of the statistical analysis of the responses to the objective questions. The results suggest that strategic firms deployed a wider range and greater amount of resources to the development effort than reactive firms. These resource investments included co-locating the buying firm's engineers at the supplier's site and direct investments in supplier training.

The supplier is also expected to deploy resources to implement the development effort. The results of the statistical analysis in Table 9 indicate that strategic firms received a higher level of resource deployment from their suppliers than reactive firms. Suppliers working with firms that took a strategic approach to supplier development invested in employee training and dedicated engineering and other personnel to improve performance to a greater degree than the reactive firms.

4.2.10. Rewards and recognition

The results of the qualitative data analysis indicate that strategic-approach companies were more

likely to have supplier recognition programs to foster suppliers' momentum to continued performance increases after the supplier development effort is finished. These programs varied from recognition in company newsletters to more formal and public recognition in the form of supplier award banquets and supplier council meetings.

Not all supplier development efforts are successful. Many respondent companies indicated that if progress toward continuous improvement was not evident in subsequent supplier performance evaluations, corrective action might be taken, including reducing the supplier's share of business and/or disqualification for future business. This outcome contrasts markedly with successful suppliers, that might be rewarded with repeat business, increased sales, and profitable growth. The statistical analysis revealed no significant differences between the strategic and reactive firms in the reward and recognition part of the supplier development process. This result indicates that both groups were equally likely to foster ongoing commitment through recognition and awards.

4.2.11. Institute ongoing continuous improvement activities

Once a supplier development project has been completed, the supplier's continued progress must be monitored and tracked over time. Ongoing exchange

Table 8
Supplier development activities

Description of activity	Level of implementation (mean score)		
	Strategic firms	Reactive firms	<i>p</i> -value
Co-location of engineers to supplier facilities for supplier development	1.84	1.30	0.007 *
Direct investment in supplier training	2.31	1.74	0.010 *
Formation of total cost reduction teams (suppliers and engineers)	3.22	2.73	0.067
Joint cost/quality improvement work sessions held regularly	3.10	2.65	0.074
Direct investment in supplier facilities	1.57	1.29	0.100

1 = Not implemented.

2 = Limited implementation.

3 = Somewhat implemented.

4 = Extensively implemented.

5 = Fully implemented.

* Significant at $p = 0.05/5.0 = 0.010$ (Bonferonni method).

Table 9
Supplier resources dedicated to supplier development activities

Resource provided by the supplier	Degree to which supplier provides the resource (mean score)		
	Strategic firms	Reactive firms	<i>p</i> -value
Supplier has hired additional engineering and other personnel to support our development needs	2.88	2.23	0.001 *
Supplier has dedicated personnel to us specifically to improve performance	3.52	2.94	0.008 *
Supplier has invested in employee training to support our development proposal	3.18	2.58	0.010 *
Supplier has provided discrete and/or additional investment in generalized (as opposed to specific) production capacity in the expectation of supporting our requirements	3.30	2.88	0.039
Supplier has invested dedicated equipment specifically to improve capability/performance for our business unit	3.26	2.88	0.055

1 = Not provided/done.

2 = Limited extent.

3 = Moderate extent.

4 = Extensive.

5 = Very significant/extensive.

* Significant at $p = 0.05/5.0 = 0.010$ (Bonferonni method).

Table 10
Continuous improvement activities

Practice description	Implementation level of practice (mean score)		
	Strategic firms	Reactive firms	Statistical significance *
Internal program to respond to suppliers' needs for development	2.51	1.94	0.022
Ongoing communication with supplier community via supplier councils	3.00	2.42	0.062
Joint cost/quality improvement work sessions held regularly	3.10	2.65	0.074
Supplier is part of supplier council that provides feedback on our performance	2.28	1.78	0.078

1 = Not implemented.

2 = Limited implementation.

3 = Somewhat implemented.

4 = Extensively implemented.

5 = Fully implemented.

* No items are significant at $p = 0.05/4.0 = 0.0125$ (Bonferonni method).

of information is needed to maintain momentum of such projects. Respondents indicated that this momentum can be sustained by creating visible milestones for objectives, updating goals, open communication, and adopting continuous improvement strategies. Table 10 indicates that there were no statistically significant differences between strategic and reactive firms in their efforts to achieve ongoing supplier improvements. Using the Bonferonni method for pair-wise comparisons, only those items with a p -value of 0.0125 ($0.05/4.0$) would be considered statistically significant.

5. Conclusion

This research attempts to develop an understanding of firms' supplier development processes. The supplier development process model shown in Fig. 2 was developed based on the examination of in-depth responses to open-ended survey questions, and was validated through statistical analysis of quantitative data. The survey data represented the perceptions of a cross-industry sample of purchasing managers from 84 companies. We found that firms' supplier development efforts vary in, at least, one significant way: companies tend to use supplier development either as a strategic tool or a reactive tool. The strategic approach is characterized by allocating supplier development resources where they will provide the firm with competitive advantage. By contrast, firms using supplier development as a reactive tool focus

on a supplier whose poor performance threatens the buying firm's ability to provide a competitive product or service to its own customers. Some companies used both approaches, but clearly tended to emphasize one approach over the other.

Fig. 1 indicates that firms tend to use supplier development as a reactive tool and later, as suppliers' performance and capability levels improve, use it as a strategic weapon. Such an approach seems justified. Firms should place special emphasis on poor-performing suppliers, either eliminating them from the supply base or investing in them so as to prevent poor performance. Once buying firms have eliminated suppliers' performance problems, they can view the supply base from a strategic perspective, and supplier development investments can be made based on the potential for competitive advantage.

A number of interesting questions arose in this study. First, we question whether firms will continue to use supplier development as a *strategic* weapon for the continuous improvement of supply base performance. A study that establishes valid measures of supplier development success, in terms of short-term performance indicators and measures of long-term relationship-specific and competitive advantage outcomes, would be useful.

The results of Table 4 indicate that strategic and reactive-approach firms' competitive priorities differed only on product/service technology, that is, firms taking the strategic-approach to supplier development placed a higher priority on product/service technology as a competitive priority than firms using

the reactive approach. This result suggests proposition 1.

Proposition 1: Firms that compete in markets characterized by high rates of technological change are more likely to be involved in strategic supplier development.

This proposition is also hinted at by Monczka and Trent (1995) and Nishiguchi (1994). Strategic-approach firms may rely on suppliers to share the burden of designing and producing products that incorporate the latest technology, and the related production capabilities that accompany such an effort.

Second, as firms continue to experience the high levels of competition that characterize global markets, we question whether organizations will recognize the potential competitive advantage to be derived from taking a strategic approach to supplier development. This question suggests proposition 2 (also discussed by Yoshino and Rangan, 1995).

Proposition 2: Firms that compete in markets characterized by high levels of competition are more likely to be involved in strategic supplier development.

There is another researchable proposition related to the contribution of this article.

Proposition 3: Firms that focus on strategic supplier development reap greater long-term benefits from their efforts than firms using the reactive approach.

Certainly, the strategic approach to supplier development requires significantly greater levels of resource commitments. Thus, the rewards should be commensurate with the greater level of investment. These rewards could conceivably include: more responsive suppliers, more certainty and continuity in buyer–supplier relationships, and higher levels of supplier input in the new product development process. These benefits are more likely to yield a competitive advantage for the buying firm than the performance-oriented supplier development outcomes such as higher quality levels, shorter order cycle times, and increased delivery reliability (reported by Krause,

1997). However, only an empirical study can substantiate this proposition.

Future research should also address two major limitations inherent in the present study. First, our sample was not randomly drawn. Thus, our results have limited generalizability from a statistical perspective. However, the in-depth responses to the questionnaire provided details that are important to our inductive research approach and are unavailable in a typical questionnaire-based study. Clearly, the supplier development process model in Fig. 2 should be validated in future research efforts. Second, this study only examined supplier development from the buying firm's perspective. A dyadic study with paired buyer and supplier firms could provide crucial insights into how suppliers perceive the buying firm's role in supplier development, the outcomes of these efforts, and the long-term effect supplier development has on suppliers.

Supplier development is of interest for managers who are struggling to gain or maintain world-class performance levels from the suppliers of important inputs into their operations. Our review of the academic literature indicated that researchers have largely overlooked supplier development as an area of study. Additional questions that could be addressed in future research efforts include:

- How do supplier development efforts vary when buying firms' supplier development goals vary?
- Is the presence of a cross-functional team a necessary ingredient for supplier development success?
- Does the composition of the cross-functional team vary with the goals of the supplier development effort?
- What is top management's role in supplier development?
- What alternative forms of reward and recognition can be used to motivate improved supplier participation in supplier development efforts?
- What criteria should be used to identify suppliers that have a high probability of development success?
- How can strategic supplier development efforts be sustained in the long term?

The previously-posed propositions and these questions provide direction for future research in supplier development.

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Appendix A

A brief outline of the questionnaire is presented below. The questionnaire included extensive use of open-ended, as well as five-point Likert scale, questions.

A.1. Identification and prioritization of supplier development opportunities

Describe the process you use to select commodities requiring supplier development.

Describe the process you use to select suppliers requiring supplier development.

Discuss the five most important events or requirements that would be classified as drivers for supplier development.

Describe the methods you use to determine how much time, effort and resources should be dedicated to supplier development.

A.2. Supplier development strategies, practices and methods

Please provide a detailed description of all the strategies, practices, tools, methods you use for supplier development.

Describe organizational strategies or structural changes used to carry out your supplier development strategy.

Describe any system (automated or manual) you use to carry-out supplier development strategies.

Describe other enabling actions you use to carry-out supplier development strategies.

Describe how cooperation between functional groups is achieved to implement your supplier development strategy.

Describe critical success factors underlying your supplier development program.

Identify three most important or key measurable results typically achieved from your supplier development strategy.

List other key soft results from your supplier development strategy.

What continuous improvement efforts could you have done to improve the implementation process and results derived relative to your supplier development strategy?

What are your future plans for supplier development?

A.3. Tools / practices to identify suppliers for development efforts

Rate the extent to which each of the following processes are used to identify suppliers for development efforts, from 1 = not employed to 5 = very extensive, almost total application.

1. Formal process to identify suppliers requiring development
2. Identification of high-performing critical suppliers for cost reduction and other improvement opportunities
3. Regular joint meetings with commodity managers and plant managers to identify key suppliers for cost/quality improvement projects

A.4. Cross-functional involvement in supplier development

Indicate whether the identified functions are involved in your typical supplier development effort.

Function	Typically involved?	
	No	Yes
Operations		
Production/process engineering		
Senior management		
Purchasing executive management		
Design/engineering/R&D		

A.5. Strategies for identifying critical performance areas for improvement

Rate the extent to which each of the following processes are used to identify critical performance

areas for improvement, from 1 = not implemented to 5 = fully implemented.

1. A supplier-focused total cost management program to assist in identifying and eliminating non-value-added costs
2. Development of targeted quality and other improvement benchmarks within the supply base
3. Criteria established about when to enter into supplier development
4. Formal process to identify supplier cost reduction targets
5. Coordination of supplier quality engineers worldwide (across facilities)

A.6. Agreement on performance improvement metrics

Rate the extent to which each of the following processes are used to develop and reach agreement on performance improvement metrics, from 1 = not employed to 5 = very extensive, almost total application.

1. Development of objective supplier quality metrics (percent reject, PPM, etc.)
2. A formal supplier assessment system to measure cost, quality, service, delivery performance, technology and environment
3. A formal supplier assessment system to determine capabilities

A.7. Implementation strategies for supplier development efforts

Rate the extent to which each of the following strategies, practices, tools or methods are used by your business unit to implement your supplier development efforts, from 1 = not implemented to 5 = fully implemented.

1. Co-location of engineers to supplier facilities for supplier development
2. Direct investment in supplier training
3. Formation of total cost reduction teams (suppliers and engineers)
4. Joint cost/quality improvement work sessions held regularly
5. Direct investment in supplier facilities

A.8. Supplier resources dedicated to supplier development activities

Rate the extent to which each of the following are provided by suppliers to realize your supplier development efforts, from 1 = not provided/done to 5 = very significant/extensive allocation.

1. Supplier has hired additional engineering and other personnel to support our development needs.
2. Supplier has dedicated personnel to us specifically to improve performance.
3. Supplier has invested in employee training to support our development proposals.
4. Supplier has provided discrete and/or additional investment in generalized (as opposed to specific) production capacity in the expectation of supporting our requirements.
5. Supplier has invested dedicated equipment specifically to improve capability/performance for our business unit.

A.9. Continuous improvement activities

Rate the extent to which each of the following processes are used by your business unit to drive and realize continuous improvement in your supplier development efforts, from 1 = not implemented to 5 = fully implemented.

1. Internal program to respond to suppliers' needs for development
2. Ongoing communication with supplier community via supplier councils
3. Regularly work with suppliers to improve performance of second tier suppliers
4. Joint cost/quality improvement work sessions held regularly
5. Supplier is part of supplier council that provides feedback on our performance

A.10. Performance improvements

For each of the performance areas shown, indicate whether you typically achieve performance improvement in that area, regardless of the stated intention of the supplier development effort. (See Table 12 for a listing of performance areas.)

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