

# Configuring and managing strategic supplier portfolios

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Received 11 March 2003; received in revised form 17 November 2003; accepted 19 January 2004

Available online 8 May 2004

## Abstract

Acknowledging that not all supplier relationships can nor should be close partnerships, this article explores the development of strategic supplier portfolios. The strategic portfolio perspective considers risks, trade-offs, and interdependencies between the firm's array of supplier relationships. Based on over 50 interviews with managers and archival data from 12 multinational companies, a strategic supplier portfolio management framework is developed. The authors explore processes that firms use to plan, implement, and monitor strategic supplier portfolios. This research indicates that by assembling superior supplier bases, developing suppliers and integrating them into product development and manufacturing, strategic supplier portfolios contribute to competitive advantage.

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*Keywords:* Supplier portfolio management; Purchasing; Portfolio; Case study research

## 1. Introduction

A large and rich body of literature on supplier relationships—often framed as interfirm buyer–seller relationships in business markets—has developed (e.g., Anderson & Narus, 1990; Dwyer et al., 1987; Jap, 1999). Much has been learned about relationship dynamics, processes, and structures. However, some scholars have noted a tendency to atomize the interfirm relationship by focusing on understanding an individual relationship in isolation of other relationships of the firm (Dyer et al., 1998; Wagner & Boutellier, 2002) or a network of firms (Anderson et al., 1994; Madhavan et al., 1998). An enlarged perspective that considers more than an individual relationship may be useful, especially with regard to supplier management issues.

Consistent with such thinking, this paper involves a broadened view of relationship management. It is argued that relationship management consists of more than the management of an individual relationship or even several important individual supplier relationships. Instead, a port-

folio perspective is taken, introducing the notion of *strategic supplier portfolio management*, that is, the management of an array of supplier relationships, each having various characteristics and each serving the firm in different ways. The firm manages its supplier relationships not only individually, but as a set, developing a portfolio of supplier relationships that leads to an optimized supplier base for the firm.

While a number of authors have addressed portfolio perspectives in purchasing relationship management (e.g., Bensaou, 1999; Dyer et al., 1998; Gelderman & van Weele, 2002; Nellore & Söderquist, 2000; Olsen & Ellram, 1997), firms now face conditions of highly turbulent environments, rapid technology turnover, market restructuring, and globalization that have made it necessary to rethink extant portfolio perspectives. Specifically, the aim of this paper is to advance and extend portfolio approaches and systematically examine how supplier portfolios can be configured, developed, and managed to contribute to the firm's value creation and competitive advantage. With the classic strategic management process model as a backdrop, this paper explores how firms (1) formulate the strategy content, (2) process or implement the strategy, and (3) control the supplier portfolio management process so that ultimately it will contribute to sustainable competitive advantage (e.g., Srivastava et al., 1998).

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In the contemporary business environment, taking a portfolio perspective in supplier management is important because of the increasingly critical role in a firm's success that is played by suppliers. Strategic supplier portfolios allow a firm to take into account the various interdependencies among relationships with its suppliers, and the trade-offs in terms of risks, abilities, and other characteristics. Allocating management capacity, administrative manpower, time, and financial funds selectively across the range of relationships in its supplier portfolio allows the firm to conserve and optimize its inevitably limited resources. To realize the potential benefits of strategic supplier portfolios, firms must understand and develop key tools involving supplier evaluation, selection, development, and integration. Through such processes, a portfolio perspective helps the firm differentiate and set priorities in terms of which supplier partnerships should consume a greater share of resources and which should be managed in a manner that demands fewer resources.

## 2. Conceptual background

### 2.1. *Supplier relationships*

A major factor in supplier management involves the type of relationship the firm develops and maintains with its suppliers. Relationships have been portrayed as ranging from markets to hierarchies (e.g., Thorelli, 1986) or from arm's length to partner-style collaborative relationships (e.g., Dwyer et al., 1987). The latter type of relationship has also been termed quasi-hierarchy or strategic partnership because of the investments necessary and the high levels of interdependence. As a refinement on this, supplier relationships can also be described as durable arm's length or quasi-market relationships where there is little interdependence and asset specificity but yet the relationships are long term and involve large volumes of business (Dyer et al., 1998).

Recent research provides a rich treatment on the factors that determine the form of supplier relationships. Among these are, for example, extent of idiosyncratic investment made and required (e.g., Williamson, 1996), as well as the type of governance mechanisms in place (e.g., Heide, 1994; Williamson, 1996). Cannon and Perreault (1999) suggest that supplier relationships can vary according to information exchange, operational linkages, legal bonds, cooperative norms, and buyer/seller adaptations. In information exchange, a mutual sharing of important information characterized the relationship. Operational linkage involves the functional integration of the firms in the relationship in terms of their systems, procedures, routines, and technologies. Cooperative norms describe the extent to which there is an expected pattern of working together toward joint and individual goals. Relationship specific adaptations involve the extent of idiosyncratic investment in accommodating the

processes, products, capabilities, and procedures of the partner (Cannon & Perreault, 1999). Two fundamental issues underlie these works. First is the duality of simultaneously optimizing on relationship factors while minimizing transaction costs (e.g., Dahlstrom & Nygaard, 1999; Heide & Stump, 1995). Second is the increased creation and role of relational (i.e., social) capital in interfirm relational management (e.g., Dwyer et al., 1987; Dyer & Singh, 1998). In conjunction with these two issues, a third is emerging in the literature, which is the increase in the strategic role of interfirm relationships (e.g., Dyer & Singh, 1998; Johnson, 1999; Jap, 2001).

Other important factors that affect buyer–seller relationships can be grouped into local and macro influences. Local influences consist of product-related factors, buying structures and practices, and firm-level factors. First, product-related factors include the buying class, that is, modified rebuy versus straight rebuy, degree of standardization, product requirements, product life cycle, product complexity, and frequency of purchase, for example (e.g., Anderson & Narus, 1990). Second, the firm's buying practices and procedures influence the relationships. These include buying center structures in terms of who participates in the process and how, buying procedures in terms of the role of bidding and preferred vendors, and the location, level, and number of managers engaged in boundary spanning, for example (e.g., Dwyer & Tanner, 1999; Venkatesh et al., 1995). Third is firm level characteristics such as the firm's strategic aggressiveness and its tendencies toward relational proclivity (e.g., Johnson & Sohi, 2001). Also included here are interfunctional relationships and individual factors, such as buyers' or boundary spanners' competencies, ethical positions, interpersonal communication and social skills, influence on supplier relationship management (e.g., Hult et al., 2000).

In addition to the local influences, macrolevel factors also represent a major influence on supplier relationships. Primarily, environmental influences include the characteristics of the buyers' and sellers' industry as well as the general environment (e.g., Achrol, 1991; Madhavan et al., 1998). Industry characteristics as described in Porter's (1980) five forces model, that is, rivalry among established firms, risk of entry by potential competitors, bargaining power of buyers, bargaining power of suppliers, and threat of substitute products determine supplier management to a great extent. Within the general environment macroeconomic factors, country risks, resource availability, the political, legal, and regulatory environment, and technological change are influential.

### 2.2. *Portfolio models*

Portfolio theory in general addresses the view of trade-offs in expected returns relative to risk characteristics of investments (Markowitz, 1952). Portfolio ideas have been incorporated early into strategic management and market-

ing, for example, to enhance business and product planning (e.g., Wind & Claychamp, 1976). Although portfolio management is not new to purchasing (e.g., Kraljic, 1983; Turnbull, 1990), until quite recently it has not been widely nor systematically researched (e.g., Dubois & Pedersen, 2002; Gelderman & van Weele, 2002; Nellore & Söderquist, 2000; Olsen & Ellram, 1997; Tang, 1999). In addition, recent changes in interfirm management approaches, increased pressures for competitive advantage, and increasingly turbulent global environments are harbingers for a revamping of extant portfolio thinking. For example, while Kraljic (1983) pressed for movement from purchase management to supplier portfolio management, a limited number of factors were considered. Important factors such as alternative governance forms, pressures to reduce portfolio size, and increased concern for sustainable competitive advantage through interfirm relationships were not included. Beyond these concerns, patterns of functional interdependence between firms have changed. Products are often jointly developed by buyers and suppliers and evolve during the relationship. As Dubois and Pedersen (2002) note, the shift from firm level and dyadic to relationship and network perspective easily overwhelms simplified purchasing portfolio models.

### 2.3. Strategic supplier portfolios

With regard to suppliers, the firm's supplier portfolio consists of all a company's relationships with its suppliers. To some extent, portfolios of supplier relationships evolve naturally with various relationships serving the firm differently, taking different forms, and being governed differently. However, strategic supplier portfolios involve a much more deliberate approach where the general views of risk management relative to expected returns apply just as in traditional portfolio management. A strategic supplier portfolio consists of the set of supplier relationships assembled by the firm with the intent of managing risks and optimizing returns where management activities involve not just individual supplier relationships but the entire supplier portfolio as a group. The portfolio is structured deliberately according to factors identified by the firm as important to sustainable competitive advantage, superior economic performance, or both. Explicit consideration is given to the strategic role of the various relationships, where dependencies and interdependencies are created, the alternative governance mechanisms, and where the firm will invest in and leverage relational capital.

Although the risk and return trade-off undergirds portfolio development, the specific risks and returns at issue vary considerably from traditional notions. They include trade-offs in terms of the length and depth of the relationship and in terms of transaction characteristics and governance. Factors such as managing interdependence, idiosyncratic investments, contractual hazards, opportunism, and competitive hedging, as well as long-term versus

short-term payoffs in the relationship play a role. In essence, any factor that concerns the commitment of managerial time and energy in supplier management plays a role.

Another major and important issue in supplier portfolios, supplier default risk, derives from the extended and intensified functional aspects of the relationship. Supplier relationships involve risk in terms of the timeliness of deliveries, the customer and technical support, and product and service quality. Beyond this, supplier contribution to product innovation is critical and made even more so by the application and attributes involved in the product development and acquisition situation. Product architecture, innovation task interfaces, and supplier competencies must match the supplier relationship, as indicated by four archetypical sourcing concepts, that is, traditional, modular, black box, and system sourcing (Boutellier & Wagner, 2003), which create and contribute to various levels of interdependence. Because of the risks associated with these sourcing concepts, firms continuously evaluate supplier relationships. For example, buyers may reduce uncertainty through information or minimize risk through some sort of algorithm or decision heuristic to evaluate risk (e.g., Puto et al., 1985) in the management of its entire supplier portfolio.

In addition to the issues above, research suggests that firms configure supplier portfolios on the bases of other factors that may involve targets. These target variables include, for example, number of suppliers. Specifically, many companies have significantly reduced the number of major suppliers in recent years. The goal has been to establish closer relationships with fewer selected suppliers (e.g., Goffin et al., 1997), which has vast implications for interdependence, governance, and risk. Other target variables for the supplier portfolio structure may involve a certain ratio of minority-owned suppliers or a desired level of ISO-9000-certified suppliers. Likewise, regional dispersion of suppliers can be important in portfolio configuration because (1) domestic supply markets may not be sufficient for low-cost, high-quality suppliers with proven engineering, technological, and process capabilities, (2) a global supplier base that supports geographically dispersed manufacturing activities can alleviate problems associated with physical and cultural distances with suppliers, and (3) offset or countertrade requirements, where buying from a foreign firm may be tied to purchases from a home country firm, are practiced in some countries. Therefore, to compete in a given country the firm must include competent suppliers from that particular country.

Subsequently, a systematic understanding of the configuration and management of supplier portfolios will be developed. This includes not only *where* and *why* a supplier is positioned in a firm's portfolio matrix, but also *how* the strategy is developed, implemented over time, and continuously controlled, that is, the strategic supplier portfolio management process.

### 3. Methods and study

Given the intent to develop a framework for formation of strategic supplier portfolios, the research design employed for this investigation involved multiple case studies (Anderson et al., 1994; Eisenhardt, 1989; Workman et al., 1998; Yin, 1994). In contrast to positivistic field studies that focus on reconstructing existing models, drawing heavily on existing literature, and ultimately preparing models for quantitative testing (e.g., Workman et al., 1998), the study underlying this article relied on inductive case study approaches. Inductive approaches draw primarily on field observations to develop theory (e.g., Ellram, 1996; Larson, 1992), following, for example, Glaser and Strauss's (1967) procedure where "grounded theory" emerges (e.g., Drumwright, 1994). In the discovery of grounded theory, the adequacy of a theory is closely linked to the process of creating it. During the research process, categories begin to emerge, form patterns and interrelations, ultimately forming the core of the emerging theory (Glaser & Strauss, 1967).

Limits in generalizability pose problems for case studies with a small number of cases anchored in the specific context. To address these limitations, multiple cases based on theoretical sampling (Glaser & Strauss, 1967) were selected. An attempt was made to select varied cases to gain a deeper understanding of the study's concepts and to assess contingent factors. In addition, through theoretical sampling, the applicability and robustness of the findings was further enhanced (Miles & Huberman, 1994; Yin, 1994). The companies included in this study cover a broad spectrum of industrial activity and contexts, thus enhancing the robustness and generalizability of the results.

As dictated by the research topic, manufacturing industries provided the study context. Twelve multinational original equipment manufacturers (OEMs) headquartered in Europe with operations in multiple countries were selected. Although, there is no "ideal" number of cases, researchers have recommended around 10 (e.g., Eisenhardt, 1989; Ellram, 1996). This study meets this benchmark and exceeds the number in comparable studies. See Table 1 for a summary of the firms studied. They participate in a range of industries from military/defense to household appliances, and utilize a variety of technologies and production approaches, ranging from one-off to mass production. The sample firms range in size with annual sales varying from US\$420 million to \$14 billion and an average of \$2.6 billion. The firms in this study face highly competitive environments and high rates of technological change suggesting the need for a broad range of suppliers and compelling them to press quality improvements and optimize on cost and technology. Thus, all firm's included necessarily rely heavily on outside sources of supply and innovation.

Over 24 months, data were gathered from two sources for each firm: interviews and written documents. The interview component involved 50 personal and 5 telephone interviews. The 44 key informants interviewed included the

Table 1  
Firms in the case study sample

Firm name (business unit)	SIC	Major products
Audi	371	Automobiles
Balzars Process Systems	355	High-technology IT-production equipment
DaimlerChrysler Aerospace (Airbus)	372	Commercial airplanes
DaimlerChrysler Aerospace (Defense and Civil Systems)	366/376	Defense electronics/ guided missiles
Geberit	308	Sanitary plastics products and systems
Siemens (Automotive)	363	Automotive electronics
Siemens (Power Generation)	361	Power-generation plants
Swisslog	353	Materials handling systems and logistics equipment
Temic	363	Automotive electronics
Vorwerk	363	Electrical household appliances
Wacker Siltronic	367	Silicon wafers
Webasto	356	Automotive air-conditioning, thermo-, and roof systems

highest ranking purchasing executive in each company (e.g., VP Purchasing, Head of Purchasing). Key informants were identified previously in a prescreening process with the case study firms. To aid in data collection, a provisional framework rooted in the literature and prior interviews with practitioners and academicians was drafted. It included an a priori specification of constructs to facilitate theory building and provide empirical grounding (Eisenhardt, 1989). An interview guideline based on the provisional framework was used in data collection and ensured consistent interviewing procedures (Miles & Huberman, 1994). The interviews lasted from 90 to 120 minutes with the first part focusing on supplier base configuration, supplier development, and supplier integration. The second part focused on supplier portfolio management structures (organization and processes, technology, and human resources). The interviewer liberally used follow-up questions to explore constructs, patterns, interrelations, and particular situations of the firm further.

Because taping interviews is not customary in European countries (e.g., Workman et al., 1998), data recording involved extensive notes based on the guideline components. Immediately after the interviews, transcriptions of the notes were completed. Standardized descriptive profiles for each firm, including some demographic and financial information, descriptions of the purchasing practices, and organization, were added to the transcripts.

The second source of data involved extensive documentary evidence. The researchers accessed a number of published, but mostly internal documents from the case study firms. The documents included annual reports, product descriptions, newspaper and journal articles, supplier brochures, purchasing handbooks, portfolio reports, controlling reports, process mappings, consultants' analyses and reports, descriptions of tools and methods used in purchas-

ing and supplier portfolio management, formal and informal forms, and supplier contracts. The broad range of documentary evidence and interview data presented alternative views of supplier portfolio management processes and subprocesses. Throughout the study, the researchers triangulated and complemented the evidence gathered from multiple interviews and documents. A coding procedure consistent with the grounded theory method was followed. It consisted of (1) comparison of incidents applicable to each category, (2) integration of categories and their properties, (3) delimiting the framework, and (4) writing the framework (Glaser & Strauss, 1967).

#### 4. A process for configuring and managing strategic supplier portfolios

Based on the case study data, this section presents the framework and discusses the various subprocesses that comprise it (see Fig. 1). For the firms, the configuration and management of strategic supplier portfolios is composed of the planning, implementing, and monitoring of their supplier relationships with the specific intent of contributing to the accomplishment of their strategic objectives. Note that the processes comprising the framework are components of a systematic supplier portfolio management approach and not a rigid procedure. The data indicate that the subprocesses are complementary and iterative, with firms often repeating all or a number of them. The extent of reiteration, however, depends on local and macro influences and is to some extent company specific.

The strategic supplier portfolio management framework derived from the literature (Ellram & Edis, 1996; Frazier, 1983) and supported through the data of this research should facilitate development of the firm's capacities to anticipate and adapt in supplier portfolios. Below, the case study findings are discussed with respect to the individual processes.

##### 4.1. Planning the strategic supplier portfolio

The executives in this study indicated that they simultaneously weighed risks and opportunities to develop a

reasonably formal assessment that provided input for supplier portfolio management decisions. Additionally, they pointed out that measures to assess goal achievement must be articulated. Consistent with the benefits for such formal strategic planning activities in general (Claycomb et al., 2000; Pearce et al., 1987), these managers anticipated positive outcomes from planning activities related to supplier portfolios. Not only did the managers in this study believe that supplier portfolio management should involve formal planning activities, but they saw it as imperative for success. Although the informants used a range of terminology, for example, supplier strategies, supplier portfolios, material portfolios, supplier road maps, and supplier dossiers, the data showed that they distinguished between two kinds of strategic supplier portfolio planning activities: (1) which suppliers to include in the supplier base and (2) the optimal strategy for individual supplier relationships.

The starting point in the planning of strategic supplier portfolios involves the question of *which* suppliers the company should work with in future, that is, the *composition of the supplier base*. Here, the firm creates a target supplier portfolio by looking at existing or future supplier strengths and at its own requirements. Company strategies, anticipated changes in the portfolio of supply, and developments in the supply market influence this decision. The automobile manufacturer, for example, planned to internationalize production and sales. Hence, the internationalization of its supplier base necessarily followed. The manufacturer needed suppliers of strategic items to be able to operate on a global scale and to support development of its manufacturing operations in Brazil and China. Importantly, at this point, managers noted that measures for achieving the desired structure should be specified as part of this process. In general, the managers showed a tendency to foster strategic supplier portfolios to enable development and implementation of differentiated supplier strategies.

Next, the company asks *how* it should work with each of its suppliers in future. Firms identify the type and configuration of each individual supplier relationship that they consider advantageous and optimal, that is, the *specification of individual supplier relationships*. The relationship form is influenced by the factors mentioned earlier in conjunction

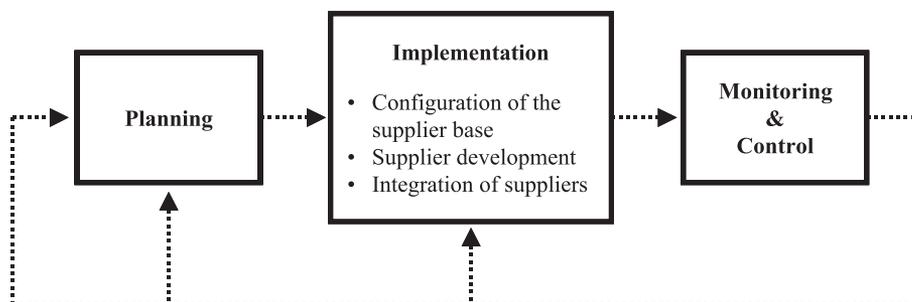


Fig. 1. Configuration and management of strategic supplier portfolios.

with the long-term goals for the relationship and the configuration of other relationships in the portfolio. The airplane manufacturer structured relationships differently, depending on whether it sourced technology material, production-related commodities, or non-production-related commodities from a supplier. In case of technology materials, sizeable packages and systems were outsourced to a single supplier. To circumvent the risk associated with this strategy, the firm invests in relational capital to establish joint activities and a close partnership.

The data indicated that the composition of the supplier base and the specification of individual supplier relationships are derived from an assessment of the future coupled with strategic and operational goals. One of the automotive electronic suppliers thoroughly incorporates the current status and the expected future situation regarding the supplier's technology capabilities, manufacturing plants as well as R&D locations. Throughout the planning step, managers continued to focus on the introduction of measures and assessment tools so that the risk within the supplier portfolio could be managed.

Several managers stated that planning the relationships between a company and its important suppliers crosses functional areas. For the automotive electronics manufacturer in this study, the team that sets up and amends supplier strategies consists of people from purchasing, R&D, and quality management. Top management involvement is also essential. The defense electronics firm even reports in a supplier brochure: "Cooperation in a partnership starts with the definition of objectives at top management level and stretches all the way to operational collaboration. Only in this way we will gain the necessary understanding for each other and be able to exploit our potential with a win-win strategy." This seems important to secure the commitment of resources necessary to accomplish the specified goals.

Wacker Siltronic illustrates how firms carry out planning activities involved in developing strategic supplier portfolios. Wacker Siltronic is a producer of silicon wafers for the semiconductor industry with major operations in the United States, Germany, and Singapore. The company uses supplier strategies and distinguishes between the two planning activities described above. On the one hand, Siltronic looks at the market requirements and developments for its products and designs its supplier base accordingly. This process provides the answers to a number of questions, such as: Which worldwide suppliers are available? Which suppliers are active for Siltronic? Which suppliers should become key suppliers in future? How is their technological and business performance? Which (production) capacities does the supplier plan to provide? Siltronic evaluates all these aspects on a global basis. Supplier roadmaps, on the other hand, help the purchasing department find out whether suppliers are able and willing to follow Siltronic's development. In this context, individual

supplier objectives play an important role. Supplier roadmaps are an important starting point for targeted supplier portfolio management and supplier integration. They are regularly updated and revised, mostly once a year. Wacker Siltronic executives are convinced that the benefits clearly outweigh the costs of drawing up supplier roadmaps for the 40 to 50 key suppliers from a 600-strong supplier base.

#### *4.2. Strategic supplier portfolio implementation*

The implementation step of the proposed framework, conceptualized here as the enactment or the execution of the strategic supplier portfolio plan, consists of three subprocess steps including: configuration of the supplier base, supplier development, and integration of suppliers. Each of these, in turn, involve several subprocesses of their own. Each of these subprocesses is detailed below.

##### *4.2.1. Configuration of the supplier base*

This phase of implementation is broad based because it involves improving the supplier base, as well as wide-ranging issues of individual suppliers. For all firms studied, configuring the supplier base encompassed a number of subactivities including reducing the number of suppliers, segmenting the supplier base, and assessing and selecting suppliers.

Rising expectations of suppliers, changing product strategies, and the advent of supplier networks mean that companies now work more intensively with fewer suppliers. Some firms cope by reducing the number of suppliers through cutting component numbers, that is, changing the product strategy, and then strategically segmenting the supplier base. The reduction and hence the restructuring of the supplier base was mentioned by the majority of firms in the study's sample as one of the most important issues they face. The household appliance manufacturer, for example, reduced its supplier base from more than 300 suppliers to 130 within four years. This was driven by the need to significantly improve the quality of purchased materials and parts. Not all suppliers were able to upgrade to the new requirements. In general, the firms saw their bargaining power reduced by limiting their supply options. This poses obviously a higher risk for the supplier portfolio. Still, the firms in the sample saw the trade-off in terms of increased performance. Higher dependence on fewer suppliers encouraged suppliers to look further than short-term performance and invest beyond contractual requirements; improved innovation, information exchange, and flexibility resulted. Ultimately, the firm can win with fewer suppliers. Most informants indicated that the more complex the products being procured, the more likely this win-win scenario developed.

Related to this, the firms studied relied heavily on segmenting suppliers as a starting point for supplier portfolio management activities. Segmentation typically involved

ABC analyses, which considers factors such as volume, suppliers' performance in terms of technology, quality, logistics, or price, and suppliers' strategic importance. Using the annual purchasing volume with suppliers in an ABC analysis, the firms in this study typically assigned the largest suppliers (accounting for 80% of the total purchasing volume) to category A, the next largest suppliers (accounting for another 15% of the total volume) to category B, and the rest of the suppliers to category C. Common approaches with A suppliers were on minimizing the cost of the procured materials by establishing partnerships, devising major account strategies, and integrating suppliers early on or through joint value-analysis projects, for example.

Again, to circumvent the risk associated with close cooperation and strong dependence on A suppliers, some companies in the sample try to strengthen the partnership with these suppliers. The sanitary plastics products manufacturer designed a standard "cooperation contract," which it ratifies with A suppliers. The contract stresses the development of an ongoing partnership between the manufacturer and the supplier and includes issues such as productivity increases, improvement in logistics, exclusivity, or "last call" options. On the other hand, with C suppliers, that is, those with lower volume, the aim approach was to reduce purchasing process costs by optimizing sourcing process efficiencies, direct supply strategies, or e-procurement approaches.

The data suggested that the criteria used in assessing and selecting suppliers often vary, largely due to the fairly vast disparity in the requirements the companies face. The risk trade-offs often related to the supplier relationship and the items being sourced. For example, supplier relations involved in sourcing simple and highly standardized items or otherwise nonstrategic inputs tended to resemble arm's-length arrangements. One strategy observed involved a brief assessment of suppliers on a few key criteria, and then selection of the lowest price supplier. For complex, non-standardized products and strategically important items, such as aircraft body parts for the airplane manufacturer or turbine blades for the power-generation plant manufacturer, supplier relationships tended toward long-term, partnership-type arrangements. The airplane manufacturer was forced—in order to reduce the enormous risk due to extremely high R&D expenses—to arrange "risk-and-revenue-sharing" partnerships with suppliers. These partnership-type relationships extend from the beginning of the concept phase throughout the lifetime of the aircraft. In general, the case study firms relied in such cases on extensive, careful, and holistic assessment of the supplier and relationship potential. Buyers follow the risk strategy of "playing the odds" by choosing the supplier whose value appears the most beneficial (Puto et al., 1985).

Although the managers in this study often cited reducing supplier numbers, segmenting the supplier base, selecting, and assessing suppliers as the critical activities in refining the supplier base configuration, the following case demon-

strates the full gamut of activities that provide potential benefits.

Many of the supplier base activities of Balzers Process Systems (BPS) demonstrate how complex successful companies approach the subprocess. *Key supplier management* is used in the case of very carefully selected and important suppliers that are subject to extremely high demands in terms of management of core skills, market and technological leadership. In effect, this means absolute single sourcing from key suppliers and very close supplier relationships. *Top management involvement* in key supplier portfolio management is considered imperative at BPS. Management recognizes the importance of suppliers for technological refinements and operating results. The top management at BPS holds annual or six-monthly meetings with suppliers at which information is openly exchanged about strategies, technologies and products. These meetings often give rise to new ideas. The discussions may be informal, but a great deal of implicit knowledge is exchanged. *Supplier days* are also held annually for key suppliers, known as "Supplier Dialog", at which BPS talks to suppliers about itself and the company's topics and aims in general and sourcing in particular. At these supplier days, BPS' top management also talks openly about the company's strategy, market trends in general, BPS sales, the risks and opportunities facing BPS and suppliers, organizational changes and the company's current and future projects. Of course, specific sourcing topics also arise, such as sourcing strategy, the targets and successes of last year's Supplier Dialog, defining and understanding the partnership between BPS and the supplier, and current and future sourcing projects. The aim is to ensure that suppliers can coordinate their strategies with BPS and get to know how this high-tech company thinks. The company also awards a "Supplier of the Year Award" in recognition of a supplier who has worked particularly hard in partnership with BPS and has stood out as a reliable, prompt, and cost-effective supplier of quality products. Looking at how the 1997 award winner's sales have grown shows that the award is not just a piece of paper but is of real benefit to the winner. The volume BPS sourced from that supplier quadrupled within a year. For BPS, *supplier awards* will only motivate suppliers if they can see real benefits from the additional effort involved.

#### 4.2.2. *Supplier development*

Sometimes firms conclude that existing supplier portfolios, supplier performance and relations cannot meet strategic goals and future needs. Options for managing this depend on the situational factors surrounding the sourced item with the two extremes essentially involve changing, that is, terminating the current relationship and seeking another, or absorbing the problem supplier (vertical integra-

tion). These extreme actions offer little satisfaction and often simply are nonviable. The notion of supplier development provides a meaningful alternative (Handfield et al., 2000).

The executives interviewed cited a number of supplier development approaches including supplier assurance, supplier assistance, supplier sponsoring, supplier advancement, supplier performance improvement, and reverse marketing, for example. All share two common characteristics. First, because of the high expected supplier performance gains, the firms favored direct supplier development (Krause et al., 2000). These development programs go beyond tactics such as setting supplier targets or imposing contractual requirements that are considered indirect in nature. They ranged, for example, from technical assistance to a financial commitment to suppliers. The second commonality in supplier development that was observed is that through these activities, the customer signals interest in a close partnership-type supplier relationship. Direct supplier development is a systematic effort to create and maintain competent suppliers and to improve various supplier capabilities. The aim is to enable suppliers to produce more efficiently and improve quality and costs in future. The silicon wafer manufacturer was aware of the risk inherent to supplier development (e.g., selecting the wrong supplier to be developed, time and resource requirements). Therefore, the firm based this decision on a supplier strategy and evaluated supplier development activities based on total cost of ownership (TCO) estimates. In addition, the firm adheres to a rigid timeline for the measures to be implemented. If it is not achieved, the activities will be terminated.

The case study data indicated that successful supplier development depended on a number of factors. Rather than intuitive notions of relationship duration, sourcing volume involved, or proportion of sales involved, factors such as relationship climate and dynamic, knowledge transfer, and supplier motivation were important in successful supplier development (Krause & Ellram, 1997). The executives who were interviewed indicated that in general, for supplier development to be successful, the buyer–seller relationship necessarily demands intensive collaboration. This suggests in turn that a relationship climate and dynamics characterized by trust and cooperation along with intensive and open communication and information flows are imperative. Additionally, in supplier development, information should be exchanged constantly, informally, and promptly, not just according to formal agreement and procedures. The norm is that the firms automatically pass on all useful information and keep one another fully informed of changing events as they occur. Communications flow through numerous contacts in various positions in both companies (Krause & Ellram, 1997).

To ensure that suppliers are actively involved in development programs, the firms often provide incentives and motivations. These include financial incentives and, more

importantly, the implied or explicit promise of repeat and follow-up business. The customer firm can rely on the “shadow of the future” to motivate the supplier (Heide & Miner, 1992).

Other influences on the success of supplier development with respect to portfolio considerations include the resources of both buyer and seller. Typically, supplier development programs are necessary because the supplier does not have adequate resources to improve on its own. In certain situations where the payoff is present, the customer can reinforce the supplier’s infrastructure or select projects where the need for human and financial resources is low, or provide assistance in staff or training.

A final factor that contributes greatly to the success of supplier development is sustainability, that is, ensuring that the programs and activities are continued and consistently integrated and implemented. The study’s evidence suggests that to accomplish this, customer firms should be sensitive to how the programs are managed. Specifically, evidence was found that process-oriented rather than results-oriented supplier development may be more effective. This increases the supplier’s ability to act on its own yet ensures that the program effects will last once the customer stops actively supporting the supplier. However, process-oriented approaches can be used in combination with results-oriented approaches (Hartley & Jones, 1997). In either case, to ensure that the improvements instigated by the customer are maintained some customer surveillance is likely required (Handfield et al., 2000).

In recent years, the carmaker, Audi, has opened or extended production plants abroad, such as in Curitiba, Brazil, or Changchun in the People’s Republic of China. The company’s aim is to open high-growth foreign markets by expanding its operations in growth markets in a focused fashion. Audi is also relocating production of models from Germany—with as few national modifications as possible—to those countries, such as the Audi 100, 200, and A6 to Changchun. To German suppliers, Audi’s activities in these countries represent a major opportunity, both in opening new markets and in setting up production in those countries. Seen through the eyes of purchasing, the ultimate aim is to establish these overseas operations in partnership with existing series suppliers. The declared aim is to have as much local content as possible. To match these two goals, Audi is taking the initiative to help suppliers establish production capacity and markets abroad. To the suppliers, such activities are usually a novelty in terms of the market and assembly or production site. To help suppliers gain a foothold in China, or even make access possible in the first place, Audi acts as what one informant called a “marriage broker” between its existing German series production suppliers and local Chinese companies. This may seem a simple task, but Audi has to employ enormous resources to facilitate such things as negotia-

tions with potential joint venture partners. Audi's future joint venture with First Automobile Works (FAW) in Changchun, making the A6, will involve around 70 of the current approximately 650 A6 suppliers in China. These are A and B suppliers, enabling Audi to buy around 50% of volume locally in future. For the remaining 50% of the volume, Audi will resort to alternative sources in Europe or supply completely knocked down (CKD) kits from Germany.

#### 4.2.3. *Integration of suppliers*

Supplier integration is the strategic integration of buyer resources with supplier resources and the extension and blending of relevant activities between the buyer and seller firms. The data underlying this study indicated that the buying firms in this sample distinguished between two approaches when strategically integrating suppliers in internal processes. First, in the product development phase, buyers and suppliers jointly create innovative and market-oriented products. Second, in the subsequent manufacturing phase, suppliers are closely incorporated in efforts to continuously enhance effectiveness and efficiency in production and logistics processes.

With *supplier integration in the product development phase*, firms can extend critical new product development activities such as conceptualization, design, engineering, production, and sourcing and integrating internal company resources with the critical resources of other supply chain members. The case study firms have tried to install new team concepts with external (supplier) participation, joint development projects, or external simultaneous engineering teams. With regard to timing, the data indicated that early integration of suppliers is vital—an approach often labeled as “early supplier involvement” (ESI). When suppliers are integrated early they experience a stronger feeling of ownership, can make themselves comfortable with the task, build up trust with the buyer, assume greater design responsibility, and enhance interorganizational learning (Primo & Amundson, 2002). The airplane manufacturer exemplified this. Key suppliers were integrated right from the design phase, enabling the use of supplier know-how the most effectively at all early critical decision phases. Above all, the requirements of technology materials, that is, strategic items in portfolio terms, were defined jointly with suppliers right from the outline specification phase with the suppliers assuming responsibility for the detail specifications and developments later. Thus, suppliers delivered up front on financing the development costs and recovered costs gradually throughout the product life cycle.

Firms recognized that the ability to extend product development activities across organizational boundaries can enhance competitive advantage. Suppliers increase the buyer's product and project success by contributing their capabilities to innovate and develop products. Buyers benefit from strategically integrating suppliers early in product development rather than working independently in product

development, cost management, quality, and cycle time in commercialization. Such an integration strategy can help firms gain new competencies, conserve resources and share risks, move more quickly into new markets, and create attractive options for future products (e.g., Birou & Fawcett, 1994; Clark, 1989; McGinnis & Mele Vallopra, 1999).

Differentiating supplier roles in terms of risk and the degree of responsibility assumed by the supplier can help the buyer set priorities and allocate resources (e.g., Wynstra & ten Pierick, 2000). Because of the inherent risk in product development projects, it is important that the parties agree early on how to deal with risk (e.g., technical, time, commercial) and how to deal with future business that results from a development project, for example, in terms of preferred treatment of the supplier or promises of future business (LaBahn & Krapfel, 1999). An example of the hazard is when a supplier quotes prices that do not cover development costs and then, in later design modifications, charges fees significantly higher than the true value of the engineering work involved. Especially the automotive and automotive supplier firms experienced such supplier behavior. In addition, the airplane manufacturer indicated that their company runs the risk of suppliers buying in with excessively low prices and then recovering their lost margins later by exaggerating the costs of change. This risk can be mitigated by close supplier partnerships coupled with “risk-and-revenue-sharing” set up in earlier process steps of the supplier portfolio management process. Confidentiality agreements along with trust address another risk, that is, losing confidential proprietary information to rivals.

Integrating and overlapping development tasks across firm boundaries increases interdependencies and adds complexity to the development project. Buyers must therefore closely coordinate all supplier efforts in the new product development process and manage all integration objectives. Shared education and training programs, collocation of supplier team members, on-site supplier representatives, supplier participation in buyer project teams, shared physical assets, and common and reliable ways of sharing R&D information with suppliers all help in this interfirm coordination effort (Birou & Fawcett, 1994; Ragatz et al., 1997). In this process, the role of acquisition becomes critical. Supplier integration succeeds if purchasing is closely involved in new product development (McGinnis & Mele Vallopra, 1999) and if purchasing assumes the appropriate boundary spanning role as well (Burt & Soukup, 1985).

The methods and aims of integration in the development phase are different from *supplier integration in the manufacturing phase*. The former emphasizes comprehensive, project-oriented activities, whereas the latter involves transaction-oriented improvements in the supply chain. Supplier integration in manufacturing includes upstream activities of supply chain management (SCM). SCM recognizes that integrative action can increase efficiency considerably (e.g., Speckman et al., 1998). An underlying philosophy

of “co-makership” is that “... the supplier should be considered to be an extension of the customer’s factory with the emphasis on continuity” and a “seamless end-to-end pipeline” is often advocated (Christopher, 1992, p. 204). Improving supplier integration in the manufacturing phase reduces replacement times, makes delivery times more reliable, limits variations from schedule, reduces stock levels, allows rapid implementation of product changes, limits quality problems, establishes stable, competitive prices, and sees suppliers awarding orders a high priority. In the wider sense, logistics can be improved through supplier integration in the manufacturing phase. In aiming for better logistics, firms develop and implement joint structures and processes with their suppliers. This results in customer requirements, such as reliability, delivery times and flexibility, order fill rate, order status information, spare part availability, and so forth, reaching a competitive level (Christopher, 1992).

The nature of the sourcing strategy affects stock turnover rates and hence stock levels considerably. More frequent deliveries as with just-in-time (JIT) delivery systems or continuous replenishment programs (CRP) result in substantially higher turnover rates (Christopher, 1992; Waters-Fuller, 1995). JIT systems—frequently implemented in this study’s firms—aim to have the materials needed in the right quantities, at the right time and in the right place at all times. For this sourcing strategy to succeed, integration of information technology, for example, via electronic data interchange (EDI), extranet or Internet solutions, frequent formal and informal communications, coordinated scheduling systems, and working together as partners, as well as other transaction-based preconditions (e.g., Waters-Fuller, 1995), are imperative (Frazier et al., 1988). In addition, working with a single supplier for each commodity helps reduce stock levels, thereby reducing inventory costs. To circumvent the risk associated with such sourcing strategies, one of the automotive electronic suppliers restructured the internal purchasing organization that holds the responsibility for the firm’s supplier relationships. At least one member of the central purchasing department is permanently located in the decentralized manufacturing plants (e.g., in Germany, Hungary, Mexico, or the Philippines) in order to act as what the firm calls a “troubleshooter” when problems with JIT suppliers arise.

By managing costs, businesses can sell their products at lower prices without undermining profit margins. Outperforming the required product quality and preventing, testing for, and avoiding faults in outsourced components is costly. In working with suppliers, some informants emphasized the increasing importance of TCO concepts in their firms. Consequently, they have installed more comprehensive and non-price-based vendor evaluation systems, rather than relying only on price-based evaluation procedures. Furthermore, companies are looking for additional avenues to reduce inventory and logistics costs by integrating suppliers more closely in their internal operations. If there is a lack of

supplier integration, and if information is not being passed on adequately, the “bullwhip effect” that arises in multi-stage value chains can also have a serious impact on costs. The minor fluctuations in end user demand are enhanced as one moves upstream in the value chain (Lee et al., 1997), and can reach as much as 50–70% among component and raw materials suppliers. As well as setting up demand categories, depending on forecast variations, businesses can improve demand forecasting considerably by passing on information to suppliers. All of these factors in supplier integration in the manufacturing phase, improved product quality, lower stock levels, improved logistics, and lower costs help, directly or indirectly increase customer satisfaction, and hence make the firm more competitive in the long run (Christopher, 1992).

Geberit, a manufacturer of molded and extruded sanitary products and systems, describes the approach developed in a relationship between the Geberit Group and Bossard, nowadays Geberit’s single source supplier for fastener and assembly solutions such as nuts, bolts, and screws. The successful new direct supply strategy for supplying the plants, implemented jointly with Bossard, shows that partnerships in the manufacturing phase, combined with proven innovative solutions, can unleash enormous potential for rationalization. Bossard’s kanban two-container system is based on the simple but effective principle that there are at least two containers for each product, arranged one behind the other at the point of consumption. If a container is empty, this means a top-up is required. When an empty container is replaced with a full one, this is the signal for issuing a top-up order. By integrating Bossard, Geberit simplified its sourcing process considerably. All the individual tasks, from obtaining estimates to stock management that give rise to such high costs in conventional solutions and mean the risk of more faults are abolished. The kanban two-container system reduced logistics costs by 72% and material costs by 27% annually. Savings resulted from completely doing away with logistics and order administration, saving the costs of incoming goods and incoming goods checks, minimizing the costs of internal movements at Geberit, automatic volume correction, eliminating the need for Geberit to unload containers, and eliminating packing and monthly accounts. Applying the kanban principle was furthermore seen as an opportunity to reduce stock levels, improve stock availability, and achieve cycle-time reductions. According to Geberit, this system could work only because Bossard always supplied top-quality materials via a high-performance delivery system. Since Geberit completely delegated all responsibility for procuring screw joints and integrated its supplier very closely in production-oriented supply processes, having confidence in Bossard’s performance and in the long-term partnership were vital. There were originally ten suppliers supplying the Geberit

group with screw joints (multiple sourcing); now there is just one (single sourcing).

#### 4.3. Strategic supplier portfolio monitoring and control

As a proactive management tool, the monitoring step focuses mainly on goal-oriented management of the strategic supplier portfolio as well as the establishment of an early warning tool that constantly monitors and controls performance. Of central importance here is that supplier portfolio management controlling be guided by strategies set up in the planning step of the framework.

Various types of supplier portfolio management monitoring and control systems have been observed, ranging from those measuring *outputs* (e.g., reduction of R&D costs due to supplier's R&D work) to those measuring *behaviors or actions*. The airplane manufacturer, for example, controls not only financial results, but also the dependence on important suppliers, or the communication between the airplane manufacturer and its suppliers. Frequency of interpersonal contacts, the breadth of contacts across different functions, and the level in the organization at which they occur comprise possible contact patterns for measuring in the monitoring phase (Cunningham & Homse, 1986).

The managers interviewed favor supplier portfolio management monitoring and control systems that are flexible enough to allow them to react to unanticipated circumstances. In addition, they require that the systems provide a true picture of the suppliers' performance and the performance of those managers responsible for supplier relationships and supplier portfolios. In addition, information must be provided in a timely manner so that managers can react on time, initiate corrective action, and adjust supplier portfolio plans. Effective monitoring and control hinges on sufficient information and the capacity to process, analyze, and present it. Several of the executives interviewed noted the importance of IT support and the impact it has on their ability to monitor and control. While some managers observed that their firms lack the kind of integrated, intelligent IT systems required for supporting controlling tasks in supplier portfolio management, the airplane manufacturer adequately combines all available and necessary information in an intranet tool. Data sources are the firm's enterprise resource planning (ERP) system, the quality management system, and manual reports.

Monitoring and control models assume that significant deviations from the plan deserve managerial attention. The absence of any irregularities implies that all is proceeding smoothly. Managerial action is taken only when the deviation is negative; for example, supplier reduction targets or cost reduction targets are not reached. The underlying logic seems to concentrate only on poor performance. In the sense of a learning process, positive deviations need also to be understood (e.g., Hult et al., 2000). That means all underlying significant deviations from plan, both positive and

negative, should be evaluated. Monitoring and control result in positive outcomes when the focus on performance evaluation is consistent and learning is emphasized. However, the formal appraisal or review process should include performance against objectives. Good performance and the integration of short- and long-term goals for supplier relationships and portfolios depend in part on the reinforcement of behavior consistent with those ends.

When control systems do not allow errors, managers tend to become preoccupied with avoiding mistakes because incompetence is attributed. This plays out as a relatively unproductive level of risk aversion. Instead of the blind emphasis on error avoidance, firms can institute training for individual buyers so that they frame the acquisition problem/process relative to specific performance targets as reference points (Puto et al., 1985). Importantly, in an atmosphere where control systems can deal with errors, mistakes are viewed as a necessary consequence of innovation. Dealing with these problems and issues properly will help firms exercise control in supplier portfolio management. Some respondents noted that such control measures are crucial when communicating with top management.

This final process step in the framework is, however, where many of the firms indicated that they have the most catching up to do. The executives cited problems with objectives and meeting targets adequately and noted that the most significant opportunity to improve is to tie rewards to the successful implementation of strategies when configuring relationships with suppliers. Only if rewards are connected to outcomes will managers pay attention to both setting up *and* implementing strategic supplier portfolio plans. Some firms have no more than the traditional purchasing control tools. Some managers involved in the study suggested that new financial measures such as "rate of return by supplier" be developed and innovative controlling tools, such as the "balanced scorecard," be adapted to the requirements of supplier portfolio management.

Temic illustrates the issues involved in strategic controls in the development of supplier portfolios and a proposed approach to controlling its supplier portfolio management activities. Temic is a manufacturer of automotive electronics systems, operating in an extremely innovative and rapidly changing environment. As Temic's product range is a very young one (42% of sales are accounted for by products less than 2 years old), the products are at an early period in their life cycle. This means that Temic's suppliers must also be highly innovative, and that the percentage cost cuts that suppliers generate each year must be in double, not single, digits. Continuously improving cost prices by a few percent is not enough. Basically, all technological requirements stem from the need to cut costs, but in the final analysis, technological advances lead back to the real aim: the fast and high cost reductions that OEMs demand. There are supplier

strategies that can be quantified in cash terms, such as reducing the number of suppliers, setting up second sources, or global sourcing. Nonpriceable variables, such as technology and image, are also used. Achieving the objectives for the supplier base and individual supplier relationships is among the MBOs of all purchasing staff and the head of purchasing. Attempts are also being made at present to assess how effective supplier strategies are. The possible indicators here include the costs of supplier portfolio management, logistics and quality cost trends, or R&D costs.

## 5. Discussion and implications

Perhaps the most important implication of this research for managers is that all firms have recognized supplier portfolio management as a strategically important component in the overall success of their firms. This is consistent with supplier relationship management research. Supplier relationship management can be a distinctive advantage for a firm, one that in turn contributes to sustainable competitive edge and high profitability. The strategic supplier portfolio management process is the firm's relational competence (Dyer & Singh, 1998) put into practice. Because of suppliers' potentially significant contribution to a company's competitive position, implementing strategic supplier portfolio management processes could provide real advantage.

Importantly, only if firms recognize the fundamental differences between the traditional approach towards suppliers and the proposed strategic supplier portfolio management process will they be able to benefit. One major difference is the portfolio as opposed to a dyadic view. Firms should configure and manage their supplier relationships as a portfolio of relationships and consider various interdependencies and trade-offs among relationships, for example, in terms of risk or resources required. Another major difference to traditional approaches is to understand supplier portfolio management as a strategic management process that should comprise planning, implementation, and control activities.

Having acknowledged the importance of strategic supplier portfolio management and the differences from traditional approaches, firms should work toward a better understanding of the antecedents of supplier portfolio management processes. To date, little attention has been paid to the essential activities of supplier portfolio management and their organizational rudiments. Despite the abundance of research on relationship patterns and their impact on company performance, the "how-to" question has been widely neglected. Employing a comprehensive framework, this paper investigated how firms actually should approach the configuration and the subsequent management of supplier relationships and supplier portfolios in supply chains. In this research, a process consisting of five major process

steps was identified and the main thrust of each was discussed.

In the planning step it is vital that firms set up plans for individual supplier relationships as well as the supplier base as a whole. Based on research, analysis, and projections of the future, these plans are the foundation for the subsequent steps. With regard to implementation, some basic activities are performed by every firm, regardless of its proficiency in supplier portfolio management. The case studies indicate, however, that supplier base configuration can span a much wider array of activities, ranging from segmentation to elaborate supplier communication. Firms are advised to apply them more intensively for gains in performance. In case of performance gaps, or even before problems arise, firms should implement supplier development activities after thorough evaluation of the costs and benefits and the risks associated with them. Risks can originate on the supplier's side, the buyer's side, and in the process itself. Little experience with supplier development, insufficient collaboration, or low incentives are likely problems to be overcome. Also on a case by case decision, a small number of suppliers should be integrated more intensively in internal processes. Depending on the company's goals and the supplier's capabilities, integration may focus on the product development phase or manufacturing phase. In the final step, the monitoring and control step, actual results in terms of outputs or behavior must be measured, assessed, and fed back to the previous process steps.

Companies should use the proposed strategic supplier portfolio management process as an instrument to plan, implement, and control supplier relationships and supplier portfolios in a practical and coherent manner. For companies that are just starting to set up supplier portfolio management activities, the process can serve as a reference list for the steps, activities, and organizational prerequisites that need to be considered. At the same time, the framework can also assist companies that aim to further professionalize, structure, and integrate their activities related to supplier portfolio management.

As with every major organizational change, the successful implementation of the proposed strategic supplier portfolio management framework requires other capabilities. All the recommendations in this paper largely call for aggressive as opposed to steady approaches. Supply chain management has to shift its focus from striving for the lowest possible purchasing price to the sustained optimization of the strategic supplier portfolios. This as well requires strategic and dynamic thinking in other supply chain functions of a firm. The most successful firms will be those that are able to improve the supplier portfolio management process continuously and hence uphold a strong relational competence. To achieve this end, measures based on suppliers and supplier portfolios must become part of companies' management evaluation systems. Regular changes in the portfolio of supply (internally) and the supply market (externally), as well as changes in the company's functional

and business strategies, also require continuous adaptation of supplier portfolio management activities. This is the only way that buyers, together with other members of the company, can exploit sustainable and long-term potential from suppliers and the supply market. Hence, firms should not only focus on *working within* the supplier portfolio management process. Instead, they should pay a significant amount of time *working on further enhancement of* the supplier portfolio management process itself.

In addition, firms practicing supplier portfolio management have to understand that in the long run results can only be further improved if they take the entire upstream portion of the supply chain into consideration while carrying out the five steps proposed in the framework. For that reason, it is vital to incorporate first-tier, second-tier, and even third-tier suppliers in the process as well.

This research sheds some light on how firms can implement strategic supplier portfolio management. However, there is a pressing need for researchers to further examine the organizational background of supplier portfolio management that has been and could be effective in enhancing supplier relationships and supplier portfolios. Specifically, researchers need to explore how integrated supplier portfolio management programs are assimilated and integrated in firms. Many questions remain concerning what are the right forms of organization, processes, and management systems for any given business or industry, and the procedures, success factors, and pitfalls in implementing supplier portfolio management approaches. Furthermore, like other business functions, supplier portfolio management needs better quality and quantity control tools to enable professional control of activities. The development of innovative planning and control strategies such as performance measurement or balanced scorecard, and innovative information and reporting systems in particular, need to be investigated.

In addition, as businesses start to use Internet and intranet solutions for gathering information, communicating, designing marketplaces, supply chain integration, sourcing management, and so forth, supplier portfolio management will be revolutionized as well. The effects these new technologies will have on supplier portfolio management are still largely unexplored, both conceptually and empirically. With the preliminary evidence and perspectives provided in this research, investigating the strategic supplier portfolio management processes and practices should provide intriguing research questions as well as benefiting managers.

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