Chapter 3 – Supply Chain Strategy: Lean and Agile

Executive Summary

This chapter is about supply chain strategies and it especially concerns the strategies lean and agile. First, the chapter generally introduces strategy as concept, then talks about manufacturing, and finally introduces the two strategies and further how they can be combined. Choosing supply chain and logistics strategy must go hand in hand with the overall strategy of the firm, and furthermore it is very important for a firm to be adaptable and set up for volatile demands.

Key Terms

SCM	Supply Chain Management.
Supply Chain	Views material flows moving downstream from source to customer.
Value Chain	Flows up with demand from the customer to the supplier.
TPS	Toyota Production System, named after their competitive advantage in the production of cars.
Mass Customization	Makes use of the principle of postponement.
Postponement Principle	The final value-adding activity in the supply chain is delayed until the customer's order is received.
Decoupling Point	The point going from base product to customized product.
Agility	The ability to respond rapidly to unpredictable changes.
Leagile	The combination of lean and agile logistic philosophies.

Notes

Strategy:

Logistics and supply chain strategy is definitely not divorced from a firm's general strategy, in many instances logistics and supply chain strategy can be the key component and the driver within the firm's strategy. A usual starting point with strategy is the top-down structure. This starts with the wide corporate strategy and its objectives. The overall financial and growth targets for the organization, which markets to focus on, and their impact on the environment. Below the corporate strategy comes the business unit strategy as many large organizations are divided into such business units, sometimes also referred to as silos i.e. marketing, production, etc. The final level is functional strategy and refers to the development of strategies for specific areas of activity within a business unit.

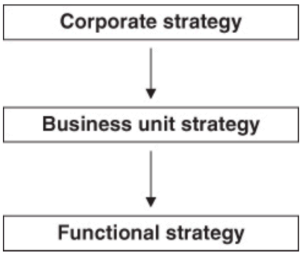


Figure 4.1 Top–down perspective on strategy

However, not everyone agrees on this structure as it doesn't allow for bottom-up perspective and in the case of logistics it assumes that these functions are just like other functions within the firm. Another structure of strategy is the holistic approach with a cross-functional, process based perspective.

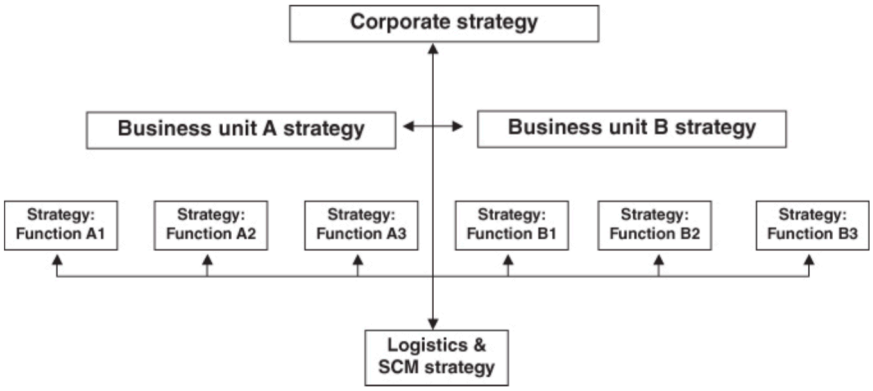


Figure 4.2 A holistic view of logistics and SCM strategy formulation

The most important part of a strategy is implementing it, 90 % of strategy is implementation. Make whatever changes necessary in the following weeks, months, or years. Formulating strategies for logistics and SCM should not be bound or restricted, but rather take a cross-functional, process-based perspective. Two principal logistics and SCM strategies are Lean and Agile, which will be explained further later. Furthermore, a one-size-fits-all approach to logistics strategy makes less sense, and thus also combined logistics strategies will be considered.

The evolution of manufacturing:

Before the industrial revolution production was primarily craft production, think on the history of shoemaking, where shoes were made for each individual by hand. It was a costly production, and still exist today in a few specialist high-value industries. Henry Ford developed the mass production exploiting economies of scale. However, the variety of products were limited. The book mentions his Model T motor car, which customers could have in any color they would like as long as it was black. Today we are closer to a point which entails both mass production and great variety, and this may

primarily be because of lean production and mass customization, which will be explored in the following sections.

Lean production:

Lean production origins back to Toyota, who looked at the methods from Henry Ford and tried to improve every aspect of the production process. It gave Japan a significant competitive advantage as a result of their total quality management (TQM). Many production systems are "push" based, where they produce a specific amount of products based on a forecast and a budget, and they push their products out in the market. Toyota sought to develop a "pull" based system to prevent stockpiling inefficiency, this is also known as just-in-time (JIT).

The Toyota Production System (TPS) was built upon seven key areas:

1. Overproduction: Make-to-order (MTO) instead of make-to-stock (MTS)
2. Waiting: Poor design/planning many times result in waiting and inefficiency, e.g. healthcare
3. Transportation: Is a non-value adding waste of time, one might try to find a way to add value while the product is been transported
4. Inappropriate processing: All products are processed equally, even though only some of them need the extra processes
5. Unnecessary inventory: Excessive inventory is costly and may hide other problems
6. Unnecessary motion: Poor design/planning may result in unnecessary transportation
7. Defects: Follow an emphasis on zero defects with a total quality system

The key aspect of lean production is to make sure that every stage of the process adds value, and those that do not are eliminated.

In recent years many of the aspects from lean production has been transferred to the service sector as well. These has been transformed to the following six principles from lean consumption:

1. Solve the customer's problem completely
2. Don't waste the customer's time
3. Provide exactly what the customer wants
4. Provide what's wanted exactly where it's wanted
5. Provide what's wanted where it's wanted exactly when it's wanted
6. Continually aggregate solutions to reduce the customer's time and hassle

Agile supply chains and mass customization:

The agile supply chain is made to handle volatility of demand and is known as mass customization. It is based on a principle of postponement, which is about standardizing as much as possible, and delaying the customization to the very final stage of the process. In this way the customers can demand a customization of the final product. Another name for this approach is delayed product configuration or late stage customization. It implies that the firms must have a base product, core product, or generic product which then can be customized.

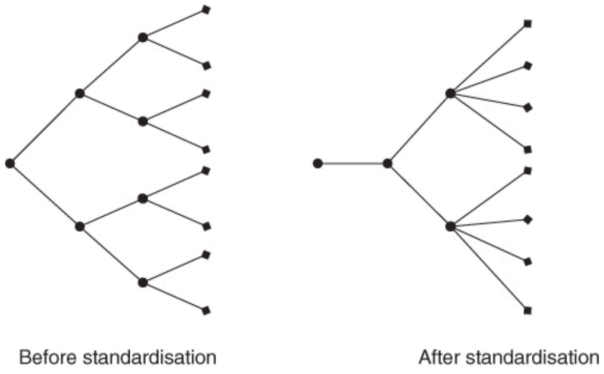


Figure 4.4 The principle of postponement

The point where we move from the base product to the customized product is called the decoupling point. An example is the purchase experience of paint. Because of technology development, it is now possible to buy very many different paint colors and even in many difference can sizes. The range of stock-keeping units (SKU) are huge. However, instead of having all possible SKU's in every paint store, each store has a machine and the primary base colors, and they can then just plug in the formula on the color to make. All that is required is the primary colors and some different can sizes to fill it in.

Agility is said to be concerned about responsiveness. It is about the ability to match supply and demand in turbulent and unpredictable markets.

Combined logistics strategies:

A framework has been put forward in order to determine which model to use when. However, it is still important to mention that a one-size-fits-all still does not apply, each firm must always be aware of the changing circumstances internal and external.

	Predictable demand	Unpredictable demand
Long lead time	**Lean** Plan and execute	**Leagile** Postponement
Short lead time	**Lean** Continuous replenishment	**Agile** Quick response

Lean, continuous replenishment: Short lead time and predictable demand, will apply for a supplier making regular deliveries to a retailer. Steady demand pattern, and predictability can be further improved with facilitating full visibility from the retailer to the supplier by giving direct access to electronic point of sale (EPOS).

Agile, quick response: Short lead time, unpredictable demand, the fashion store Zara is a good example, as they are specialized in fast fashion. They rapidly react to the ever changing trends in fashion, by making use of postponed production, they can quickly configure the base product into a new required final product.

Lean, planning and execution: Long lead time, and predictable demand, more planning is required. Lean principles can be applied in supply chains where any uncertainty caused by long lead time can be managed. A classic example is that of artificial Christmas trees sourced in from Asia to Europe every year.

Leagile: Long lead time, and unpredictable demand. Combination of lean and agile logistics, also called hybrid strategy. Using postponed production, the base product can be produced at a remote location and shipped to locations nearer the final market. Here it can be configured into the required final product. E.g. electronic generic products are produced and shipped to distribution centers in different geographic locations where they are customized with language, packaging, and different power cables. Taking the decoupling point into account, lean principles will be applied up until the decoupling point, where after the agile principles can be applied.

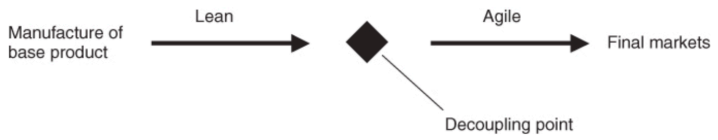


Figure 4.6 The leagile supply chain

Critical factors to consider in supply chain planning:

The separation of different functions (silos) in organizations may be the cause for difficulties of aligning supply chain and logistics in a company. The best supply chains should be adaptable and agile and have aligned interest with the rest of the company. However, even great supply chains cannot overcome poor design buying decisions which fail to introduce attractive products in the first place. Any measure of supply chain success include the three critical elements: people, process, and technology.

Week 7: Chapter 8, Logistics Service Providers

Executive Summary

This chapter describes the role played in supply chains by logistics service providers (LSPs). The different types of LSPs are discussed. It goes into the growth of a category of LSPs called 3PLs, which are LSPs who generally offer multiple logistics services, often in an integrated fashion. The chapter presents various services that LSPs can provide and recommends that you use multiple 3LPs in order to "keep them on their toes".
This chapter is very brief and does not go very deep into any of its subjects, it almost spends more space referencing to other chapters.

Key Terms

Key Term	Definition
LSP	Logistics service providers. Company that provides logistics services.
3LP	Those LSPs that provide multiple logistics services, often in an integrated fashion, are called *third-party logistics companies (3PLs)*.
Own-account transportation	Own-account transportation is when a company provides its own transport services.
4PL ®	LSPs that offers complete supply chain management, companies can outsource their supply chains to a 4PL.
5LP	Although still new and not clearly defined it refers to LSPs who use technology solutions across complex networks that incorporate multiple supply chains – it would thus appear to be most suited to LSPs serving e-commerce companies.

Introduction

Many companies do their own logistics, but this chapter presents the range of logistics service providers. Traditionally the only services provided were transport, warehousing and customs clearance, but with time, this has expanded to encompass a raft of other activities

Classifying logistics companies

Many logistics companies started by transporting freight using one mode of transport onl
In recent decades the fields of logistics and SCM grew both in popularity and complexity, spurred on by developments such as the proliferation of containerisation and advances in tracking technologies. For freight transport companies, there was an opportunity to do more than just simply move freight using a single mode of transport from A to B.
Generally, there has been an increasing tendency of companies to outsource various activities, many of which they may regard as non-core, and focus on their core competencies. This meant that many companies started outsourcing their logistics moving away from own-account transporation → More demand for logistics service providers.

TABLE 8.1 Classifying logistics service providers

There is a considerable overlap between all of these categories.

Type	Services typically provided
Freight carriers	Basic carriage of freight – by hauliers, trucking companies, train companies, airlines, shipping companies
Freight forwarders	Make transportation and other arrangements. A significant area of activity for many freight forwarders is in arranging customs clearance for freight that moves internationally (brokerage). Freight forwarders have broadened out their product portfolio to encompass many other activities (e.g. acting as agents for ships arriving at ports, freight consolidation services). Many other freight forwarders have evolved to a stage where they now operate their own vehicles and warehouses.
Couriers	Urgent delivery of products. The term ‘onboard courier’ is used to describe courier employees who travel with ultra-urgent shipments either as checked-in or hand luggage on a flight.
Integrators	Offer a seamless (i.e. integrated) end-to-end service from consignor to consignee (FedEx, UPS). One of the general difficulties in supply chains is that when freight gets lost or damaged it is usually at what are known as the ‘touchpoints’ (these are where freight is handled or transferred from one carrier to another). Integrators argue that the service they provide often circumvents these problems as they retain sole responsibility for freight from origin to destination, and they will usually ‘track and trace’ freight as it moves along

Type	Services typically provided
	their transport chains and thus have enhanced visibility of the product and any problems which may arise.
Agencies	Companies combine buying power to gain reduced freight transport rates, e.g. in the shipping sector companies come together and charter a vessel – this is known as an **NVOCC (non-vessel owning common carrier)**

As freight companies provide a broader and more integrated range of services, many have come to be known as **third-party logistics companies (3PLs)**.

Fourth party logistics

In recent years a concept known as **fourth-party logistics (4PL®)** has emerged, which provides a radical solution that offers companies totally outsourced supply chain solutions. It was invented and trademarked by Accenture in 1996, who originally defined it 'as a supply chain integrator that assembles and manages the resources, capabilities and technology of its own organisation, with those of complementary service providers, to deliver a comprehensive supply chain solution'

4PL and 5PL

Typically, 3PL companies offer a 4PL solution; a 4PL® type concept where individual 3PLs offer an overarching solution for an individual customer and which encompasses offerings from different (competitor) 3PLs. Some people use the description '4PL control towers' to refer to the role played by such 4PLs.

5PL is even more advanced and technological, but is not clearly defined yet.

Carrier responsibilities

Once freight leaves a consignor, it is up to responsible LSPs to ensure that it reaches the consignee in the right condition, at the right time etc. This chapter does not delve to deep into this subject, but does mention that a lot of documentation of details often is required.

Selecting LSPs and services

If a company wishes to use LSPs, the book recommends the following strategy: a strategy that is often used by logistics managers is to give a large share of their business to one carrier, and the remaining smaller share to a competitor carrier. This has two advantages: firstly if there are any problems (for example delays) with the preferred carrier, then they can, if necessary, switch traffic to the alternative carrier; secondly this dual approach has the

advantage of keeping both carriers ‘on their toes’, because they know there is an alternative available if their performance starts to weaken.

Factors to consider

These factors are recommended to be considered when deciding on the use of 3LSPs:

- Services to be provided (geographical areas, volumes including fluctuations, time frame etc.)
- Costs and costing approach (open book, gain share, penalties, inflation/cost increases etc.)
- Terms of carriage, applicable Incoterms, insurance (responsibility for damage and shrinkage)
- Speed/transit time
- Performance metrics and service levels, reliability
- Information systems (especially with regard to systems integration), other technology issues (e.g. capability to ‘track and trace’ freight and requirement to use advanced technologies such as RFID) and documentation requirements
- Core versus value-adding services required
- Staffing issues (e.g. transfer of undertakings with respect to previous employees, legal responsibilities, company image and responsibility, union recognition, disruptions)
- Reverse logistics issues (packaging, returns – damaged and faulty goods, failed deliveries etc.)
- Implementation/termination/ability to alter conditions
- Details on the LSP's history, client references etc.
- Digitisation and transparency capability in the end-to-end supply chain

Chapter 10 – Inventory Management

Executive Summary

This chapter is all about inventory and covers how much inventory to order, how many per year to order, and how to decrease the inventory in order to save money. The chapter includes different calculations and shows how money can be saved by changing inventory system and by optimizing the inventory management. Finally, an ABC Analysis is presented in order prioritize different items in the inventory based on the 80/20, because often a few items will account for a lot of the expenses.

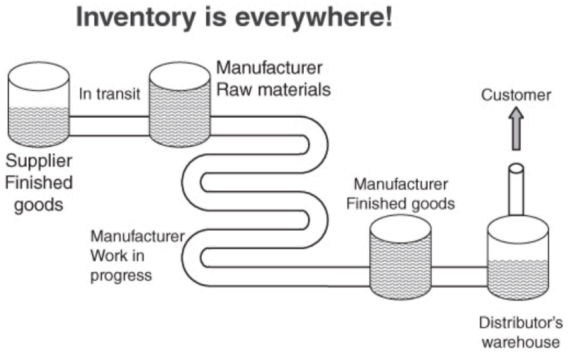
Key Terms

Inventory Turnover	How often the average inventory is changing in a year.
Forward Cover	The inventory available to support the sales plan/forecast.
Reorder Point (ROP)	The point in time where a new order is issued.
Lead Time	The time it takes for the order to arrive in the inventory.
Safety Stock	Also called buffer stock in need for any variations.
Reorder Point System	A new order is made every time the inventory hits the ROP
Periodic Control System	Orders are issued based on a maximum inventory level.
Delayed Product Differentiation	Having a base product for as long as possible.
Part Commonality	Using the same parts for many different products.
Transit Inventory	The inventory that moves across the supply chain.

Notes

<u>The importance of inventory management:</u>

Inventory is found many places in a supply chain. Manufacturers have *raw materials* to convert them into *finished products*. And before they are finished, they are called *work in progress*. And furthermore, there may also be products *in transit* when transporting them. See the picture below:



Holding inventory costs money because it is money that could have been invested elsewhere, so it ties up capital and space, and affects the cash flow. Furthermore, it costs money to have a building for the inventory and having people to look after it. However, one must have some inventory or else customer orders will simply take too long time to produce. Inventory turnover is an important concept used to measure how good firms are to minimize their inventory level:

$$\text{Invenotory Turnover} = \frac{\text{Cost of all goods sold in a year}}{\text{Value of average inventory held throughout the year}}$$

Most firms have a turnover about 10, however well-performing firms may have 50 or more.

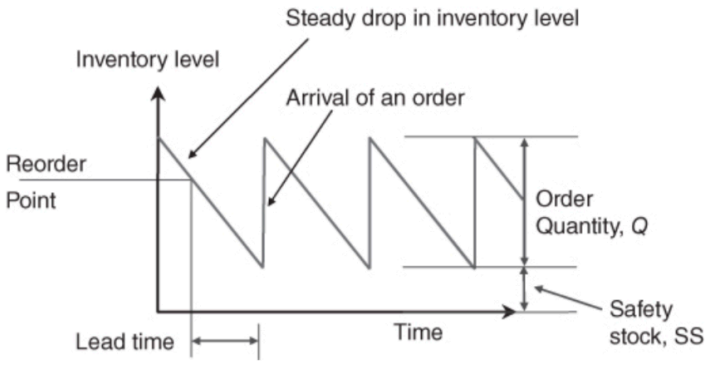
There are several reasons to have inventory, and it may be seen as a necessary evil as there will be often be trade-offs between more or less inventory. A buffer of inventory is required to absorb the variability in demand, supply, internal processes, and externalities.

The Economic Order Quantity Model:

First, some definitions

D:	Annual use of a particular item, in number of items per year
S:	Order-processing cost, in $/order
p:	Price per item, in $/unit
H:	Holding cost per unit per year, in $/unit/year
Q:	Number of items ordered in one purchase order, in units
T:	Time periods between purchase orders in fraction of a year
SS:	Safety stock, in units
L:	Lead time, in fraction of a year
I:	Current inventory on hand, units
TAC:	Total annual cost

When the inventory is at a certain level, called the reorder point, a new order is made for the item. After some time, called the lead time, the item arrives at our inventory, and our inventory of that item increases by Q. This cycle repeats itself over the year with time, T, between each period. Also note that the inventory is always kept above some amount called SS, safety stock.



The total annual inventory costs consist of the purchase cost, the holding costs, and the order processing costs. The annual purchase costs must be

$$Purchase\ costs = p * D$$

The annual holding cost, also including opportunity cost of tying the capital, is based on the average amount of inventory held. The average level of inventory is dependent on the maximum amount (safety stuck + amount Q ordered) and the minimum amount (safety stock):

$$Average\ inventory\ level = \frac{SS + Q + SS}{2} = SS + \frac{Q}{2}$$

And now the annual holding cost must be

$$Annual\ holding\ cost = \left(SS + \frac{Q}{2}\right) * H$$

Where H is the annual holding cost per unit. We also know that D determines the annual usage, and that we order the quantity Q every time we place an order. So the number of orders made in a year must be $\frac{D}{Q}$. And finally, we have S which is the order processing cost per order made:

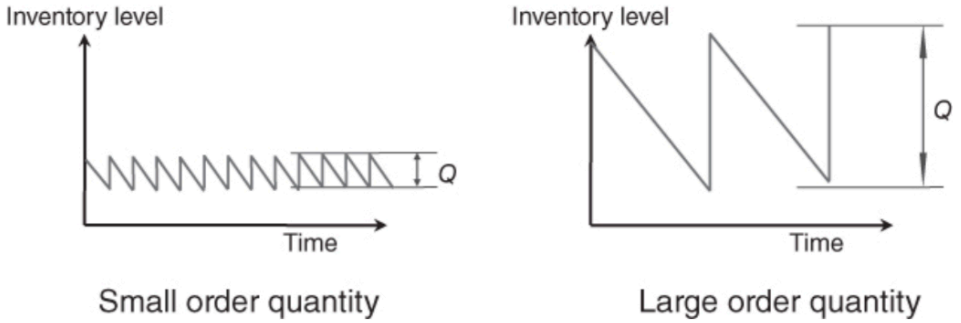
$$Annual\ order\ processing\ cost = \frac{D}{Q} * S$$

Adding the three together gives us the total annual costs

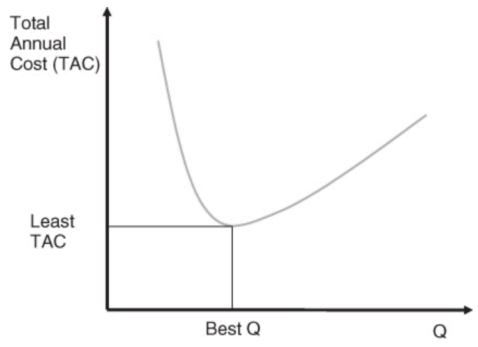
$$TAC = purchase\ cost + holding\ cost + order\ processing\ cost$$

$$TAC = p * D + \left(SS + \frac{Q}{2}\right) * H + \frac{D}{Q} * S$$

The order quantity influences this, because a small order quantity increases the number of orders which increases the order processing costs. However, few but large orders will increase the average inventory level.



Therefore, one must find the optimal order quantity:



The order quantity that minimizes the total annual cost is known as the economic order quantity (EOQ) and is given by:

$$EOQ = \sqrt{\frac{2DS}{H}}$$

To derive this formula see p. 301 in the 3rd edition pdf book.

Inventory Control Systems:

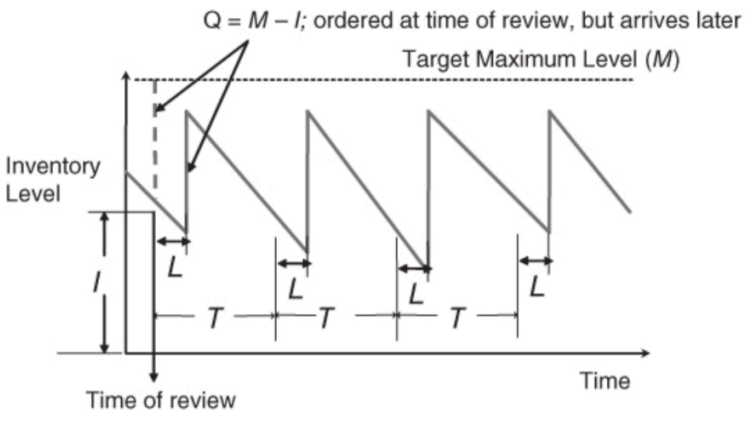
- The reorder point inventory control system

When an order is issued at the reorder point (ROP), the inventory gradually decreases down to the safety stock over the lead time. The use of inventory over the lead time is $D * L$, since the annual demand is D. Thus the reorder point is given by

$$ROP = D * S + SS$$

- The periodic inventory control system

Here, orders are reviewed periodically after some time T (not continuously as above). At each review, the inventory level (I) is determined, and inventory is ordered to bring the inventory level to a target maximum level (M).



Often firms may decide on a weekly or a fortnightly ordering cycle, but in the absence of such policy, the time period T may be calculated

$$T = \frac{EOQ}{D}$$

The highest amount of inventory will be lower than the maximum level set when ordering home, as the inventory level gradually decreases in the lead time. So the maximum level is set above the actual level because of the lead time. Therefore, the quantity ordered will be

$$Q = M - I$$

In the two systems above, both have a safety stock, SS. Many events could happen to disrupt the planning e.g. late deliveries, higher inventory use than forecasted, issues with poor quality products, production problems, transportation problems, etc. Safety stock may also be referred to as buffer stock, and the root reason for it may be described as variation. Variation of demand, supply, lead time, production, etc. Safety stock need to be held in proportion to such variations as a safety stock is not free. The cost of holding safety stock is included in the total annual cost as $SS * H$.

Supply Chain Inventory Management:

It can be a good idea to centralize inventories, because the variation will be less with one large inventory compared to the aggregate variations from e.g. three different distribution centers. And with less variation, a smaller safety stock is needed. The concept of inventory reduction by centralization is sometimes stated as the "square root rule". That is an approximation and states the inventory buffer needed is proportional to the square root of the numbers of locations. With the example of 1 and 3 centers it would be

$$\frac{\sqrt{1}}{\sqrt{3}} = 0{,}58$$

So one would save 42 % on centralizing.

Delayed product differentiation gives another opportunity for the firm. Instead of having several different products with several safety stocks, one could have a base product which could become all of the other products. Then the aggregate safety stock needed would again become smaller and the firm could save money. The delayed product differentiation does not only save money, but does also offer a greater flexibility and simplicity to manufacturing.

Part commonality is similar to above, however part commonality tries to reduce the number of different parts in order to decrease safety stocks. E.g. think of Lego who uses many of the same bricks in their different boxes. If they had to come up with new brick for every campaign box, their inventory should have been enormous.

Transit inventory is when inventory moves across the supply chain. The annual transit cost inventory cost is

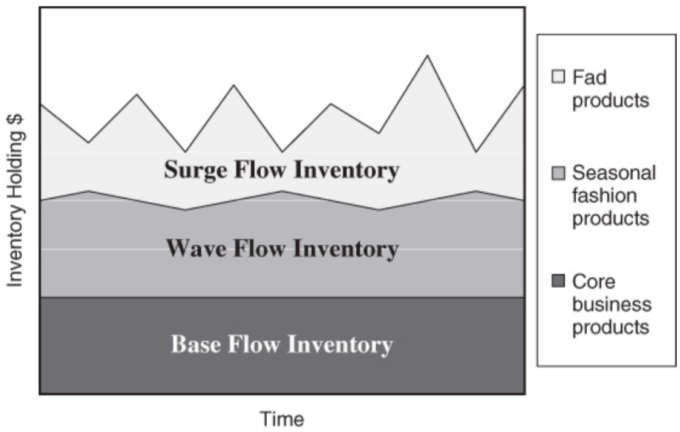
$$Annual\ transit\ inventory\ cost = D * L * H$$

This demonstrates a reason to reduce the lead time whenever possible as it will reduce the cost. Often when making transporting decisions, the transport with the lowest costs will be chosen, however that transport will also often be the slowest transport mode, increasing the lead time. The cheaper the transport mode, the more expensive transit inventory cost.

Matching Inventory Policy With Inventory Type:

Firms use a tool called ABC-analysis to separate out the most important items in their inventory. Some few items may have the highest expenses, which is why it makes sense to focus more on those. Inventory items can be labelled A, B, or C according to their importance in terms of expenses. A general rule of thumb says that 20 % of the items account for 80 % of the expenses.

Also different inventory flow types exist. They are shown here below in three categories. The base flow with core business products and will often be everyday items. Then there is the wave flow inventory, here with the example of seasonal fashion products. And finally, the fad products with extremely variable demand.



Different stockholding policies will fit the different flow types, see the table below:

TABLE 9.3		
Stockholding policies for alternative inventory flow types		
Type	**Characteristics**	**Stockholding policy**
Base flow	Predictable high flow rates	Minimum stocks. Direct deliveries from suppliers
Wave flow	Slow moving flow rates. High criticality. Perishable. Peaks are relatively predictable	Minimise stockholding, building them during peak demand period. Direct delivery from supplier where possible
Surge flow (1)	High criticality. Low value. Long lead time. Small physical size	Hold high level of stock thereby allowing safety stock delivery lead time and demand fluctuations
Surge flow (2)	Low criticality. High value. Bulky physical characteristics. Peaks are relatively predictable	Minimise stockholding, building them only during peak demand period. Direct delivery from supplier where possible

Inventory Reduction Policies:

Reducing inventory is a primary goal, but this reduction needs to be consistent with the strategic goals of customer service. Below are the principles for inventory reduction:

- Pool Inventory

Where ever inventory can be combined, one should pursue centralization. Inventory can also be combined by using common components or delayed product differentiation. Furthermore, pooled inventory has the advantage of less inventory management.

- Reduce variation

Holding safety stock is to reduce variation, so with less variation one can reduce their inventory. The same effect can be seen with quality, as quality variation also increases the need for safety stock. So a firm must iron out all the wrinkles in their supply chain and ensure a quality production.

- Reduce lead time

Both the reorder point and the transit inventory cost can be reduced by reducing the lead time. With a long lead time, we need to forecast a long time into the future making it less precise, which therefore requires a higher safety stock.

- Just-In-Time inventory system

Inventory is needed because of variation, which can also be called problems. Problems with transportation, production, quality, etc. Therefore, finding the root cause instead of hiding the problems with a greater inventory will be beneficial.

JIT further seeks to reduce order processing cost so the ideal of small quantity ordering can be accomplished, decreasing the average inventory. JIT seeks to facilitate this small lot production by actively improving the setup process so that the time and effort in setups ae reduced drastically.

Chapter 12 - Outsourcing, Offshoring and Procurement – Week 8

Executive summary

Chapter 3 discusses the importance of relationships across the global supply chains. This chapter explores and differentiates, the areas of outsourcing, offshoring, integration and collaboration. Each respective strategy is complemented by reasons for execution, risks, dilemmas and possible solutions. Multiple models are presented to visualize exactly these decision-processes which are designed to assist in making the right decision and illustrate the importance of patience in development to maximize efficiency.

Key words

Outsourcing	The transfer to a third party of the management and delivery of a process previously performed by the company itself.
Offshoring	The transfer of specific processes to lower cost locations in other countries.
Supply chain integration	A term that embodies various communication channels and linkages within a supply network. Integration can also be described as the alignment and interlinking of business processes.
Collaboration	A relationship between supply chain partners developed over a period of time. Collaboration can either be vertical or horizontal.

Notes

Globalization has encouraged multinational enterprises to develop their own supply networks to maximize efficiency and quality of the final product. Globalization of the manufacturing sector has resulted in the following trends:

- Global competition
- Competitors, partners and customers from around the world Global sourcing
- Global presence
- Global value chains resulting in increasing complexity and competition
- Global access to knowledge and new technologies
- High levels of customer awareness and expectation Rapid pace of technological change
- Fast rate of product commoditization
- SCM expertise and innovation as preconditions for business success

In the manufacturing sector there have been a number of changes in recent years. Manufacturing organizations now give greater importance to relationships with partners in their supply chains. Furthermore, globalization has led to increased **outsourcing** where companies decide to outsource certain activities to other companies. There are 4 central reasons for outsourcing:

1. Cost
2. Flexibility
3. Focus on core competences (continue all tasks where the company has a competitive advantage, while outsource all others)
4. Technology

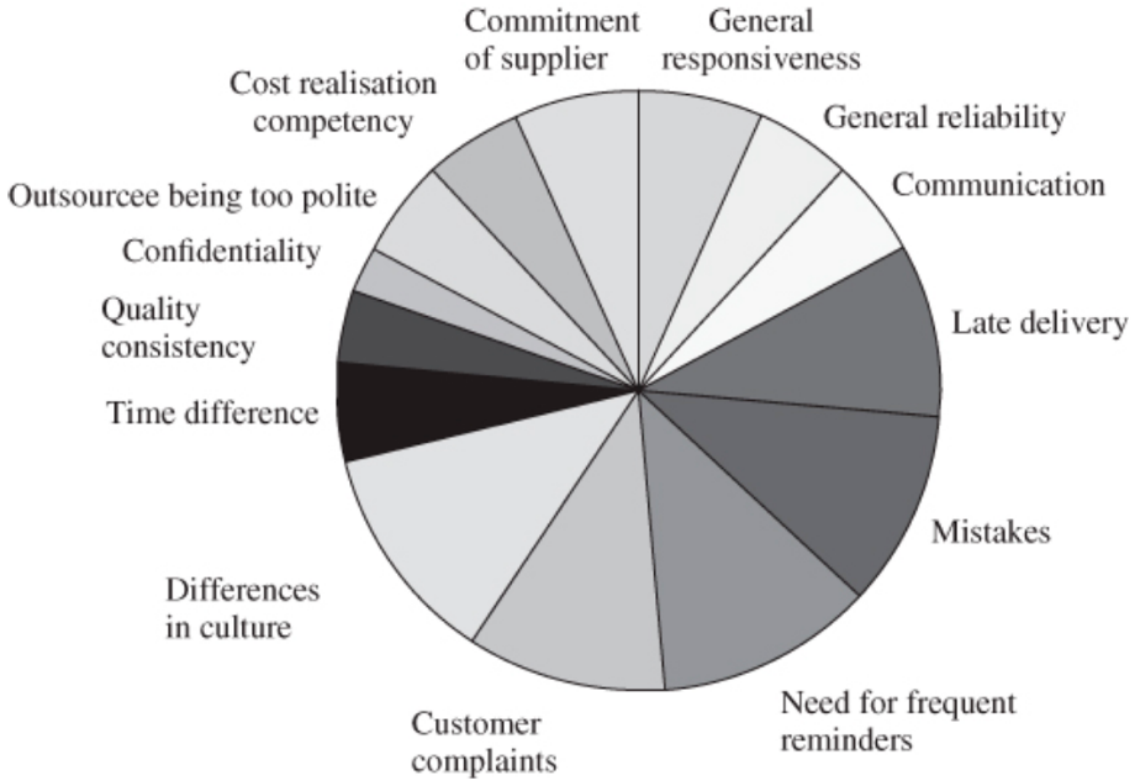
There are a number of issues to be considered in outsourcing: first how to go about selecting an outsource partner, and then how to effectively manage the chosen partner. In order to effectively manage the outsource arrangement, companies generally put in place a **service level agreement** (SLA) and performance metrics.

An SLA is a key part of a contractual agreement between a customer and a supplier to identify upfront the performance (i.e. service) levels expected. This is a legally binding contract. Potential suppliers will have to first qualify by meeting those criteria and/or performance expectations defined in the SLA before they are given proper consideration. We refer to these minimum

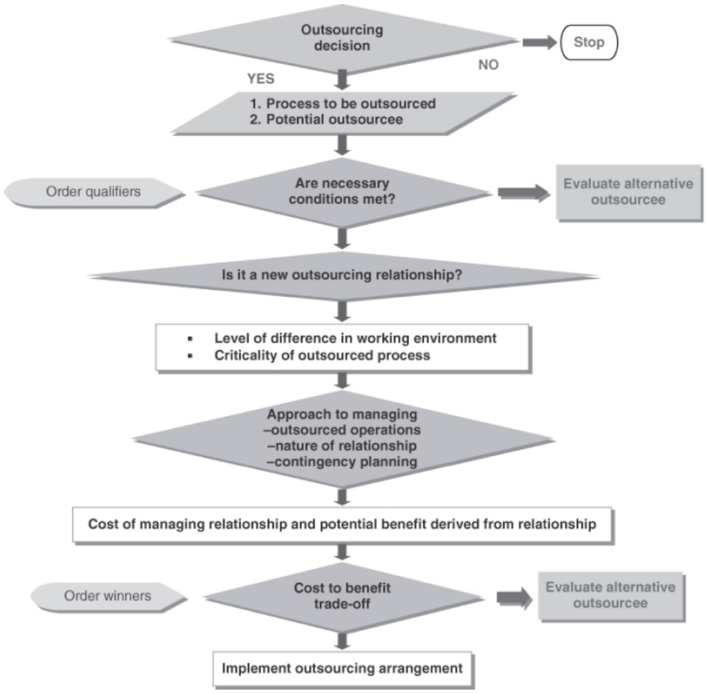
requirements as order qualifiers, while the criteria that allow the supplier to actually be selected, we refer to as order winners. Many studies have shown that good supplier relationship management leads to better results and added benefits, especially when it is over an extended period of time, sharing risks and benefits.

If you think of a pyramid, the top tier is the manufacturer or client organization. Below this are what are referred to as first-tier suppliers, below these the second-tier suppliers and so forth. Sometimes the term **original equipment manufacturer (OEM)** is used to describe the top-tier organization, i.e. the manufacturer/ultimate client organization. Such OEMs are the producers of the final product that carries their brand.

The main reasons for a failed outsourcing are listed below:



Once an outsourcing decision has been made, the first step is to evaluate the potential outsources. The framework for evaluating and selecting outsources is visualized below:



The main criteria that are included as order qualifiers include:

- Reliability of delivery
- Quality certifications
- Conformance to agreed specifications Delivery lead time
- Financial capability
- Performance track record
- Price or cost reduction
- Senior management attitude Responsiveness to demand uncertainty Record of corporate social responsibility

After having set up an outsourcing agreement, a relationship between the outsourcer and the outsorcee arises. In fact, research has shown that outsourcer–outsourcee relationships can move across four stages:

- **Master–servant stage**: in this conventional relationship the outsourcer sets the expectations and the rules and the outsourcee delivers as per the stipulated norms. Low cost is the main driver of the outsourcing arrangement.
- **Consultative stage**: this stage is a type of a 'consultant–client' relationship. The outsourcer consults with the outsourcee on a regular basis. In addition to the cost, other factors such as quality, reliability and responsiveness are also important for sustaining the outsourcing arrangement.
- **Peer-to-peer relationship stage**: this is considered to be the ideal stage where the outsourcer and the outsourcee share a peer-to- peer relationship. This stage of collaboration results in a more synergistic long-term relationship creating 'win–win' situations for both parties.
- **Competitive stage**: in this stage the original outsourcee company takes the lead role and starts to compete with the outsourcing company in global markets.

Offshoring is another and increasingly popular approach companies are using to reduce costs. Offshoring is the transfer of specific processes to lower cost locations in other countries. Offshoring is not the same as outsourcing because outsourcing involves handing process ownership over to a third party, whereas with offshoring the company may still own and control the process itself in the lower cost location.

The main reasons for offshoring include:

- Lower costs in offshore regions
- Less stringent regulatory controls in offshore regions
- Deregulation of trade facilitates offshoring
- Lower communication and IT costs
- Improving capabilities in many offshore regions
- Clusters of specific activities (e.g. call centres) emerging in certain regions

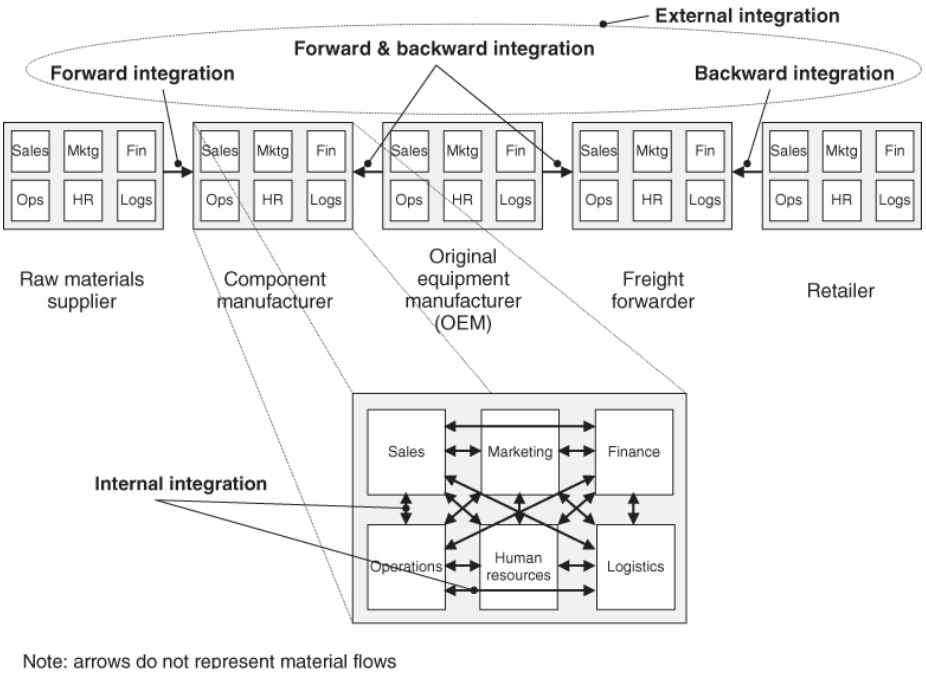
Offshoring does imply multiple risks which requires increased monitoring (and thereby also increased costs). Additionally, the increased monitoring is accompanied by larger travel distances. As a result of the potential risks and delays associated with moving products from a distant location, some companies are moving their offshored activities to countries closer to their home market, a practice called n**earshoring**. In some cases, companies will abandon offshoring (perhaps because of the aforementioned risks and delays, but usually also because of a new awareness of total costs

issues) and move the activities back to the original home market, a practice called **backshoring** or **reshoring**. Indeed, yet another term has recently emerged –**rightshoring**, which is seeking to locate the activity at the 'right' location.

Supply chain integration is a term that embodies various communication channels and linkages within a supply network. While supply chain integration is the alignment and interlinking of business processes, collaboration is a relationship between supply chain partners developed over a period of time.

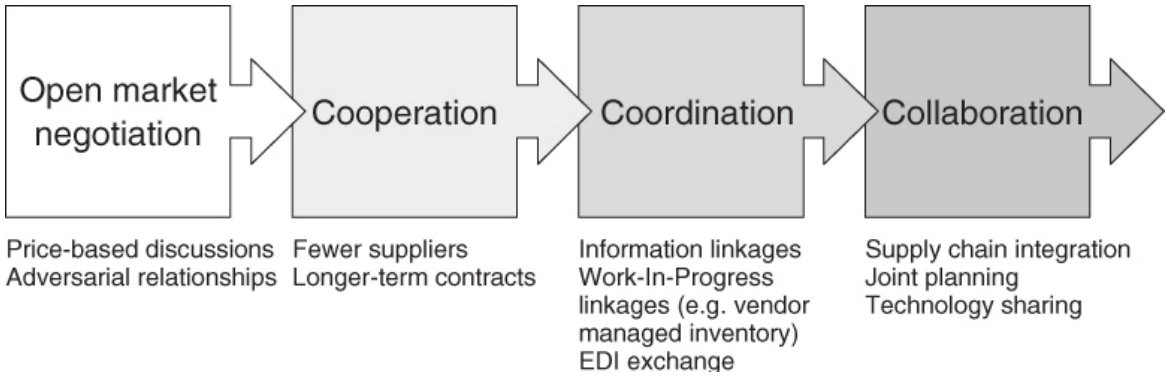
There are four primary modes of integration within a supply chain

- **Internal integration:** cross-functional integration within a selected organization.
- **Backward integration:** integration with selected first-tier and increasingly second-tier suppliers.
- **Forward integration:** integration with selected first-tier customers or service providers (e.g. logistics service providers). Forward integration with second-tier customers is uncommon.
- **Forward and backward integration:** integration with suppliers and customers. This 'total' integration is rare but theoretically ideal.

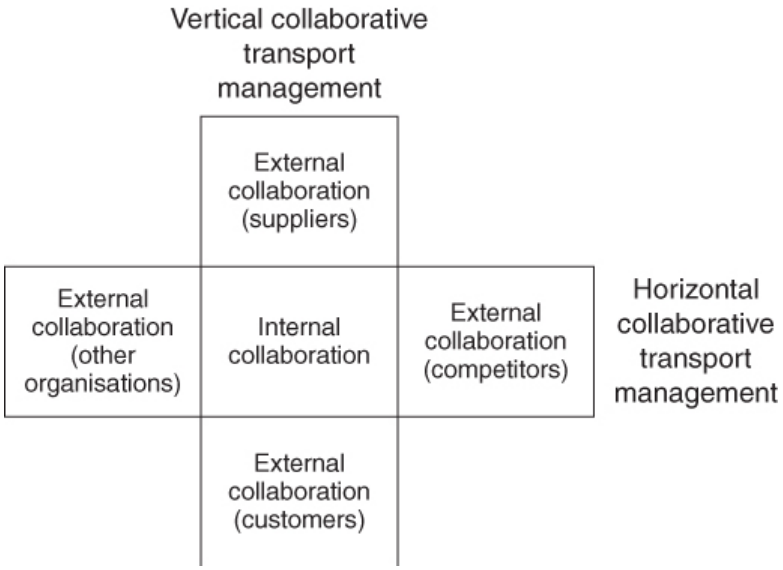


Note: arrows do not represent material flows

Integration takes time, where development is mandatory, and trust is a necessity. This is exemplified in the model below:



Collaboration has two dimensions: **vertical collaboration** between suppliers and customers, and **horizontal collaboration** between competitors and other supply chain actors.



Chapter 16 - Sustainable Logistics and Supply Chain Systems

Executive summary

Chapter 16 (14 in old book) looks beyond how logistics and SCM can influence organizational success, e.g. lower costs, and now consider the issue of sustainability as it applies to logistics and SCM.

Key words

Carbon footprint	the environmental disbenefits associated with economic activities such as the movement of freight.
Food miles	the distance over which the various components of a particular food item have to travel before final consumption

Notes

Sustainable logistics is concerned with reducing the environmental and other disbenefits associated with the movement of freight. Sustainability seeks to ensure that decisions made today do not have an adverse impact upon future generations. Sustainable supply chains seek to reduce these disbenefits by inter alia redesigning sourcing and distribution systems so as to eliminate any inefficiencies and unnecessary freight movements.

Often sustainability is referred to as a “green” issue, however, this chapter will also consider the issue of economic sustainability, i.e. how a firm can grow without having impacts on future generation, and what is the role of logistics and SCM in this context. In particular, increased outsourcing and offshoring to lower cost locations have generated huge flows of international freight. The movement of freight is however, not responsible for all of the environmental disbenefits associated with transportation ("externalities"), e.g. the movement of people also creates disbenefits, and some logisticians argue that freight takes an unfair share of the blame.

The ‘green revolution’ and supply chain redesign

Recently, we have seen a dramatic increase in what is known as ‘green’ issues, which can generally be regarded as encompassing respect for the world's natural environment (including its atmosphere) so as to ensure that actions taken today do not hinder future generations. The below figure summarize the key drivers behind the increased emphasis on green issues:

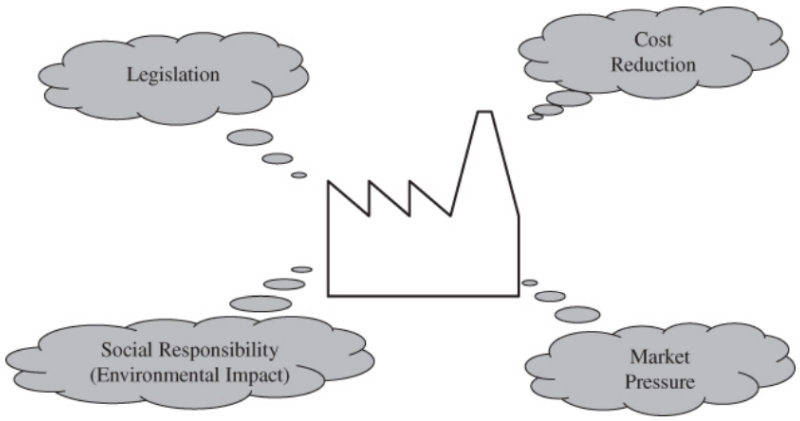


Figure 14.1 The drivers behind the increased emphasis on green issues

(Source: Kevin Ord, Scarborough Campus, The University of Hull)

A key concern is particularly around fossil fuels and the carbon emissions, where the international Kyoto Protocol has called for a 60% reduction in carbon emission by 2050. Consumers are becoming increasingly aware of the impact of purchasing goods which are sourced at a long distance. However, it is simplistic to think of the distance having a larger impact, as the impact also depends on the way the goods are manufactured/distributed.

You can generally measure a carbon footprint with the following formula:
$(Fuel\ used) * (the\ appropriate\ emission\ factor\ for\ the\ type\ of\ fuel\ used) = kgCO_2eq,$
Where 'eq' refers to 'equivalent' as this also captures other gases such as methane and nitrous oxide

The below figure illustrates the carbon footprint for a real life study of container movements from Middle East to UK

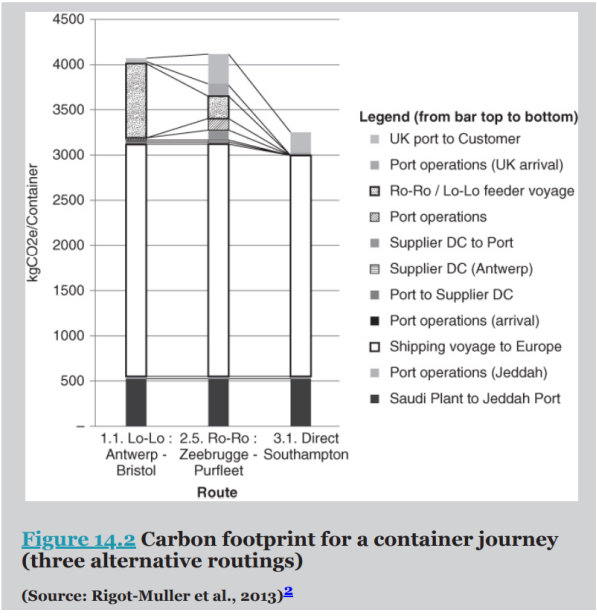


Figure 14.2 Carbon footprint for a container journey (three alternative routings)

(Source: Rigot-Muller et al., 2013)[2]

Another term used is food miles, which is the distance over which the various components of a particular food item have to travel before final consumption.

It is overall difficult to measure exactly how "green" a supply chain is, as established industry standards don't exist yet. However, it is publicly available how to measure carbon footprints, energy consumption and GHG emissions of transport services. What is accepted, however, is that "greening" a supply chain is largely about forward planning. While various initiatives such as, for example, switching to hybrid fuel vehicles are obviously welcome, and generate publicity benefits for companies, it is the **supply chain design decisions, such as deciding where to locate warehouses and distribution centres and which transport modes to use, that have the greatest impact**.

Short-sea shipping where goods are moved over short sea routes (a more environmentally friendly mode of transport) rather than along (and environmentally more harmful) roads, is becoming increasingly popular. However, here some difficulties have emerged. In some parts of the world, particularly near coasts and populated areas, Sulphur Emission Control Areas (SECAs) have been established to ensure ships burn cleaner fuels (i.e. less sulphur). A consequence of this is that ships have to use more expensive fuel for some parts of their journey, which implies that road transport alternatives may be economically more favorable but more environmentally damaging.

Another example of sustainable SC redesigns include reconfiguring distribution networks as to make consolidations and centralize hubs, and thereby replace the small deliveries with centralisation.

The key is to ensure that if goods are sourced overseas, it is done in an environmentally sustainable manner. Furthermore, as many businesses have profit as their primary objective, the key is to ensure that they see the business benefits of environmentally sustainable activities, which may include e.g. reduced energy bills and enhanced consumer loyalty. The authors summarize the three ways we can improve sustainability of logistics and supply chain systems:

- Redesigning supply chains
- Using *scale* to reduce the negative environmental effects of logistics activities (i.e. by moving freight in larger single loads, thus cutting down on both unit costs and disbenefits)
- Similarly promoting various *efficiency* solutions (by transporting and handling freight more effectively)

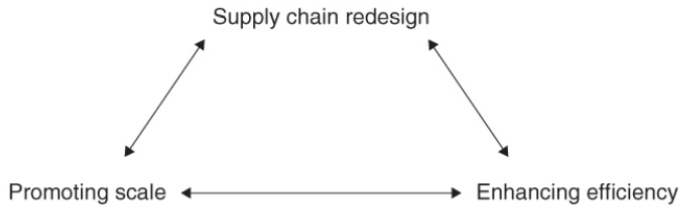


Figure 14.3 Sustainable logistics and SCM

It is important to note that these three solutions are not mutually exclusive: a smart, environmentally sensitive supply chain will combine all three.

THE LINK BETWEEN ECONOMIC GROWTH AND TRANSPORT GROWTH

We know that economic growth and growth in transport are closely linked. Hence, a cores issue for policy makers is to find ways of allowing economic growth without comparable growth in transport. It is notable in the last couple of years that trade expanded at nearly the same rate as GDP, thus calling into question the validity of the established historical (2:1) ratio between GDP and trade growth. The authors suggest reasons to include the fact that the service sector has faced high growth (i.e. non-manufactured goods), as well as we may be shifting to more environmentally friendly modes, such as rail and costal shipping.

EFFICIENCY SOLUTIONS

As well as looking to increased scale, many logistics operators are also seeking efficiencies with how they move and store freight so as to reduce the environmental impact of their activities. Companies are, for example, seeking to reduce unnecessary road haulage movement for imported maritime freight, and in turn reducing carbon footprint of these movements. The below table lists some ways in which logistics efficiencies can be generated:

TABLE 14.1

Improving road haulage logistics efficiency and reducing environmental penalties[13]

- Reducing empty running, pooling and sharing capacity, obtaining 'backhaul' loads (a number of websites have been developed which match carriers who have available capacity with shippers seeking capacity – see the caselet on electronic logistics markets)
- Increasing vehicle payload capacity (by weight and/or by cubic volume) – double deck and higher trailers, single tractor unit and multiple trailer combinations, etc.
- Improved vehicle routing using GPS and other systems
- More efficient use of packaging and loading of containers
- Improved vehicle driving (in-cab computer monitoring of driving style, even examining the benefits of air conditioning versus open windows!)
- Enhancing vehicle operating efficiency (for example using hybrid fuels, ensuring correct wheel alignment and enhanced aerodynamic styling of trucks)

In transportation, it is not just the road haulage sector that is seeking to reduce its environmental footprint. With the growth of air travel, spurred on in particular by rapid growth in the so-called low fares category of air travel, many commentators are looking towards the air transport sector to reduce its impact on environment.

In logistics, efficiency solutions are not just restricted to transportation. The area of green warehouse design is also growing in popularity. Many warehouses and their environmental footprints can be reduced by, for example, more efficient lighting and heating/refrigeration systems.

Chapter 17 Emerging Supply Chain Designs - Lecture 13 – Week 10

Chapter 18 in the 3rd edition book

Executive Summary

The particular focus of this chapter is to elaborate how various trends are shaping logistics and SCM, and in turn how supply chains can be best designed to meet these challenges, and what skills logistics and supply chain managers will need in the future.

I am sorry – this note sheet will comprise mostly of passages copied and pasted from the book. The chapter is VERY short, and does not really provide any new insight into GSCM. As it is the last chapter of the book, it is mostly to be considered as a recap of the book.

Key Terms

Design for supply chain efficiency	By taking supply chain concerns into account in the product and process design phase, it becomes possible to operate a much more efficient supply chain

Notes

Strategies and Practices in SCM

Common strategies:

- Pursuit of strategies based around lean and agile principles, and varying combinations of both
- Mass customisation/postponement/additive manufacturing
- Time compression – faster order-to-delivery cycles and elimination of non-value-adding time
- Developing value-adding activities Managing reverse logistics flows
- Coordinating and managing transport flows and directional imbalances; selecting modes and routes
- Operating in a more sustainable fashion, especially by exploiting scale and seeking out greater efficiencies, carbon footprinting

- Operating ‘own-account’ transport versus using LSPs – and with regard to the latter identifying and selecting LSPs, and determining whether to employ a 4PL approach
- Use of electronic logistics markets
- Integration of systems, business processes, etc.
- Capture and transmission of supply chain data
- Increasing visibility and information enrichment in supply chains
- Use of WMS, MRP, MRPII and ERP systems
  Selecting tracking and materials handling technologies
- Collaboration with supply chain partners, use of strategies such as CPFR and VMI
- Managing distribution centres and cross-docking facilities Consolidating freight; applying factory gate pricing
- Managing outsource and offshore activities
- Procurement (sourcing and purchasing) – addressing ethical sourcing concerns
- Supplier rationalisation and development
- Determining how much inventory to hold, in what location(s) to hold it and what inventory control system to use
- Determining costs – activity-based costs, through life costs, opportunity costs, generalised costs and landed costs
- Identifying and tracking appropriate metrics, ensuring compliance with SLAs
- Coordinating and managing upstream and downstream materials flows
- Maximising capacity utilisation and efficiency
- Assessing risks and complying with security, customs, food safety and other requirements
- Business continuity planning
  Completing appropriate documentation, selecting Incoterms
- Data analysis, forecasting of activity

The strategies may be adapted to suit the industry in which the company operates. The supply chain is, needless to say, different whether you operate in the aerospace industry or the fashion industry.

→ Best practices can, although, in most cases, be adapted and implemented despite the industry.

The ever-changing context

The business landscape is forever changing, and ensuring competitive strength is more important than ever. Companies need to reinvent themselves before they mature in the market, in order not to be overtaken by newly entered competition. This puts a pressure on managers, who constantly have to think about the future of the company.

- The key megatrends influencing SCM today, are
- The competitive landscape is increasingly dictated by supply chains, not individual firms or products, competing
- Some supply chains are becoming too stretched; wide-ranging interdependencies are adding complexity to many supply chains
- Designing for supply chain efficiency (DSCE) – and using the supply chain to innovate and add value
- Rising energy costs will have a growing impact Resource scarcity is extending reach
- Supply chain vulnerability, risk, robustness and resilience: there is an increasing need to sense and respond, to anticipate and lead and to manage unforeseen events
- There is an increasing awareness of the environmental impact – interest in carbon footprinting is growing
- Technology and the Internet of Everything have a pervasive and growing influence on logistics systems and supply chains.

Synchronizing product design and supply chain design

Discovery by managers:

By taking supply chain concerns into account in the product and process design phase, it becomes possible to operate a much more efficient supply chain.

Design for supply chain efficiency: by taking supply chain concerns into account in the product and process design phase, it becomes possible to operate a much more efficient supply chain

Often, the supply chain is in place, when a new product is designed. But, sometimes it is reasonable to redesign the supply chain.

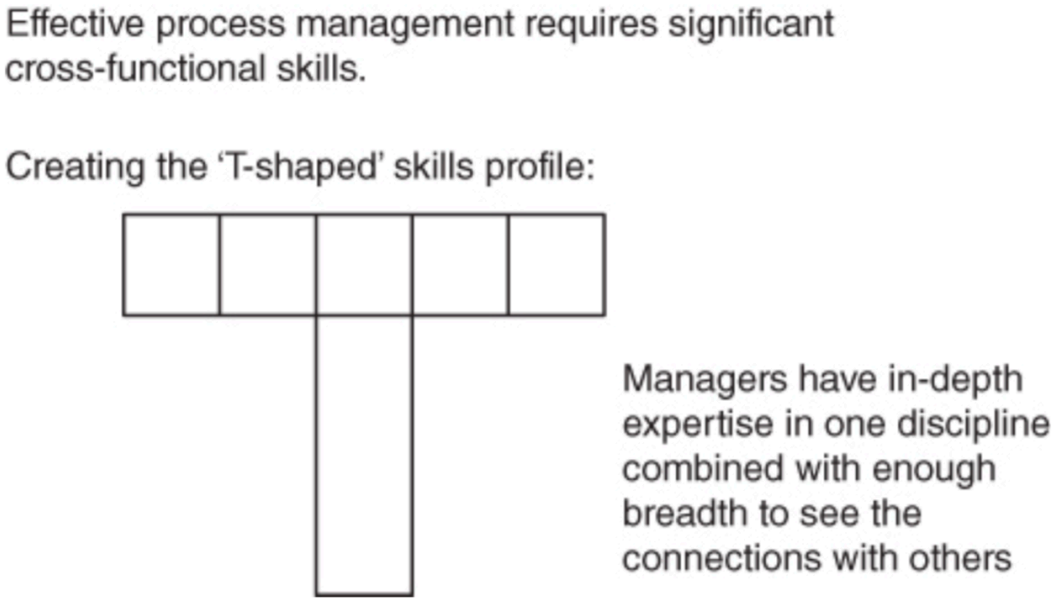
→ Also highly relevant considering sustainability – incorporating it into the supply chain, or redesigning to obtain greater environmental efficiency.

The supply chain manager of the future

A supply chain manager require the following skills to be successful:

- Market understanding, customer insight
- Management of complexity and change
- Information systems and information technology expertise
- Ability to define, measure and manage service requirements by market segment
- Understanding of the 'cost to serve' and time-based performance indicators
- Specific functional excellence with cross-functional understanding
- Team working capabilities
- Relationship management

The aim of SCM is to take a cross- functional, process perspective as distinct to a functional or silo- based perspective. This requires us to look at the role in a t-shaped manner:



The idea is that as well as bringing specific logistics management skills to the job (the vertical bar) supply chain managers need to have a wide understanding of related areas such as business process engineering, asset management and activity-based costing (the horizontal bar).

TABLE 18.1	
Key knowledge areas and competencies/skills required by logistics and supply chain managers[10]	
General knowledge areas	Finance IT Management/strategy
Logistics/SCM specific knowledge areas	Operations/SCM Focus on processes/flows Legal, security and international trade Multimodal logistics Logistics in emerging markets
Competencies/skills	Analytical Interpersonal Leadership Change management Project management