

*The performance of the supply chain directly impacts the performance of a business.*  
(cp. Plattner and Leukert 2015, p. 129).

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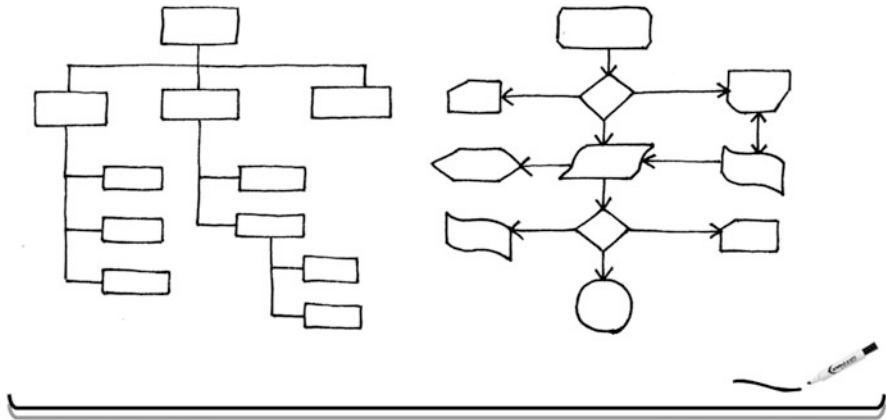
## 2.1 The Reference System of the Business

In order to develop an understanding of the special importance of the supply chain, the initial necessity to divert from the often widespread functional, to a process-oriented way of thinking and perspective, is essential. The figure below clearly shows the difference in graphical form (Fig. 2.1).

The influence of the process view of the business's success may not be detected other than in operational practice. Even scientific studies to investigate factors that have a significant impact on the company's success show that the market success largely depends on the observation and improvement of key business processes.

The process view with reference to the supply chain is very well represented in the work of Schönsleben (2012).

Let us examine an example of a concept of integration in which the business processes are at the centre, described in more detail, and are presented as the operational reference system. The graph summarises the integration concept, developed as part-funded by the European



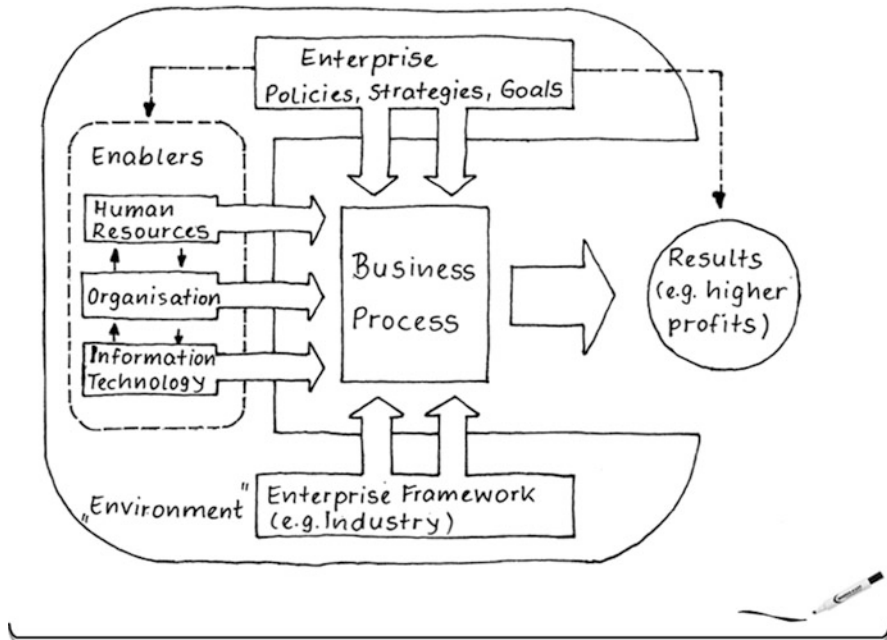
**Fig. 2.1** Simplified representation of functional vs. process views

Commission project CEBUSNET and involving the research groups of six European universities (Fig. 2.2).

As can be seen from the diagram the corporate strategy, goals and policies are paramount. These directly determine the business processes depicted by the thick arrows. Above and beyond this, they also determine the influencing factors, i.e. employees, organisation, and information technology as well as the results (depicted by the dotted arrows). Input variables such as e.g. raw material, labour and data, and output variables such as products and services, as well as activities and process steps, are not explicitly shown in the diagram, but do represent an inherent part of business processes.

The complete working paper with the CEBUSNET study can be obtained at no charge from the following website (cp. Seibt 1997): [http://www.islp.uni-koeln.de/fileadmin/wiso\\_fak/islp/pdf/WP\\_97\\_01.pdf](http://www.islp.uni-koeln.de/fileadmin/wiso_fak/islp/pdf/WP_97_01.pdf).

The central element visually represents the business processes resulting from the corporate strategy and objectives. It is strongly affected by the influential factors and the business's specific context (represented by thick arrows). The detailed influencing factors include the human resources (employees), information technology, and organisation. The influential factor 'employees' includes all process-related aspects that play a role in improving the skills and



**Fig. 2.2** Consolidation framework for business process design (cp. Seibt 1997, p. 6)

the motivation of employees. Information technology has been considered for quite some time now to be a relevant factor for enabling optimum process handling. It includes the application solutions and information systems, and related procedures and processes. Also, in addition to the organisation as a factor influencing its own structure, the rules and operations are summarised in so far as they are related to the business processes. The business-specific context (environment), is influenced by factors such as the industry, the individual competition, import and export restrictions, and so on.

Depicted on the right hand side are the results of operations or the handling of business processes. These are, for example, the products and services that arise from the business processes. Further results are the key performance indicators, such as customer satisfaction and cycle time which are defined as business targets.

A very compact and outstanding overview of the strategic management and the definition of corporate strategy and objectives can be found at [Kotler et al. \(2010\)](#).

These will be discussed in more detail in further course, as they play an important role in the context of supply chain management. Results may be either intentional or unintentional. An intentional result could be to achieve higher profits; an unintentional result could be the disclosure of losses as opposed to profits. The risk of unwanted results arises partially due to the definition of corporate goals and strategy.

Over and above this and with regard to the four main areas shown which are important for the execution of business processes—namely business, influencing factors, the corporate context and results of operations—feedback processes are of course in existence that are not explicitly shown in the diagram.

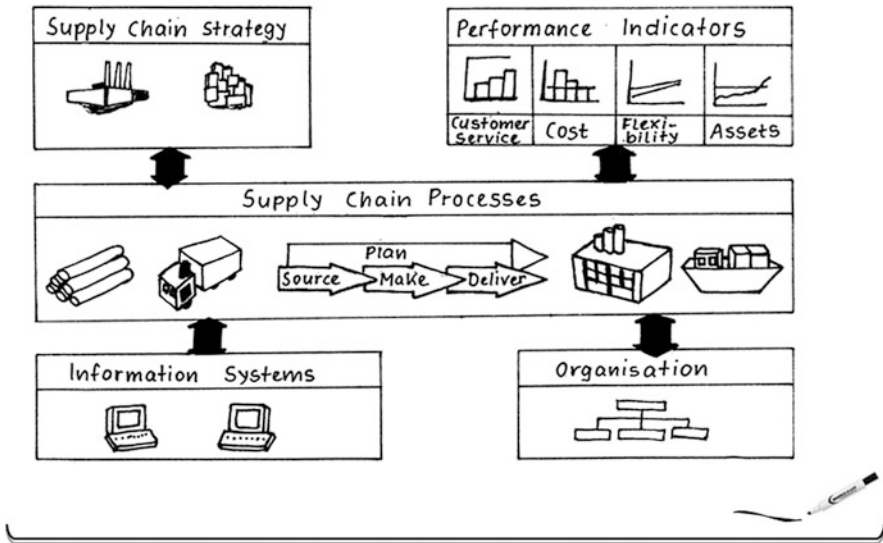
Since the concept of integration as a comprehensive framework for businesses and the supply chain runs through all the relevant business process areas, reference to this will be made on several occasions in further course. It is used, in a sense, as a kind of “continuous thread” that runs through the book and will help to keep the focus on the essential—or, in other words, on the actual and required knowledge levels of management and employees with regards to the processes in procurement, manufacturing, storage and logistics. But first, clarification is necessary as to what actually lies hidden beneath the concept of the supply chain.

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## **2.2 What Is a Supply Chain?**

To view the supply chain in the further course of working closer therewith, we will first attempt to establish a definition of the term. Synonymously, the term logistics chain is sometimes used. The difference is that the logistics chain focuses on the physical activities of the logistics in the narrower sense. In addition to this, the supply chain covers the accompanying monetary and information flows and extends much further.

In literature we find a large number of definitions, some of which are listed below by way of example. Because the term has been mainly developed in the United States and advanced from there, the definition has been heavily influenced by writers from the English-speaking world (Fig. [2.3](#)).



**Fig. 2.3** Typical elements of supply chain (cp. Myerson 2015, pp. 4)

Understanding the supply chain is of particular importance to those who are involved in measures to implement process and system improvements. The definition of a supply chain can vary greatly, dependent upon the perspective from which the definition is made. The current trend leans more towards a broader definition. For example, the area in focus has been extended and added to the view expressed in the CSCMP definition as part of a conference conducted by the Council of Supply Chain Management Professionals (CSCMP) in 2002. In accordance with this, the supply chain can be described as the total of all activities, processes, etc., which are applied to the product from the beginning to the end.

The Council of Supply Chain Management Professionals (CSCMP) was founded in 1963 in the United States under the original name National Council of Physical Distribution Management (NCPDM). The name was later changed in Council of Logistics Management (CLM) and the acronym finally renamed CSCMP. Further information can be found on the following website: [www.CMP.org](http://www.CMP.org)

In this sense, a supply chain approximately begins with the extraction of mining ores and the planting of seeds, i.e. acquiring raw materials

from the earth. The chain flows through a variety of conversion and distribution processes that deliver the product to the end user. It ends with the final disposal of the product and its residues. In accordance with this understanding, however, the supply chain is more than the physical movement of the goods: It also includes information, financial movement and the creation and distribution of human resources.

The *product lifecycle* includes the essential stages of the product development through the production and right up to recycling. Changes and improvements must constantly be carried out above and beyond the lifecycle, which will only then create a lasting success in the market (cp. Stark (2015), pp. 5).

In summary this suggests that the supply chain covers all processes throughout the product lifecycle, including the physical, informational, financial and knowledge-based processes for moving products and services (from suppliers through to end users). With the inclusion of the process side, it follows that this results in a supply chain being composed of all people and businesses involved in the development, production and supply of a product or service to the market.

### 2.2.1 Meaning of Supply Chain

The definitions to be found in the scientific and application-oriented literature include a whole range of perspectives—from a very narrow to very broad concept delineation. Although the spectrum of the supply chain has expanded considerably in recent years, even today narrower or barycentric definitions can be found. The following explanations represent an overview of the various approaches to the definition given to the supply chain. Their comprehension is a prerequisite for also understanding the approaches to the management of the supply chain.

Initially, the difference between the definitions can be distinguished by studying from which side the supply chain is approached, i.e. the customer or supplier side. In the supplier-centric approach, the supply chain is a network of suppliers which manufactures goods. These goods are exchanged both mutually and with other parties. The

goods come from the original supplier, and finally reach the target customers. In between, they often pass through middlemen and processing businesses.

In contrast, the customer-centric approach assumes that a supply chain consists of all stages that are, directly or indirectly, involved in and required in order to fulfill a customer request. The focus in this case lies specifically upon the transportation businesses, warehouses, retailers, and the actual customer. The combination of the two approaches leads to a higher-level definition of that, for which a supply chain is recognised, namely the coordination of organisations in order to provide the market with products and services.

A good overview of the customer- and supplier-centric approaches can be found, for example, at Chopra and Meindl (2015).

This comprehensive view can still be raised to a global level and placed into the context of a global organisation network. A supply chain is, in this sense, a global network of organisations which work together to improve the material and information flow between suppliers and customers. The operational objectives are the lowest possible cost and the highest possible speed. The ultimate goal is the satisfaction of customer requirements. The material flow runs, so to speak, in a forward direction (i.e. from suppliers to customers). The flow of payments, however, runs backwards (i.e. from customers to suppliers).

To observe the supply chain from the viewpoint of the material and information flows, Bolstorff and Rosenbaum (2011) and Govil and Proth (2002), are highly recommended.

In addition to this, information flows from customers to retailers, manufacturing businesses, logistics businesses and raw material suppliers. Material flows from the original raw material or component suppliers to customers. It is imperative for both material and information flows, that the process amongst supply chain partners is carefully coordinated. This implies that a close coordination, both forward- and backward-facing, is necessary.

This approach can be further differentiated by the supply and demand aspect. A supply chain then has the primary purpose of delivering products and services from the suppliers to the consumers (e.g. organisations, businesses, and individuals). The activities within the supply chain change, depending upon the product and the nature of the demand. However, a number of generally applicable value-adding activities allow themselves to be identified:

- Producing: manufacturing materials, components, etc.
- Combining: assembling, packaging, etc.
- Moving: distributing, collecting, etc.
- Storing: movement into storage, out of storage, etc.
- Customising: installation, configuration, etc.

The demand-side supply chain, which is also called the demand chain, focuses on the market demand to suppliers. The specific observance of the demand element accentuates the fact that the role of such a supply chain is virtually governed by the requirements and actions of the customer. This is sometimes called “The Concept of Control by Demand Pull” (as opposed to “The Concept of Supply Push”).

In the case of the prevalent *supply-push approach*, semi-completed and completed products are manufactured and stored until they can be sold and delivered due to customer orders and within the next stage of the supply chain. This often results in long lead times and high inventory levels. In contrast, the *demand-pull approach* is characterised by the customer’s decision to purchase a particular product for which he specifies his exact requirements in terms of type and delivery time. Based upon this, the required quantity of resources is procured. The production and distribution process should lead, as far as possible, to a close correspondence with the customised delivery, as requested by the customer (quality, time, location, etc.), (cp. e.g. [Poluha 2007](#), pp. 8 and pp. 25).



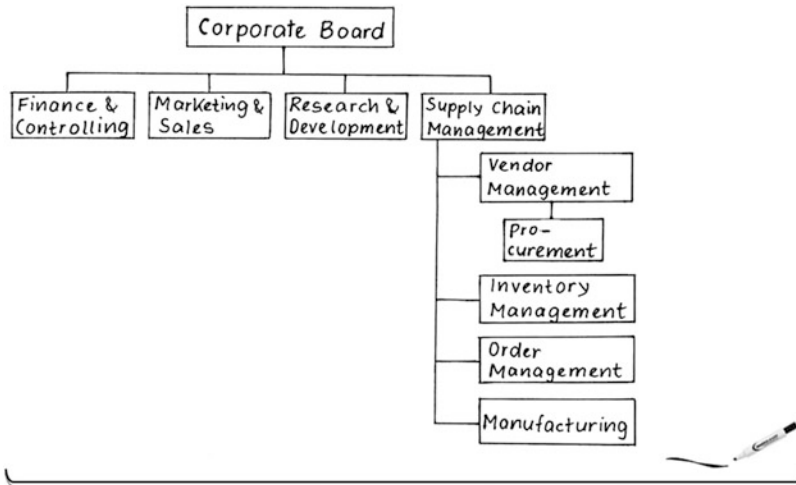
Just as a supplier can have a variety of supply chains which he must control, the supplier's customer has his own particular demand chains, which can be separately analysed. The demand chain enables the conversion of the customer's goals into information, which can be used as a working guideline by the supplier. It is governed in this sense by a decision-making process, which in turn is characterised by four generally-accepted stages: the first stage is the definition of the purpose of the demand chain. In the second stage the planning takes place, for example, in the form of a categorised plan. The third stage can then include the monitoring, control and management of usage and requirements within the inventory. Finally, the focal point of the fourth and last stage deals with the purchase transactions, e.g. the call order within a framework agreement.

Another approach is the organisation-specific observation of the supply chain. In accordance with this, the supply chain is a series of processes within the business as well as with other businesses (intra- and inter-business processes), which produce goods and services for customers and also deliver to them. It includes activities such as the material procurement, production planning, and distribution.

The organisation-related perspective is well represented by Bovet and Martha (2000).

These activities are supported by the necessary information flows. Purchasing, manufacturing, inventory management, warehousing and transportation are usually considered to be a part of the supply chain organisation, whereas marketing, sales, financial accounting, and strategic planning, are not. Product development, sales planning, order entry, customer service and cost accounting are not clearly classified: although they clearly belong to the supply chain processes, they are rarely a part of supply chain organisation (see Fig. 2.4).

If the process- and organisational-side perspectives are combined, the supply chain includes all the organisations and processes that are required for the procurement, storage and disposal of raw materials, and semi-completed and completed products. The material flow is connected by physical, monetary and information-side processes.



**Fig. 2.4** Example of a supply chain organisation (cp. Cohen and Roussel 2013, pp. 91)

The approaches already discussed arise from a one-dimensional method of observing the supply chain. A further-reaching distinction can be made on the basis of stratification into different levels. Thus, a supply chain is a sequence of suppliers and customers that starts at one end with a raw material and provides a finished product to the end customer at the other end. The supply chain can then be broken down into several levels.

A single-stage supply chain only represents the direct customers and suppliers, whereas a multi-stage supply chain can be extended to encompass the suppliers of raw materials on the one hand and the removal of worn-out end products on the other. The complexity increases disproportionately with an incremental number of levels. Therefore, most businesses have neither the means nor the resources to monitor the entire supply chain network, and are therefore limited to one or two levels. In addition to the levels, consideration must be given to the components flowing through the supply chain, and these must also be included into the illustration: goods and services in one direction, payments in the other, and information in both directions.

The understanding of a bi-directional flow of information reflected herein represents the reality far better than the one-directional flow of

information previously described. Current approaches such as the concept of Collaborative Planning, Forecasting and Replenishment (CPFR), are based upon an information flow in both directions.

The concept of *Collaborative Planning, Forecasting and Replenishment (CPFR)* provides both suppliers and customers with a cross-business cooperation for demand and sales forecasts, as well as a regular update of plans based upon a dynamic exchange of information, and has optimal inventory levels for customers and a reduced inventory for the suppliers as its goal (see e.g. Handfield and Nichols 2002, pp. 298).

Another criterion that can be included and flow into the description of supply chains exists in the form of the decision aspect. Within a supply chain that includes a relatively large number of supply chain partners, a number of decisions must be made. These decisions usually apply to investments, strategies for coordination and cooperation with partners, customer service, and profit maximisation strategies, etc. Some of these decisions have far-reaching effects upon the supply chain and are of a complex nature, because an ever increasing degree of uncertainty pertaining to the impact and variety of variables must be taken into consideration due to increasing market dynamics. The resulting supply chain is sometimes referred to as a market-driven supply chain.

If one integrates the corporate functional areas and the associated core activities, this leads to a functional description of the supply chain. The following five core activities can then be identified within a supply chain:

- *Sales activity*, which includes all market-orientated activities, including marketing and retail.
- *Purchasing activity*, which includes those tasks required in order to purchase raw materials, components, resources and services.

- *Manufacturing activity*, which involves the creation of products or services as well as the required guarantee for maintenance and repair of the resources, and the training of employees—in its entirety therefore, the implementation of all tasks that are necessary for production.
- *Movement activity*, which includes the transport of materials and personnel, both inside and outside the supply chain.
- *Warehouse activity*, which involves the products currently under development (Work in Progress, or WIP), as well as raw materials, whilst they await transportation or alteration, and the end-products before they are sent to the customer.

The incorporation of the functional area-related activities highlights the transition from a static to a dynamic perspective of the supply chain.

For the “penetration” of the supply chains due to the Internet and its implications for the supply chains, cp. for example Gottorna (2012/1 and 2012/2), and Ross ([2011](#)).

The flows of material, payments and information previously mentioned have hitherto been regarded as linear and coupled. The introduction of the Internet and the related acceleration of the flow of information mean that these flows have been, to a certain extent, uncoupled from each other, and the information flow occurs largely independently from the material and payment flows. Thus, the supply chains have, in the traditional sense, further evolved into networked supply chains, which link the partners within the network to the most suitable components, technologies and customer services. These networks are also dynamic in nature, allowing supply chain partners to be subjected to inclusion or exclusion in accordance with certain criteria (such as customer preferences, technological advantages or product lifecycle).

The value generation in the sense of profit gained by corporate activity constitutes the initial aim of the productive activities of businesses. It is measured using the difference between the performance of a business entity and the intermediate performance rendered in order to secure the provision of the said performance. There is usually an expectation that the added value created (value-add), will lead to higher business revenue (non-profit organisations are the exception). The generation of value embraces the increase in not only monetary, but also non-monetary values, which is regarded as desirable by the business's management, its employees, and its shareholders. In this respect, a generation of value results not only from an improved and increased profitability (of income in relation to expenditure or performance in relation to costs), but also from the improved effectiveness and greater efficiency of operational processes (see e.g. Thurow [2008](#), pp. 419).

These dynamic supply chains drive, amongst other things, the development of new business strategies, in which the integration of customers, the outsourcing of business functions, the customer and supplier cooperation, and warehouse management are the focal point. Traditional linear supply chains are thus converted into dynamic networks.

Another integral element of such supply chains is their value-adding character. The supply chain, accordingly, is a network of organisations linked to each other in both a forward-orientated and backward-orientated fashion, in order to generate value within different processes and activities. This value is reflected by products and services which are delivered to end users. This generation of value may be seen in both a cross-business and business-internal respect.

The relationship between the value generation and the corporate strategy may be summarised as follows (in accordance with Normann and Ramirez [2000](#), p. 186):

Strategy is the art of generating value. It provides the notional framework, the concepts and models and the regulatory guidelines, which are designed to enable executives to identify opportunities

that offer the contribution of value to customers and thereby helps them to attain and secure profit for their own organisation. In this sense, the corporate strategy defines the way in which a business presents itself and competes with others within the market.

In order to finalise the supply chain strategy one must first clarify and define the level of the desired value generation. The aim is to answer questions such as: with which products and services is the business joining the competition? Does it offer a standard product of a single model for all customers, or an individually customised serial product? What scope of quantity is envisaged (few, many)? Does it offer only a single product, or also for example, the performance of additional services such as the replenishment of the customer's stock levels? To what extent is the level of in-house vertical integration sufficient?

The best information about the concept of the value chain can be found in [Porter \(2008\)](#). The concept of a value network is well illustrated in [Bovet and Martha \(2000\)](#) and [Christopher \(2005\)](#). On how to gain competitive advantages through the use of information technology, see e.g. [Porter and Millar \(1985\)](#).

One approach which establishes the aspect of value generation in relation to the supply chain is the concept of the value generation chain, or value chain in short, which was developed by Michael Porter. With given consideration to the generation of value, the aspects of Information Technology can ultimately be included in order to ensure that a supply chain is operational. The result is a so-called value network or value net. In this way, a value network is a business design that uses digital supply chain concepts to ensure both customer satisfaction and maximum profitability. The value network is focused primarily upon the competitive factors of time and flexibility, and therefore has the primary goal of being able to react quickly and flexibly to customer requirements.

The strategic triangle encompasses three decisive factors in competition: cost, time and quality. In the more recent strategic square another factor arises, namely flexibility (cp. e.g. [Poluha 2007](#), p. 13 and p. 313).

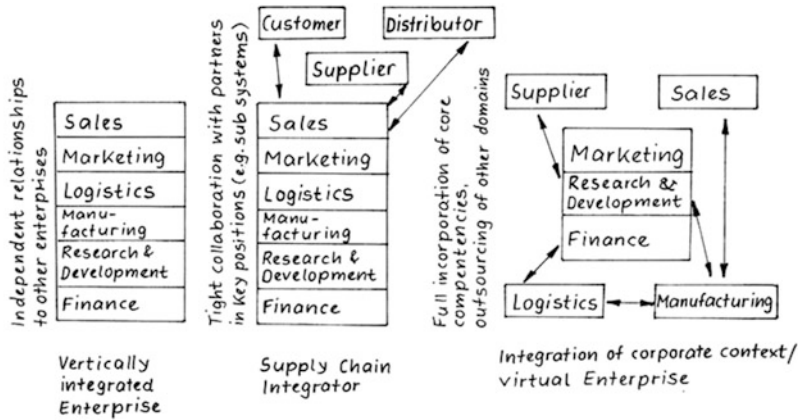
The special characteristics of a value network can be described as follows, and differ significantly when in comparison to a traditional business design:

- Focused on the customer.
- Based on cooperation and integrity (i.e. is holistic).
- Mobile and scalable.
- Possesses fast material, information and cash flows.
- Based upon information technology (IT).

The term value network therefore rises above the supply chain itself. It presupposes its own circumstances and focuses explicitly on the generation of value for all involved parties (businesses, customers and suppliers). Whilst it still remains, for the most part, a static system, the (bilaterally) flowing information contained therein is, however, often supported by modern IT systems.

The approaches previously represented emanate from the assumption, that the participants in the supply chain are physical partners (businesses, persons, etc.). A relatively recent development is the establishment of so-called *virtual networks*, in which the construct of the *virtual enterprise* represents the focal-point, or in other words the temporary fusion of core competencies of the involved businesses. The resulting entity becomes apparent to the customer in the form of a single unit. Inwardly however, a virtual enterprise has no interlocking legal or organisational structure. The linear, physical supply chain model as it has been previously known has shifted accordingly, as shown in Fig. 2.5.

The transformation goes beyond the physical boundaries of a marketplace and enters into the global and rapidly evolving digital



**Fig. 2.5** Development of virtual enterprise structures (cp. Simchi-Levi et al. 2008, pp. 1)

economy. With the introduction of the Internet and the new role of technology as a catalyst for new strategies, businesses see themselves simultaneously confronted with new strategic challenges and management problems. Whereas in the past, business-strategies have driven Information Technology, IT can be implemented today in order to create the possibility of new business models.

The *core competency approach* provides a frame of reference to analyse the strengths and weaknesses of a business and assumes that there are certain core competencies that constitute a competitive advantage. These core competencies can be resources, capabilities or general assets in the balance sheet and a business must seek markets within which it can achieve the highest returns based on these core competencies (see e.g. Prahalad and Hamel 1990). For more information with reference to virtual networks and virtual businesses, see e.g. Sroka and Hittmár (2015).



The real-time exchange of information and the interactive capabilities of the Internet have changed the business environment to the extent that now both customers and other businesses have better access to alternative products and services. New distribution channels have thus been established, which offer alternative new ways to optimise the generation of value and simultaneously allow interactions to become more transparent. The winners in these virtual value networks will be those who have faster access to information and resources, and are, at the same time, in a position to be able to derive the appropriate competition and supply chain strategies from it.

As a result, the traditional physical unit has developed into a virtual unit, in which a large number of potential partners exist and which exchange information with each other. In this sense, the virtual network represents a series of market partners who work together as a virtual unit, in which each individual adds a component of value, so to speak. The value-generating activities extend from the supply side in the form of raw materials, inbound logistics and production procedures, and right up to the demand side in the form of outbound logistics, marketing and sales.

Michael Dell, founder of computer manufacturer DELL, has literally described a virtually integrated business as an organisation which is not cross-linked by the wealth of physical assets, but is rather more connected into a network by means of information or, in other words, through information and communication technology.

Thinking consequently ahead, the supply chain represents part of a superior and comprehensive Electronic Business concept. E-Business must be differentiated from the related concept of Electronic Commerce (E-Commerce), which in general describes the electronic processing of business transactions. Thus, it constitutes a part of the overarching E-Business concept and is therefore subordinate to this.

Due to its pronounced process-orientation, one highly suitable description of E-Business is expressed as follows according to Dietrich Seibt (cp. [Poluha 2007](#), p. 15): *A business may then considered to be operating Electronic Business, if several and up to all business processes*

- *within the business*
- *between itself and its business partners*
- *between itself and third parties (e.g. authorities)*

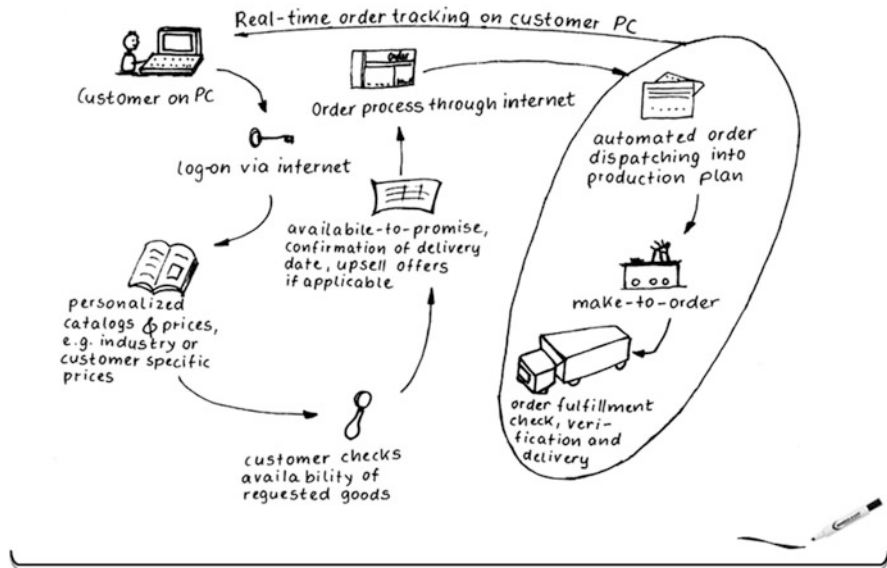
*are completely or partially provided with the assistance of electronic communications networks and supported by the use of Information and Communication Technology systems.*

An excellent overview of the relevant aspects of Electronic Business and related concepts, such as Electronic Commerce, may be found in Laudon and Trave ([2015](#)), and [Jelassi et al. \(2014\)](#). For further-leading information on Electronic Supply Chain Management (E-SCM), [Graham et al. \(2013\)](#), and [Ross \(2003\)](#), are recommended.

The concept which specifically concerns itself with the supply chain-related area of E-Business is also often referred to as Electronic Supply Chain Management (E-SCM). In this sense, E-SCM represents the tactical and operational components of a corporate strategy, the target of which in the first instance is the linkage of the communal production capacities and resources of overlapping supply systems by means of the usage of internet technologies, with the primary goal of creating customer benefit. The main difference compared to the “conventional” management of a supply or value chain becomes apparent in that E-SCM Internet technology is used to support the optimal management of work processes and the material and information flows ([Fig. 2.6](#)).

### 2.2.2 Types and Characteristics of Supply Chains

The definitions previously described have focused upon different properties or characteristics of supply chains. Based upon this,



**Fig. 2.6** Example of the practical implementation of electronic business concepts in supply chain management (cp. Poluha (2010), p. 27)

various categorisations allow themselves to be put into effect, which we will discuss in detail in the following. One possibility lies in the decision as to whether the supply chain is predominantly focused upon the product, or rather upon the target customers. This results in a differentiation into two categories:

- Product-centric supply chains are those which are tailored to accommodate very special products. This specific tailoring can lead to the fact, that separate supply chains must be introduced for several products on offer.
- *Customer-centric supply chains* however, are tailored to accommodate specific market segments. This may result in single or multiple supply chains, which are organised around market segments.

A further differentiation can be carried out by using the business strategy and associated business requirements (according to Hughes and others (1998), pp.4):

- *Instantaneous open competition*: in this case, competitive offers and tenders are dominant. Emphasis is on intensive trade.
- *Trading of bulk commodities*: independent trade, forced into being by the necessity of the transaction. Emphasis is on controlling the fluctuation-span of bulk goods.
- *Lean supply chains and system integration*: cost minimisation and gradual transformation of the cost structure. Emphasis is on effective cooperation, but not so much on the savings, which can result in resource bottlenecks.
- *Competing constellations of associated businesses*: market leaders join forces with the best partners in the market. Emphasis is on performance ability, capabilities, and the organisation of cultural compatibility.
- *The interlocking network supply between competitors*: merger for the progressive settlement of transactions. Emphasis is on an association, within which low competitive advantages exist, with the aim being the usage of synergies.
- *Assets control the supply, market leadership is the goal*: gain control over the assets and implement them purposefully. Emphasis is on the proper use of the competitive instruments at the tendering stage.
- *Virtual offer—no production, just customers*: low fixed costs by means of the outsourcing of production. Emphasis is on the marketing and distribution capabilities.
- *Partnerships for the benefit of customers*: trust, candidness and sharing of the work to be carried out. Emphasis is on the performance provided by the supplier to the customer (directed forwards in the supply chain), and the value aspect represented by the customer to the supplier (directed backwards in the supply chain).

For a more detailed illustration of the various *competitive strategy alternatives* according to Michael Porter, the original editions are particularly recommended (see [Porter 1998/1](#) and [1998/2](#)). For a more current summary refer to [Porter \(2008\)](#). Accordingly, the three alternatives allow themselves to be briefly characterised as follows:

- *Overall cost leadership* is a strategy which focuses on the competitive advantage of the lowest cost compared to that of the competition.
- *Differentiation* focuses on creating at least one unique performance characteristic within the whole of the specific branch of the industry.
- The *Focus strategy* involves the focusing of a supplier on a market segment or on a particular demand group. The fundamental assumption is that a supplier can only be successful if it concentrates on one of the three basic types of strategies and the competitive advantages resulting from them. Otherwise, figuratively speaking, the business runs the risk of being “stuck in the middle”.

The observation of the primary focal-point of the supply chain is another possible method of categorisation. At the same time a differentiation may be made according to strategic competition and the focus of perspectives upon the distribution flow, the material flow, the work flow, and the information flow.

From the competitive strategy perspective, the supply chain is a series of resources that are used to support the position of a product on the market with regards to the combination of target customers, pricing and sales measures. The primary purpose is to improve the profit margin across the span of product sales.

The focus on the work flow processes is based upon its assumption of a pre-defined sequence of activities within an organisation. The work flow supports an operational and technical view of the processes and provides information pertaining to factors such as costs and revenues. The primary objective lies, consequently, in the most efficient handling of the procedures.

In the material flow perspective, the flow of information between the various parties represents the main integration factor. An integrated supply chain possesses, in this sense, a communal basis of information in addition to the mechanisms required in order to exchange this information amongst the participants.

When focusing on the distribution, it is assumed that the supply chain is the physical history of a product through a number of operating systems and facilities which are linked by a transport network. These facilities and equipment include factories, warehouses, distribution centres, and fleet and distribution centres. The primary objective is to minimise the costs in the functional areas which are relevant to success.

In the information flow perspective, the flow of information between the various parties represents the main integration factor. An integrated supply chain has, in this sense, a common information base and the mechanisms to exchange information among the participants. The primary goal can be efficient information processes, but may also be advantages in the differentiation.

Even though the main focal point may vary, the growing idea of an integrated perspective increasingly asserts itself, by which the business processes, the material and information flows, and the work flow processes are observed and optimised together. This will be discussed in the course of the second chapter.

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## **2.3 How Did Supply Chain Management Evolve?**

### **2.3.1 From Logistics to Advanced Planning Systems**

The role of supply chain management within an organisation has changed considerably over the last three to four decades. In the 1970s, it was known primarily as logistics, limited to the integration of storage and transportation within a business. In addition, high double-digit interest rates that existed in most countries during that decade forced businesses to pay special attention to the use of their capital. Logistics executives were primarily concerned with the reduction of inventory. The focal point was mainly how the business would carry out internal changes which could reduce the inventory and logistics costs. Even efforts to reduce production and delivery

lead times and thus reduce safety stocks were introduced as a priority within the business, as lead times had been mainly considered as input information for the forecasting and procurement processes.

In the 1980s, the focus shifted towards overhauling the cost structures within the supply chain. The attention was then directed at integrating the procedures of the supply chain, thereby reducing operational costs and capital investment. In the late 1980s, the aims and activities within supply chain management then finally shifted from the reduction of costs to the improvement of customer service. The benefits which were sought by improving performance included an increased growth in sales and higher profitability, primarily due to a larger market share and pricing advantage over the competition, which is reflected in the form of higher profit margins.

Interest in improving customer service increased during the early 1990s. Similarly, the growth of the business also came to be regarded as an additional goal of supply chain management. Up until that point this had been considered, within many businesses, to be the responsibility of product development, marketing and sales.

In the previous and current decades, a new wave of change has taken a steady hold in the field of SCM in many businesses, namely the development of a strategic management of the supply chain. Contrary to the traditional view in which it was purely a part of the operational definition of objectives, SCM has since then acquired a strategic function that directly contributes to the success of the business, whilst at the same time becoming a central and immanent part of our business strategy. The current status of the opinion, which is increasingly gaining ground, is that SCM both determines the strategy of many businesses and has even enabled them to introduce the strategy in the first place. In other words, SCM is a prerequisite for the successful implementation of the respective business strategy, as well as an essential factor for the determination of the business strategy.

SCM was initially also strongly focused upon improvements to the supply-side processes. In this context, however, one tended to overlook the fact that businesses wanting to manage their supply chain in an optimal manner could only achieve this goal if they recognised the fundamental connection between supply and demand—and the resulting impact on the supply chain strategy.

Often, however, businesses have reviewed their supply-side options, whilst apparently neglecting the demand factor. The relationship between supply and demand lies in the fact that the demand dictates the target of the supply, thereby possessing a determining position, whilst the supply-side capacity supports the fulfilment of the demand. Businesses therefore need to create new methods for the coordinated control of both the supply and demand chains. Supply Chain Management is a central part of these efforts.

The possibilities of an enterprise to adjust supply and demand with each other are a function of its *reactive capacity*, or in other words, its ability to offer a timely response to market signals. This flexibility is in turn heavily influenced by the capital costs of work and operation. Organisations have often struggled with the task of adjusting supply and demand, because the focus during these attempts has usually been upon improving forecast accuracy, optimising production and inventory levels, and reducing lead times.

However, it should be noted that although these measures are useful they provide no complete solution. Businesses must therefore take into account those measures, which include the cost of labour and resources. And they must find new methods within the business in order to align their incentives both within the business and within the extended (meaning partner-orientated), supply chain.

For the topics of logistics and logistics management, the works of Ghiani et al. (2013), Murphy and Knemeyer (2014), and Rushton et al. (2014), are especially recommended. The books of Heizer and Render (2013), Reid and Sanders (2013), and Stevenson (2014), are very up-to-date and comprehensive on the topic of Operations Management.

Long before the concept of the supply chain was introduced and the new discipline of supply chain management emerged, one spoke of a so-called Logistics Chain. This chain stood in the centre of a discipline that was called logistics or logistics management (and is today still partially referred to as such). The term operations management was also sometimes used, which is again currently being used more frequently. Let us therefore first consider several definitions in order to allow a differentiation between the terms.



In the classical terminology of the aforementioned Council of Supply Chain Management Professionals (CSCPM), logistics are described as the process of planning, implementing and controlling the efficient flow of material, ranging from the storage of raw materials to the stock in the production process (Work In Process, WIP), finished products and services, and related information, from the point of origin through to the point of consumption. This includes goods receipts and goods issues, and internal and external material movements. The ultimate purpose is to be able to meet customer needs.

With regard to the planning levels we can differentiate between:

- i) *Operational*: short-term (less than 1 year for the current accounting period or invoice period) and mainly with regards to a part of the operation or the activities.
- ii) *Tactical*: medium-term (time span from 1 to 3 years) and mostly for a larger part of the business or of the activities, and
- iii) *Strategic*: long-term (time span longer than 3 years) and mainly and objectively with regards to the major product areas, the activities of the operations or the business as a whole, and the aspects critical to success (see e.g. Abraham 2012, pp. 159).

Logistics, however, can also be seen from the organisational aspect. From this perspective, it is a goal-oriented framework to control the process of planning, allocation and control of financial resources and labour, which are intended to deal with the physical distribution, manufacturing, support and purchasing transactions.

Any additional definitions focus on the conceptual idea of integration, in accordance with which the term logistics generally encompasses the creation of time, space, quantity, form and ownership, both within a business and in cooperation with other businesses. The special tools which logistics uses to achieve its goal consist of strategic management, infrastructure and resource management. This goal is to create products and services that satisfy customer

requirements. Logistics are thereby involved in all planning and execution tasks, on both *strategic* as well as *operational* and *tactical* levels.

Logistics management inevitably also has limitations and dependencies. So the logistics activities typically include inbound and outbound logistics, fleet and fleet management, warehousing, material handling, order entry and fulfilment, logistics network design, inventory management, demand and supply planning, and the coordination and management of logistics service providers. To a certain limited extent, they also include procurement and purchasing, assembly and packaging, and customer service.

With this, the connective bridge to supply chain management was already in place, whereby the fundamental difference was in the integrative nature. In this way, SCM involves not only the logistics, but also other business areas, such as purchasing, production, warehousing, marketing and information technology. A major purpose of this is to improve the efficiency of the supply chain. In other words, SCM can be defined as the integrated planning and control of processes in the value chain. The primary objective thereby is the improvement of the efficiency of the supply chain. The overriding aim lies in the optimum satisfaction of customer requirements.

*Effectiveness* is defined within Business Administration as the degree of achievement of objectives, and is therefore a means of measuring performance. It is therefore a question of doing the right things. *Efficiency* represents a relationship between input variables and output variables and can therefore serve as a measure of cost effectiveness. Thus, it constitutes a potential sub-goal of effectivity. It is therefore a matter of doing things right, i.e. making sure things are being done in the correct manner (see e.g. Poluha 2007, pp. 44).

In this sense logistics management is an inherent part of SCM, which has the task of planning, implementing and controlling the efficiency and effectiveness of the forward- and backward-facing flow of goods, services and related information, with the intention of fulfilling customer requirements as satisfactorily as possible.

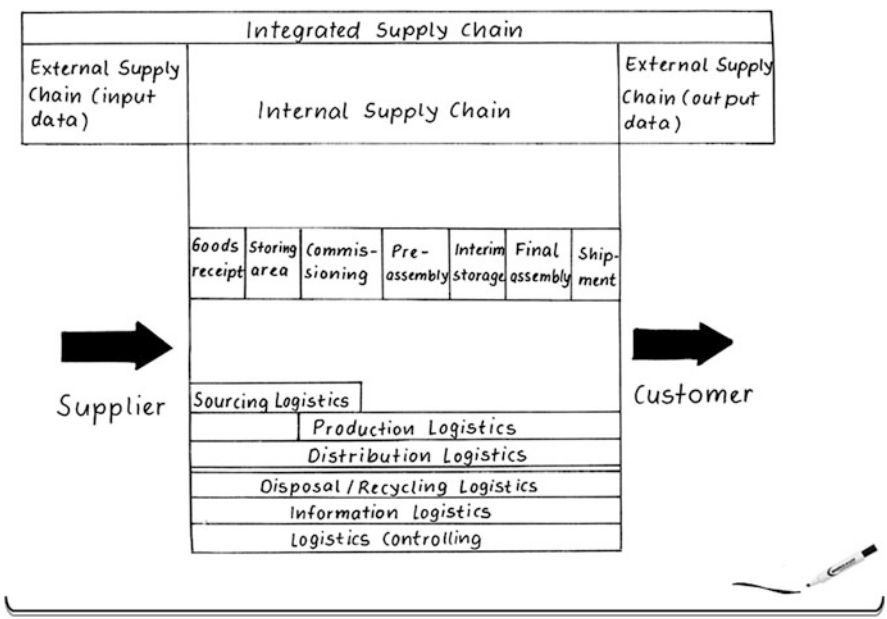
SCM consequently represents an integrative functional area which is primarily responsible for the connection of the main business functions and processes within an organisation, as well as those of other businesses that are involved in the supply chain, in order to form a concept in the shape of a consistent and high-performing business model. This role includes, in addition to the activities of logistics management, the production processes as well as the task of coordinating the supply chain processes with the functional areas of product design, inventory management, marketing, sales and finance.

Furthermore, SCM involves planning, managing and controlling all activities of logistics management. Above and beyond this, though, it includes the coordination of, and cooperation with, partners in the supply chain such as suppliers, distributors, logistics service providers and customers, thus ensuring the coordination of supply and demand within the business. However, a clear demarcation of terms is not as easy as one would imagine as far as the proliferation of information and the level of topical knowledge is concerned. In actual fact the term is associated with various meanings and across various businesses (see Fig. 2.7).

In the broadest sense, it covers all logistics activities, customer-supplier relationships, warehouse management and equipment, as well as the development and introduction of new products.

We principally have the ability to differentiate between *business-internal* and *business-integrated supply chains*, whereby the latter is concentrated upon the interfaces and interactions of an organisation with its external partners.

Practitioners usually define the term more narrowly and restrict the definition to activities within the supply chain of a single business. This would significantly and inevitably reduce the scope of improvement measures, which will be more closely dealt with in the following chapters, to the internal supply chain, but without taking into account the perspective of the interaction with other businesses. To illustrate the range of possible definitions of the terms, let us look below at a series of exemplary attempts at definition.



**Fig. 2.7** Internal and external supply chain (cp. Coyle et al. 2013, pp. 509)

Based on the classic planning and control approach, the management of the supply chain is an expansion of logistics into an interactive planning and control approach, which may also be between one or more businesses.

In addition to the term supply chain management, there is also the less commonly used term of *progressive planning system* or *Advanced Planning System (APS)*, which especially highlights the aspect of the support already explicitly incorporated by information technology.

If the planning element is included, SCM can be defined as the coordination of strategic and long-term cooperation between all participants throughout the supply chain network. This includes both the purchase and the shop floor and goes beyond the field of product and process development. The purpose is to develop and manufacture products. Each supply chain participant is active in the field in which he can rely on his own core competencies. The choice of further supply chain partners is based mainly upon how much potential they possess to create an increase in competitive advantages.

A good overview of the various definitions of terms and classifications in conjunction with SCM may be found, for example, at Cohen and Roussel (2013), and Hugos (2011). For references regarding the term *Advanced Planning System* (APS), the work of Stadtler and Kilger (2014), must be highly recommended.

Based on a process approach, SCM may be described as the process of planning, implementing and monitoring an efficient and effective flow of goods, services and related information from the starting point of the supply chain and up to the point of consumption. The purpose is to satisfy customer requirements. By means of a further-leading differentiation of the process-related perspective, it can then be viewed as the design, maintenance and operation of supply chain processes to satisfy the requirements of end customers. In this sense, SCM extends both to the formulation of the supply chain as well as its subsequent operation and maintenance. This results in new tasks for managers and executives, as traditional tasks need to be completed in a different way. It has basically become apparent that as a result, the introduction of an SCM-discipline involves an extension of the duties and areas of responsibility for a multitude of employees.

The business process-orientated definition can also be extended to the effect that SCM represents the integration of business processes—from the end customers through to the suppliers. This integration provides the products, services and information that generate value for the customer. Accordingly, SCM leads to an alteration of the existing supply chain and generates customer value via the targeted use of information which is associated with the supply chain. In addition, the organisational processes have to be planned, monitored and controlled within the supply chain. For this purpose a universally accepted targeting system is required.

Based on the (physical) material and goods flows, the supply chain includes all activities associated with the flow and transformation of goods, ranging from the raw materials to the end consumer, as well as

the associated information flows. SCM thus represents the integration of these activities through improved relationships with supply chain partners, in order to achieve a lasting competitive advantage.

The terms *Lean Production* and *Lean Management* denote the principle of increasing efficiency, usually in terms of decentralisation, outsourcing the manufacturing, flatter hierarchies, performance compression and, accompanying this, the resulting decrease in personnel. Total Quality Equating with “lean” in this sense is an oversimplification of the Japanese concept of an all-encompassing quality management or rather Total Quality Management (TQM). It offers the basis for attaining the advantages in efficiency and flexibility that are being strived for and which are visible from the outside as, amongst other things, organisational changes (see for example O’Mara 2013; Schonberger 2007).

The definition can also be determined on the basis of a constantly-evolving management philosophy. As a part of this philosophy the aim lies in the unison of the joint production skills and resources of the business functions, which are both business-internal and business-external (the latter being with the allied supply chain partners). The primary goal is to create a competitive network which is, to a large extent, furnished with benefits for the customer, and which aims at developing innovative solutions and synchronising the flows of products, services and information. The ultimate goal is to create the maximum value for customers.

Retrospectively studying the evolution then allows a further development and transition of previous management approaches, such as *Lean Manufacturing* or *Lean Production*, into the concept which is presently recognised as SCM. The scope for its application will hereby be extended to cover the distribution, whereby the distribution represents a portion of the order management process which focuses on the final delivery to the customer. In this sense, the goal of SCM lies in the improvement of the efficiency of the product delivery process, beginning with the material suppliers and proceeding right through to the end customer, in order to deliver the right product at the

right time and in the right place, using a minimum of security stocks and processing effort. The focal-point of improvement measures lies primarily in the areas of warehousing, distribution, production and procurement—across organisational units and various businesses.

Observed from the functional side SCM allows itself to be defined as the systematic and strategic coordination of traditional business functions, in addition to the tactical and operative measures which span across these business functions. These include the functions within the relative business, and also the various businesses which are integrated as partners within the supply chain. The main purpose is to improve the long-term performance of the individual businesses, as well as improving the supply chain as a whole.

From a behavioural point of view, SCM can be defined as those activities and tasks which are carried out in order to influence the behaviour of the supply chain and obtain the desired results. Seen in this light it represents the coordination of procurement, production, stocks, locations and transportation amongst the participants, in order to secure the best balance between performance capability and flexibility on the one hand and efficiency on the other.

A further possible differentiation can be made by means of using both sides of the supply chain, i.e. the control of the supplier-side on the one hand and the customer-side on the other. Accordingly, the hallmark of the supplier-centric approach is that the business and its suppliers, distributors and customers—that is, all interfaces and connections of an organisation in a broader sense—work together in order to provide the market with a common product or service, for which the customer is willing to pay the amount requested.

For the combination of the normally conflicting targets of cost and quality, there is also the term *Outpacing Strategy* which is characterised by the fact that during the strategic adjustment of its activities, a business changes direction between the two main competitive strategy alternatives in good time (these alternatives being cost leadership and differentiation according to Michael Porter), in order to achieve a stable and sustainable advantage over the competition (see [Gilbert and Strebel 1987](#)). Above and beyond this strategy, which is not based upon a simultaneous, but rather on the assumption of a successive application of various alternative strategies, there are also so-called *hybrid competitive strategies* that fall under the simultaneity-approach, which is based upon the assumption that the application of a combined strategy is at least temporarily possible (see e.g. [Porter 2011](#), pp. 1).

The group of businesses that recruit from the supply chain partners or participants functions similar to an expanded business, with the aim of ensuring the optimum usage of shared resources (employees, procedures, technologies, etc.), in order to attain the establishment of synergies. This results in products and services that are of high quality and inexpensive, and can be quickly delivered to the market. Therefore the aim is to achieve a combined and simultaneous use of the normally conflicting targets of the respective Strategic Triangle or Strategic Square.

The definition of the customer-centric approach requires only that the traditional definition is extended as follows (highlighted by underlining): the company and its suppliers, distributors and customers, i.e. all parties in the supply chain in the wider sense, work together to provide the market with a common product or service for which the customer is willing to pay the required amount throughout the entire lifecycle of the product.

For the adjustment of SCM on the customer side, there are also the concepts of *order-orientated SCM* or *demand-orientated SCM*. The primary goal of these concepts is to generate value for the customer, whilst improving the performance in terms of capital investment and cost-effectiveness.



In summary it can be said, that the primary goal of SCM is the increase in sales of products and services to the end user or consumer, whilst reducing inventory levels and minimising costs. An inevitable conflict of goals arises from this, because the underlying competitive factors (cost, time, quality and flexibility), are in competition with each other. Therefore, SCM is aimed at optimising the effectiveness and efficiency of the involved business processes, and the harmonisation of conflicts in goals—with the inclusion of the priorities in accordance with the respectively chosen competitive strategy.

### **2.3.2 Value-Orientated Supply Chain Strategies**

In recent years, the number of businesses that follow a value-orientated supply chain strategy, in which the concept of the value chain previously described is the focal-point, has sharply increased. This trend was largely driven by businesses that use advanced information technology to improve their abilities in the field of SCM. In conjunction with this, the aim of the supply chain competence is to better cater for customer requirements, make better decisions, and be able to increase overall operational performance for the benefit of gaining a competitive advantage.

The consequence is that a large number of organisations have developed strategies that focus on the relevant processes to satisfy those requirements. These strategies should ultimately help to optimise order processing times, cash flows, return on investment, market share, and profitability. They represent the basis of a supply chain strategy which describes what a business wishes to attain with its supply chain, and which performance improvements the business wishes to achieve with it. Using this method a business can define how, by means of its supply chain processes and the associated infrastructure, it can contribute to the competitive capability of the organisation. The aim of the strategy definition is the identification of relevant competitive factors and their implementation within the supply chain. The supply chain strategy is thus subordinate to the business and competitive strategies or derived from these, and must, as such, support them. An important feature of a successful supply

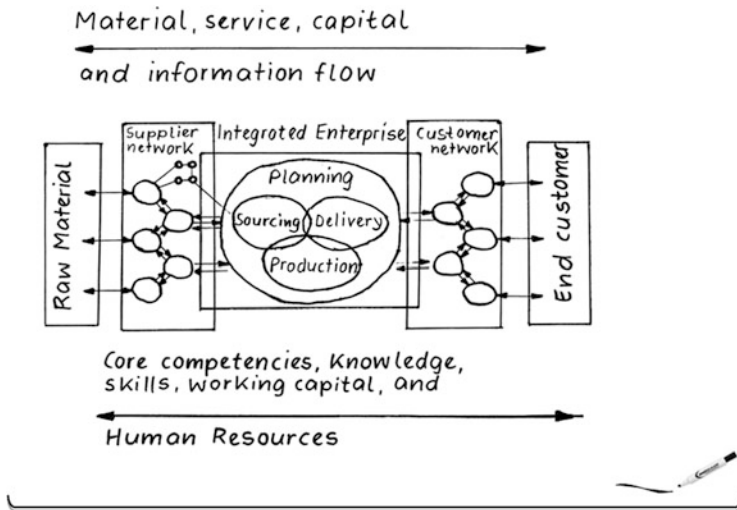
chain strategy is therefore the adjustment to the business strategy and with this also the strategic core vision of the business.

For the combination of corporate strategy and supply chain strategy, as well as the specifications and distinctive features of supply chain strategies please see, for example, Chopra and Meindl (2015), and Dittmann (2012).

SCM represents an interdependent organisational structure which links functions, businesses and countries, synchronises the movement of goods with the demand rate and increases the amount of goods created on the global market. For every product there is a supply chain and for each supply chain there is a competitor. The development of these supply chains is promoted by large corporations—typically major retailers and original equipment manufacturers (OEM)—which have the necessary vision and perseverance to drive the performance of their partners, exchange information, and work in unison, in order to secure a superior market position and the efficiency of their business functions.

The development of value-based SCM approaches results from the realisation that the isolated optimisation of individual parts of the supply chain does not lead to a cost-effective overall solution. In other words: *The sum of local optima does not equal the global optimum* (cp. Goldrath 1999, p. 4).

It is therefore necessary to look at the sequence of events within the supply chain holistically—starting with the customer order and orientated backwards to the purchase order raised upon the raw material suppliers, as well as forward-orientated through all of the following businesses which are involved in the manufacture and supply of the product or service to the end customer. The focus on the holistic supply chain represents the first step, the focus on the product the second, and the inclusion of value generation within the framework of a value-orientated process organisation which relates to the supply chain—as opposed to the traditional performance measurement, which is based upon the organisational structure—represents the third step. In this way, a type of “value flow” may



**Fig. 2.8** Integrated supply chain (cp. Cohen and Roussel 2013, pp. 41)

emerge, which better reflects the present business processes as was the case with the traditional supply chain (Fig. 2.8).

The organisational structure represents the scaffolding of an organisation (e.g. of a public authority or a business), and regulates the framework conditions, i.e. which employees and materials are responsible for the completion of which tasks. In contrast, the process organisation regulates all running procedures within this framework, and the information processes (on the topic of organisation structure, see for example Daft 2015, pp. 320).

### 2.3.3 Integration vs. Fragmentation

Fragmented supply chain strategies are a diametrically opposed approach to conventional supply chain strategies, as the latter precisely positions the importance of integration into the spotlight. With the word “fragmented”, the opposite of “integrated” in the sense of “incorporated” or “included”, is usually understood. That is, “fragmented” stands for “non-included” or “non-incorporated”. An example from the practice of current daily business will help to clarify what exactly is meant by this.

The idea of the SMART car was initially created by Nicolas Hayek, founder of the Swatch Group. His vision was that of “Swatch-Cars”, which should preferably be small and should have an interchangeable body (similar to Swatch watches). The *Smart* business was founded by Hayek in 1994 as the Micro Compact Car AG in Biel and as a joint subsidiary of Daimler-Benz and SMH SA (Société Suisse de Microélectronique et d’Horlogerie). In September 2002, the Micro Compact Car AG was renamed Smart GmbH. With effect from the 1st of October 2006 the employees were integrated into the then Daimler-Chrysler organisation, and the Smart GmbH was dissolved end of 2006. The manufacturing facilities are located mainly in Hambach, France, which due to this is also called “Smartville”, and partly in Born in the Netherlands ([www.smart.com](http://www.smart.com)).

As part of the development of the so-called *SMART car*, a feasibility study was initially carried out by Mercedes-Benz. The supply chain which was developed and presented for this purpose at the time, in the mid-1990s, represented a completely new approach. In accordance with this, for example, new models were created for the integration of suppliers and the outsourcing of production. These were characterised by pre-assembly at the site of the suppliers, integration of the suppliers into the design and final assembly, and shared ownership of production plant locations, etc. Additional challenges arose, for example, from the fact that the initiating business only contributed about 15 % of the added value within the supply chain.

The specific question which resulted was: how can a supply chain be monitored and controlled, in which the central business only offers a relatively minor contribution in value? Developed as part of the feasibility study, the fragmented supply chain provided the basis for the introduction of the so-called *customer-specific serial production* or *mass customisation* (see Van Hoek and Weken [2000](#)).

The *customer-specific serial production* or *mass customisation* represents another variety of the aforementioned hybrid competitive strategies. Essentially, the understanding of this is—expressis verbis—the customised mass production of goods for a large retail market. The products must therefore satisfy the differing requirements of the purchasers. In this case the prices should represent those of a mass production of standardised products. This approach therefore seeks the balanced combination of continuous mass production with discontinuous single production (see e.g. Kull 2015; Gardner 2009). For the connection between product customisation and supply chain management Anderson (2008), is particularly recommended.

The term *strategic networks* can sometimes be found to describe the fragmented supply chain approach, which is understood to be the opposite pole to the previously illustrated value-orientated supply chain approach. In accordance with this, the value-orientated approaches within the business systems are the most effective, which simultaneously postulates a close cooperation and the maintenance of independent businesses. From valuable experience, four characterising features allow themselves to be identified, which favour the development of strategic networks:

- The speed of adjustment of the supply chain is crucial for market success.
- Some of the critical supply chain activities must have advantages when they are carried out in a fragmented form. This can be as a result of differences in terms of market entry barriers, competitive advantages, etc.
- Specialised investments lead to higher efficiencies. These investments may constitute capital investments or investments in workforce.
- Innovation requires a holistic understanding of the supply chain system, whereby the word *innovation* in this context is understood to mean the development and implementation of examples for new thought and operation patterns.

In the case of the SMART car all of these factors have come into play, which has contributed to a fundamental rethinking with regards to the postulate integration of the supply chain, that up until then had been regarded as irrefutable. One of the associated consequences was, that the use of fragmented elements within an otherwise integrated supply chain has been discussed to a greater extent and increasingly used in daily business practice.

For an introduction into the topics of *innovation* and *innovation management*, the work of Davila et al. (2013), is particularly to be recommended, whilst the book of Davenport (1993), represents a standard reference work on the topic of *process innovation*. A very comprehensive overview of the various aspects in conjunction with innovation and the associated changes can be found in Drucker (2013).

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## 2.4 Practical Examples: Consequences of Supply Chain Mismanagement

Listed below are some practical examples, presented to illustrate the serious consequences which may be involved if a business does not pay the necessary attention to the management of its supply chain, or does not have the required supply chain expertise. The potential errors associated with this concern all relevant areas of the supply chain (cp. Lee 2004):

- Design: for example, lack of adaptability.
- Control: for example, inadequate responsiveness or insufficient flexibility.
- Coordination: for example, lack of consideration for the interests of partners, etc.

The effects can be serious and possibly even threaten the existence of the business itself.

### 2.4.1 Lack of Adaptability at Lucent Technologies

Executives often wonder whether it is really necessary to continuously update their supply chains and adjust them if considered necessary. This depends to a large extent on the fact that it is difficult to accept that continuously changing competitive conditions make a permanent process of change and adaptation necessary.

In the middle of the 1990s the executives of Lucent Technologies realised that the business could only gain a foothold in the Asian market if it possessed production facilities on site. Consequently Lucent adjusted its supply chain accordingly. Factories were constructed in Taiwan and China and they could therefore, similar to their competitors Siemens and Alcatel, adapt digital exchange cost-effectively in order to better fulfil customer requests. In order to integrate the interests of the parent and subsidiary businesses, the executives decided to no longer charge the Asiatic business excessive prices for the import of structural components from the USA. This enabled Lucent to recapture its lost market share in China, Taiwan, India, and Indonesia by the end of the 1990s, and to strengthen its competitive position at a later stage.

Until mid-2006 *Lucent Technologies* had been an independent business with headquarters in Murray Hill, New Jersey, USA. The Group developed and distributed systems, software and services for communications networks with emphasis on the convergence of networks, services and communication media. Their clients included service providers, global businesses, and local authorities. In the fiscal year 2004 Lucent Technologies achieved a revenue of 9.1 billion US Dollars (about 8.3 billion Euros at the exchange rate in mid-2015), and employed approximately 31,000 people worldwide. Following the take-over by its competitor, Alcatel in 2006, the group operated under the name of Alcatel-Lucent. On April 15, 2015, Nokia announced that it would acquire Alcatel-Lucent for 15.6 billion Euros ([www.nokia.com](http://www.nokia.com)).

Up until then, the correct action had been taken, but following this Lucent failed to continuously adjust its supply chain. The

management had obviously not realised, that many middle-sized manufacturers had then developed the necessary technology and gathered the required expertise, in order to manufacture components and assemblies for digital switching centres (so-called “switches”). Due to the advantage gained by the scale of the quantities, they could manufacture at a fraction of the cost required by the integrated businesses, and Lucent failed to take advantage of the fragmented elements of the supply chain to counteract. The competitors had recognised the sign of the times and forcefully outsourced the manufacture of the switching systems. Due to the resulting cost savings they could offer them at lower prices than Lucent.

Meanwhile, the management of Lucent Technologies hesitated with the outsourcing of its manufacturing, because the business had invested in its own factories. Finally, however, the group had no other choice than to close its Taiwan factory in 2002 and to begin to build an outsourced supply chain. However, the transformation of the business took place too late to regain control of the worldwide market. In mid-2006, Lucent was taken over by its competitor, Alcatel.

#### **2.4.2 Lack of Consideration Shown for the Interests of Supply Chain Partners at Cisco**

Different businesses within the same supply chain can have different interests. To not offer adequate consideration to this fact can also lead to serious problems, such as a lack of adaptability. During the 1990s, most experts assumed that Cisco’s supply chain was the “ideal” type and therewith practically infallible. The business was amongst the first to use the Internet to communicate with suppliers and customers, and to automate business processes between trading partners. It was due to this, for example, that the previously illustrated concept of Collaborative Planning, Forecasting and Replenishment (CPFR) became more intensely used.



*Cisco Systems* was founded in 1984 by scientists at Stanford University in California, USA. The Group, which has its headquarters in San Jose, California, is now a leading global provider of networking solutions for the Internet. In the fiscal year 2014, Cisco had a turnover of 47 billion US Dollars (about 43 billion Euros at the exchange rate as at mid-2015), with more than 74,000 employees ([www.cisco.com](http://www.cisco.com)).

In addition to this, Cisco was also a pioneer in collaborative production procedures, such as Online Product Tests, that will help suppliers receive high quality results with a minimum amount of manual data entry. The business also outsourced the manufacturing of most of its networking products, and worked upon selecting those sites which were best suited to cover its requirements in order to work closely together with various contract manufacturers (outsourcing).

In 2001, Cisco surprisingly had to write-off stock to the value of about 2.25 billion US Dollars (about 2.06 billion Euros at the exchange rate in mid-2015). As it turned out later, there were several factors that played a role in this, but the most serious was the conflicting interests of Cisco and its partner contractors: above all, Cisco was mainly interested in paying the lowest possible prices to its suppliers and therefore insisted upon freezing the prices for as long as possible. This course of action, however, was not always in the best interests of the contract partners, because even a mere rise in the cost of raw materials or wages and salaries would have forced the already negligible profit margins further downwards. However, when economical growth slowed down in the USA at the end of 2000, the cost of raw materials lay noticeably lower than at the time of the original agreement. The contracted partner manufacturers therefore produced and accumulated large amounts of inventory at an unchanged rate for months without taking into account the actual market demand for Cisco products.

Finally, Cisco realised that it could not use most of the materials delivered, because the demand at the end customer had considerably reduced. The business was therefore forced to sell the excess inventory as obsolete, and write off the loss in capital. With this, Cisco had

therefore paid a heavy price for the lack of consideration for the interests of its partners.

### 2.4.3 Insufficient Responsiveness at Hewlett-Packard

Businesses often overlook the fact that supply chains should be flexible in order to respond as quickly as possible to changes in demand behaviour. This comes largely from the fact that, for some time, the adaptability and the balance of interests have been recognised as relevant supply chain requirements. However, it is a false conclusion to believe that a satisfactory responsiveness automatically accompanies this. The latter represents an additional and more recent requirement. However, even if the supply chain is both adaptable, and respects the interests of all participating businesses, it is dangerous to disregard the aspect of responsiveness.

*Hewlett-Packard (HP)*, was founded in 1939. The business is located in Palo Alto, California (USA). In 2002, it merged with its former rival Compaq Computers. With more than 300,000 employees in 170 countries and a turnover in the 2014 fiscal year of around 114.9 billion US Dollars (about 104.5 billion Euros at the exchange rate as at mid-2015), HP with its two divisions, Hewlett-Packard Enterprises and HP Inc., belongs to the world's leading information technology businesses. The product range includes, amongst others, Computers, printers and printer supplies, digital cameras, consumer electronics, servers, storage devices, IT application solutions and services ([www.hp.com](http://www.hp.com)).

In 1995, Hewlett-Packard got together with its competitor Canon, to jointly develop and market printers. At the very beginning, the American company tuned its own interests to those of its Japanese partner, i.e. showed exemplary behaviour in this respect. It was agreed that HP would assume the production of printed circuit boards, whilst Canon was to build the motors for the newly-planned LaserJet series.

The division of labour was regarded on both sides as fair and just, and the research and development teams quickly learned to work closely together. After the LaserJet printer had been commercially released, HP and Canon swiftly adjusted the supply network for marketing the product. HP used its factories in Idaho, USA and in Italy. Canon manufactured in its factories in West Virginia, USA and Tokyo, Japan. After some time, however, a problem emerged that neither HP nor Canon had foreseen.

To keep costs low, Canon had agreed to vary the number of motors produced. However, this was subject to the condition, that HP would advise them of the changes long beforehand—in some cases at least 6 months before the printers were due to be put on the market. However, at the earliest, HP was only able to predict the demand 3 months before the printer was launched. At this time, however, Canon could only modify its production plan marginally by a few percentage points. The result was that the supply chain could no longer absorb sudden fluctuations in demand.

As the demand for the LaserJet III declined towards the end of its lifecycle, HP was left with a large and costly amount of its revenue invested in excess printer motors, known as the infamous “LaserJet-Mountain”. Although HP had an adaptable supply chain which also preserved the interests of all partners, this fact did not assist the business to avoid the negative consequences that had arisen due to the lack of responsiveness of its supply chain—for which it had to accept significant losses.

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