Procurement Policy

5

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The subject of this chapter is supply chain management. It describes a number of changes in technology that have taken place in recent times that have significant implications for supply chain management. The nature of supply chain management strategies is explained, including the make or buy decision. This chapter also discusses about what is involved in supply chain planning, implementation, and quality control.

5.1 From Buying Behavior to Supply Management

In addition to the further influences discussed in this book (cf. Chap. 4), the behavior of industrial buyers is also affected by the procurement policy of the company. This policy comprises the strategic and operational aspects of procurement. Due to an increasing focus on core competencies as a result of greater outsourcing activity and rapid developments in information technology, the role of networks of interconnected firms in value creation and delivery is becoming increasingly apparent and important (cf. Chap. 3). This inevitably makes firm performance increasingly dependent on the way it manages its external relations with suppliers and how it marries this with its internal processes (Wilkinson & Young, 2002, Wilkinson, 2008). In this chapter, we describe the main features of

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industrial procurement management and show how "supply management" and "supply chain management" are complementary and interconnected processes.

To date, there is no single, uniform definition for the term "procurement" (Kaufmann, 2001). Most authors do, however, differentiate between the terms "procurement" and "buying"/"purchasing" (Kaufmann, 2002; Monczka, Trent, & Handfield, 1998). Often, the terms are applied in the sense in which they have developed historically. "Buying," or "purchasing," is defined as a chain of primary operational activities involving the identification of a need, the attainment of ownership of an input, and the administration of these activities. While the terms "buying" and "purchasing" are used to describe the operations of a buying or purchasing department, the term "procurement" is used in a more general strategic sense to include not only these operations but also strategically relevant activities such as supply management and market research. Figure 5.1 presents an example of how materials management could be divided into more or less strategically relevant activities.

Here, we refer to Kaufmann, who defines procurement management as "all processes of supplying the company with direct and indirect materials, services, rights, and machinery and equipment from external sources to the organization, aimed at contributing to the achievement of sustainable competitive advantage" (Kaufmann, 2002); Kaufmann uses the terms "supply management," "procurement," and "sourcing" synonymously.

Kaufmann's definition of supply management takes not only the processes into account but also the nature of the products and services being purchased. Many books on this subject limit their discussion of supply management to materials, services, rights, and machines/equipment. The approach taken by German writers is broader and includes the procurement of capital and human resources.[1] We will use Kaufmann's definition here, as capital and human resource procurement have special characteristics that go beyond the scope of this book and these matters are handled by specialist departments within a firm.

Based on Porter's value chain concept,[2] Kaufman differentiates between primary and secondary activities, and thereby between cross-transactional processes that create the necessary "infrastructure" for supply management and transaction-specific concepts that support this infrastructure. This is shown in Fig. 5.2.

"Supply chain management" is viewed by Kaufmann as being "[. . .]an umbrella term encompassing cross-company supply, materials, and logistics management involving the source of raw materials to the final customer as well as the disposal and renewal of the material, including reverse logistics." (Kaufmann, 2002, p 12f) This highlights three key features of the process:

[1] Cf. in example of international authors (Dobler & Burt, 1996; Monczka et al., 1998) and for an overview of approaches in the German language (Kaufmann, 2002, p. 11).

[2] Cf. Sect. 1.4.

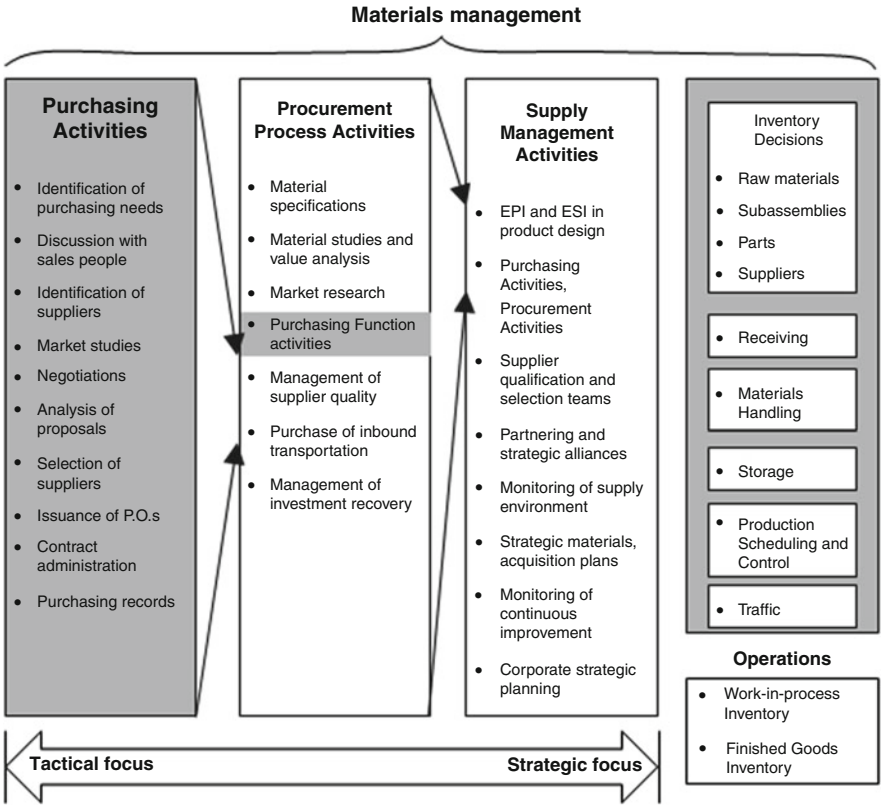

Fig. 5.1 Material management as a comprehensive management function (Source: Dobler & Burt, 1996)

- The final customer's needs form the basis of supply chain management.
- Supply chain management is business-process oriented and includes the organization of processes extending beyond the individual company.
- The value-creation chain involves an interdependent network of firms and organizations performing different tasks.

We first consider the transaction-specific activities involved in the management of industrial procurement processes and then move on to consider cross-transactional processes.

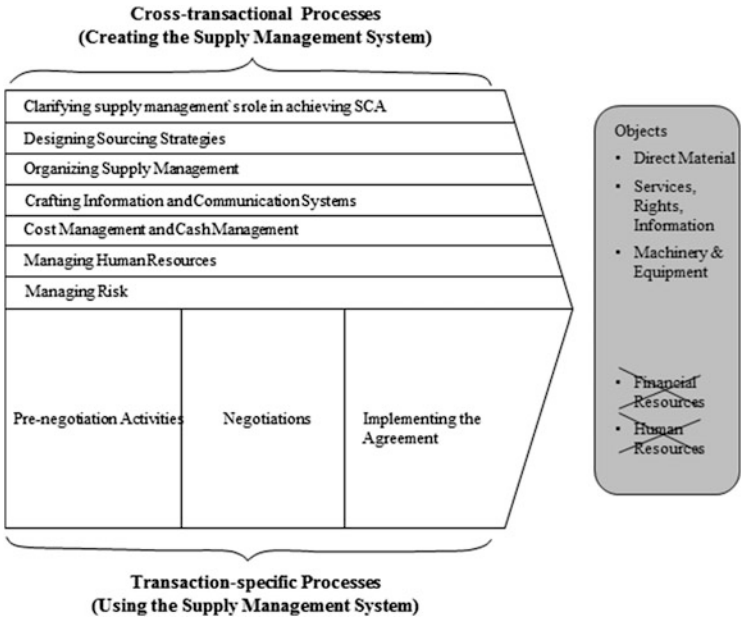

Fig. 5.2 Cross-transactional and transaction-specific procurement processes (Source: Kaufmann, 2002)

5.2 Management of Procurement Processes

5.2.1 Procurement Objectives

Procurement objectives form the basis of the procurement process as they determine the desired effects to be achieved. They are derived from the basic objectives of the organization and from the objectives of other functional areas—such as sales and production (Koppelmann, 2004). There are five types (Meyer 1990):

- Cost objectives
- Risk objectives
- Flexibility objectives
- Quality objectives
- Corporate social responsibility objectives.

In addition, three subtasks of the supply function may be distinguished (Arnolds, Heege, & Tussing, 1996):

- Cost optimization
- Security of supply
- Support of other company function areas.

Cost optimization is not the same as minimizing procurement and transaction costs. The total costs of procurement need to be examined and compared to offers made by competitors. Of particular interest here are postpurchase costs, such as operating costs (in the case of machine purchases), or disposal costs. In recent years, companies have begun to undertake "life cycle cost" and "total cost of ownership" analyses in order to take into account all the direct and indirect costs involved (Cf. Chap. 3). Additional types of costs to consider include internal order-handling costs, storage costs, and stock out costs. Stock out or shortage costs are the costs that arise when required products and services are not available when they are needed (Arnolds et al., 1996).

Since the energy crisis in the 1970s, supply security has been a major issue for companies. Although in most markets today it is sales that is the main constraint on the firm's performance and growth, in some cases procurement can become a bottleneck. In seller's markets, for example, the position of the buyer is weaker, such as in the following situations:

- When the supply of raw materials is limited or possibly running out; when supply is restricted by powerful, monopolistic suppliers (e.g., OPEC); or when supply is regulated through international agreements on raw materials (e.g., rubber and tin)
- In markets with reduced production capacities due to profit opportunities that are no longer attractive or because demand has outstripped supply at least in the short term, as has happened with microchips in the past
- Markets subject to political control and trade barriers.

In such circumstances, procurement has to secure long-term supply of materials. This can be done in various ways including in-house production rather than external procurement ("make" instead of "buy"); strategic investment in reputable suppliers; and long-term supply contracts. Supply risks need to be identified at an early stage and be either avoided, counteracted, or limited.

The third subtask involves the management interactions and relations with other functional areas of a firm. In the past, procurement has been viewed simply as the department that processes orders passed to it from other departments. A request may come from sales and may be modified by production or finance departments before it is passed on to purchasing. Here, procurement merely executes the plans of other functional areas by purchasing what is required. But, these days, procurement is being seen increasingly as an important strategic area of a firm that demands top management attention. Not only are goods procured that add to a firm's costs, goods are procured that add to a firm's profits and performance as well. The task of procurement has been extended to include a new dimension that is creative, innovative, and proactive rather than just reactive in nature. A procurement department has to be able to identify opportunities in the market for reducing costs and for increasing profits through its impacts on other parts of the organization and through

its impacts on customers and sales. This makes procurement much more than a reactive, derivative, tactical operation, carrying out the orders of others. It makes it a problem-solving body, a codesigner of the system (e.g., Überall, 2006). Such responsibility requires in-depth knowledge of both the internal customers and market customers (e.g., Kaufmann, 2002). The procurement process must therefore be set up in such a way that it is integrated and aligned with overall company strategy.

5.2.2 Different Types of Sourcing Strategies

If it is assumed that the general question of outsourcing vs. insourcing is determined at the level of corporate strategy,[3] then the question arises as to how a sourcing strategy may be designed to decide what to buy and from whom (Kaufmann, 2002). The most common dimensions of procurement strategies are as follows (Klaus & Krieger, 2000; Janker, 2004):

- Number of sources—single sourcing vs. multiple sourcing
- Scope of service/supply—unit sourcing vs. modular sourcing
- Geographical location—local sourcing vs. global sourcing
- Place of performance—external vs. internal sourcing
- Provision of materials—just-in-time vs. storage)
- Individual vs. collective sourcing
- Strategies related to the number of supply sources

Multiple Sourcing
Multiple sourcing or order splitting has the effect of maintaining or promoting competition among suppliers. Supply risks are also reduced because procurement is divided among different suppliers. A regional distribution of supply sources also provides a hedge against various types of risks such as the expiration of tariff contracts or possibly employee strikes (Arnold, 1997).

But multiple sourcing can result in variation in quality that necessitates more intensive control and monitoring efforts. In other words, the decision must be considered with regard to all cost- and quality effects.

Single Sourcing
There are four types of single sourcing (Kaufmann, 1995): model-dependent, e.g., airbags from a supplier for a particular car model; model-independent, e.g., airbags from one supplier for all car models; production-facility-independent, e.g., airbags

[3] The term outsourcing connotates the external execution of one or more processes in which a company is not sufficiently competent and cannot execute itself so as to achieve a competitive advantage (cf. Quinn, 2002).

from one supplier for all production; and production-facility-dependent, e.g., airbags from one supplier for a particular production unit.

Single sourcing can be forced on a firm when one supplier dominates the market or enjoys a superior position over the competition. Also, it can be the only viable option in the case of cost-intensive supply and/or logistical relationships. An example of this is just-in-time supply relationships, which require a stable and well-developed communication and logistical system, and therefore can only involve a limited number of suppliers. Single sourcing is also relevant when there is joint product development between a buyer and supplier, as in simultaneous engineering.

The disadvantage of single sourcing is that, eventually, competition among suppliers is reduced. This can be counteracted with a request for proposals in the early phases of, say, the development of a supply part for a new model (Kaufmann, 1995). In the automobile industry, the term "design competition" is used to refer to this practice, and suppliers have the opportunity to discuss their ideas with the manufacturer and enter into a business relationship.

Dual Sourcing

A compromise between these two extreme forms of sourcing is dual sourcing. In this case, a limited number of suppliers are considered. Formal lists are made of potential suppliers that are not reviewed for long periods and which provide the basis for awarding contracts and for contract negotiations. Dual sourcing can involve a firm producing part of a required product or service itself and buying in the rest. This is appropriate when the supply risk is very high and a firm wants to avoid being overly dependent on one or more suppliers. A positive effect of this is greater competition among suppliers because of the threat of self-supply, which may stimulate improved supplier performance.

The advantages of single- and multiple sourcing are as follows (Baily, Farmer, Jessop, & Jones, 2005)[4]:

- Stronger position in price negotiations due to larger order quantities
- Reduced delivery costs
- Little to no danger of quality variation in products
- Easier quality control
- Reduced administrative burden
- Improved communication through closer, possibly long-term relationships
- More support received from supplier with regard to technical application, research questions, and special problems
- Reduced costs in the event that tools, samples, etc., must be provided or at least made available

[4] An overview of the characteristics of multiple- and single sourcing can be found in Arnold (1997, p. 99).

- Facilitated planning through improved communication and contingent contracts (Helm, 1997)

Advantages of using several different suppliers:

- Distribution of risks with greater supply security
- More competition among suppliers
- Less dependency on one supplier and greater flexibility
- Cost shifts to the supplier (assuming that the buyer's position is strong and they are in a position to request additional services)
- More opportunities for identifying and developing innovations
- Development opportunities for smaller suppliers
- No economic and moral obligations to a particular supplier

5.2.2.1 Strategies Related to the Complexity of the Inputs

Four different levels of complexity in supply inputs may be distinguished with complexity decreasing as we move from System, to Modular, Component, and Parts Sourcing.

System/Modular Sourcing

When complex goods are to be procured, the question of whether to buy a system (package) or individual components arises. This applies, for example, when industrial production facilities are to be procured or when different components are obtained for later assembly. With modular or system sourcing, individual components are not procured. Instead, complete or partly complete systems (subassemblies or functional units) are sourced, which can be installed as an integrated system or unit. In the automobile industry, the steering wheel, handlebar, airbag, and steering box are no longer delivered as single components from different suppliers, but as a preassembled complete steering system. Modules and systems differ to the extent that modules are predominantly developed and constructed by the vehicle manufacturer, and then produced and completed by the supplier. Whereas for a system, the supplier takes on most of the responsibility for development, production, and logistics—coordinating its subcontractors for this purpose (Wolters, 1995). Figure 5.3 shows modular sourcing in schematic form.

From the perspective of the buyer, two contrary objectives can be simultaneously achieved through modular or system sourcing: less in-house production and higher order quantities and fewer suppliers (Wildemann, 1992). Having a smaller number of suppliers reduces transaction costs, as fewer contracts are required and fewer supply relationships must be managed. Labor costs and effort may be saved as well, due to fewer individual orders which reduce workloads for the purchasing department (Wolters, 1995). However, increased transaction costs occur related to selecting and managing and system-suppliers. Figure 5.4 presents the supply structure with modular or system sourcing.

A further means of cost savings for both the buyer and the supplier is through a "platform strategy." This takes the form of a uniform design for a vehicle's internal

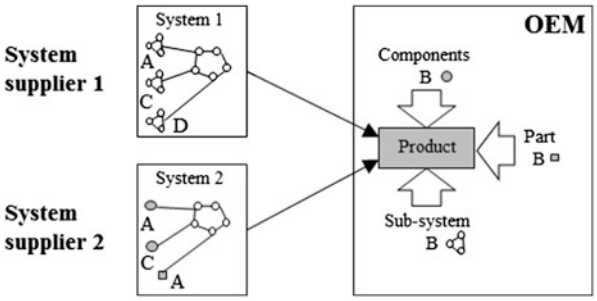

Fig. 5.3 Modular sourcing

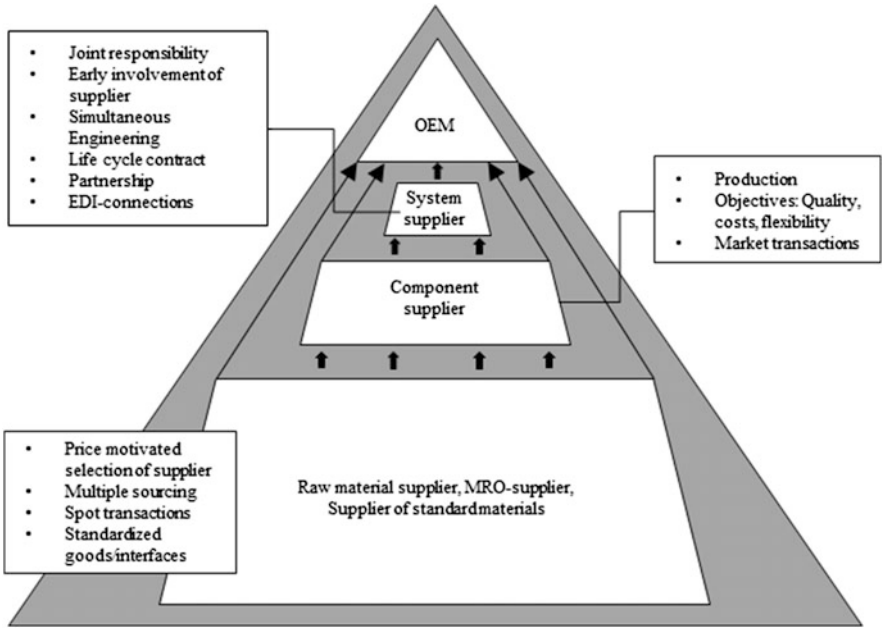

Fig. 5.4 Supply structure with modular- or system sourcing (Source: Arnold & Essig, 1997, cited in Schönsleben et al., 2003)

structure or architecture, such as the underbody, motor, or drive train, regardless of type or model. Volkswagen's A-platform is found not only in the inner structure of the Golf and similar models, such as the Variant and Cabrio, but also in the Audi A3, Seat Cordoba, and Skoda Oktavia (Dudenhöffer, 1997).

Table 5.1 summarizes the advantages of system sourcing. It is apparent that costs are saved not only in the area of procurement but also in R&D, production, and logistics, leading to a total savings effect.

Table 5.1 Advantages of system sourcing (based on: Wolters, 1995)

Functional area	Advantages with manufacturer	Net rationalization effect
Research and Development	Specialization in core competencies Fewer modifications (e.g., tools/ instruments) Faster problem solving Reduction of required engineer capacities	Shorter development time Better developed products Lower development costs Reduction of personnel
Procurement	Reduction of suppliers Fewer orders/less administrative burden Reduction of personnel in purchasing department	Reduction of personnel Reduction of material costs
Production and Logistics	Less preassembly Lower error rate (assembly) Reduction of storage Reduction of required area Reduction of logistical interfaces (e.g., deliveries)	Economies of scale Lower quality control costs Reduction of personnel Learning curve effects Lower capital tie costs Better product and process costs

Component Sourcing

This refers to the sourcing of components involving less value added and requiring less system integration. They normally comprise several parts with generic functions (Wolters, 1995).

Parts Sourcing

Parts are not very complex in use and have universal standardized functions and low levels of innovation. They require little if any further value adding or integration, such as screws or switches. A parts supplier usually competes on price, whereas component suppliers may also take over logistical services, such as just-in-time deliveries.

The services of system or module suppliers include the adjustment and/or assembly of parts and components, as well as the coordination of sub-suppliers. System suppliers also carry out R&D, are involved in product and service development for the buyer, and can contribute comprehensive before and after sales service support. The early inclusion of such a supplier in product and service design and development is often referred to as Forward Sourcing. Table 5.2 summarizes these different types of procurement relationships.

With systems suppliers, the assembly of single components is shifted to the supplier (the systems leader). This changes the structure of the supply chain. A pyramid-like structure emerges. On the first level are the system suppliers, the "first-tier suppliers." At the next level are the "second-tier suppliers" and so on. The number of direct suppliers to an original equipment manufacturer (OEM) is reduced. This does not necessarily mean that the total number of suppliers in a sector is reduced. Previous direct suppliers may become sub-suppliers, "second-tier suppliers," to the system supplier. The direct business relationship the supplier had

Table 5.2 Typical service scopes involved in various types of procurement relationships (Source: Wolters, 1995)

Type of supplier	Service				
	R & D	Production	Logistics	Parts aggregation/ completion	Coordination of sub-suppliers
Parts supplier		x			
Components supplier		x	x		
Module supplier		x	x	x	x
System supplier	x	x	x	x	x

with the OEM is discontinued, and from the perspective of the OEM, the number of supply relationships has been reduced.

Figure 5.5 illustrates the path from parts manufacturer to module supplier.

5.2.2.2 Strategies for the Geographical Location of the Supply Sources

Local/Domestic Sourcing
With local sourcing, inputs are obtained from a nearby supplier and the goods are made available when and where they are needed. Domestic sourcing occurs for the same reason—to reduce potential transport problems and to ensure supply. It also avoids problems relating to crossing international borders, including dealing with different laws and cultures

Global Sourcing
The increasing internationalization of business has resulted in a growth in international or global procurement and global sourcing means that firms utilize supply sources from all over the world. There are many reasons for this, including

- Lower purchasing costs, prices, and/or transaction costs
- Financial risk distribution (currency and sovereign risks)
- Sales support in the case of reciprocal business
- Technology access and research
- Circumvention of trade barrier.

For upstream suppliers, a global sourcing strategy can result in a sub-supplier moving its production facilities to a foreign country in order to avoid domestic cost pressures. Or, the procurement strategies of local and global sourcing can be combined to become "glocal" sourcing. This occurs, for example, when national module suppliers are asked by their customers to globally procure primary products that are labor intensive, or they do this on their own initiative. In this way, international differences in costs can be taken advantage of, in addition to the financial and logistical advantages.

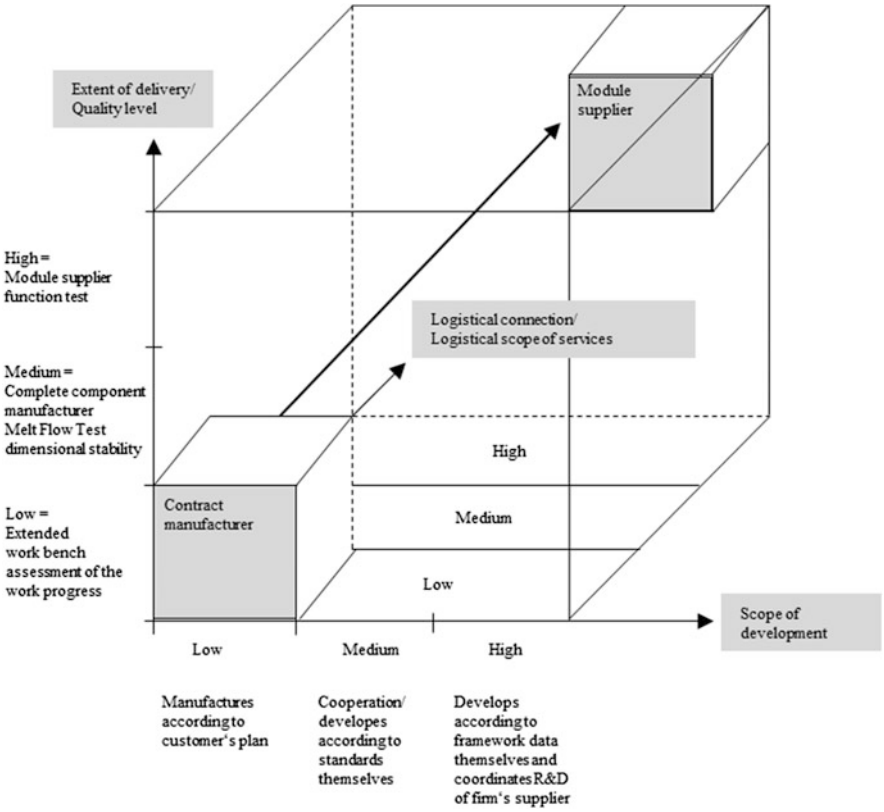

Fig. 5.5 The path from parts manufacturer to module supplier (Source: Wildemann, 1992)

A global sourcing strategy is handled through the establishment of procurement offices, sometimes referred to as "technological spy centers."

A useful framework for summarizing the main characteristics of the different types of international sourcing strategies is shown in Fig. 5.6.

Based on the degree of control of the customer, we may distinguish between a simple foreign purchase (offshore purchasing), foreign subcontracting (offshore subcontracting), foreign supply through a production joint venture (joint venture offshore manufacturing), and supply from a wholly owned foreign production facility (controlled offshore manufacturing). International purchasing involves establishing relationships between industrial suppliers and foreign customers. The transactions may be direct or indirect via agencies based in the customer's or supplier's country, or even a third country. One-time purchases (spot purchases) and long-term supply are both possible. In the case of offshore subcontracting, the customer is more strongly connected to the foreign supplier, which maybe supported through the provision of product descriptions, specification of assembly requirements, raw materials, and/or even financial and technical assistance. The

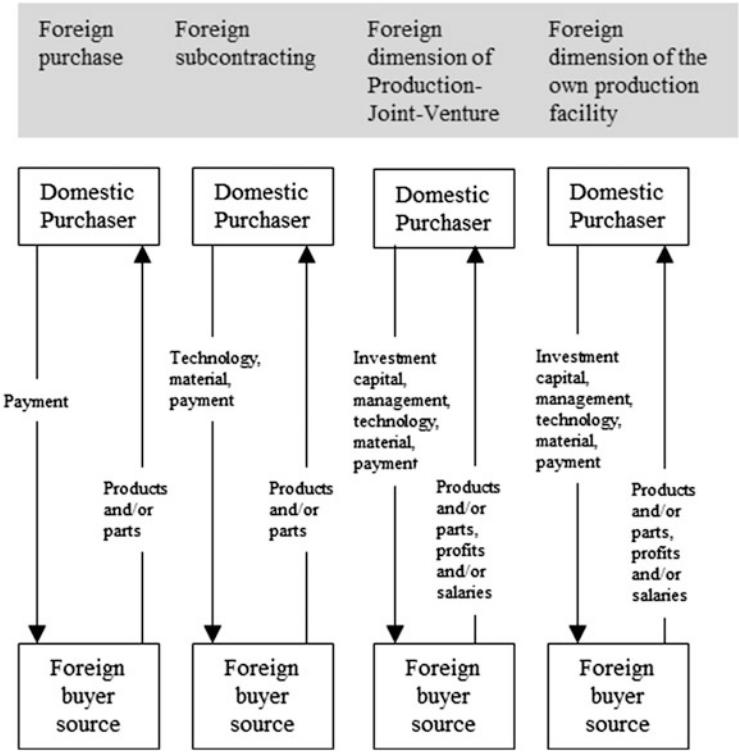

Fig. 5.6 Types of foreign supply sources (Source: Moxon, 1982)

duration and intensity of the relationship can vary, as well as the degree of involvement of various types of intermediaries and third parties.

With a foreign manufacturing joint venture, the degree of control of the customer increases. This may be reflected in their participation in running the joint venture as well as the amount and types of resources contributed. Finally, fully owned offshore production facilities involve total control but are subject to the legal rules and regulations of the host country and the types of financial arrangements linking the foreign with the home base.

The various criteria involved in assessing international sourcing alternatives are summarized in Fig. 5.7.

Cost savings through global sourcing are best achieved with standard parts bought in large quantities.

5.2.2.3 Strategies Related to Location of Suppliers' Operations

Internal Sourcing

Traditionally, suppliers have performed their services in their own production facilities, outside the customer's facilities, but often there is a need to integrate

Procurement objects	Global Sourcing ⟷ Local Sourcing		
Physical characteristics - Volume - Weight - Homogenous	Small parts ⟷ High volume parts Light parts ⟷ Heavy parts Homogenous parts ⟷ Varied parts		
Monetary characteristics - Value - Significance of price as competitive factor	Low value ⟷ High value Price competition ⟷ No price competition		
Informational characteristics - Necessary coordination - Information communicated	Low ⟷ High Little, non-critical ⟷ Much, Specific		
Examples From the automobile industry	- Batteries - Spark plugs - Steering wheel - Bumper - Radio - Rims	- Turbo charger - Air bags - ABS - Semi-conductor - Floor textiles	- Instrumentation - Front end

Fig. 5.7 Scheme for assessing procurement objects for global and local sourcing (Based on: Kaufmann, 1995)

the supplier's services and inputs within the customer's own operations and production systems. This is referred to as "internal sourcing." Three levels of such internal integration may be distinguished.

By founding an industrial business park, the buyer can locate key suppliers close to its own production facilities. This not only reduces logistical problems but also fosters a closer relationship between customer and supplier, leading to a more customized supply.

An even closer relationship is created when the supplier's production processes are transferred to the customer's production facilities. Machinery and equipment remain the property of the supplier and employee salaries are paid by the customer. This approach has even fewer transaction problems and costs than an industrial park.

The strongest form of integration is when the product or service is not only produced as part of the customer's production facilities but is also directly mounted, assembled, or otherwise incorporated into the final product or service of the customer. In this manner, the supplier bears full responsibility for transaction problems.

5.2.2.4 Strategies Related to the Delivery Timing of Inputs

Three types of strategies may be identified.

Stock Sourcing

With stock sourcing, a buyer attempts to secure supply through buffer stocks. The basic intention is to protect the production process from external disturbances, such as the inability of a supplier to deliver, to cover the time between deliveries, and/or protect against possible shortages in the market. Stocks may also be built up when a future price increase is expected. A disadvantage of large stock levels is the amount of capital that is tied up. Additional problems are possible deterioration in goods during storage as well as pilfering and safety issues. Generally, only materials of low value are suitable for stock sourcing.

Demand-Tailored Sourcing

With demand-tailored sourcing, an attempt is made to deal with the disadvantages of stock sourcing. A differentiation is made between orders based on a specific requirements and production-synchronized delivery. With individual orders, materials are ordered when they are needed (made-to-order production), and storage and capital costs are, to a great extent, minimized. But one-off purchases can lead to higher prices for specialized goods, and there is also a danger that they cannot be delivered on time.

In contrast, production-synchronized delivery takes place with close cooperation between the customer and the supplier. Arrangements are made to match the delivery with production. In this way, stock levels can be minimized and costs saved, including capital, personnel, and risks such as aging and spoilage. The purchasing process is also facilitated, although the precise coordination required between supply and demand does require extra effort and cost to set up and maintain. Prices are normally higher due to the transfer of storage, quality-assurance, and logistical functions to the supplier. Price is also dependent upon the market positions of buyer and supplier.

Just-in-Time Sourcing

A further development of demand-tailored sourcing is the just-in-time (JIT) principle. This is a holistic approach involving sustainable, economic impacts on two levels of value creation (Kleinaltenkamp, 1997). With JIT, neither the customer nor the supplier holds stocks. The supplier starts production of, usually, high-value parts (A-parts) when it receives a specific request from the customer, including quantity and delivery time. This is usually communicated via electronic data interchange (EDI) (cf. Sect. 5.3.1.). JIT procurement is only possible for certain goods, such as assembly parts, modules, and systems, and the selection of parts for such a system can be made using a combined ABC/XYZ analysis, as shown in Fig. 5.8.[5]

[5] Cf. Sect. 5.2.3.1. Often, an ABC/LMN/XYZ analysis is applied. LMN defines the volume per package unit (cf. Bogaschewsky & Rollberg, 2002).

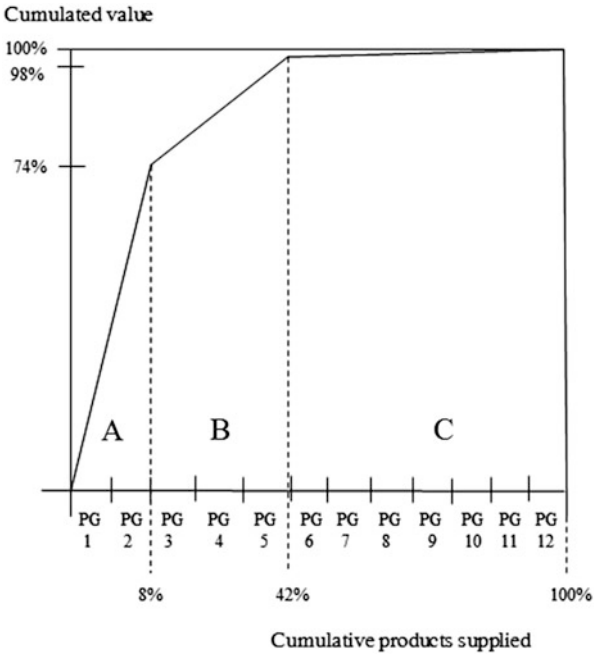

Fig. 5.8 ABC-Analysis (Source: Wildemann, 1988)

In this example, 8 % of the goods supplied (products 1 and 2) account for 74 % of the total amount purchased. An XYZ analysis sorts the goods according to the predictability of their demand. The following classification can be used (Wildemann, 1988):

X = Regular demand with only minor fluctuations. A weekly predictability rate of over 95 % and monthly fluctuations in quantity demanded of $\leq \pm 20$ %.
Y = Demand subject to greater fluctuations. A weekly predictability rate of over 70 % and monthly fluctuations in quantity demanded of between 20 % and 50 %.
Z = Demand is irregular. A weekly predictability rate of less than 70 % and monthly fluctuations are $\geq \pm 50$ %.

Fluctuations in demand are smaller in the case of mass production compared to batch or one-off production because of the law of large numbers and the canceling out of fluctuations on a large scale. Particularly well-suited for just-in-time procurement are high value goods with a regular pattern of demand that is predictable. Table 5.3 summarizes the main factors affecting the use of JIT systems.

As the table shows, the main criteria for assessing JIT are

- Quality of supplies
- Quantity reliability
- Delivery date reliability

Table 5.3 Assessing the suitability of supplies for just-in-time systems (Source: Wildemann, 1988)

	Value		
Predictability	A-parts	B-parts	C-parts
X-parts	High demand High predictability Consistent demand	Medium demand High predictability Consistent demand	Low demand High predictability Consistent demand
Y-parts	High demand Medium Predictability Semiconsistent Demand	Medium demand Medium Predictability Semiconsistent Demand	Low demand High predictability semiconsistent Demand
Z-Parts	High demand Low predictability Stochastic Demand	Medium demand Low predictability Stochastic Demand	Low demand Low predictability Stochastic Demand

Well-suited for JIT-procurement

To secure supply, a dual sourcing arrangement (e.g., 70 % from one supplier and 30 % from another) may be advisable whereby only the main supplier delivers just-in-time

With JIT, quality control is very important. The system can only be successful with 100 % quality reliability. Additional issues are those to do with establishing effective and efficient communication systems and material flow systems between the supplier and customer. Contract preparation also requires care. JIT procurement usually involves increased delivery frequency, which can have significant cost ramifications for the supplier. For this reason, a regional carrier strategy is often used in which goods for a defined region are combined daily as a bulk load in order to obtain better rates (Wildemann, 1988; Bogaschewsky & Rollberg, 2002).

5.2.2.5 OEM Procurement Strategies

Procurement for OEM can be for individual firms or groups of firms.

Individual Sourcing

Individual sourcing is the most common form of sourcing in industry today. Large firms often combine the requirements of different units of their organization into a central purchase in order to achieve economies and price advantages. This type sourcing involves internal or intracompany cooperation.

Collective Sourcing

Coordination of procurement systems across different firms is referred to as collective sourcing and may involve both horizontal and vertical forms of cooperation. The supplier is approached by a group as a whole, rather than by individual firms.

Horizontal forms of purchasing cooperation are more of an exception but it can be useful for small- to medium-sized businesses as a way to combine orders so as to achieve quantity discounts. In addition, by combining orders with other firms, better conditions may be negotiated with suppliers. In order for such cooperation to occur the purchasing requirement of firms have to be similar both in terms of specifications and timing of deliveries. Developments in e-purchasing systems make this type of purchasing coordination easier to organize.

The following examples of this type of cooperation can be found in business-to-business markets:

- Joint purchase of plant engineering companies
- Buying clubs, e.g., for engineering or roof-laying
- Joint ventures, particularly between medium-sized firms
- Buying through system centers, such as in franchising systems
- Buying market platforms (specialized service providers who act as intermediaries including via the Internet)
- Sporadic cooperation for technical purchases.

The level of organization can vary from loose agreements all the way up to the establishment of joint procurement offices.

The problems with collective sourcing include the search for and selection of partners (Arnold & Essig, 1997; Essig, 2002). Cooperation also means that the autonomy of an individual firm is constrained and the resulting dependency can be disadvantageous. Contract provisions can, however, give a certain degree of security.

Vertical cooperation involves cooperation between customers and suppliers. If the buying company is a lead user for the supplier, then the supplier will strive to work together with the company in order to secure future success and to promote innovative products, which is one of the functions of a business relation. Should a customer require particularly innovative products, joint efforts in the areas of R&D, and construction or engineering may be necessary and a less in-house production will facilitate such a development.

The problem is one of business mating, finding attractive potential partners with whom to cooperate (Wilkinson, Freytag, & Young, 2005). Various sources of information may be used including market research concerning alternative supplier's patents and resources, as well as recommendations and referrals from trusted third parties. And it may be as much a matter of getting chosen by an attractive counterpart as it is one of choosing a business mate.

Cooperative procurement also includes simultaneous engineering which involves the codevelopment of product and production facilities with suppliers. Such a partnership is often combined with the strategy of single sourcing or modular sourcing, as described above.

The foregoing discussion makes clear that different types of strategies are not really mutually exclusive and that certain types of interdependencies must be taken into consideration when planning of a consistent sourcing strategy. Table 5.4

Table 5.4 The sourcing toolbox (Source: Arnold, 2003)

Supplier	Sole	Dual	Multiple	Single
Procurement object	Unit	Modular	System	
Procurement area	Local	Domestic	Global	
Timing procurement	Stock	Demand tailored	Just-in-time	
Procurement subject	Individual	Collective		
Place of value creation	External	Internal		

describes possible relationships between the individual strategies in terms of a sourcing toolbox.

5.2.3 Procurement Planning and Organization

5.2.3.1 Models of Procurement Planning

Demand and Quantity Approaches to Procurement Planning
Procurement planning begins with the specification of demand requirements, including both current and likely future demand.

To determine demand in the early phases of buying, the method of value analysis is particularly useful. This is a systematic, creative, and cooperative search process for improving the quality of products and for reducing their costs. Products are analyzed in terms of as many partial qualities and subfunctions as possible. These are then individually assessed as to whether they are really needed and, if so, whether the current quality (material strength, quality) is necessary or whether they could be produced less expensively with different material or processes.

To analyzes its outputs in a customer-oriented manner, as firm will also try to anticipate the customer's future purchase requirements. A customer's evaluation depends on their perceptions of how well suited a product or service is to the intended areas of application and they will use various sources of information to aid their evaluation.

The most important aspects of value analysis are the following:

- The selection of products to be subjected to value analysis (e.g., products strongly threatened by competition or core cost factors)
- The target or target costs
- Selection of the team for the value analysis

- Assessing the current costs (problems with isolating costs, assignment of fixed costs, and common cost calculations)
- Functional analysis (which functions have been fulfilled in which way up to this point and what will be needed in the future?)
- Search for new solutions to better fulfill functional demands (including all methods of creativity and idea development, such brainstorming, synectics, and morphological methods).

For value analysis, competing products should be included in the evaluation. The timing of this can be important as, for example, too-early a comparison can lead to a fixing and narrowing of viewpoints that is not always advantageous. Conflicts may arise in the analysis group and must be given due attention at an early stage. Strategies for dealing with such conflicts can also be set up in advance.

In addition to value analysis, order quantity calculations are employed to determine what is most cost-effective. Determining optimal order quantities is the subject of an extensive literature but in the following, only one such approach will be discussed, i.e., the classic model or "lot size." The analysis is based on the following assumptions (Arnolds et al., 1996):

- The demand per time unit is known and is consistently regular.
- There are no restrictions regarding the suitability of the material for storage, storage capacity, and liquidity.
- Quantity discounts are normally not taken into consideration.
- Each item is ordered independently of the others and stored in only one warehouse.

In Fig. 5.9, the connection between stock, quantity, and time is presented. Delivery of the (regular) order quantity is assumed to be made at the moment that stocks are exhausted. The length of the period between orders is the order interval. It is dependent upon the demand per unit of time (the demand rate). The average stock level equals half of the order quantity. The aim of order-quantity optimization is to minimize the relevant costs during a planning period and order and storage costs depend on the decision to order. The procurement costs do not change as no quantity discounts are assumed to exist.

The annual order costs decrease with order quantity, whereas storage costs rise with order quantity. The minimum costs position is given by the Andler formula:

Definition 1

$$\text{Optimal order quantity} = \sqrt{\frac{200 \times \text{annual demand} \times \text{ order costs}}{\text{purchase price} \times \text{storage cost rate}}}$$

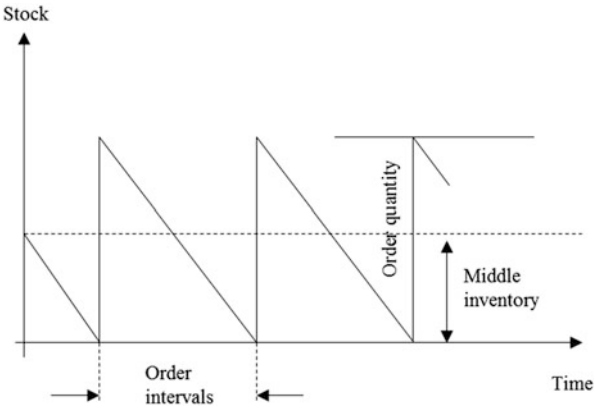

Fig. 5.9 Saw-tooth curve (Source: Arnolds et al., 1996)

Consider the following example. A firm has an annual demand of 5,000 units for an externally sourced component regularly used in production. The list price is € 0.50 each. The order process cost is € 40 per order/delivery and the annual storage cost is 20 % of the average stock value.

$$\text{Optimal order quantity} = \sqrt{\frac{200 \times 5,000 \times 40}{0,50 \times 20}} = 2,000 \text{ items}$$

This quantity is ordered 5,000/2,000 or 2.5 times a year (5 times in 2 years). The annual order costs are therefore $2.5 \times 40 = 100$ €. The annual storage costs are $1{,}000 \times 0.50 \times 20\ \% = 100$ €.

With this optimal order quantity, the order and storage costs are equal. This is a particular quality of the formula. The two cost components of the optimization calculation may be illustrated as follows (Fig. 5.10):

The classic order quantity formula can be modified and expanded indefinitely (e.g., Troßmann, 2006), including the price effects of combining orders for different products and synchronization with production. Also, more dynamic order quantity models dispense with the requirement of regular and consistent demand per period and allow for fluctuations in demand.

The basic model is based on fairly restrictive assumptions and other difficulties also arise:

- The result is not a whole number
- Order quantities and package sizes vary
- Order rhythms have long intervals with technical or economic product modifications occurring in the meantime
- An accurate calculation of the order costs and the storage cost rate is difficult.

As part of its marketing efforts, a supplier may try to assist the buyer in developing a stock-ordering model, such as through the joint use of a computer-based planning and e-purchasing system. With such cooperation, the supplier

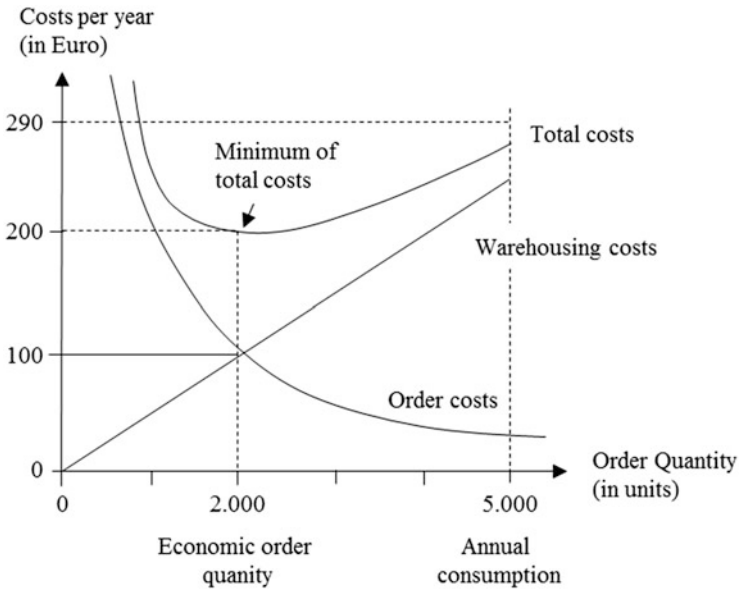

Fig. 5.10 Cost curve with the Andler formula (Source: Arnolds et al., 1996)

would have a certain level of security with regard to upcoming orders and the sales risks would be more calculable.

Cost-Oriented Approaches to Procurement Planning

The potential for cost reductions is a major issue for many companies and new approaches are emerging that offer more "holistic" cost analyses. Examples of this include the analysis of life cycle costs and target costing. A strategic procurement decision requires considering all the costs associated with a product over its entire life cycle, i.e., *the total cost of ownership*. Even costs occurring after use must be considered, including whether a supplier is willing to remove the product or take it back at the end of its life cycle, or cover the costs for disposal/recycling measures.

The concept of a life-cycle cost analysis originated from the analysis of large-scale projects, such as those in the construction industry, industrial plant construction, or in the space and aviation industries. Life cycle costs comprise all costs incurred during a project, including preconsiderations, planning, realization, operation, and shut down. Use of the term "cost" is inadequate here, as various resources are used at different points in a project. A more fitting term would be "expenses," which could be discounted to the point of time of a decision.

An example is a comparison between an electrical energy-saving light bulb Dulux El by Osram and an ordinary light bulb. Dulux El can be purchased for 23 €, needs only 15 W for the same performance as a 75-W light bulb and burns for 8,000 h, compared to 1,000 for an ordinary bulb. The ordinary, 75-W bulb costs 0.98 €. In the following diagram, the life cycle costs of both bulbs are shown. A

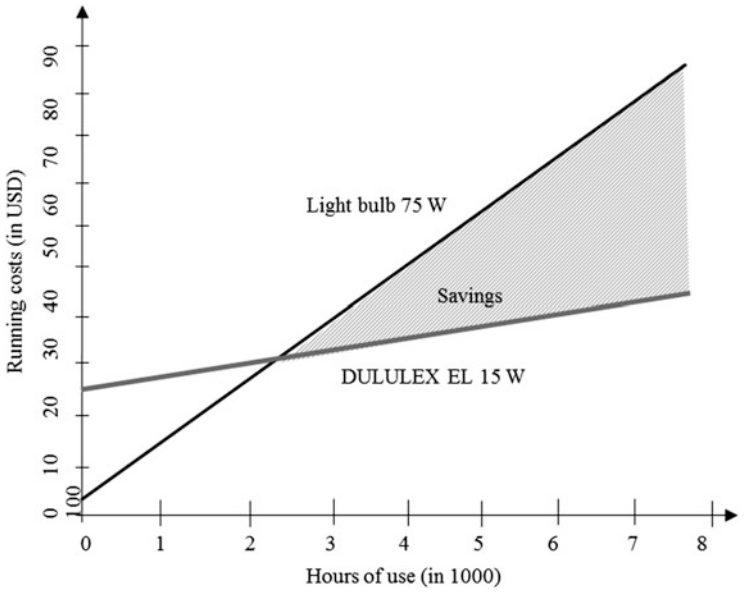

Fig. 5.11 Life-cycle-cost comparison of energy-saving bulb DULUX EL and ordinary bulb (based on: Simon, 1992)

price per kilowatt hour of 0.13 € is assumed. Not considered here are secondary costs, interest costs, costs of changing the bulbs, and disposal costs. The model demonstrates that, when the relatively high list price of the energy-saving bulb is compared to its low running costs, it is clear that it is the economically wiser choice in the long run, despite a higher initial purchase price (Fig. 5.11).

The break-even point—the point at which changing from one type of bulb to another becomes more economical—lies at an expected duration of approx. 2,600 h (Simon, 1992). As a marketing measure, a supplier should be able to present such a cost calculation to the buyer so that cost advantages may be made explicit. Should there be cost disadvantages with the product, other possible benefits must then be pointed out and emphasized. More expensive suppliers employ such arguments.

Target costing involves a comprehensive package of cost-planning, control, and management activities leading to the formulation and realization of cost objectives or targets in the initial development/construction of a new product. Based on a target purchase price, production costs are assessed. If target costs are less than the target price, the difference represents a possible profit.

From a marketing perspective, the most sensible method for determining the target price begins with an assessment of customer requirements and competing prices offered. After the desired profit margin is set, the target costs result.

The difficulty with target cost management is the necessity to break down the total targeted costs into different elements, including processes of production and the components, materials and personnel required. The aim is for manufacturers to

receive clear target cost parameters for, say, a car's side-view mirror. Make-or-buy considerations also follow.

Considering demand-relevant target prices early on ensures a market and customer orientation throughout all phases of production and marketing. But the allocation of costs among various functional areas or process elements remains difficult and requires close cooperation among all key participants, which can include sub-suppliers, who are also involved. Sub-suppliers may be asked to present their cost structures if they want to keep their business relationship with the customer. Responsibility for contacts with sub-suppliers normally lies with the procurement department and the suppliers need to signal a willingness to work in teams with the customer at an early stage if they are to be able to defend the target costs they provide.

Supplier-Oriented Approach to Procurement Planning

When there are several possible suppliers for the same product, supplier analysis and assessment need to be undertaken. Many factors are relevant in selecting a supplier, each of which needs to be evaluated and their importance determined in order to reach a decision. Only in special cases is the decision made solely on price. The factors involved include:

- Price
- Product quality
- Guarantees
- Before and after sales services
- Reliability of the supplier
- Delivery risks (e.g., with import)
- Conditions, additional costs
- Granting of credit
- Product range
- The supplier's image
- Existence of long-term business relations
- Possibility of reciprocal business
- Supplier's capacity
- Financial or contract-related obligations
- Fulfillment of basic conditions, norms, standards, environmental parameters, and disposal regulations

Some of these are essential and allow for an initially screening out of some suppliers. This is often the case with functional quality and the reliability of the product, which cannot be made up for through price reductions or additional services. The evaluation involves more than efficiency considerations. Even if all factors could be measured in terms of costs purely quantitative analysis would never be enough.

To begin with, a checklist can be developed and suppliers evaluated simply in terms of "yes," "no," "given," or "not known" for each attribute. A scoring model can be used, which involves the following steps:

- Listing of relevant factors and potential suppliers
- Weighting of factors in terms of their importance
- Evaluation of each supplier on each factor using a predetermined rating scale
- Weighting ratings by their importance and summing across different types of factors
- Developing and overall score or score profile for each supplier
- Choosing one or several suppliers based on their overall scores.

A simple example is given in Table 5.5. The method makes qualitative factors quantifiable, incomparable factors comparable, and implicit factors explicit, and allows intersubjective assessment, i.e., different people can do the evaluation and the results compared and discussed. A subjective component cannot be excluded and the problems this can lead to should also not be underestimated. Nevertheless, a certain degree of transparency is achieved and a systematic rational, defendable assessment of suppliers is made possible. Care must be taken to critically assess the precision and sensitivity of the model and results—too much reliance on minor score differences should be avoided. The same method can also be used for other types of decisions and can be automated using a computer.

Another method for supporting strategic procurement planning is *procurement portfolio analysis*. Here, alternative suppliers are compared in terms of their profit impact and risks.

Different types of inputs are first classified according to their importance and purchase share (ABC analysis). Usually, only a few inputs account for most of the procurement costs. These are referred to as A-goods. They have the greatest impact on costs in the long-term. In addition, qualitative factors play a role, including the impact of image-enhancing components, materials, and accessories, which can have an effect on sales without involving high procurement costs, e.g., "Intel Inside" or organically produced agricultural inputs.

Potential supply risks include:

- The consequences of a supply failure for production and sales
- The ease of use of substitutes
- The possibility of in-house production
- The number of available suppliers
- Storability

Inputs can be classified as "high" or "low" on these factors, which results in the typology shown in Fig. 5.12.

The amount of procurement effort depends on where the input is located. Strategically significant inputs demand more careful attention, including more

Table 5.5 Supplier analysis using a scoring model—a basic example

	Supplier A	Supplier B
1. Capabilities	1	2
2. Cooperation and service	3	2
3. Quality	2	1
4. Delivery time	1	3
5. Total costs	2	2
Sum	9	10

Evaluation: 1 to max. 5 points for the best score

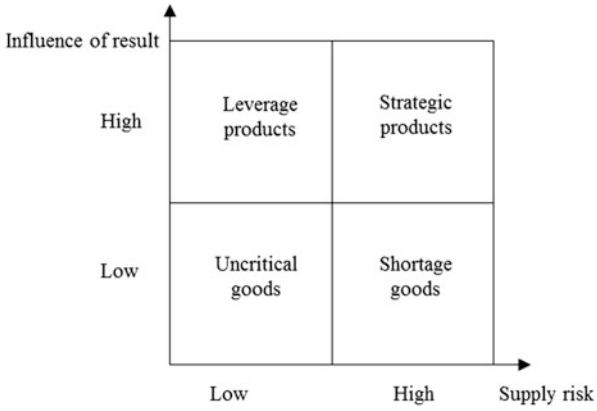

Fig. 5.12 2 × 2 matrix for product evaluation (Based on: Kraljic, 1988)

extensive market research and intensified interactions with the supplier. Noncritical materials demand correspondingly less.

For strategically important products, a purchasing portfolio can be developed in terms of the buyer's and seller's power. From this, further strategies may be derived. Table 5.6 provides an overview of the criteria for assessing these two dimensions and Fig. 5.13 gives an example.

From Fig. 5.13, a number of strategic recommendations can be derived, including:

- The allocation of purchases among suppliers; combining them into optimal cost order quantities
- Where to focus negotiations on price reductions and transaction costs, without endangering the supplier's survival
- Where spot market purchases can be made
- Where security stocks can be minimized
- Where to focus demands for quality assurance and improvement
- Where in-house production should be maintained or reduced

With a strategy of diversification, supply security plays a major role. Here procurement is limited to a few, comparatively reliable suppliers. The price emphasis is modest, long-term supply contracts are preferred, and the supplier is supported

Table 5.6 Assessment criteria for buyer's power and seller's power (Source: Kraljic, 1986)

Criteria for assessing seller's power	Criteria for assessing buyer's power
Market size in relation to delivery capacity	Purchase quantity in relation to the most important production units
Market growth in relation to capacity development	Growth of demand in relation to capacity development
Full capacity use or risk?	Full capacity use of most important production units
Competitive situation	Market share in comparison to the most important competitors
Return on investment (ROI)	Profit contribution of the most important finished products
Cost and price structure	Cost and price structure
Profit margin	Costs in case of a failed delivery
Particular quality of the product and technological stability	Possibility of in-house production, depth of integration
Entry barriers (due to necessary capital or know know)	Entry costs for new supply sources in relation to the costs of own in-house production
Logistical situation	Logistics

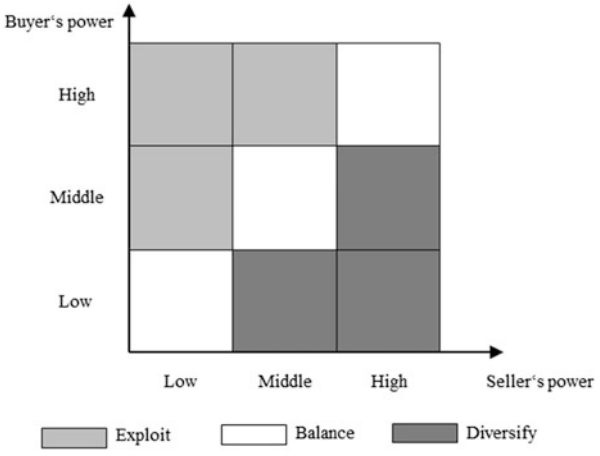

Fig. 5.13 Purchasing portfolio matrix (Source: Kraljic, 1986)

in their quality assurance efforts. The aim is to balance the goal of supply security and rationalization of procurement.

Such strategic recommendations must be approached with a degree of caution. The strengths of the approach lie more in the diagnosis than in therapy. It is suggestive but requires further examination and modification depending on particular circumstances. Such generic strategies cannot be a substitute for a detailed analysis, but they can make a valuable contribution to a procurement portfolio analysis.

For the supplier, there is the question of whether they can obtain feedback on how they have been evaluated. Suppliers are often interested in getting such

feedback and use it to help make improvements. This brings us to the next point—the supplier's response. These should be about improving performance in areas important to the buyer. Provided that the improvements are compatible with competitive circumstances, the responses of the supplier can lead to a strengthening of customer advantages, while improving the supplier's own sales at the same time.

5.2.3.2 Organization of Procurement

Business theories regarding the organization of procurement focus on process and structure (in the realm of which responsibilities are predominantly determined). As we have mentioned, these need to be designed so that the strategy pursued is fully realized.

Task analysis is the first step. The overall task is divided into subtasks. The procurement task may be divided according to function, type of purchase, purchase phase, purpose, or geographical aspects. The functions involved include demand analysis, demand assessment, market research, supply–source research, supply–source negotiations, selection of supplier, contracts, delivery, goods inspections, and delivery of supplies to actual users. The purchase phases include planning, implementation, and control.

Two fundamental issues arise:

1. Integration of the procurement function within the firm, including:

   - Centralized vs. decentralized
   - Definition of the scope of the tasks involved and who is able to do it, including the division of tasks between procurement and other departments such as production and sales
   - Regulation and coordination of cross-functional interfaces
   - The hierarchical positioning of the procurement department.

2. Internal organization of the procurement department, including:

   - Division into specialized units
   - Regulation of interdepartmental coordination, in particular communication between specialized units
   - Use of information and communications technology.

First, we consider the question of centralization, which requires that existing firms structure and processes are taken into consideration because they are hard to change quickly. More generally structure needs to match strategy.

The advantages of a centralized procurement are:

- Larger order quantities and quantity discounts. Internal, administrative order costs are reduced
- The number of suppliers can be reduced, which reduces transaction costs
- Standardizing materials used in the firm

- Reduced stock levels, saving storage space, and avoiding individual oversupplies
- Uniform treatment of risks, such as those related to labor laws, outsourcing, cooperation with supplier, etc.
- Ability to employ more specialized and technically qualified personnel
- Procurement is uniformly controlled and managed
- There is a clear division of tasks and responsibilities

The disadvantages of centralizing procurement are

- Longer chains of authority and problems with cross-functional relations
- Longer paths of communication with a loss of flexibility
- Danger of too little know-how (especially technical) and understanding of user's needs
- Higher transportation costs with a centralized delivery of ordered materials
- Innovations in the company may "leak"
- Problems encountered by the users cannot be directly discussed with the supplier

The conclusion to be drawn is that a balance needs to be worked out. Too much decentralization can have an equally negative effect as different parts of the firm act independently of each other.

For firms with purchasing functions distributed across several locations, the establishment of material group teams (MG teams) can be beneficial, with members drawn from different organizational units. Whether global teams are appropriate depends on the travel and communication costs resulting compared to the potential cost savings achievable through better coordination.

The concept of material group management is just as suitable for central services, such as computer-related procurement, consulting, market research, and more. A better term therefore is "service/performance group management."

To be customer-oriented, appropriate resources, skills, and qualifications need to be developed in the purchase organization. The team should be multifunctional and include members from the purchasing department, construction, sales (possibly marketing), quality assurance, and production (Droege & Comp, 1998). Having five to seven members has been shown to be effective (Kalbfuß, 1996). Because competencies from different areas of the firm are required, the term "competence center" has been used to refer to such teams.

The tasks of the team involve examining the extent to which supplies can be across the firm, assessing suppliers, and developing a sourcing strategy package. It meets at regular intervals to discuss current developments and procurement experiences. The advice of specialized external consultants may also be sought by the team. Figure 5.14 summarizes the concept of material group management.

The values presented in Fig. 5.15 illustrate how material group management unites centralized and decentralized structures.

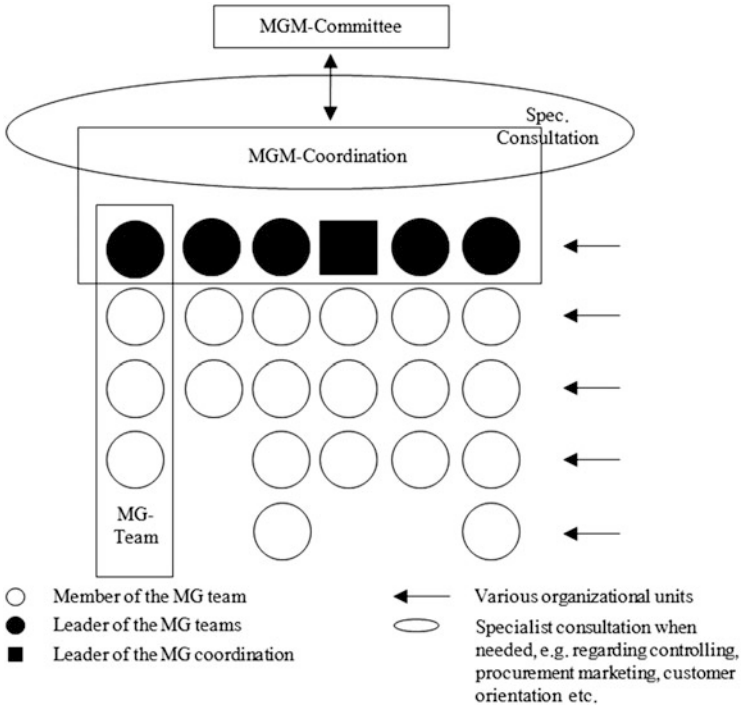

Fig. 5.14 The concept of material group management (Based on: Kalbfuß, 1996)

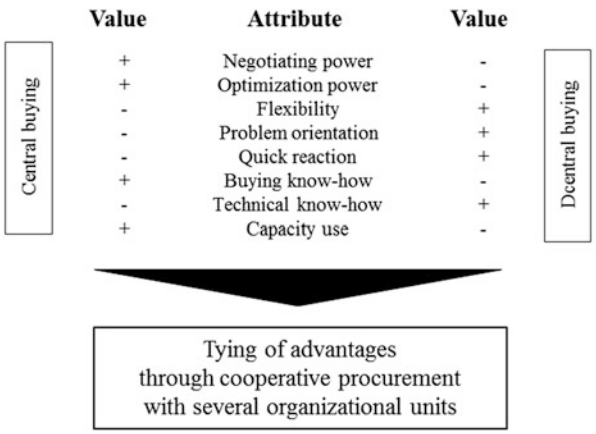

Fig. 5.15 Advantages of material group management (Based on: Kalbfuß, 1996)

Due to its multifunctional nature, material group management can be carried out without major adjustments or changes to the total organization. When the concept is consistently followed, the complete purchasing function may be carried out by the MG teams, providing that top management decides to delegate this responsibility.

With stronger decentralization, additional teams are formed for other work processes. These are appropriate when more than one organizational unit has a stake in solving a particular problem or can contribute to its solution. The initiator is often the unit for whom the problem is most important. The teams may be built based on agreements reached between individuals or by higher authority.

Teams are well suited for solving interfunctional coordination issues, particularly those related to function and know-how, because they overcome barriers created by work divisions and separate legal and organizational units. They can prove useful in both centralized and decentralized organizations but should only be kept on for as long as they produce results.

Successful team work for procurement can take various forms including

- Materials teams, including development/construction, production/production planning, purchasing/procurement, materials management/stocks/planning, users, norm points, quality management, controlling/cost accounting
- Supplier teams, including development/construction, production/production planning, purchasing/procurement, materials management/stocks/planning quality management, and users
- Supply management teams, including representatives of the customer (development, quality management and users); representatives of the supplier (sales, marketing, development/construction, quality management, production/production planning/logistics
- Make-or-buy teams, with, purchasing/procurement, materials management/stocks/planning, users, quality management and controlling/cost accounting
- Value analysis teams, with purchasing/procurement, users, quality management, controlling/cost accounting, and at least one strategic supplier
- International sourcing teams, with representatives from the most important purchasing departments or functions
- Information and Communications Technology (ICT) teams, comprising users from different parts of the firm areas

Teams could also be formed for certain processes or to facilitate coordination of cooperative and outsourcing activities. Procurement is then no longer the task of a single department but also involves other divisions in the form of a network. Procurement teams become service providers for all organizational units.

If supply management is consistently applied, a delegation of responsibility for certain supplier relationships is made to supply managers. These communicate with a key account manager on the supplier side. The customer analysis carried out by the key account manager will be made more difficult by the multidimensional structures in the buyer's company and the decision-making structures in the buying center are difficult for him to identify.

Network Competence

A way of assessing the requirements and skills required for establishing, coordinating, and managing supply relations is in terms of the network competence

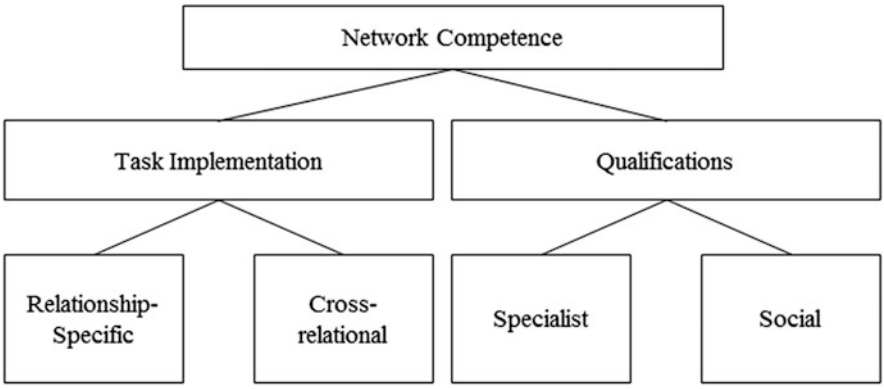

Fig. 5.16 Network competence (Source: Ritter et al., 2002)

of the firm. This is a concept developed out of German research on managing relations with technology partners (Ritter, 1999) but later generalized to all types of supply or interfirm relations (Ritter, Wilkinson, & Johnston, 2002).

A firm's network competence is defined as "the degree of network management task execution and the degree of network management qualification possessed by the people handling a company's relationships" (Ritter, 1999, p. 471). It comprises two dimensions as shown in Fig. 5.16. The first is *task execution* which comprises (a) relationship-specific tasks to maintain a single supply relationship—initiation, exchange, and coordination and (b) cross-relational tasks to maintain the network of connected relationships as a whole—planning, organizing, staffing, and controlling. The second dimension refers to skills and qualifications required including both technical and social/interpersonal. The items used to measure each of these dimensions and their subcomponents are provided in Ritter et al., 2002.

5.2.4 Market Research and Procurement Evaluation and Control

5.2.4.1 Procurement Market Research

More intensified market research is required these days due to the growing strategic significance of procurement. This is further complicated by the increasing levels of internationalization and global sourcing and the technological complexity of many products and services. The task of procurement market research is to systematically identify, process, and interpret information relevant to a firm's procurement planning and management. Market research involves the following steps:

1. Identifying the types of inputs to be analyzed
2. Identifying the kind of information to be gathered
3. Identifying the methods and information sources to be employed
4. Identifying the means of analysis and presentation of results (Stangl, 1985).

For cost reasons, extensive market research cannot be carried out for all potential inputs. It is necessary when there is a gap between the firm's requirements and existing offers.

Step 1. The following criteria are relevant in assessing the types of inputs to be more extensively researched (Stangl, 1985):

- Changes in the content, scope, timing of a firm's purchasing objectives
- Strategic changes
- Character of demand: consistent vs. inconsistent, first purchase, and one off purchases
- Purchasing risks: market, supply failure, performance, and payment
- Business risks: material handling (storage, distribution, disposal) production, sales, financial
- Value of the object: dollar spend, relative spend.

Step 2. Many types of information are required to evaluate procurement markets. These include the alternative supplies and suppliers available and the power of the buyers and sellers. The sales strategies of the suppliers are also relevant, as well as its strengths and weaknesses. Finally, if there is competition for supplies, information on the procurement strategies of competing buyers is a relevant consideration.

Step 3. The integration of procurement market research within a firm is an important issue. Centralizing all market research within one department can lead to various types of synergies and economies of scale and cope. But there are also advantages to locating purchasing-related market research in the procurement department or supply-management group. In some cases, ongoing market monitoring is left up to the purchasing department and large-scale projects are assigned to the market research department. Unlike sales-related market research, the creation of independent market research institutes for procurement market analyses is not common.

The methods of procurement market research are very similar to those of sales market research, which are described in Chap. 6.

5.2.4.2 Procurement Evaluation and Control

> The task here is formulating objectives and targets, guiding and directing the process or goal achievement, through providing timely and relevant information to aid the implementation process, and evaluating the results of procurement activities in terms of target achievement. On the basis of ongoing performance, methods of control, correction and adaptation are developed and action taken. Discrepancies between desired and actual are scrutinized and, based on the analysis, counter measures are recommended (Pfisterer, 1988 p. 68).

Several types of evaluative criteria can be relevant and can be assigned to individuals in the form of targets and objectives, which are then monitored over time. Some examples of such objectives are the following:

Definition 1

$$\text{Negotiation target} = \frac{\text{Acquisition price}}{\text{Market price}}$$

Definition 2

$$\text{Costs of order processing} = \frac{\text{Costs of procurement department}}{\text{Number of orders}}$$

Supply performance can be measured through a comparison, over time, of the following ratios:

Definition 3

$$\text{Complaints} = \frac{\text{Complaints}}{\text{Number of incomming goods}}$$

Definition 4

$$\text{Late delivery} = \frac{\text{Number of missed deadlines}}{\text{Number of incomming positions}}$$

Further important criteria are:

- Machine downtimes and production plan changes due to missing parts
- Price concessions
- Discounts
- Enquiries per buying agent
- Number of visits to supplier by buying agents

Procurement monitoring and control indicates which types of information are target and decision relevant and which can lead to further insights, including understanding and analyzing discrepancies between actual and planned results. Finally, analysis of this information provides the bases for identifying ways to improve procurement systems and procedures and supplier relations.

5.2.5 The Balanced Scorecard as a Tool for Procurement Control

The Balanced Scorecard (BSC) was originally developed at the beginning of the nineties by Robert S. Kaplan and David P. Norton because they were dissatisfied with existing tools for measurement and management (Kaplan & Norton, 1992). In particular, they criticized other methods because they overemphasized financial factors and because the link between control in terms of these measures and the firm and its strategies was not well developed. The aim of a "balanced" scorecard was to create a balanced relationship between qualitative and quantitative measurement criteria. Four perspectives are differentiated:

- Financial perspective: How do we appear from the view of the shareholder?
- Customer perspective: How can we best serve our customers? How do we position ourselves on the market?
- Business process perspective: How can we organize ourselves in such a way so as to guarantee long-term, efficient performance?
- Learning and growth perspective: How can we sustain and continuously improve our strengths and innovative potential?

A large advantage of the BSC is that, when used correctly, it allows a joining of corporate strategy, divisional strategies, and operations implementation into one cohesive system. The following conditions need to be fulfilled:

- Strategic and operational activities as well as divisional and corporate activities must be closely aligned and interrelated.
- Effective control systems need to be in place.
- Appropriate and timely management communication systems need to be established, including both top down (setting objectives) and bottom up (feedback and objectives agreement). The Balanced Scorecard team should be comprised of individuals from various departments/divisions or corporate units.

The most important elements for successful development and implementation of the BSC concept are

- Definition of strategic targets.
- Description of the group involved or affected.
- Specification of key questions to be addressed in regard to each of the four perspectives, i.e., strategic targets, success drivers, key resources and outputs, measurement criteria, and underlying values.
- Definition of performance measures.
- Implementation of a continuous improvement process.

For the procurement strategy, it is necessary to position the company with regard to more general strategies, such as overall supply management or e-procurement strategies and strategies related to material groups and supply-specific elements.

Strategically relevant aspects at the general firm strategies need to be translated in more specific departmental, divisional, and functional strategies and targets. The corresponding business processes then need to be specified and tied to the financial and other control criteria.

Figure 5.17 illustrates the way a Purchasing Scorecard can be linked to the overall Company Scorecard.

5.2.6 Quality Control in Procurement

Quality control in the form of total quality management (TQM) is an important focus of procurement organization, as a means of responding to competition and customer requirements. This applies particularly to the supply of materials and components but can extend to the procurement of complex inputs. Cost considerations have meant that many processes previously undertaken by a firm have been shifted to the supplier, including areas such as goods receipt, quality assessment, and material flow. As a result, suppliers are being increasingly featured and integrated into TQM systems. TQM is a management method that strives to place quality at the center of attention, where quality is defined as the fulfillment of customer requirements, as the means to ensure long-term business success for the firm and for society in general. The TQM concept is similar to and complementary to the concept of customer orientation described in Chap. 2.

TQM arrangements are defined in contract agreements and secured by audits and certification of quality assurance systems. Suppliers must demonstrate their quality control capabilities through the ISO 9000 certification system or a firm may enforce its own regulations. Chrysler, Ford, and General Motors introduced the norm QS-9000 in 1995 and asked their suppliers to realign their quality management systems to it to gain certification by an accredited institution. Today, many automobile manufacturers use independent but accredited institutions to help with the control and assessment of supplier quality. This means the customer no longer needs to engage in quality control and inspection systems itself, which reduces its costs. There is, of course, always the question as to whether a neutral certifier is truly following all the conditions required by the customer. A way of dealing with this issue is to establish clear quality standards for auditing and certification by third parties.

The ISO 9000 standards are structured as follows:

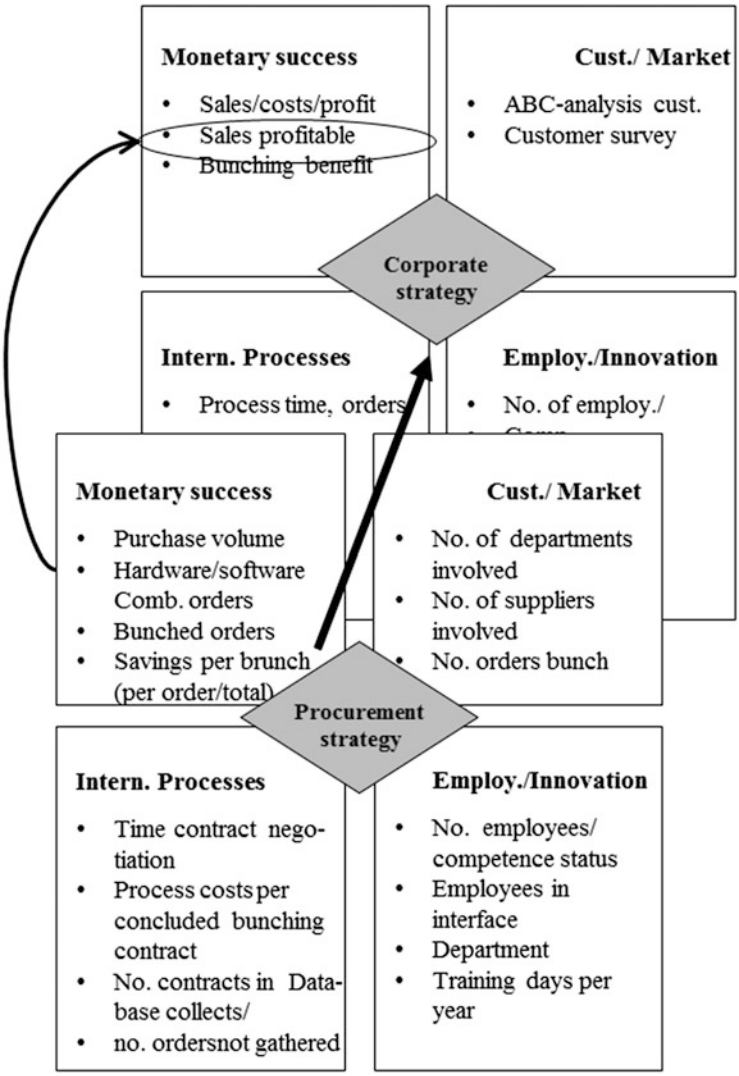

Fig. 5.17 Possible joining of a purchasing scorecard and a company scorecard (Source: Engelhardt, 2003)

ISO 9000 (2005): Quality management—fundamentals and vocabulary. This standard is an introduction to the topic of quality management in firms. The most important concepts are discussed and the terms used are defined. The system process model used in ISO 9001 is also described.

ISO 9001 (2000): Quality management systems—requirements. This sets down the detailed specifications for a quality management system. The main elements are

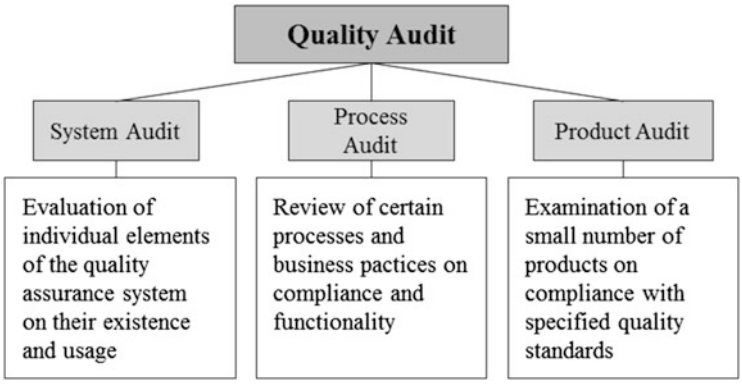

Fig. 5.18 Types of quality audits

based on PDCA (Plan, Do, Check, Act) and focus on process quality optimization perspectives.

ISO 9004 (2000) provides a guide that deals with the effectiveness and efficiency of quality management systems. It includes instructions for implementing TQM. It is, however, not a basis for certification or contracts.

ISO 9002 (1994) and ISO 9003 (1994) have been removed.

A quality audit involves assessing whether organizational procedures introduced to assure continuous quality are adhered to and are in compliance with the ISO standards. There are system, quality, and product audits, as summarized in Fig. 5.18:

The costs of certification depend on the size of the firm to be audited. But many firms underestimate the potential cost savings that will result. Processes are optimized, tasks are clearly delegated, and weak spots are identified. The entire effort is aimed at achieving zero error in production and delivery.

Certification is repeated or reconfirmed about every three years. Because competition has prompted nearly all suppliers to seek certification, many customers have begun placing even greater quality demands on their suppliers. In addition, there are now various types of "quality awards" established in different countries to support, reward, and celebrate achievements in this area. The forerunner here is Japan, where the International Demming Application Prize has been awarded annually since 1950. In the U.S., the Malcolm Baldrige National Quality Award has been awarded since 1987 and since 1992 the European Foundation for Quality Management prize has been awarded. The criteria extend far beyond the certifiable quality assurance system presented in the ISO standards. The European prize, for example, recognizes firms:

- Whose products and services achieve a high level of customer satisfaction
- With a high level of internal quality in the sense of satisfied employees
- Who have fulfilled their own quality goals to a high degree

- Who practice process management of a model character
- Whose management behavior is quality-oriented
- Whose application of resources is quality-promoting
- With an exemplary quality strategy
- With an extraordinary position with regard to social responsibility.

The criteria for the quality awards provide a basis for assessing supply relationships generally and potential suppliers may even be asked about awards they have won in addition to certification.

5.3 Procurement Process Organization to Improve Supply Chain Management

There are a number of business and environmental trends that impact on corporate strategy, including procurement (Schönsleben, Hieber, & Alard, 2003):

- Increasing globalization
- Increased focus on core competencies
- More modular- and system-sourcing concepts
- More frequent formation of differentiated and strategic customer–supplier relationships
- Faster dynamics and quick response to customer wishes
- Increasing process and network orientation
- Increased use of information- and communication technologies.

All of these impact on procurement. Increasing globalization has resulted in a greater focus on global sourcing strategies, which is an efficient way of organizing international procurement processes and a source of competitive advantages. A greater focus on core competencies means more of a firm's activities are outsourced. Modular- and system-sourcing concepts lead to the development of more focused and differentiated customer–supplier relationships. The shift from a producers' to a buyers' market also leads to greater competition shorter product life cycles, and growing product complexity, which make business relationships more important in achieving success. Finally, the trend toward flexible, process-oriented organizational structures depends on the use of modern information and communication technology in logistics and e-commerce systems.

5.3.1 E-Procurement Solutions

The term "e-procurement" includes all network-oriented solutions ranging from "...the simple, electronic communication system, to the electronic catalogue system, requests for proposals and auctions, to electronic markets and supply chain management concepts." (Brenner & Zarnekow, 2003). E-procurement integrates all

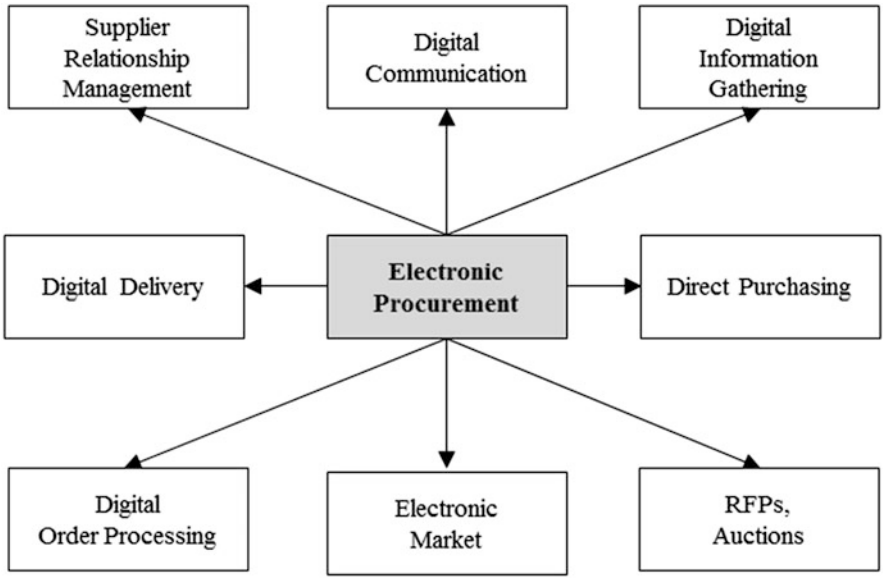

Fig. 5.19 Application areas for e-procurement (Source: Brenner & Zarnekow, 2003)

forms of electronic communication processes for purchasing. The objective is to reduce costs, save time, and improve quality.

Eight different areas of application for e-procurement may be distinguished, as shown in Fig. 5.19.

The Internet has dramatically changed communication behavior. The best example of this is email. With the increasing use of broadband Internet, the telephone and paper mail services have to a great extent been replaced and online conferences are a common practice. Also, the Internet is a vitally important source of information for firms. In addition to the general information to be found on the web, many specialized service providers offer databanks with specialized information services for purchasing.

Using direct purchasing systems makes it possible to carry out procurement processes in a decentralized manner, without the involvement of a specialized procurement department, efficiently and effectively, while at the same time maintaining centralized monitoring and control. It also provides for greater transparency in the form of online manuals, software, and market data. Originally, these systems were used to order low-value and indirect products, such as cost center materials, auxiliary materials, tools, or repair services. Now, any products or services that can be ordered from catalogues can be bought using desktop-purchasing systems, which automatically generate invoices and order confirmations.

Direct purchasing systems can be accompanied by "purchasing card systems," which are special kinds of company credit cards with corresponding accounting

systems that can be given to employees. Within the budget on the card, the holder may make decisions autonomously. Accounting control is done by the financial service provider. If purchasing cards and desktop-purchasing systems are combined, the credit card can be restricted for use only for suppliers listed in the catalogue system. The advantages of decentralized procurement are thereby achieved without sacrificing the possibility of a central supplier control and evaluation.

Project-specific services not found in the catalogue may be requested electronically, including requests for proposals, auctions, or electronic market places.

Electronic markets can be classified in various ways (Arnold, 2003):

- Open vs. closed
- Horizontal vs. vertical
- Buyer-oriented, seller-oriented, or neutral
- Consortial vs. individual firm

In closed e-markets, there is trade only with existing suppliers, whereas, in an open market place, others may also register and participate. Horizontal e-markets extend across all sectors having to do with, for example, maintenance repair and operation (MRO) related purchases. Vertical e-markets tend to focus on one sector only and high-values parts. E-markets maybe controlled by buyer or seller firms or neutral third parties. They may also involve consortia of firms with common interests in developing e-markets for the products and services they buy and sell. Who operates and controls the e-market is important in terms of possible fees, the volume of transactions concluded and data protection.

While e-procurement systems mentioned serve to optimize routine procurement processes, the *concept of e-collaboration* goes further than this. It is designed to improve production costs more generally and involves greater degrees of cooperation and coordination of activities among suppliers and customers. These are referred to as supply chain management concepts or supplier relationship management and include

- Information gathering and analysis
- Cooperation and coordination of activities
- Integration of business processes across the entire supply chain.

Table 5.7 shows a supply chain management structure for the procurement of direct and indirect materials.

5.3.2 Efficient Customer Response and Supply Chain Management

Efficient Consumer Response (ECR) is a strategic concept for cooperation between producers, wholesalers, and retailers, primarily in consumer goods markets. It aims

Table 5.7 E-procurement strategies for direct and indirect materials (source: Arnold, 2003)

Procurement object:	Indirect material	Direct material
Procurement concept:	E-procurement	Supply chain management E-collaboration
Procurement objective: (optimization objective)	→ Efficiency (Process costs)	→ Effectiveness (Production costs)
Procurement path: (Example)	Optimization of procurement costs through process automatization using catalogue order systems (desktop purchasing systems or electronic, Internet-based catalogue market places)	Optimization of procurement prices through bunching effects and market power, and the employment of modern negotiation tools (e.g., online auctions, online RFPs; and, in particular, online reverse auctions, collaborative commerce or e-collaboration)

at structuring the entire value chain in an integrated manner ECR has the following subobjectives (Corsten & Gössinger, 2001):

- Efficient inventory management and replenishment
- A customer-oriented and profit-oriented product range achieved through cooperation between manufacturer and distributors
- Coplanned and implemented sales campaigns
- Efficient product launches.

The last three are often referred to as "category management." ECR is broader than "quick response" delivery systems, as it aims at developing an efficient and effective overall process organization involving "continuous replenishment."

To guarantee continuous supply, an attempt is made to optimize stock levels using automatic stock replenishment systems. These involve inventory and order information being automatically communicated to a central warehouse and outlets for analysis and response (Gleißner, 2000). The order rhythms of distributors are synchronized with actual demand and the management of inventories is transferred from the distributor to the manufacturer. This is achieved through the continuous exchange of sales and delivery information between those involved.

Figure 5.20 depicts a quick response system.

If the manufacturer controls the distributor and retailer stock levels, the term "vendor managed inventory" is used. A mixed form of control is "comanaged inventory." Common data and communication standards between the firms are necessary such as the European Article Numbering EAN-System and the Unified Coding Council UCC-System and Automatic Data Capture for capturing barcode scan data. Regarding the labeling of articles, different standards may be used. With the introduction of new technologies, there has been a convergence between digital services and physical service delivery. Technologies like Radio Frequency

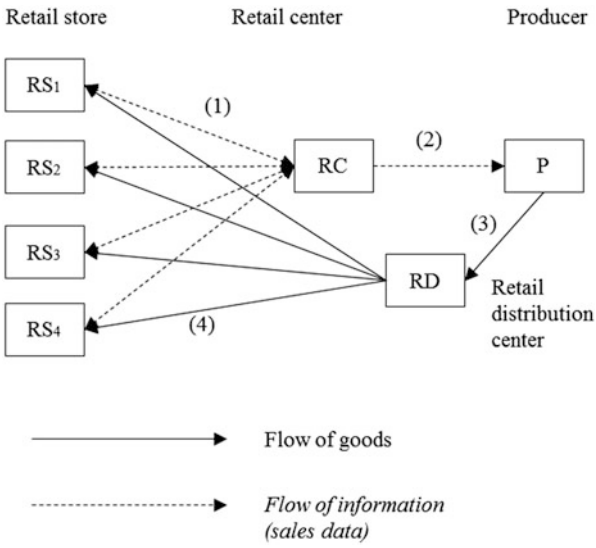

Fig. 5.20 Procedures for a quick response system (Source: Corsten & Gössinger, 2001)

Identification (RFID) make it possible to present real objects like people, products, and/or business resources in the virtual world of the Internet. In this way, the physical and online worlds are automatically linked to each other and manual interfaces are minimized. "Passive RFID tags" are creating enormous advantages in the areas of identification, location or follow up. In the future, there will be more and more active or smart tags, which independently take up information from their environment (e.g., temperature), process it (e.g, is this temperature too high?), and communicate it to relevant parties (e.g., warning, temperature is too high) (Fleisch & Christ, 2003).

The ECR concept is an application of the just-in-time strategy. As with just-in-time, EDI (Electronic Data Interchange) plays a major role in the communication between different companies or divisions. The information communicated can include origin data, invoice data, regulation data, sales information, and order data. Electronic transfer on the basis of uniform standards accelerates the flow of information and reduces the rate of errors. This in turn reduces the time needed for business processes. Through reduced stock levels, logistic costs are reduced and personnel may be reduced due to the low error rates (Corsten & Hofstetter, 2003). With the further development of these technologies, there will be even more improvements in the future.

5.3.3 The Evolution of Supply Chain Management

There are five phases in the evolution of production and procurement planning systems (Bellmann, 2002):

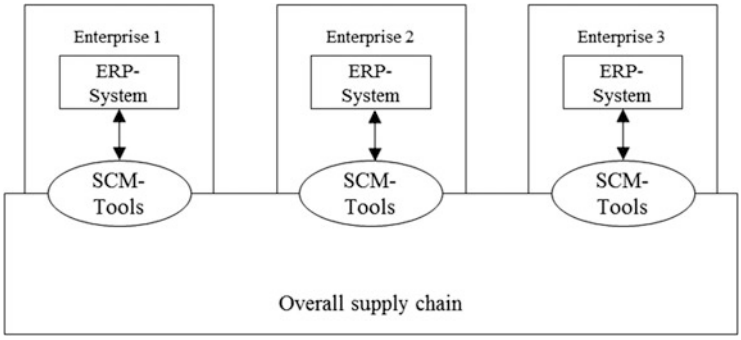

Fig. 5.21 Interplay between ERP- and SCM systems (Source: Corsten & Gössinger, 2001)

- Production planning
  This is the era of production orientation that still dominated in the middle of the twentieth century. Here production, assembly, delivery and stock management, research and development, and procurement are all viewed as subelements of production.
- Material Requirement Planning (MRP)
  The emergence of the MRP concept resulted in the separation of procurement from the other tasks of production in order to seek greater efficiencies. Sales initiated demand, which was then carried out by production and procurement. With the help of item-list processors, the secondary demand for production and procurement according to type, quantity, and delivery date was generated.
- Production Planning and Control (PPC)
  Due to the increasing rate of change in products and increased component variety in the 70s, a need emerged to expand MRP systems. The PPC systems were developed to deal with these more complex buying tasks and allow for flexible planning. The best known concept is the Manufacturing Resource Planning or MRPII concept.
- Enterprise Resource Planning (ERP)
  The next step in the evolution of the procurement function from a purely operational focus to a key area of strategy came as the PPC system was embedded into integrated business application systems. These ERP systems comprise modules for financial accounting, cost and performance systems, personnel management, quality management, all the way to maintenance management, and corporate planning (Corsten & Gössinger, 2001).
- Extended Resource Planning (XRP)
  The convergence of intraorganizational coordinating systems, such as ERP, and supply chain systems did not occur until the midnineties. There were two different kinds of developments (Corsten & Gössinger, 2001). First, existing supply chain management software systems now took over individual ERP modules. Second, ERP systems were being supplemented by certain types of supply chain management (SCM) models. But existing ERP systems remain and continue to form the backbone of XRP systems (Bellmann, 2002). Figure 5.21

shows the interaction of the two systems in supply chains today. The future will involve even more sophisticated, intelligent, flexible, and integrated ICT systems linking and coordinating the activities of the networks of firms involved in supply chains.

Exercises

1. Characterize the term "supply management"!
2. Name, categorize, and describe the different types of procurement objectives!
3. Give the main characteristics of just-in-time procurement!
4. Explain the advantages and disadvantages of "single sourcing," "sole sourcing," "dual sourcing," and "multiple sourcing"!
5. Give the main characteristics of "modular sourcing" and "system sourcing"!
6. Explain the advantages and disadvantages of "local sourcing" and "global sourcing"!
7. Briefly describe the particular features of "internal sourcing"!
8. Explain the advantages and disadvantages of "stock sourcing" or "just-in-time sourcing"!
9. Explain the requirements for and manifestations of "collective sourcing"!
10. Name and describe the different approaches to procurement planning!
11. Discuss the advantages and disadvantages of a centralized purchasing organization.
12. What is to be understood by the term "material group management"?
13. What are the tasks of procurement market research?
14. Discuss the advantages but also possible problems tied to a use of the Balanced Scorecard!
15. Describe the concept of "total quality management"!
16. Explain the difference between the terms "electronic procurement" and "supply chain management"!

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