3. Supply Chain

Supply chain can be defined as a chain of supply. The term is relevant to all companies that develop, create or deliver a commodity – or are respectively involved in any of the processes. In this way, the meaning of supply chain encompasses all phases of the process from the raw material suppliers up to their receipt by the end user. This chain follows the flow of material, information and financial resources by means of the chain of supply to the companies involved in the service process. This chain of supply, or rather, network and its accompanying relationships are not rigid in any respect. Relationships and network partners alike are subject to the market development as well as the focal company strategy (a focal company is the stakeholder within a network who is looked after by the network management).[4] In this instance, the tempo at which an adjustment must be made is determined by the previously mentioned points.[5] The following illustration depicts the performance objects within the supply chain.

[4] Cf. Essig et. al., 2013, p. 10
[5] Cf. Beckmann, 2004, p. 1-2

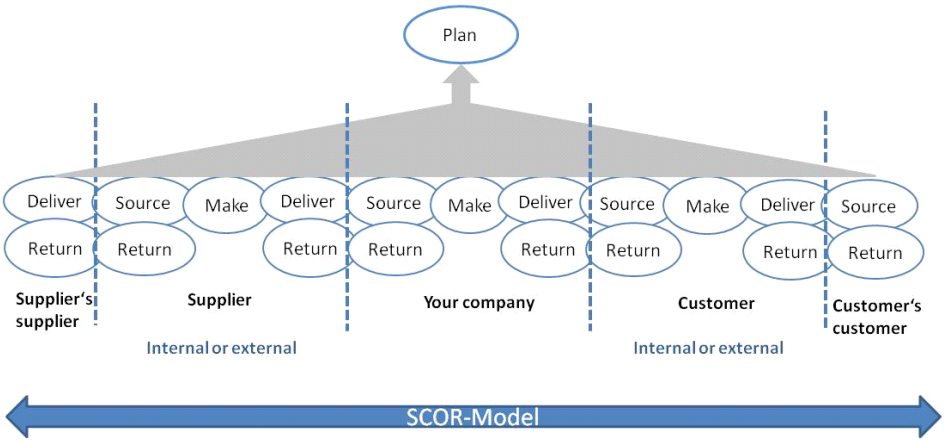

Figure1: Flow of material,finances andinformation within thesupplychainvia theSCOR Model[6]

The illustration shows the top level process of the SCOR Model, wherein there are five different processes. All planning processes are assigned within the process plan. The process source includes all acquisition activities that are necessary in order to generate a service. The subsequent process is known as „Make", in other words, the manufacturing stage of the product. This concerns the production processes as well as related activities i.e. capacity control. The delivery process includes distribution processes, which is found at the customer interface. The last link in the chain is the Return process and it is associated with any refund of goods, but also includes direct customer returns, repairs as well as all disposals.[7]

[6] Source: Bolstorff und Rosenbaum, 2012, p. 11
[7] Cf.Essig et. al., 2013, p. 288

3.1. Supply Chain Definition

Literature provides numerous explanations regarding the definition of supply chain. Yet in this case the multifaceted nature of its meaning is not as pronounced as in other definitions, but emerges only from the depth of its perspective. For instance, the supply chain is regarded as the central object of analysis for competition analysis.[8] This definition is very superficial. Beckmann supplies a vastly more precise meaning. He describes supply chain as the flow of service objects that extends from raw material suppliers to the end users and moves via a network of value-added partners. Distinct characteristics of the supply chain concept constitute:

- documentation of all processes along the supply chain
- encompasses all parties involved and logistic processes
- objectives are development, acquisition, production and distribution processes
- oversteps organisational boundaries
- coordination by means of a consistent information system
- fundamental objective is to create customer value while considering costs and profit.[9]

Another definition interprets supply chain as a network made up of flows of money, information and products, which identifies a market that generates utilisable products.[10] One developmental step in the vision of supply chain management is supply network management. This vision includes the seamless intertwining of complex supply processes. All persons involved with the respective aspects of the

[8] Cf. Bauer, 2011, p. 9
[9] Cf. Beckmann, 2004, p. 2-3
[10] Cf. Gleich und Daxböck, 2014, p. 23

process must be optimally informed and each individual must be able to draw a greater benefit than would have been feasible from the previous strategy. Networks of this nature are known as virtual companies.[11]

3.2. Branch-specific Characteristics of Supply Chains

Before the branch-specific characteristics of supply chains can be delineated in detail, reference will be made concerning the influence of the industry structure in which the supply chains are designed. This influence shall provide the initial insight into branch-specific characteristics. Kodama developed a very useful model that distinguishes between three different industry types. The termination rate of development projects serves as a basis for the differentiation, which can occur within the three industry types at various times. As a result, valuable information regarding the influence of product structure can be elicited. The industry types consist of the following:

- dominant design industry
- high tech industry
- science-based industry.[12]

The dominant design industry is characterised by mature markets and pre-existing key technology. Its success is due to low product costs. The following industry sectors can be appropriated to the dominant design category: the foodstuff industry, raw materials

[11] Cf. Voegele und Zeuch, 2002, foreword
[12]Cf. Corsten und Gabriel, 2004, p. 237-238

industry, steel industry and automotive industry as well as mechanical engineering.[13]

Rapidly growing markets and a high and strong momentum in technological developments are characteristic of the high-tech industry. In this case, the time to market is the greatest factor of success, in other words, the first with a new product on the market. [14] The electrical industry and electronic industry, the computer and software industry as well as the telecommunications industry comprise industry sectors that have been designated as a high tech industry.

The science-based industry has a very strong association with science. The most significant success factor is the meticulous planning of the product pipeline. The close connection to science involves high investments, which very sharply increase the risk for these projects. Industry sectors falling under this category include the chemical and pharmaceutical industries.[15]

A subsequent and much more detailed development began in 1996 with the founding of the independent and non-profit organisation, the Supply Chain Council (SCC). The goal of this organisation is to develop an ideal model of the supply chain. In the course of time, its members designed the Supply Chain Operations Reference Model (SCOR). This model facilitates the description, evaluation and analysis of supply chains for companies and industry cross-sectors

[13]Cf. Kodama, 1991, p. 129
[14]Cf. Kodama, 1991, p. 129
[15]Cf. Corsten und Gabriel, 2004, p. 240-241

alike. Version 11 of the SCOR Model is currently in use.[16] This yielded the four fundamental types of supply chain design, in which the most significant impacts are taken into account with respect to the customer, market, product and technology.[17]

Branch	Supply Chain Design
Automotive industry	Lean supply chain design
Chemical and Pharmaceutical industry	Associated supply chain design
Electronics industry	Agile supply chain design
Consumer goods industry	Fast supply chain design

Table1:The four basic types ofsupplychain design[18]

The four basic types of supply chain design shown in the table represent an abundance of features. These types are divided into requirements determined by the market: product and technology, resultant consequences for procurement, production, distribution and planning.[19]

[16]Cf. Werner, 2013, p. 64-65
[17]Cf. Corsten und Gabriel, 2004, p. 246
[18] Source: Corsten und Gabriel, 2004, p. 245
[19]Cf. Corsten und Gabriel, 2004, p. 247-248

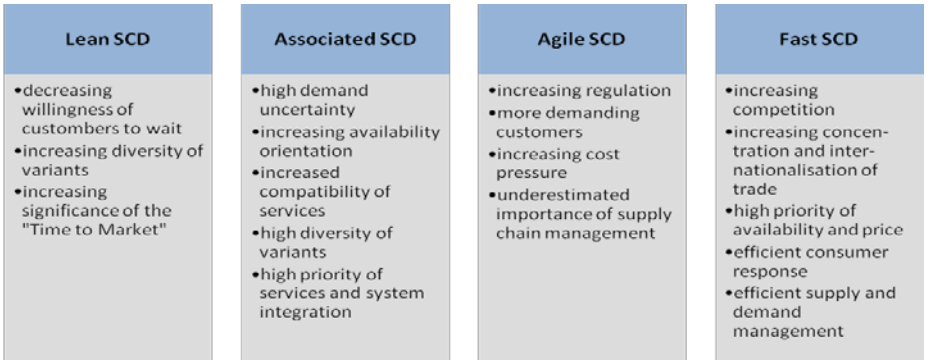

Figure 2: Brief description of the four supply chain designs inrelation to marketandcustomer requirements[20]

The figure depicts various demands on companies within the different branches relevant to the market and customer base. To be sure, designating categories is not always so straightforward in practise. It is more important for each individual company to specifically tailor the respective supply chain to their customer and market. However, such a defined supply chain design is not set in stone. It must be assessed at regular intervals and adjusted where necessary.

In a PWC study from 2013, the most important competitive factors as predefined by the survey clients from the various branches were requested. The variety of industries is certainly greater than those defined by the Supply Chain Council, yet can also be allocated accordingly.

[20] Source: Corsten und Gabriel, 2004, p. 247

Industry / Comp-etitive factors	Auto-motive	Chemicals & Process Industry	Industrial Products	Pharma-ceuticals & Life Sciences	Retail & Consumer Goods	Technology & Telecom
Minimised Costs	**90%**	**87%**	93%	94%	90%	83%
Max. Delivery Performance	87%	**87%**	**98%**	**100%**	**95%**	**94%**
Max. Volume Flexibility and Responsiveness	83%	77%	74%	78%	79%	90%
Complexity Management	67%	72%	61%	72%	70%	71%
Minimised Risks	67%	58%	60%	78%	60%	58%
Sustainability	53%	52%	38%	67%	45%	50%
Tax optimisation Efficiency	48%	42%	38%	53%	46%	50%

Table2:Importance of competitive factors in variousindustries[21]

The figure above shows defined competitive factors according to sector. The importance of these factors is measured in percentages. The data originates from a questionnaire issued by PricewaterhouseCoopers, in which 500 companies from Europe, America and Asia were surveyed in 2013.

[21]Source: PWC-Studie, Global Supply Chain Survey, Next generation supply chains, 2013, p. 20-31

Within the industrial products and pharmaceuticals and life sciences sectors, maximum delivery performance is given absolute top priority, whereas in other sectors it is less pronounced by up to 13%. These competitive factors consistently commanded first or second place with the exception of the technology and telecom sectors. Overall, this factor took first place. Minimised costs followed in second place. This category was rated as the most important for the automotive and chemicals and process industry sectors. It is remarkable that the pharmaceuticals and life sciences sector indicated the highest percentages for virtually all competitive factors. That is to say, the importance and associated intensity of the processing are somewhat higher than in comparable sectors.

3.3. Distinctive Features of Supply Chains in the Steel Industry

Steel manufacturers serve a varied and extensive customer base, ranging from rebar manufacturers which supply their products to the construction sector, to low-alloy sectors which supply materials to manufacturers of chains, cold headings, or to peeling operations as well as the automotive industry. The customer base also includes manufacturers of high-alloy and super-alloy steels, which produce tool steels, rustproof, acid-resistant and heat-resistant steels as well as high-grade and roller bearing steels. However, many steel manufacturers have one sector in common, the automotive industry. Yet in most cases it is not directly supplied by the manufacturers. Steel manufacturers are situated between supply chain levels tier 3

and tier 6, depending on how they have organised their own structures. It is then not surprising that in 1991 Kodama was already associated with the automotive industry and steel manufacturer in the same dominant design industry group. The dominant design industry prescribes a particular environment in which companies operate. Pre-existing key technologies and mature markets are examples within this scenario.[22] Consequently, cost reductions remain one of the most essential competitive factors in the steel industry. A powerful tool to this end is known as "fill the mill", which means that steel manufacturers try to make maximum use of their facilities in order to reduce costs.[23] Another important aspect is delivery performance. Since customer buying behaviour has drastically changed in the last few years and the market has become increasingly dynamic and complex, delivery performance must be even more proficient in confronting such changes.[24] Furthermore, it is essential to be responsive to product quality demands. Tolerances are more narrowly interpreted on a continuous and sustainable basis by steel manufacturing customers.[25] In conclusion, it can be maintained value drivers in the steel industry for many steel manufacturers are congruent with the automotive industry. This is attributed to the fact that they are at different levels in the same supply chain.

[22]Cf. Corsten und Gabriel, 2004, p. 237-238
[23]Cf. Studie Roland Berger, Challenging Conventional Wisdom in Steel, 2014, p. 2
[24] Cf. Warrian, 2012, p. 81
[25] Cf. Zipp, 2012, short summary