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# *Supply Chain and Supply Chain Management*

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## 1. Introduction

By separating and specialising systems we make them more efficient, provided that the cost of the connections does not exceed the gains from separation. As the quality of connections (both the structure and infrastructure) has improved, there has been increased separation and specialisation.

Businesses have evolved from autonomous entities that generate products out of thin air for a small set of customers into networks of organisations that deliver value to their customers in the form of products and services.

Supply chain management includes designing (i.e. selecting, integrating and leading) and coordinating the companies involved in order to serve the customer. The “focal company” is responsible for this integration and coordination activity. This company may be the brand known to the client or, in many cases, an anonymous actor whose survival depends on building and maintaining the network.

The supply chain is formed by aligning the goals and means of the various stakeholders (or by changing stakeholders) and adjusting them to the target customer’s needs. Often, the product (volume, value, fragility, exclusivity, etc.) is what really drives the network and governs how it changes, with changes to the product triggering changes to the whole structure.

## 2. Supply Chain and Supply Chain Management

The concept of supply chain, based on the overall process of separation and specialisation that make systems more efficient, has become widely accepted.

“Supply chain” can be defined as:

*“the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer (Christopher, 1998).”*

Some authors believe that the network of organisations should include legally independent entities. This contrasts with the opinion of plant managers in large multinationals who believe that plants similar to their own, within the same distribution chain, are their main competitors (although they are clearly also collaborators, and even customers or suppliers). It is therefore the non-aligned objectives that establish the existence of a chain, and not simply a process with various actors who must be aligned.

(Stadtler, Kilger and Meyr, 2004) define supply chain management as the task of integrating organisational units across a supply chain and coordinating material, information and financial flows to meet the end customer’s demands, with the common goal of improving the competitiveness of the supply chain as a whole.

(Chopra, 2016) establishes three levels of decision making, i.e. strategy, planning, and operations.

The strategic level should determine the configuration of the chain for the coming years. The decisions to be made include the products to be manufactured, the degree of reliance on subcontracting, the location and capacity of factories and warehouses, the

modes of transport and the type of information. The data needed to make these decisions are very uncertain. In reality, there is no need for data, since decisions are made through “intuition”.

At the planning level, the company makes use of the resources at its disposal to maximise the difference between income and costs. This phase sees a reduction (but not the elimination) of uncertainty with regard to demand, taxes, foreign exchange rates and price changes. According to a more restrictive outlook, the planner decides which markets are served by each facility, the level of resource usage, inventory policies, etc.

The operational level is about meeting the customer’s needs in the best possible way. In principle, uncertainty about the value of parameters should have been eliminated. Instead, another type of uncertainty arises i.e. availability. The product or supplier may be unavailable as a result of incidents and the contingency plans in place will have a major effect on the outcome.

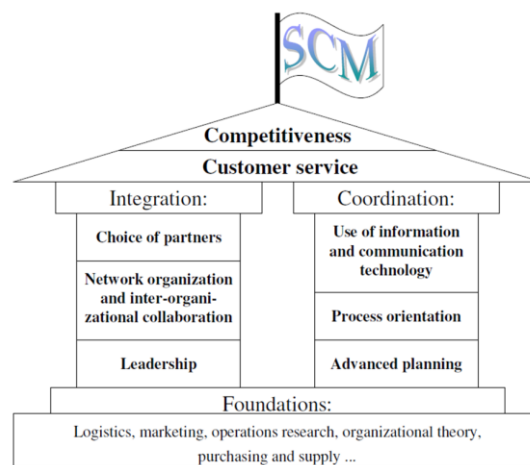


Figure 1: House of SCM (Stadtler, Kilger and Meyr, 2004)

(Stadtler, Kilger and Meyr, 2004) suggest two different types of activity: those relating to integration/design and those relating to coordination/management.

- Integration activities include partner selection, organisation of a network and defining modes of inter-organisational collaboration. In the Stadtler model, inter-organisational leadership (exercised by the focal company) forms part of the integration activities.
- Coordination activities are supported by ICTs, systems are process oriented and advanced planning mechanisms are used (wherever possible).

To support all these activities the classical tools of marketing, operations research and organisational theory must be reoriented to serve a multiplayer system.

One of the activities that support supply chain management is logistics, so much so that many professionals see the two terms almost as synonyms.

It is clear that the network is shaped and managed through the connections between nodes. At the same time, the connections ensure the flow of materials and information, which is the object of logistics. In addition, the proper management of a chain’s logistics usually implies the emergence of additional nodes and connections, gradually increasing the complexity of the networks in which each node takes part.

### 3. Setting up the right supply chain

A company’s competitive strategy must define the needs of the end customers it wishes to satisfy. Their needs can be met by offering variety, speed of response, low costs and excellent quality (whatever this means for the customer).

Choosing priorities defines the product (good or service) that will be offered to the customer. Moreover, the demand that the customers as a whole generate can be more or less easily predicted.

In shaping the product, a company also selects suppliers and technologies that may be more or less predictable in their behaviour for the company and its competitors.

(Lee, 2001) proposes classifying the supply chain on the basis of two dimensions: products and processes. Functional products are products with predictable demand, while innovative products are products whose demand is not very predictable. Stable processes are those that can guarantee the product will be made as and when planned. Evolving processes are those that cannot guarantee an adequate supply of the product procured.

Markets for functional products and stable processes require efficient supply chains that focus on reducing prices and efficiently using installed capacity. To achieve this, inventories are typically reduced to keep costs low and cut lead times without affecting costs.

		Demand Uncertainty	
		Low (Functional Products)	High (Innovative Products)
Supply Uncertainty	Low (Stable Process)	Efficient supply chains	Responsive supply chains
	High (Evolving Process)	Risk-hedging supply chains	Agile supply chains

Figure 2: classification of supply chains (Lee, 2002)

If processes are evolving but products have very predictable demand, the supply chain will face risks. Depending on the risk, different strategies should be adopted. Reasonable strategies include having more installed capacity than required, reaching agreements with other chains and/or having capacity available in various locations. Such strategies may not be efficient but they add resilience to the chain as a whole.

Stable processes with innovative products lead to risks on the demand side. In such cases, it makes sense for a company to have a responsive supply chain that allows it to be flexible and thus to adapt to customer demands. A supply chain in this environment aims to have modular products that can be differentiated at the last minute, thus aggressively reducing lead times in order to avoid holding stocks of finished products (although it usually does stock raw materials and semi-finished products).

Supply chains facing evolving processes and innovative products must be agile, ensuring sufficient capacity to react but sharing resources to reduce risks.

A particularly dangerous situation arises when the supply chain discovers a technology which competitors lack. Initially, it will be able to generate very large margins. These margins will fall if competitors can enter the market by stabilising their processes. Faced with this new situation, many companies are caught off guard as their high-margin (and therefore low cost pressure) market suddenly becomes highly competitive.

#### 4. The focal company

Most people working in logistics say they work in the supply chain, even if they do not take part in the strategic decisions that define the supply chain.

This strategic activity is performed by the so-called focal company. The focal company decides on the strategy (single supplier, long-distance suppliers, information systems, modes of remuneration for contributing to the value chain, etc.), and the remaining players then decide individually whether to participate in a certain process, which over time may reshape how they do business.

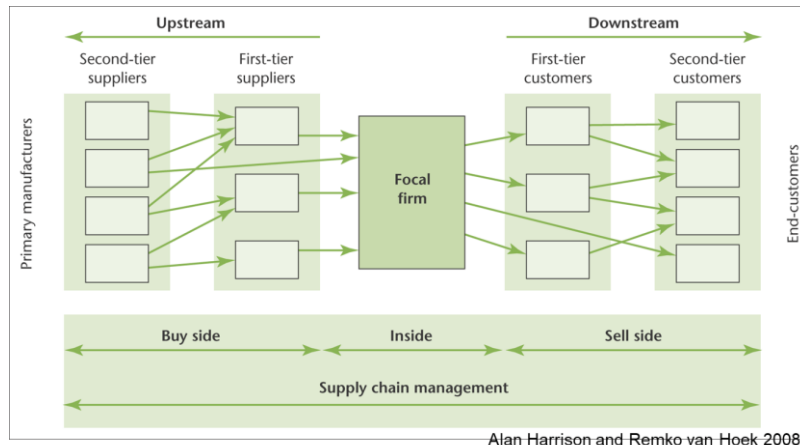


Figure 3: focal company (Harrison, Hoek and Skipworth, 2008)

#### 5. Objectives of the supply chain

A supply chain's objectives (which may not coincide with the particular objectives of the links in the chain, or worse, of the managers of each link) are measured on the basis of cost because this is the most common and, therefore, convenient approach. However, they should include aspects that are increasingly relevant to the customer, such as: reliability in terms of deadlines, product variety and availability, quality of service, traceability, response time, speed of introduction of new products, ability to return products, etc.

Furthermore, not only do the links have objectives misaligned with those of the chain but they also generally belong to several chains. In other words, in practice, rather than a chain, we are dealing with a network which in turn is made up of fragments of smaller networks that weave one network into another.

Once we start talking about a supply chain (which existed before it was given this name), it should not only be considered as an entity, but should also be managed as such. This is where the notion of supply chain management comes into play.

The combined characteristics of a product (and its demand) and the process (current and short-lived) that shapes it define the objectives of a given supply chain, which in turn guides the selection and combination of the subsystems that will make up the overall subsystem.

(Chopra and Meindl, 2016) propose the following indicators: response time, reliability, product variety, product availability, customer experience, time to market, traceability, visibility and quality of reverse flows.

To this end, each system must establish the number and type of facilities, as well as their location, the amount of inventory to be held in each and the transport between them. Each system must also consider the information systems and suppliers at its disposal, and perhaps influence pricing policy.

Given that a supply chain is in competition with other supply chains, its objectives are not defined by the focal company but by the market in which it chooses to compete, as explained above.

Once the objectives have been defined and communicated, not even the manager of a multinational responsible for relocating the manufacturing of a product from Europe to North Africa “designs the supply chain”. Rather, the manager is solely tasked with defining the cheapest, fastest, safest, most visible or most reliable way of doing this.

To this end, managers combine the various elements at their disposal: location and technology of factories and warehouses, modes of transport between them, points of decoupling or repackaging. No less important are the information systems that connect these elements. To achieve his or her purpose, the manager defines inventory systems and route management and establishes the way materials are received or the picking scheme to be used, etc.

## 6. The product and the supply chain

In every supply chain, all these elements have a common factor that shapes the system, namely the product.

Thus a small and expensive product will require a supply chain where production and warehousing are centralised and transport is key.

A product with a short shelf life will require a system with a high response speed, severely limiting options.

At the same time, technology providers will offer more expensive or cheaper applications depending on the alternatives they perceive the designer to have, thus reaching a break-even point where a reduced set of different configurations have reasonably similar investments, costs and response times (although sometimes with completely different characteristics).

In any case, logistics will aim to connect the various nodes so that the product and information circulate smoothly, minimising costs and the time between stages.

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