

LOGISTICS IN THE FASHION AND FASHION RETAIL INDUSTRY IN EUROPE UNDER CONSIDERATION OF SUSTAINABILITY ASPECTS (GREEN LOGISTICS)

Final work of the master course of study
to get the academic degree “Master of Science”

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.....
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LIST OF ABBREVIATIONS

SCM: Supply Chain Management

ERP: Enterprise Resource Planning

WWW: World Wide Web

DBT: Digital Business Transformation

SME: Small and Medium Enterprises

FMCG: Fast Moving Consumer Goods

QR: Quick Response

SWOT: Strengths, Weaknesses, Opportunities, Threats

EPOS: Electronic Point of Sale

GHG: Greenhouse Gas

PM: Particulate Material

HGV: Heavy Goods Vehicle

EMS: Environmental management standards

IEMA: The Institute of Environmental Management and Assessment

EMAS: Eco-management an Audit Scheme

DC: Distribution Center

IPCC: The Intergovernmental Panel on Climate Change

UNEP: United Nations Environment Program

WMO: World Meteorological Organization

PPP: Public Private Partnerships

EZ: Environmental Zone

ICT: Information and Communication Technology

B2B: Business-to-Business

B2C: Business-to-Consumer

MRP: Material Requirements Planning

EM: Electronic Marketplaces

ELM: Electronic Logistics Marketplace

DPM: Diesel Particulate Matter

ECR: Efficient Consumer Response

CHAPTER 1: INTRODUCTION

“Waste is a tax on the whole people.”

Albert W. Atwood

With daily stories of record temperatures, extreme weather, and floods and droughts, and of renewable energy, carbon footprints, recycling and energy efficiency, the environment is increasingly becoming headline news. The world's governments are moving slowly towards new international agreements that will start to address the impact of business on the environment, and these, undoubtedly, will place new requirements on every organization. But the situation is too urgent to wait for governments alone to act, and today's consumers expect every business to take responsibility for its actions – to look at the way it operates and measure its environmental impact, and then put in place a strategy to reduce it. Furthermore, business should become expert in communicating these changes to their customers.

This study will help you to make tough decisions, giving you a raft of options, suggestions and concrete advice on how to go green on logistics department in the fashion industry. It includes some interviews with the professional managers from the fashion industry.

The purpose of this study is to find out how are the real explanations of some hypotheses. The first hypothesis is to determine the role of logistics in supply chain management. It affects the customer satisfaction and total cost reduction, as well as company profitability. As logistics affects company profitability, it also impacts the shareholders value of a company. This is particularly significant as companies are increasingly being driven by the goal of enhancing shareholders value, a key measure of corporate performance. The second is to determine how companies think. Which one has the priority, money or environment? The other hypothesis is to determine the effect of supply chain logistics management to European fashion industry. Logistics management has a key role in fashion industry as much as the supply chain management but how does supply chain logistics management affect the fashion industry? The forth one is to the role of logistics on the environment and the explanation of green logistics in the European fashion industry. The last hypothesis is how the government acts in the face of green perspective? It will be tried to find out whether it is provided some governmental inducements/obligations to improve the environment policy on green thinking or not.

CHAPTER 2: LITERATURE PART OF RESEARCH

2.1. From Supply Chain Management to Logistics

2.1.1. Supply Chain Management (SCM)

Fierce competition in today's global markets, the introduction of products with shorter life cycles, and the heightened expectations of customers have made obligation business enterprises to invest in, and focus attention on, their supply chains. This, together with continuing advances in communications and transportation technologies (e.g., mobile communication, Internet and overnight delivery), has motivated the continuous evolution of the supply chain and of the techniques to manage it effectively.

In a typical supply chain, raw materials are procured and items are procured at one or more factories, shipped to warehouses for intermediate storage, and then shipped to retailers or customers. Consequently, to reduce cost and improve service levels, effective supply chain strategies must consider the interactions at the various levels in the supply chain. The supply chain, which is also referred to as the “logistics network”, consists of suppliers, manufacturing centers, warehouses, distribution centers, and retail outlets, as well as raw materials, work-in-process inventory, and finished products that flow between the facilities (see Figure 1).

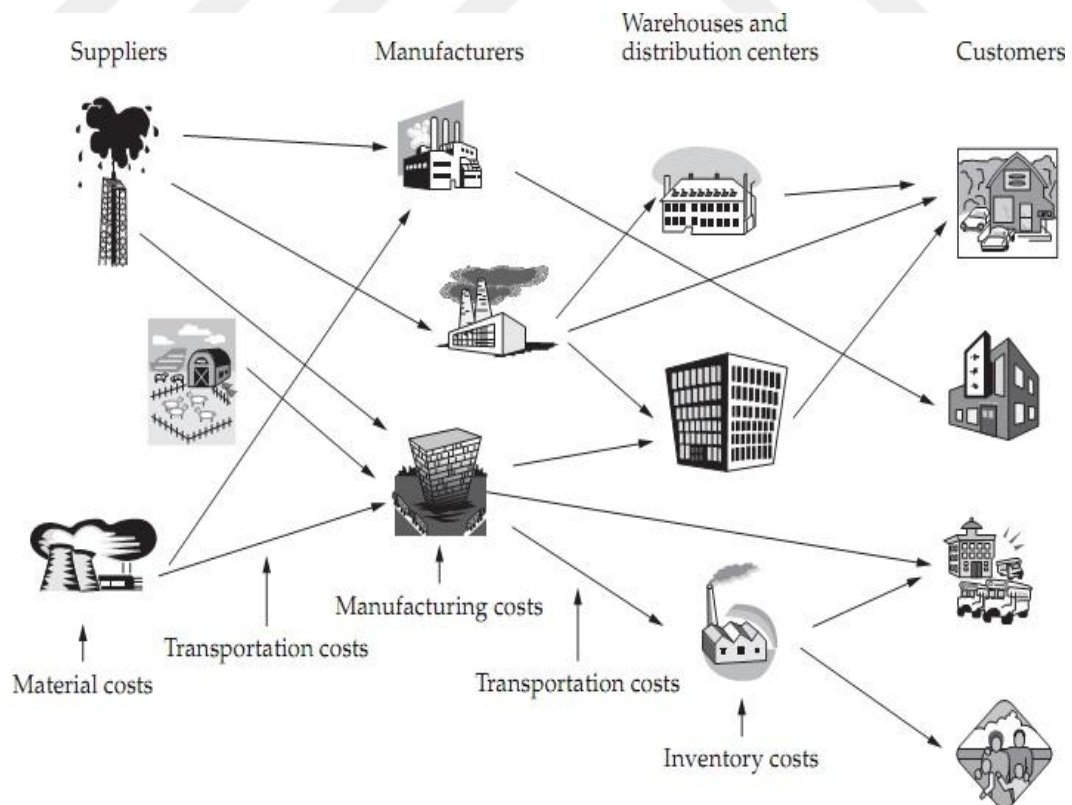


Figure 1: The Logistics Network

Source: Simchi-Levi, D. et al. (2003)

In this part, it is presented and explained by the author that the history, concepts, insights, practical tools, and decision support systems which are important for the efficient management of the supply chain. Also the revolution and evolution of the supply chain will be explained in this part.

2.1.1.1. Introduction to Supply Chain Management

Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize the entire system costs while satisfying service level requirements. (searchmanufacturingerp.techtarget.com 2011)

This definition leads some observations. Firstly, supply chain management takes into account that every facility that has an impact on cost and plays a role in making the product assimilate into customer requirements: from supplier and manufacturing facilities through warehouses and distribution centers to retailers and stores. Indeed, in some supply chain analysis, it is necessary to account for the suppliers' suppliers and the customers' customers because they have an impact on supply chain performance as well.

Secondly, the objective of supply chain management is to be efficient and cost-effective across the entire system; total entire system costs, from transportation and distribution to inventories of raw materials, work in progress, and finished goods are to be minimized. Thus, the emphasis is not only on simply minimizing transportation cost or reducing inventories but, rather, thinking of supply chain management like a complete system.

So, what makes supply chain management difficult? Let's ask this question. Although it will be discussed a variety of reasons which are according to Simchi-Levi, D. et al. (2003) throughout this part, they can all be related to some or all of the following observations:

1. It is challenging to design and operate a supply chain so that total entire system costs are minimized, and systemwide service levels are maintained. Indeed, it is frequently difficult to operate a single facility so that costs are minimized and service level is maintained. The difficulty increases exponentially when an entire system is being considered. The process of finding the best strategy is known as global optimization.
2. Uncertainty is inherent in every supply chain; customer demand can never be forecast exactly, travel times will never be certain, and machines and vehicles will break down or not. It means an existing of uncertainty.

2.1.1.2. Global Optimization

What makes finding the best systemwide or globally optimal, integrated solution so difficult? According to Simchi-Levi, D. et al. (2003), a variety of factors make this a challenging problem, like:

- a.** The supply chain is a complex network of facilities dispersed over a large geography, and, in many cases, all over the globe.
- b.** Different facilities in the supply chain frequently have different objectives. For instance, suppliers typically want manufacturers to commit themselves and purchase large quantities in stable volumes with flexible delivery dates. Unfortunately, although most manufacturers would like to implement long production runs, they need to be flexible to their customers' needs and changing demands. Thus, the suppliers' goals are in direct conflict with the manufacturers' desire for flexibility. Indeed, since production decisions are typically made without precise information about customer demand, the ability of manufacturers to match supply and demand depends largely on their ability to change supply volume as information about demand arrives. Similarly, the manufacturers' objective of making large production batches typically conflicts with the objectives of both warehouses and distribution centers to reduce inventory. To make matters worse, this latter objective of reducing inventory levels typically implies an increase in transportation costs.
- c.** The supply chain is a dynamic system that evolves over time. Indeed, not only do customer demand and supplier capabilities change over time, but supply chain relationships also evolve over time. For instance, as customers' power increases, there is increased pressure placed on manufacturers and suppliers to produce an enormous variety of high-quality products and, ultimately, to produce customized products.
- d.** System variations over time are also an important consideration. Even when demand is known precisely the planning process needs to account for demand and cost parameters varying over time due to the impact of seasonal fluctuations, trends, advertising and promotions, competitors' pricing strategies, and so forth. These time-varying demand and cost parameters make it difficult to determine the most effective supply chain strategy, the one that minimizes systemwide costs and conforms to customer requirements.

2.1.1.3. Managing Uncertainty

Global optimization is made even more difficult because supply chains need to be designed for, and operated in, uncertain environments, thus creating sometimes big risks to the organization. A variety of factors contribute to this:

- a.** Matching supply and demand quantity, type is a major challenge. Obviously, this difficulty stems from the fact that months before demand is realized, manufacturers have to commit themselves to specific production levels. These advance commitments refer huge financial and supply risks.
- b.** Inventory and back-order levels¹ undulate considerably across the supply chain, even when customer demand for specific products does not vary greatly.
- c.** Forecasting doesn't solve the problem. It is nearly impossible to predict the precise demand for a specific item, even with the most advanced forecasting techniques.
- d.** Demand is not the only source of uncertainty. Delivery lead times, manufacturing yields, transportation times, and component availability also can have significant supply chain impact.

Although uncertainty cannot be eliminated, that is why; the firms should use the supply chain system to minimize the effect of uncertainty. Or they should figure out some strategies to provide flexibility in the supply chain in order to reduce risks (Simchi-Levi, D. et al. 2003).

2.1.1.4. Why Supply Chain Management (SCM)?

Supply chain management provides "maximizing added value and reducing total cost across the entire trading process through focusing on speed and certainty of response to the market." Due to globalization, SCM has become a tool for companies to compete effectively either at a local level or at a global scale. SCM has become a necessity when it comes to deliver products at a competitive cost and at a higher quality than their competitors. The reasons why SCM has become important to today's manufacturing industry. To emphasize the importance of SCM, an article would be shared;

"Today's business climate has rapidly changed and has become more competitive as ever in nature. Businesses now not only need to operate at a lower cost to compete, it must also develop its own core competencies to distinguish itself from competitors and stand out in the

¹ A customer order that cannot be filled when presented, and for which the customer is prepared to wait for some time. The percentage of items backordered and the number of backorder days are important measures of the quality of a company's customer service and the effectiveness of its inventory management.
Source: www.businessdictionary.com (2011)

market. In creating the competitive edge, companies need to divert its resources to focus on what they do best and outsource the process and task that is not important to the overall objective of the company. SCM has allowed company to rethink their entire operation and restructure it so that they can focus on its core competencies and outsource processes that are not within the core competencies of the company. Due to the current competitive market, it is the only way for a company to survive. The strategy on applying SCM will not only impact their market positioning but also strategic decision on choosing the right partners, resources and manpower. By focusing on core competencies also will allow the company to create niches and specialization of core areas.

As an example stated by Chan Kim, the Japanese automotive industries capitalize on its resources to build small and efficient cars. The Japanese automotive industries gain competitive edge by utilizing their supply chain to maximize their core competencies and position itself in a niche market. The strategy works and now Toyota Motor Corporation, a Japanese company, is considered to be the number one auto car maker in the world beating Ford and General Motors of the United States.

SCM has allowed business nowadays to not just have productivity advantage alone but also on value advantage. Through maximizing added value and also reduce the cost in the same time, more innovation can be added to the product and process. Mass manufacturing offers productivity advantage but through effective supply chain management, mass customization can be achieved. With mass customization, customers are given the value advantage through flexible manufacturing and customized adaptation. Product life cycles also can be improved through effective use of SCM. Through SCM, the more accepted offerings by the industry to the consumers would be a variety of products catered to different market segments and customers preferences.” (Article Source: <http://EzineArticles.com/> 2011)

2.1.1.5. 21st-Century Supply Chains

In the Information age the reality of the business connectivity continues to drive a new order of relationships. Managers are increasingly improving traditional marketing, manufacturing, purchasing and logistics practices. In this new order of affairs, products can be manufactured to exact specification and rapidly delivered to customers at location throughout the globe. Logistical systems exist that have the capability to deliver products at precise times. Customer order and delivery of product assortments can be performed in some hours. The frequent occurrence of service failures that characterized the past is increasingly being replaced by a growing managerial commitment to zero defect or what is commonly called six-

sigma performance². Perfect orders delivering the desired assortment and quantity of products to the right location on time, damage-free, and correctly invoiced. Perhaps most important is the fact that such high-level performance is being achieved at lower total cost and with the commitment of fewer financial resources than was characteristic of the past. All of this fundamental change in business enterprise structure and strategy is primarily being driven by information technology (Bowersox et al. 2007).

2.1.1.5.1. Supply Chain Revolution

What managers are experiencing today as the supply chain revolution and a related logistical renaissance. These two massive shifts in expectation and practice concerning best-practice performance of business operation are highly interrelated.

SCM consists of firms collaborating to leverage strategic positioning and to improve operating efficiency. For each firm involved, the supply chain relationship reflects a strategic choice. A supply chain strategy is a channel arrangement based on acknowledged dependency and collaboration. Supply chain operations require managerial processes that span functional areas within individual firms and link trading partners and customers across organizational boundaries.

In contrast to SCM, logistics is the work required to move and position inventory throughout a supply chain. As such, logistics is a subset of and occurs within the broader framework of a supply chain. Logistics is the process that creates value by timing and positioning inventory. Logistics is the combination of a firm's order management, inventory, transportation, warehousing, material handling and packaging as integrated throughout a facility network.

SCM may appear to be a vague concept. Confusion exists concerning the appropriate scope of what constitutes a supply chain, to what extent it involves integration with other companies as contrasted to integrating internal operations, and how to best implement it in terms of competitive practices and legal constraints. For most managers, the supply chain concept has intrinsic appeal because it visions new business arrangements offering the potential to improve competitiveness. The concept also implies a highly efficient and effective network of business relationship that serve to improve efficiency by eliminating duplicate and nonproductive work. Understanding more specifically what constitutes the supply chain

² A quality-control program developed in 1986 by Motorola. Initially, it emphasized cycle-time improvement and reducing manufacturing defects to a level of no more than 3.4 per million. Six-Sigma is applicable to all industries.

Source: www.businessdictionary.com (2011)

revolution starts with a review of traditional distribution channel practice (Bowersox et al. 2007).

During the last decade of the 20th century, channel strategy and structure began to shift radically. Traditional distribution channel arrangements moved toward more collaborative practice that began with the rapid advancement of computers and information transfer technology and then accelerated with the advent of digital business transformation. The connectivity potential of the internet served to facilitate a new vision (Bowersox et al. 2007).

2.1.1.5.2. Generalized Supply Chain Model

The general concept of an integrated supply chain is often illustrated by a line diagram that links participating firms into a coordinated competitive unit. It is shown by Bowersox et al. (2007) with the figure 2 that a generalized model adapted from the supply chain management program.

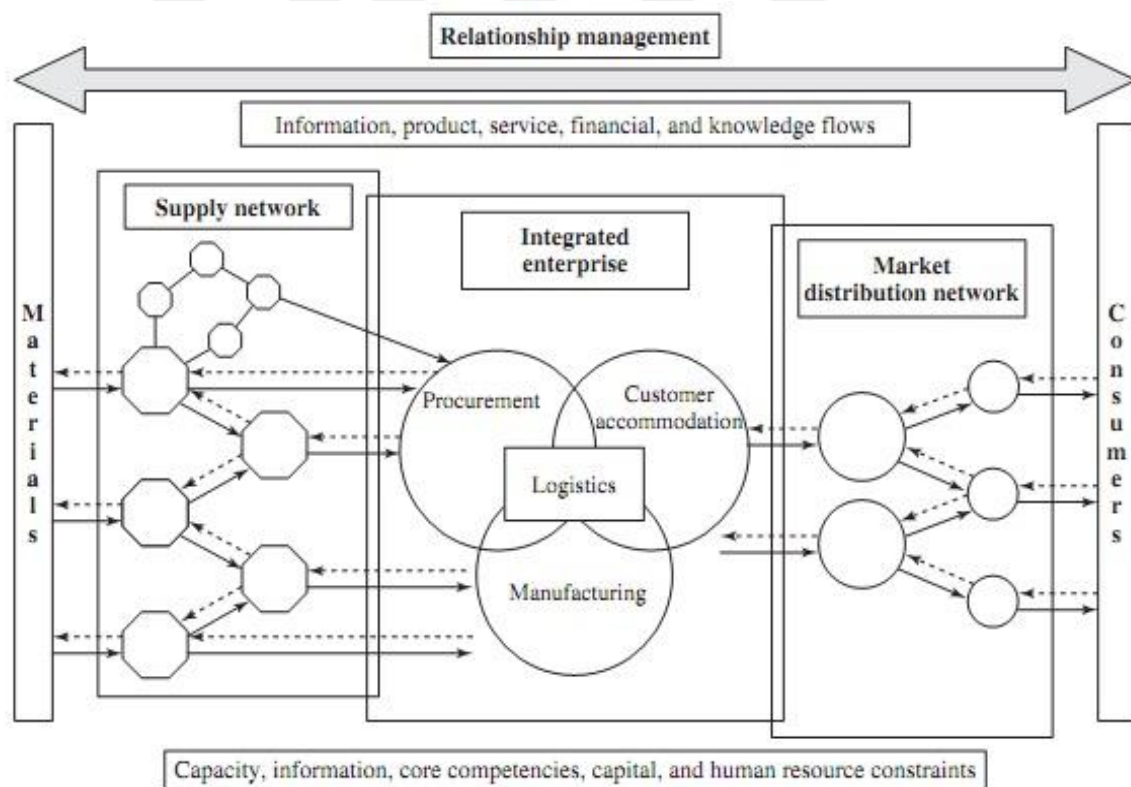


Figure 2: Generalized Supply Chain Model

Source: Bowersox et al. (2007)

The context of an integrated supply chain is multi-firm collaboration within a framework of key resource flows and constraints. Within this context, supply chain structure and strategy results from efforts to operationally align an enterprise with customers as well as the supporting distributive and supplier networks to gain competitive advantage. Business

operations are therefore integrated from initial material purchase to delivery of products and services to customers.

Value results from the synergy among firms constituting a supply chain as a result of five critical flows: information, product, service, financial, and knowledge (see the bidirectional arrow at the top of the Figure 2). Logistics is the primary canal of product and service flow within a supply chain system. Each firm engaged in a supply chain is involved in performing some aspects of overall logistics. The generalized supply chain arrangement illustrated in Figure 2 logically and logistically links a firm and its distributive and supplier network to customers. The message conveyed by the figure is that the integrated value-creation process must be aligned and managed from material procurement to end customer product/service delivery (Gullberg and Lundvall 2003).

It is obvious that, SCM is an information technology. In addition to information technology, according to Bowersox et al., 2007 the rapid emergence of supply chain arrangements is being driven by five related forces: (1) integrative management and supply chain process, (2) responsiveness, (3) financial sophistication, (4) globalization, and (5) digital transformation. These forces will continue, for the foreseeable future, to drive supply chain structure and strategy initiatives across most industries. A brief discussion of each supply chain driver provides a foundation to understand the challenges supply chain management places on exacting logistical performance.

-Integrative Management

Excellence in supply chain performance requires the simultaneous achievement of eight key processes. Table 1 identifies the eight key processes and provides a brief description of each.

Process	Description
Demand planning responsiveness	The assessment of demand and strategic design to achieve maximum responsiveness to customer requirements.
Customer relationship collaboration	The development and administration of relationships with customers to facilitate strategic information sharing, joint planning, and integrated operations.
Order fulfillment/service delivery	The ability to execute superior and sustainable order-to-delivery performance and related essential services.
Product/service development launch	The participation in product service development and lean launch.
Manufacturing customization	The support of manufacturing strategy and facilitation of postponement throughout the supply chain.
Supplier relationship collaboration	The development and administration of relationships with suppliers to facilitate strategic information sharing, joint planning, and integrated operations.
Life cycle support	The repair and support of products during their life cycle, including warranty, maintenance, and repair.
Reverse logistics	The return and disposition of inventories in a cost-effective and secure manner.

Table 1: Eight Supply Chain Integrative Processes

Source: Bowersox et al. (2007)

Although these integrative processes are not the exclusive domain of supply chain logistics, some critical elements of such performance are integral to a firm achieving high-level operational success. Therefore, supply chain structure, strategy, and continuous operational execution must be focused on achieving and continuously improving these essential eight processes. Simultaneous operational achievement of these eight processes forms the essence of achieving operational integration and performance excellence (Topolsek et al. 2004).

-Responsiveness

One could argue that the challenges and benefits of integrative management offered sufficient reason for the supply chain revolution. However, other basic drivers continue to make supply chain arrangements even more appealing. A fundamental paradigm shift in strategic thinking occurred as a direct impact of information technology. Information connectivity created the potential for developing responsive business models. To elaborate the in-detailed implications of this major development, it is useful to contrast traditional or anticipatory business practice to the emerging time-based responsive (or pull) business model (Bowersox et al. 2007).

Anticipatory Business Model

Business operations are driven by forecasts. The typical manufacturer produces products based upon a market forecast. Likewise, wholesalers, distributors, and retailers purchased inventory based on their unique forecasts and promotional plans.

By Bowersox et al. (2007) it is shown in figure 3 that the typical stages in the anticipatory business model.

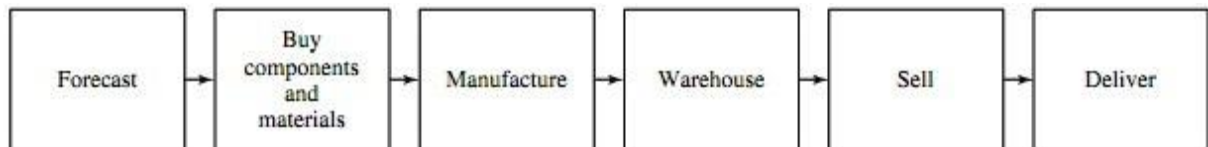


Figure 3: Anticipatory Business Model

Source: Bowersox et al. (2007)

Responsive Business Model

According to Bowersox et al. (2007) the fundamental difference in anticipatory and responsive supply chain arrangements is timing. The responsive business model seeks to reduce or eliminate forecast reliance by joint planning and rapid exchange of information between supply chain participants. The availability of low-cost information has created time-based competition. Managers are increasingly sharing information to improve both the speed and accuracy of supply chain. Figure 4 illustrates a responsive business model that manufactures or assembles products to customer order.

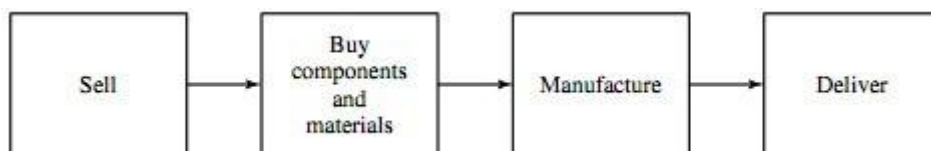


Figure 4: Responsive Business Model

Source: Bowersox et al. (2007)

The fundamental difference in responsive models is the sequence of events that drive business practice. Also notable, in comparison to Figure 3, are the fewer steps required to complete the responsive process. Fewer steps typically equate to less cost and less elapsed time from order commitment to delivery (Bowersox et al. 2007).

Bowersox et al. (2007) has explained that in reality, today's best supply chain practices do not reflect either extreme anticipatory or responsive design. Most established firms remain, to a significant degree, committed to anticipatory practices. However, responsive strategies are rapidly emerging.

-Financial Sophistication

The answer concerning how much speed is desirable is found in the financial impact. The process of creating value dictates that faster, more flexible, and more precise ways of servicing customers are justified as long as they can be provided at competitive prices. A third force driving competitive supply chain strategy is the ability to manage in a timelier manner to achieve financially attractive working arrangements (Bowersox et al. 2007). Fast delivery means less inventory and reduced need for distribution. Faster to customers means less working capital to support supply chain operations. There are three aspects of financial sophistication; Cash-to-cash conversion, dwell time minimization, and cash spin.

Cash-to-Cash Conversion

The time required to convert raw material or inventory purchases into sales revenue is referred to as cash-to-cash conversion (Bowersox et al. 2007). Cash conversion is generally related to inventory turn: Higher inventory turn brings up quicker cash conversion.

Dwell Time Minimization

A significant measure of supply chain productivity is dwell time. Dwell time is the ratio of time that an asset sits idle to the time required to satisfy its designated supply chain mission (Bowersox et al. 2007). For example, dwell time would be the ratio of the time a unit of inventory is in storage compared to the time that it is moving to achieving sales or operational objectives. To reduce dwell time, firms collaborating in a supply chain need to be willing to eliminate duplicate and non-value-added work.

Cash Spin

A popular term for describing the potential benefits of reducing assets across a supply chain is cash spin (Bowersox et al. 2007).

The benefits flowing from fast cash-to-cash conversion, reduced dwell time, and cash spin combine to increase the financial attractiveness of effective collaboration.

-Globalization

Globalization is referred international engagement of international companies for the more efficient, more productive transactions. These transactions can be referred production, logistical activities, and so on. Because of the competition between different nations' companies, production processes become increasingly specialized. The implication is that an increasing part of the value added is placed outside the company's own facilities. At the same time, we see a globalization of supplier and customer markets where domestic and local suppliers and customers are less important than global suppliers and customers.

Measures to improve the efficiency of information and transport systems have played a major role in development. These measures have made it less expensive, quicker and safer to purchase goods from remote supplier markets and distribute goods to remote customer markets (Skjoett-Larsen 2000).

According to Skjoett-Larsen (2000) another factor for this development is the quick technological development combined with economies of scale in production, which in some component markets has resulted in a concentration of relatively few global suppliers.

A third factor is the large difference in payroll and production costs between Western Europe, on the one side, and central and Eastern Europe, Asia and South and Central America, on the other side. A growing number of companies in Western Europe are moving their labor-demanding production processes to new industrial regions or buying an increasing part of the materials they require from suppliers in these areas. In this connection, Poland, Hungary and the Czech Republic are specifically interesting as they are almost at the same level as western European companies in terms of technology and quality, while their payroll costs are considerably lower.

It is stated by Skjoett-Larsen (2000) within Europe, the driving forces behind changes in logistics structure and strategies are:

- Removal of trade and transport barriers between EU countries;
- Opening of new markets in Eastern Europe;
- Acceptance of a single European currency;
- Development of information technology and fast communication systems;
- Emergence of pan-European³ logistics service providers, who offer fast, reliable and cost-efficient distribution in Europe.

-Digital Business Transformation

Digital Business Transformation (DBT) involves a complete review of a firm's whole operation to provide itself the benefits of modern information technology are being fully deployed.

Focusing on information technology, DBT seeks to meet the challenges and exploit inherent opportunities of integrative management, responsiveness, financial sophistication, and globalization. Expanding internet capabilities provide an information framework that can replace traditional one-to-one, one-to-many or many-to-one communication with web-based,

³ Relating to all European countries or the advocacy of political or economic unity among European countries.
Source: www.businessdictionary.com (2011)

simultaneous many-to-many connectivity. The potential exists for all firms participating in a supply chain to simultaneously have access to the same strategic and operational information. The potential of DBT is the synchronized distribution of information and knowledge across the supply chain. In essence, DBT is the forward-looking model for a business that is transitioning from the industrial age to the information age (Bowersox et al. 2007).

2.1.1.6. Strategic Partnership

According to Min and Galle (1997), the trend in European Industry beyond year 2000, there is a revolution in the supplier selection. There are in principle three reasons for this development;

- First of all, the supplier selection depends on production strategy under the title of strategic partnership. It is taking shape from in-house production to outsourcing a range of production processes that are not part of the company's core competencies.
- The companies have realized that the searching and evaluating suppliers as a constant activity lead to large transaction cost. Although it is possible to get price reductions in the short run by playing off one supplier against another, such a policy will often involve additional costs in connection with training, quality problems, delivery delays, etc. which in the end will exceed the short-term economies.
- The pace of the technological development is so rapid that it is more important to choose suppliers who are at the leading edge of new technology than suppliers who are competitive in price.

It is understandable that by these developments the companies which need suppliers started to differentiate their strategy through purchasing. Figure 5 illustrates some possible supplier relationships depending on the strategic importance of the purchase and the difficulty of managing the purchase situation.

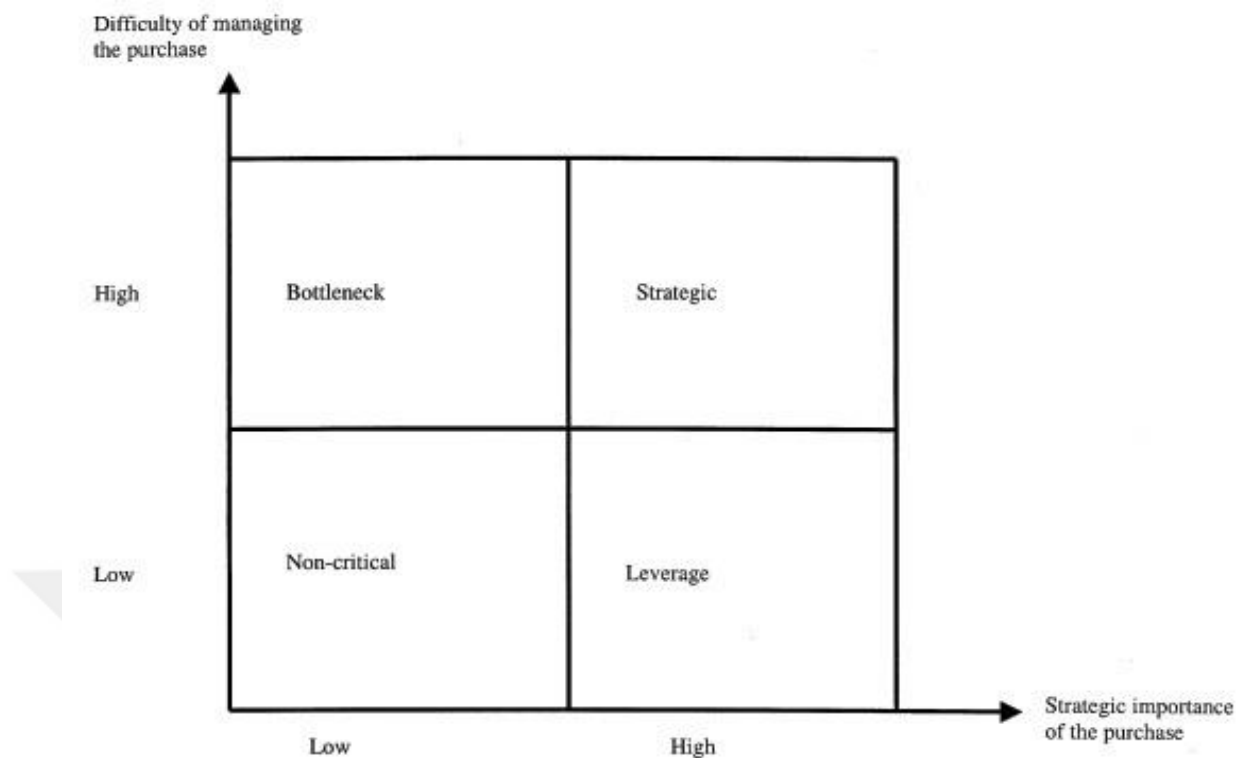


Figure 5: Supplier Relationship
Source: Skjoett-Larsen, T. (2000)

According to Skjoett-Larsen (2000) there are four generic supplier strategies;

- *Strategic partnerships/system suppliers*: Strategic partnership definition; the products have strategic importance that are crucial for the process or product of the buyer. They are characterized by a high supply risk caused by scarcity or difficult delivery.
- *Outsourcing of non-critical purchase*: Outsourcing of non-critical purchase definition; the products are non-critical items that are easy to buy and also have a relative low impact on the financial results.
- *Leverage purchasing*: Leverage purchasing definition; the products are leverage items that represent a high percentage of the profit of the buyer and there are many suppliers available. It is easy to switch supplier.
- *Bottleneck purchasing*: Bottleneck purchasing definition; the products are bottleneck items that can only be acquired from one supplier or their deliveries is otherwise unreliable and have a relative low impact on the financial results (Skjoett-Larsen 2000).

2.1.1.7. Green Supply Chain

Beside a supply chain, having all the elements of the traditional configuration (Figure 1), but extended incorporate product and packaging recycling as well as reuse and/or remanufacturing operations within a semi-closed loop. Green supply chain incorporates the

elements of a supply chain, reflecting the entire life cycle of the goods. Therefore, the main focus is reducing energy consumption, emission, and waste, and increasing recycling and reuse (McKinnon et al. 2010).

So, According to McKinnon et al. (2010) green supply chain takes into account;

- The number and location of facilities for product/packaging collection and reuse;
- The effects of traditional supply chain strategies on environmental performance;
- Simultaneous operational and environmental supply chain optimization;
- Incorporating environmental and operational goals into traditional analysis;
- The level and location of buffer inventories in forward and reverse;
- The impact of the demand and recovery processes on the uncontrollable growth of unwanted parts or the non-availability of the critical parts and other decisions.

Green performance measures

The green performance measures for on-site and off-site energy recovery, recycling and treatment, spill and leak prevention and pollution prevention activities. Additional general measures include total energy use, total electricity use, total fuel use, other energy use, total water use, habitat improvements and damages due to enterprise operations, cost associated with environmental compliance and so on.

It is pointed out that organizations may choose their environmental performance measurements specifically to meet new government regulations on emissions, energy consumption or the disposal of hazardous waste (McKinnon et al. 2010).

To generate sustainable green supply chain, Hugo and Pistokopoulos (2005) stated a method to assess the impact of supply chain to the environment. The Eco-indicator 99 method is incorporated within the quantitative life cycle assessment model to formulate an appropriate environmental impact on a European scale according to three categories (endpoints in ISO terminology): human health, ecosystem quality and resource depletion (McKinnon et al. 2010).

2.1.1.8. Role of Logistics in Supply Chains

Supply Chain Management (SCM) can be divided into three main activities that; purchase, manufacture and transport and the three elements that; supply chain business processes, supply chain management components, and supply chain network structure. Figure 6 shows the whole elements in SCM frame. It displays the details of the whole processes from purchasing, management, production, and distribution to customers.

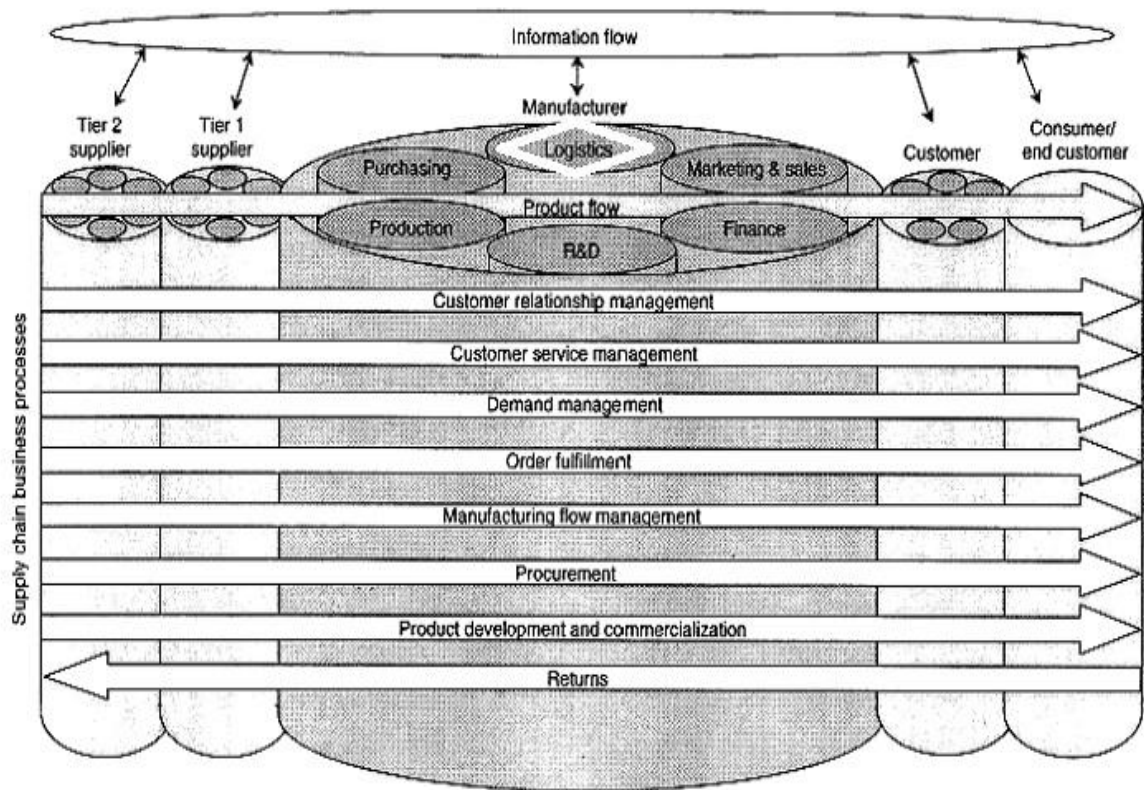


Figure 6: Logistics in the Supply Chain

Source: Adapted from Tseng et al. (2005)

The information flow is like an individual system to link the whole supply chain from supplier and manufacturer to consumer. Unhindered information flow could increase the operation accuracy for costs saving and promote the competitiveness of firms. The product flow proceeds through the whole production processes from material supply via manufactories till providing the finished products to consumers. The items in vertical direction show the various management tasks within the supply chain. Particularly, the return flow, or reverse logistic, is one of the elements in the system but with converse direction from the others.

It is declared by Craig (2010) the five key issues of logistics effectiveness are core to SCM;

- Movement of Product
- Movement of Information
- Time / Service
- Cost
- Integration, both internal and external, both organizations and systems.

SCM requires a logistics model based on quick order to delivery response. A model which focuses from vendors' doors through to delivery to customers' doors. The model must meet the customers' demanding and specific requirements. It requires organizational flexibility and responsiveness, internal and external teamwork and demands the use of processes and technology.

2.1.2. Logistics

2.1.2.1. Introduction to Logistics

There are lots of definition and name of distribution and logistics. Business logistics, materials management, procurement and supply, product flow, demand chain logistics, and so on but there is no true name or true definition because the name actually depends on companies or systems. Although, the many definitions and names are used, there is one quite widely accepted view is showed by Rushton et al. (2006) the relationship as follows;

$$\text{Logistics} = \text{Supply} + \text{Material Management} + \text{Distribution}$$

There are a multitude of definitions to be found in textbooks and on the internet. The selected few are:

Logistics is...

- The management of all activities which facilitate movement and the co-ordination of supply and demand in the creation of time and place utility. (Hesket et al. 1973 cited Rushton et al. 2006)
- The positioning of resource at the right time, in the right place, at the right cost, at the right quality. (Chartered Institute of Logistics and Transport, UK 2005)

2.1.2.2. The Importance of Logistics

Logistics is an important activity which is making extensive use of the human and material resources that affect a national economy. It is important to consider that logistics is a complex framework of relationships between manufacturer and consumer, employer and employee, manager and shareholder, and members of the business and the community in which the business operates.

Logistics management therefore has a key role in a supply chain, and in particular in the member companies, for example in contributing to their customer satisfaction and total cost reduction, as well as company profitability. As logistics management affects company profitability, it also impacts the shareholder value of a company. This is particularly

significant as companies are increasingly being driven by the goal of enhancing shareholder value, a key measure of corporate performance (Fernie and Sparks 2004).

One study from USA indicated that logistics alone represented between 10 and 15 percent of gross domestic product of most major North America, European and Asia/Pacific economies (Rushton et al. 2006).

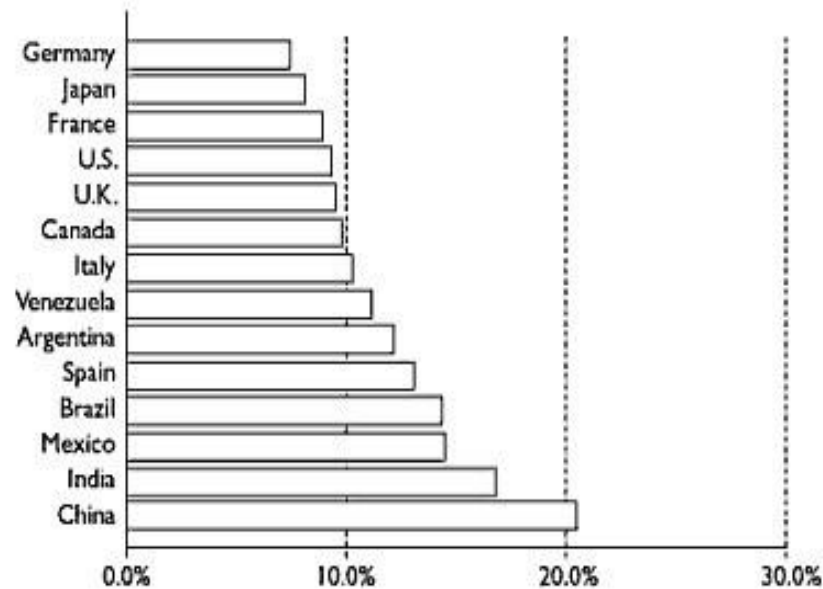


Figure 7: Logistics cost as a percentage of GDP for selected countries

Source: Rushton et al. (2006)

2.1.2.3. Supply Chain Logistics Management

2.1.2.3.1. The Logistics Value Proposition

According to Bowersox et al. (2007) logistics should be managed as an integrated effort to achieve customer satisfaction through creating value. The elements of logistical value proposition are; service and cost minimization.

– Service benefits

Logistical service can be achieved if a firm is willing to commit the all required resources. Basic logistical performance and the benefit of service are identified in terms of availability, operational performance and service reliability.

Availability, involves having inventory to consistently meet customer material or product requirements (Bowersox et al. 2007). To be available under the title of business, provide better customer satisfaction and efficient appearance.

Operational performance, deals with the time required to deliver a customer's order. It means delivery speed and consistency (Bowersox et al. 2007). To achieve effective operation, firms generally focus on delivery consistency than seek to improve delivery speed. Also to

implement better performance, firms should focus on flexibility to accumulate unusual and unexpected customer request.

Service reliability, involves the quality attributes of logistics. To achieve service reliability, it is essential to identify and implement inventory availability and operational performance measurements (Bowersox et al. 2007).

– **Cost Minimization**

Like every part of business, in logistics activities while achieving value creation, the cost of this value creation activity must be minimized in every stage. By doing this as a firm, the profit can be increased effectively without any changing your price of activities to your customers. For the development of cost minimization concept, managers must see how functional costs interrelate and impact each other in own organization. Than must improve new ways to generate minimization of these costs (Bowersox et al. 2007).

2.1.2.3.2. The Work of Logistics

Now, in order to go deeper, in-detail instructions of logistics with the explanation of the work of logistics will be stated. A supply chain should be realized how to get maximum benefit from logistics and the integration of the activities. Logistical competency can be achieved by the coordination of order processing; inventory; transportation; warehousing, materials handling and packaging and facility network. Integration, as the explanation of Figure 8, related to these functional areas creates the capabilities needed to achieve logistical value.

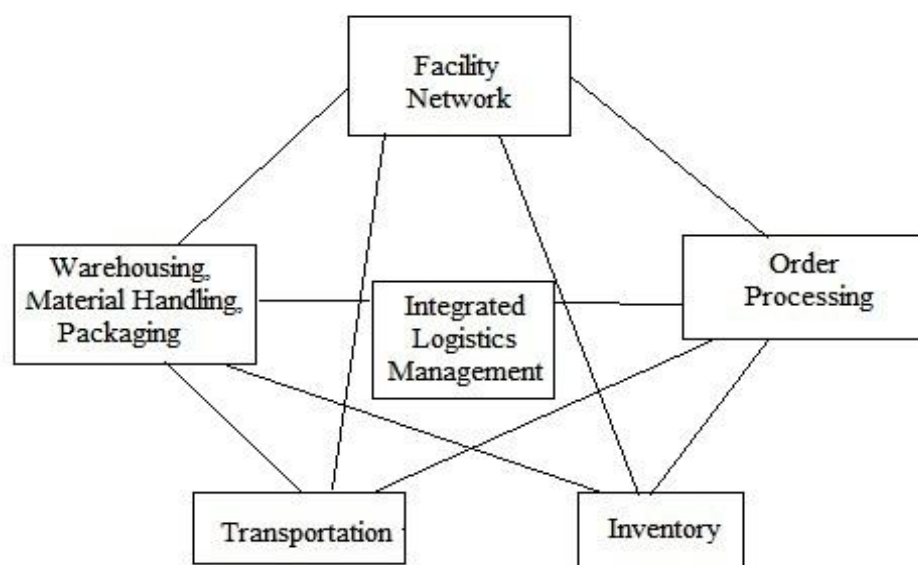


Figure 8: Integration of Logistics

Source: Adapted from Bowersox et al. (2007)

– **Order Processing**

While many aspects of information have the critical importance to logistics operation, the processing of orders has the primary importance. Mostly in supply chain, the requirements of customers are received in the form of orders. The processing of these orders involves all aspects of managing customer requirements, including initial order receipt, delivery, invoicing and collection (Bowersox et al. 2007).

– **Inventory**

A firm's degree of commitment to deliver products rapidly to meet a customer's inventory requirement is a major competitive factor. If products and materials can be delivered quickly, it may not be necessary for customers to maintain large inventories. Likewise, if retail store can be replenished rapidly, less safety stock is required (Bowersox et al. 2007).

– **Transportation**

Transportation is the operational area of logistics that geographically moves and positions inventory. Because of its fundamental importance and visible cost, transportation has traditionally received considerable material attention. Almost all enterprises, big and small, give the managerial importance and responsibility for transportation. From the logistical point of view, there are three fundamental factors to transportation performance; cost, speed and consistency (Bowersox et al. 2007).

The cost of transport is the payment for shipment between two geographical locations and the expenses related to maintaining in-transit inventory. Speed of transport is the time required to complete a specific movement. Consistency of transportation refers to variations in time required to perform a specific movement over a number of shipments. Consistency reflects the dependability of transportation (Bowersox and Closs 1996).

– **Warehousing, Material Handling, and Packaging**

Warehousing, material handling, and packaging are an integral part of other logistics areas (Bowersox et al. 2007). For example, inventory typically needs to be warehoused at selected times during the logistics process. Transportation vehicles require materials handling for efficient loading and unloading. Finally, the individual products are most efficiently handled when packaged.

Within the warehouse, materials handling is an important activity. Products must be received, moved, stored, sorted, and assembled to meet customer order requirements. The direct labor and capital invested in materials handling equipment is a significant element of

total logistics cost. When performed in an inferior manner, materials handling can result in substantial product damage.

When effectively integrated into an enterprise's logistical operations, warehousing, materials handling, and packaging facilitate the speed and overall ease of product flow (Bowersox and Closs 1996).

– **Facility Network Design**

Facility network design has priority as a responsibility of logistical management. It is concerned with determining the number and location of all types of facilities required to perform logistics work. It is also necessary to determine what inventory and how much to stock at each facility as well as the assignment of customers (Bowersox et al. 2007).

The importance of continuously modifying the facility network to accommodate change in demands and supply infrastructures cannot be overemphasized. Product assortments, customers, suppliers and manufacturing requirements are constantly changing in competitive environment. The selection of a superior location network can provide a significant step toward achieving competitive advantage (Bowersox et al. 2007).

2.1.2.3.3. Approach to Integration of these Components

SCM is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders. It follows that SCM involves integration, co-ordination and collaboration across organizations and throughout the supply chain. It means that SCM requires internal (intra-organizational) and external (inter-organizational) integration (Gimenez and Ventura 2003).

– **Internal Integration**

The internal integration as clearly understood has to be studied within the firm's boundaries. It seeks to emphasize better coordination among functional areas within the firm. Internal integration is considering the interaction among three distinct but related areas: Logistics, production and marketing. These areas must be integrated for two reasons: Firstly, the coordination between them is vital to produce and serve what customers demand, how and when they want. Secondly, logistics is an organizational function which shares responsibilities with marketing and production (Gimenez and Ventura 2003).

Companies were traditionally organized according to two main areas: Production and marketing, considering the rest as auxiliary or support functions. Before the existence of the integrated logistics concept (Supply-Production-Distribution), some of today's logistics

responsibilities were under the production or marketing control. But, when logistics appeared as an organizational function, some of the marketing and production's responsibilities were transferred to, or co-managed with the logistics' department. Figure 9 shows the activities of the production, logistics and marketing functions. This figure also shows that some activities are in the intersections of Production-Logistics or Logistics-Marketing.

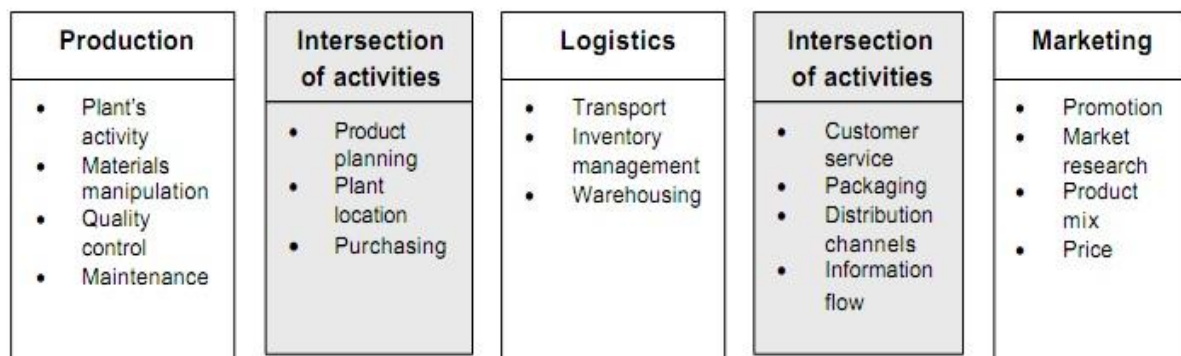


Figure 9: The Production, Logistics and Marketing Functions
Source: Gimenez and Ventura (2003)

– External Integration

External integration has to be studied along the supply chain. It is the integration of the logistics activities across firm boundaries. It follows that external integration refers to the coordination and collaboration with other supply chain members. Companies usually strategically segment their relationships and establish high collaborating relationships with some supply chain members. Accordingly, we cannot assign a global level of external integration to a firm; there is the need to consider the level of integration in each particular supply chain relationship (Gimenez and Ventura 2003).

Some authors like Lee and Hau (2000 cited Topolsek et al. 2004) emphasized three dimensions of external integration or integration across the supply chain; integration of information, co-ordination and co-use of resources as well as organizational connection of relation. The integration of information refers to knowledge and information sharing between all supply chain members, including sales forecasting, production plans, inventory levels and promotion plans. The co-ordination and co-use of resources refer to balancing decision making and responsibilities in a supply chain (Topolsek et al. 2004).

2.1.2.3.4. Logistical Integration

The Figure of logistical integration is indicated below.

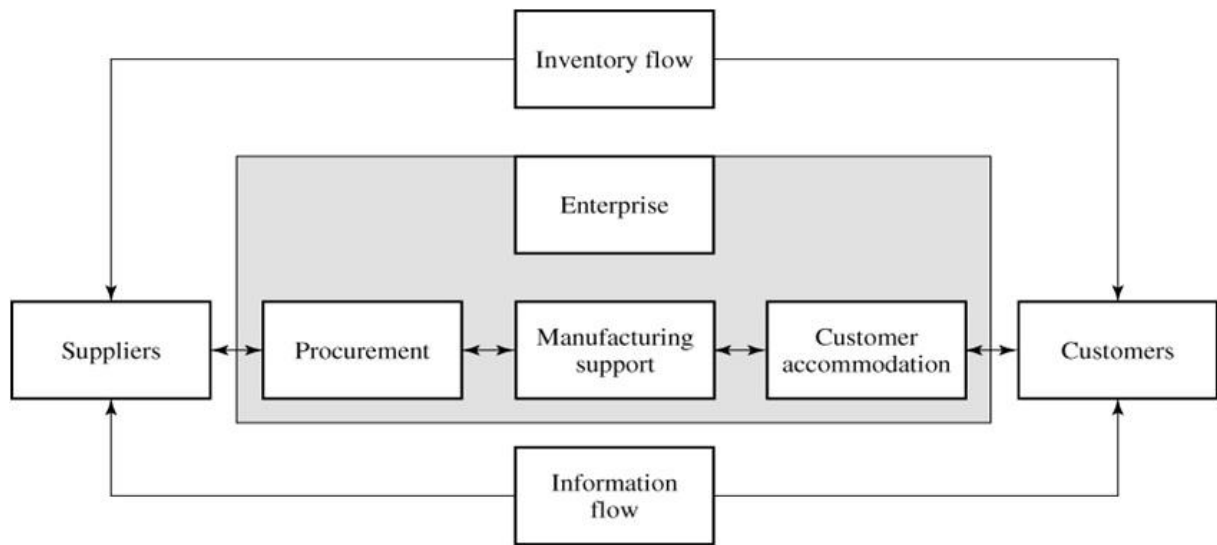


Figure 10: Logistical Integration
Source: Bowersox et al. (2007)

Inventory Flow

The operational management of logistics is concerned with movement and storage of inventory. Logistical operations start with the initial shipment of a material or component part from a supplier and are finalized when a manufactured or processed product is delivered to a customer.

From the initial purchase of a material or component, the logistics process adds value by moving inventory when and where needed. Providing all goes well, materials and components gain value at each step of their transformation into finished inventory (Bowersox et al. 2007).

For better understanding, it is useful to divide logistical operations into three areas: Customer accommodation, manufacturing support, and procurement.

Customer Accommodation

The movement of finished product to customers is customer accommodation. In customer accommodation, the customer's ship-to location represents the final destination. The availability of product is a vital part of each channel participant's marketing effort (Bowersox et al. 2007).

In the variety of many different organizations, all customer accommodation systems have one common feature: They align manufacturers, wholesalers, and retailers into supply chain arrangements to provide customers product availability.

Manufacturing Support

The area of manufacturing support concentrates on managing work-in-process inventory as it flows between stages of manufacturing. The primary logistical responsibility in manufacturing is to participate in formulating a master production schedule and to arrange for its implementation by timely availability of materials, component parts and work-in-process inventory. Thus, the overall concern of manufacturing support is not how production occurs but rather what, when and where products will be manufactured (Bowersox et al. 2007).

Procurements

The area of procurement is concerned with purchasing and arranging inbound movement of materials, parts and/or finished inventory from suppliers into manufacturing or assembly plants, warehouses or retail stores. In manufacturing, the process of acquisition is typically called purchasing. In government circles, acquisition has traditionally been referred to as procurement. In retailing and wholesaling, buying is the most widely used term. In many circles, the process is referred to as inbound logistics (Bowersox et al. 2007).

Information Flow

Information flow identifies specific locations within a logistical system that have requirements. It is important to stress that information requirements parallel the actual work performed in customer accommodation, manufacturing support, and procurement. Whereas these areas contain the actual logistics work, information facilitates coordination of planning and control of day-to-day operations (Bowersox et al. 2007).

2.2. Logistics in the European Fashion and Fashion Retailing Industry

2.2.1. Market Orientation and Supply Chain Management in the Fashion Industry

The apparel industry has always been at the top of passing fancies of styles and unstable demands of customers who want the latest design with low cost while they are still in fashion along with uncontrollable parameters such as weather and economic conditions. The fashion market today is marked by ever-changing characteristics of consumers, competition and technologies. On the one hand, sophisticated consumers seek to a non-stop changeover of choices in products, brands and retail formats. On the other hand, has accelerated the competition among fashion businesses.

In this part, it will be explained that the factors which encompass fashion retailers' competitive strategies in such a dynamic institutionally constrained homogenized system. The review of theories which are behind the concept of market orientation including an extended view of logistics and supply chain management also will be stated by the author.

2.2.1.1. The Total Market Orientation and Supply Chain Management

Into the market orientation approach, it is Elg (2003 cited Fernie and Sparks 2009) who explicitly emphasizes the impacts of market orientation at an inter- as well as an intra-organizational level by defining it as a joint process by retailers, suppliers, and other supply chain members which is indicated by Fernie and Sparks (2009) in Figure 11.

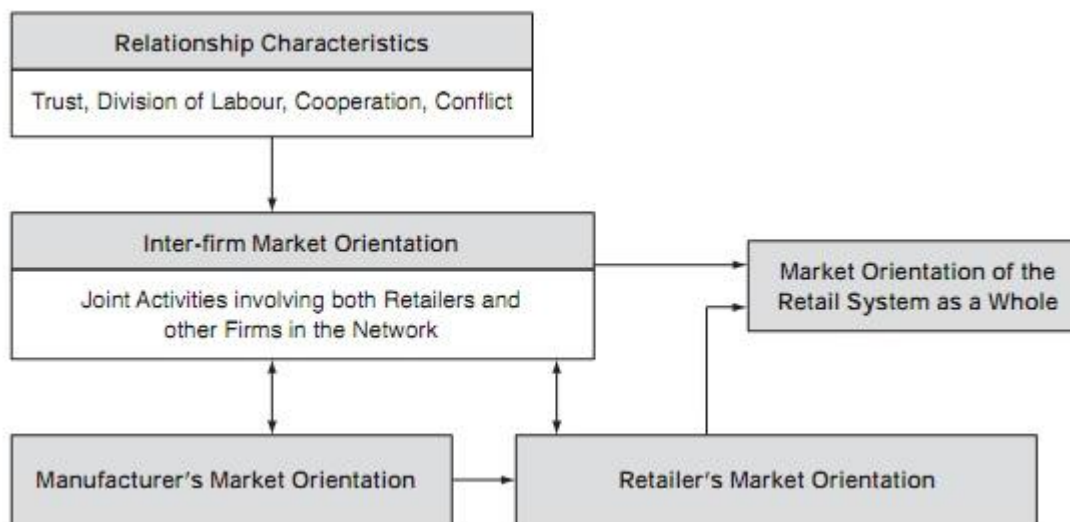


Figure 11: A framework for analyzing a retailer's market orientation

Source: Fernie and Sparks (2009)

Looking at the boundary between retailers and suppliers, Elg (2003 cited Fernie and Sparks 2009) demonstrates the latent benefit that lies in this integrated market orientation approach.

Dissemination and exchange of data about consumers among the members in a retailer's supply chain are likely to encourage each player in the network to better understand and anticipate customer needs and expectations. This also contributes to minimizing the Bullwhip effect⁴ by synchronizing the flow of information and inventories in the supply chain. Joint investment in sharing a common platform in delivering quick and effective market responses facilitates the supply chain players with opportunities to develop an

⁴ Bullwhip effect; tendency of consumers of a material or product in short supply to buy more than they need in the immediate future.

Source: www.businessdictionary.com (2011)

interdependent long-term partnership. Trust that is created through a transaction-specific investment is recognized as a critical factor in maintaining an efficient and effectual inter-organizational virtual integration in a long-term perspective (Fernie and Sparks 2009).

In addition to these official settings in supply chain relationships, Elg (2003 cited Fernie and Sparks 2009) singles out the process of informal occasions where representatives of different members of a distribution network may meet and exchange information and insights. This viewpoint shares much in common with the notion of “shared space and atmosphere” (Ba)⁵ that is first introduced by Itami (1999 cited Fernie and Sparks 2009) in the context of the product innovation process at a Japanese automotive company (Fernie and Sparks 2009).

The concept of Ba sheds light on the ambiguous effect of supply chain members’ sharing of a common platform and encoding procedure towards a particular issue, upon directing the common goals and hence collaborative behaviors and a loop of organizational learning at both intra- and inter-organizational interfaces (Kakihara and Sorensen 2002).

The role of Ba is deemed to be a moderating factor in the supply chain in that it facilitates the involved parties with motivations to keep creating a unique value in a seemingly fixed and stabilized partnership environment (Fernie and Sparks 2009).

To put it simply, the goals of supply chain management in the fashion industry are, therefore, in delivering the in-vogue style at the right time in the right place with increased variety and affordability, thus satisfying both the existing and potential needs of the customers.

2.2.1.2. The Real Market Orientation and Supply Chain Management

Fashion is, indeed, a unique phenomenon. It consistently transforms and fluctuates, reflecting the mood of the society. The degree of metamorphosis, however, is within a nominal but a discernable extent in the mind of the consumer. The condition for a fashion firm to differentiate from competition, therefore, is to create a subtle yet appealing difference to the customers in an apparently homogenized environment, where the economy of speed can no longer deliver a sustainable competitive advantage. Compression in the three dimensions of time in marketing the fashion style, serving the customers and reacting to the market

⁵ Ba can be thought of as a shared mental space for emerging relationships. This space can be physical, virtual or mental. Ba provides “a platform for interaction between individual and/or collective knowledge. We consider ba to be an emergent foundation for knowledge creation” by Nonaka et al. (2000 cited Kakihara and Sorensen 2002)

change within a supply chain has been becoming a de facto standard in the fashion industry (Fernie and Sparks 2009).

The relationships among the supply chain members in reality tend not to be motivated by common goals and objectives that are based upon an effective sharing of key information and an efficient flow of inventories in the entire supply chain. It is too often the case in the fashion industry that an extreme responsiveness of a firm's fashion supply chain is achieved through an unequal distribution of power. The players who command the creative shrewdness and the marketing function in the mid-to-downstream of the pipeline effectually impose a flexible response in the labor-intensive processes on their SME (Small and Medium Enterprises) subcontractors, who are mostly dependent upon their orders (Fernie and Sparks 2009).

An effective sharing of Ba, in reality, is hard to realize in a power-game relationship. Therefore, collaborative creation of a unique value 'from the source' is normally hard to achieve for a fashion firm, coupled with the speculation/postponement issue above. Thus, the competitive environment in the fashion industry is configured in a somewhat unique way, and this makes it difficult for a fashion firm to differentiate from competition simply via implementing a market-oriented supply chain approach. An integrated program of market orientation and supply chain management certainly provides a fashion firm and its supply chain partnerships with better visibility of its market-orientation activities and helps them deliver a rapid and flexible response to the actual and latent needs in the marketplace. Nevertheless, it doesn't allow a firm to achieve a concrete differentiation and hence a sustainable competitive advantage. Being locked into a partnership with a smaller number of suppliers, based on a transaction-specific investment, a firm would gradually decrease its capability in satisfying the market needs for variety and in executing an effective organizational leaning at both official and unofficial settings (Kakihara and Sorensen 2002).

2.2.2. Fashion Logistics and Quick Response

Especially in fashion industry, the ability to respond to customer requirements on a timely basis has always been a fundamental element of the marketing concept. 'Time-based competition' has become the norm in many markets, from banking to automobiles, also fashion. The challenge to marketing and logistics in the current environment is to find ways in which product development times can be reduced, feedback from the marketplace made more rapid and replenishment time compresses.

According to Christopher and Peck (1997), nowhere is this pressure more evident than in markets governed by fashion. 'Fashion' is a broad term that typically encompasses any product or market where there is an element of style that is likely to be short-lived. Christopher and Peck (1997) have defined fashion markets as typically exhibiting the following characteristics:

- *Short lifecycles*; The product is often ephemeral, designed to capture the mood of the moment; consequently the period in which it is saleable is likely to be very short and seasonal, measured in months or even weeks.
- *High volatility*; Demand for these products is rarely stable or linear. It may be influenced by the vagaries of weather, hit films, TV shows or even by pop stars and footballers.
- *Low predictability*; Because of the volatility of demand it is extremely difficult to forecast with any accuracy even total demand during a period, let alone week-by-week or item-by-item demand.
- *High impulse purchase*; Many buying decisions for these products are made at the point of purchase. In other words, the shopper when confronted with the product is stimulated to buy it, hence the critical role of 'availability' and, in particular, availability of sizes, colors, etc.

2.2.2.1. Managing the Fashion Logistics Pipeline

Christopher and Peck (1997) have stated that, there are three critical lead times that must be managed by organizations that seek to compete successfully in fashion markets:

1. Time-to-market: How long does it take the business to recognize a market opportunity and to translate this into a product or service and to bring it to the market (Christopher and Peck 1997)?

In these short lifecycle markets, being able to spot trends quickly and to translate them into products in the shop in the shortest possible time has become a prerequisite for success. Companies that are slow to market can suffer in two ways. First, they miss a significant sales opportunity that probably will not be repeated. Second, the supplier is likely to find that when the product finally arrives in the marketplace, demand is starting to fall away, leading to the likelihood of markdowns.

2. Time-to-serve: How long does it take to capture a customer's order and to deliver the product to the retail customer's satisfaction (Christopher and Peck 1997)?

Traditionally in fashion industries orders from retailers have had to be placed on suppliers many months ahead of the season; nine months was not unusual as a typical lead-time. Clearly, in such an environment the risk of both obsolescence and stock-outs is high as well as the significant inventory-carrying cost that inevitably is incurred somewhere in the supply chain as a result of the lengthy pipeline.

3. Time-to-react: How long does it take to adjust the output of the business in response to volatile demand (Christopher and Peck 1997)?

Ideally, in any market, an organization would want to be able to meet any customer requirement for the products on offer at the time and place the customer need them.

The challenge to any business in a fashion market is to be able to see ‘real’ demand. Real demand is what consumers are buying or requesting hour by hour, day by day. Because most supply chains are driven by orders which are driven by forecasts and inventory replenishment, individual parties in the chain will have no real visibility of the final marketplace.

2.2.2.2. The Lead-Time Gap

The fundamental problem that faces many companies – of course not just for the fashion industries – is that the time it takes to source materials, convert them into products and move them into the marketplace is invariably longer than the time the customer is prepared to wait. This difference between what might be called the ‘logistics pipeline’ and the customer’s order cycle time is called the ‘lead-time gap’. Conventionally, this gap was filled with a forecast-based inventory (Christopher and Peck 1997).

The problem was that often it would be the ‘wrong’ inventory, for example sizes, colors or styles that were not those actually demanded. Figure 12 indicates the problems of the lead-time gap which, in the fashion industry, was traditionally measured in months rather than weeks.

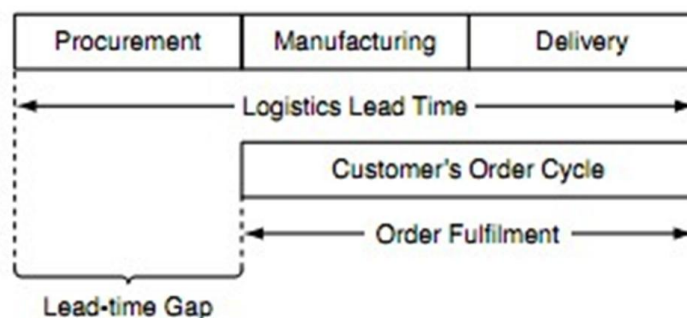


Figure 12: The lead-time gap

Source: Christopher and Peck (1997)

According to Christopher and Peck (1997), these lengthy supply pipelines often result in revenue losses in the final market.

In all fast moving consumer goods (FMCG) industries, demand is now more fragmented and the consumer more discerning about quality and choice. There is also an increasing fashion influence; no single style or fashion has dominated for any length of time (Ferne and Sparks 2009). For many consumer sectors, demand is approaching the chaotic in its insatiable appetite for diverse services and goods. 'Mass-customization' and individualized products with shorter season lengths; micro merchandizing and markets segmented at the individual level; large numbers of products chasing a diminishing market share all are evidence of the inexorable movement toward a 'sea change' and mark the folly of firms expecting to operate as they have in the past.

One of the most important findings from the early studies was the ability of quick response to compress time in the supply system. If the pipeline were condensed to about a third of its traditional length, not only did the design of goods better reflect more accurate consumer information, it was possible for the retailer to reassess the demand for products while the season was under way and receive small, frequent reorders from the supplier, provided reorder lead times are short enough (Ferne and Sparks 2009).

2.2.2.3. The Strategy behind Quick Response (QR)

According to Lowson et al. (1999 cited Ferne and Sparks 2009) quick response is defined as:

"A state of responsiveness and flexibility in which an organization seeks to provide a highly diverse range of products and services to a customer/consumer in the exact quantity, variety and quality, and at the right time, place and price as dictated by real time customer/consumer demand. QR provides the ability to make demand-information driven decisions at the last possible moment in time ensuring that diversity of offering is maximized and lead times, expenditure, cost and inventory minimized. QR places an emphasis upon flexibility and product velocity in order to meet the changing requirements of a highly competitive, volatile and dynamic marketplace. QR encompasses an operations strategy, structure, culture and set of operational procedures aimed at integrating enterprises in a mutual network through rapid information transfer and profitable exchange of activity."

The fundamental principle of QR is the alignment of organizational activity to demand. All activities within an enterprise should be paced to demand and customer behavior. Products and services are produced and delivered in the variety and volume that match

demand. The activity within a company moves to the beat of this drum. Swings in demand are closely monitored: too little or too much leads to waste and inefficiency. Whether it is marketing, purchasing, new product development or operations, all endeavors follow the market tempo and the realization that this alignment may necessitate a change in corporate culture (Christopher and Peck 1997).

For the effective quick response the configuration of resource is also important. Conventional strategy looks long term for some form of advantage by configuration of activities and resources to the environment of operation; a strategic fit between strengths and weaknesses and opportunities and threats (SWOT). In the QR world, this strategic architecture is inter-organizational. Strategy and strategic thinking are at a network level, encompassing many external interconnections. In addition, within this configuration must fit the mapping of customer/consumer values and perceived benefits onto operations, in order to underpin the link between demand and activity (Fernie and Sparks 2009).

Time is also a strategic weapon as vital to QR operation, but like any weapon its effectiveness depends upon the circumstances of its use. A time-based strategy is subtle and, above all else, must be well thought-out. As with demand, time-based competition requires careful assessment as to where best it can serve customers/consumers. According to Fernie and Sparks (2009) fast and accurate adaptation to market change is perhaps the most important element of the QR strategy. However, this architecture will only be effective if the operational environment is understood and the opportunities for time compression assessed. Accuracy and flexibility will reduce time delays, and postponement strategies will enable products, indeed all activity, to be tailored to known and exact needs rather than those forecast. It should also be remembered that the use of time for advantage will be inter-organizational; gains made internally will be rapidly lost if not carried through by network partners.

The last important point is of course partnership and alliances. Perhaps one of the most significant developments in recent management and business thinking has been externalization. From a QR perspective, the web of relationships and mutual networks upon which the organization depends requires a professional management approach, and increasingly firms are devoting staff and other resources to this task. The use of outsourcing, the concept of virtuality, and a focus on core value-adding processes have heightened this pressure for proper external organization and management with commercial partners. This requires a greater understanding of organizational behavior and communication beyond traditional boundaries, particularly power and culture, in order to manage the growing number

of strategically significant relationships that impact on the modern firm (Fernie and Sparks 2009).

2.2.2.4. The Importance of Agility-Zara Example

According to Fernie and Sparks (2009) successful companies in fashion markets seem to be not just able to capture the imagination of the consumer with their products but are often characterized by their agility. In other words, by their ability to move quickly (which means agility), uninhibited by cumbersome processes and lengthy supply chains. Many organizations are finding that it is possible to make significant improvements by adopting a twin strategy of simultaneously reducing the logistics lead time and capturing information sooner on actual customer demand.

The Spanish-based apparel company Zara provides a good example of how an integrated design, manufacturing and retail group is successfully managing its international supply chains;

The first Zara shop opened in La Coruña, northern Spain in 1975. In less than 30 years the business had grown to become one of Spain's leading textile and apparel companies, with sizable production facilities in Spain, purchasing operations in south-east Asia and the Caribbean, a finance holding company in the Netherlands and around 200 retail outlets (owned by the company) in Europe and the Americas. They produce a single global product range, designed to appeal to an international target market, in this case fashion-conscious 18- to 35-year-olds.

The whole process of supplying goods to the stores begins with cross-functional teams –comprising fashion, commercial and retail specialists – working within Zara's Design Department at the company's head-quarters in La Coruña. The designs reflect the latest in international fashion trends, with inspiration gleaned through visits to fashion shows, competitors' stores, university campuses, pubs, cafés and clubs, plus any other venues or events deemed to be relevant to the lifestyles of the target customers. The team's knowledge of fashion trends is supplemented further by regular inflows of EPOS (Electronic Point of Sale) data and other information from all of the company's stores and sites around the world.

Fashion specialists within the Design Department are responsible for the initial designs, fabric selection and choice of prints and colors. It is then up to the team's commercial management specialists to ascertain the likely commercial viability of the items proposed. If the design is accepted, the commercial specialists proceed to negotiate with suppliers, agree purchase prices, analyze costs and margins, and fix a standard cross-currency

price position for the garment. The size of the production run – i.e. the number of garments required – and launch dates (the latter vary between countries in accordance with custom and climate) are also determined at this point.

Raw materials are procured through the company's buying offices in the United Kingdom, China and the Netherlands, with most of the materials themselves coming in from Mauritius, New Zealand, Australia, Morocco, China, India, Turkey, Korea, Italy and Germany. Approximately 40 per cent of garments – those with the broadest and least transient appeal – are imported as finished goods from low-cost manufacturing centers in the Far East. The rest are produced in Spain, using Zara's own highly automated factories and a network of smaller contractors. Two guiding principles underlie all of its operations: quick response to market needs and working without inventory. Here lies the company's principal source of competitive advantage.

Only those operations that enhance cost-efficiency through economies of scale are conducted in-house (such as dyeing, cutting, labeling and packaging). All other manufacturing activities, including the labor-intensive finishing stages, are completed by networks of more than 300 small subcontractors, each specializing in one particular part of the production process or garment type. These subcontractors work exclusively for Zara's parent, Inditex SA. In return they receive the necessary technological, financial and logistical support required to achieve stringent time and quality targets. Inventory costs are kept to a minimum because Zara pays only for the completed garments. The system is flexible enough to cope with sudden changes in demand, though production is always kept at a level slightly below expected sales, to keep stock moving. Zara has opted for undersupply, viewing it as a lesser evil than holding slow-moving or obsolete stock.

Finished goods are forwarded to the company's huge distribution centre in La Coruña, where they are labeled, price-tagged (all items carry international price tags showing the price in all relevant currencies) and packed. From there they travel by third-party contractors by road and/or air to their penultimate destinations. The shops themselves receive deliveries of new stock on a twice-weekly basis, according to shop-by-shop stock allocations calculated by the Design Department. The whole production cycle takes only three or four weeks. In an industry where lead times of many months are still the norm, Zara has reduced its lead-time gap for more than half of the garments it sells to a level unmatched by any of its European or North American competitors.

(Source: Dutta 2002-2003)

2.2.3. Agile Merchandizing in the European Textile Fashion Industry

According to Fernie and Sparks (2009) an increasing number of firms are combining international and global sourcing to achieve sustainable competitive advantages such as lower prices, better quality, access to new markets and shorter product lifecycles. Globalization has become an inevitable trend in recent years as garment retailers have to deal with change more quickly and more frequently than ever before. Leading retailers in developed countries depend heavily on overseas manufacturers for their source of garments.

Some popular European fashion brands have progressively moved their supply regions from Europe to Asia as these countries are very competitive with their low product prices and increasing quality levels. For example, 33 per cent of the garments from the fashion brand H&M are supplied from China.

2.2.3.1. Global Sourcing Challenges

Globalization is an inevitable trend and global sourcing is one of the methods widely used by European garment retailers to achieve cost reductions or profit improvement, managing vendors and comparing the suppliers more closely. Manufacturers have sought to collaborate with their customers and suppliers to upgrade their purchasing functions as an integral part of the supply chain. Retailers also exploited suppliers' common strengths and technology for the support of new product development. They have also tried to integrate their physical distribution and logistics functions into supply chain management as a strategic approach to operations, materials and logistics management.

Well-established textile businesses have been transferring their technology and knowledge into less developed countries so as to benefit from the abundant access of low cost labor. With an increase in world trade, European textile manufacturers have to work hard to sustain profitability, leaving little time and money for product development and innovation. However, to survive in the long run European manufacturers need to find competitive advantage in factors other than cost (Kotzab 2010).

The traditional sourcing decisions based on manufacturing and shipping costs have been replaced by a more holistic approach to determining cost where additional requirements of lead time, inventory management, supplier performance and customer service level have to be considered. Product characteristics also have demand patterns, which facilitates a more efficient lean supply chain, while seasonal products such as fashion garments require a more responsive agile supply chain to cope with demand uncertainty and short product lifecycles. Here, agility means responsive to market knowledge and a virtual corporation to exploit

profitable opportunities in a volatile marketplace while leanness means developing a value stream to eliminate all waste, including time to enable a predictable supply profile

Retailers, particularly those selling garments and accessories, which are unable to respond to sudden market changes will experience losses due to final markdowns and missed sales opportunities. Being slow to market will result in unsatisfied customers with a consequential reduction in sales and residual stock. Consequently, a new business framework for European manufacturers has been developed with the production of garments through an agile merchandise approach (Ferne and Sparks 2009).

2.2.3.2. Fashion Merchandizing

To explain the impact of the supply response for different products Lowson (2003 cited Ferne and Sparks 2009) divided the fashion merchandise range into three major parts: basic products, seasonal products and short-season products.

Basic products (e.g. T-shirts, socks and underwear) are the products sold during the whole year with a minimal variation in demand. Seasonal products and short-season products on the other hand have shorter shelf-lives and a greater design variety, which make the forecasting process more complex. The final manufacturing decision for basic products is mainly based on physical cost reduction, productivity and high production volumes. Not surprisingly basic products are more likely to benefit from overseas low-cost suppliers than short-season products and seasonal products.

To compete in today's marketplace supply chains must be engineered to match lifecycle attributes as well as product characteristics. As products proceed through their lifecycle these characteristics dramatically change. The introduction and decline phases of the seasonal product's lifecycle correspond with the demand for higher value manufacturers providing the quick responses, flexibility and reliability required for design, sample, pre-production and top-up volumes. Overseas suppliers are often not able to respond within the time frame necessary to provide the high delivery service required for volatile fashion markets (Ferne and Sparks 2009).

2.3. Green Logistics in the Fashion and Fashion Retail Industry

2.3.1. Introduction

Green logistics, in the context of humanitarian logistics encourages all stakeholders to consider the impact of their actions on the environment. The main objective of green logistics is to coordinate the activities within a supply chain in such a way that beneficiary needs are met at "least cost" to the environment. In the past "cost" has been defined in purely monetary terms, where-as "cost" can now also be understood as the external costs of logistics associated with; climate change, air pollution, dumping waste (including packaging waste), soil, degradation, noise, vibration and accidents, as illustrated below:

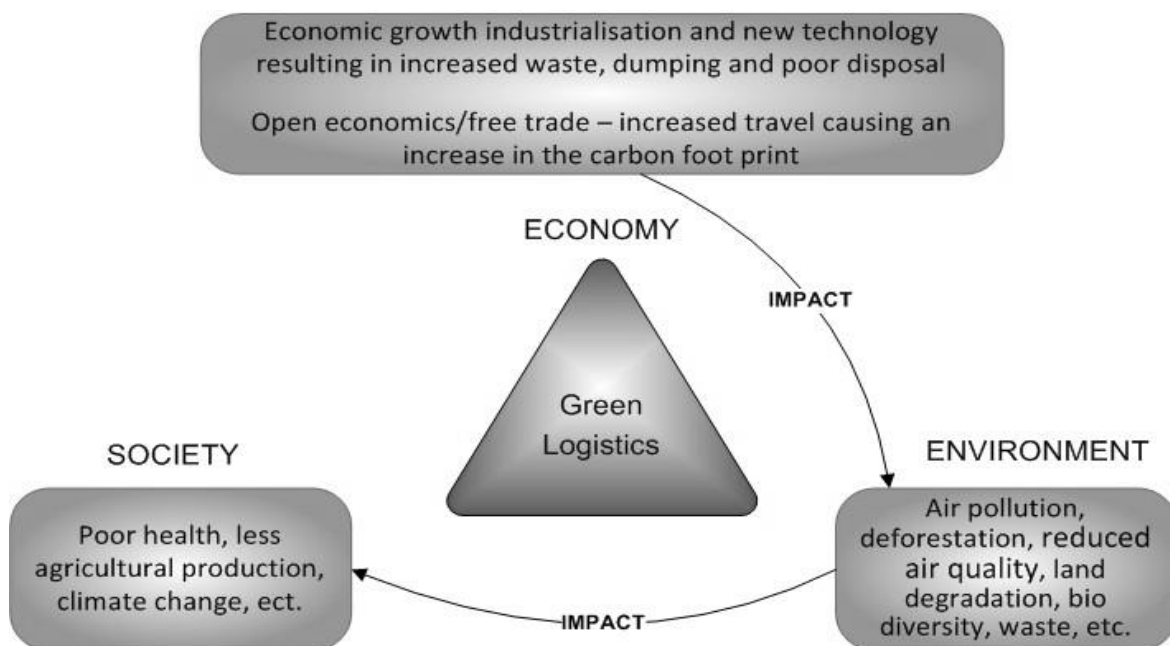


Figure 13: Where as cost

Source: <http://log.logcluster.org> (2011)

Green or sustainable logistics is concerned with reducing environmental and other negative impacts associated with the movement of supplies. Sustainability seeks to ensure that decisions made today do not have an adverse impact on future generations. Green supply chains seek to reduce negative impact by redesigning sourcing, distribution systems and managing logistics so as to eliminate any inefficiency, unnecessary freight movements and dumping of packaging.

As consumers are becoming more environmentally-conscious, retailers' green credentials are becoming a more important competitive differentiator. Environmental initiatives can generate higher revenues and secure greater customer loyalty. They can also yield cost savings by, for example, cutting energy consumption and packaging waste. By

happy coincidence, greening retail operations can represent best business practice both economically and environmentally.

According to McKinnon et al. (2010), green logistics activities include measuring the environmental impact of different distribution strategies, reducing the energy usage in logistics activities, reducing waste and managing its treatment. In recent years there has been increasing concern about the environmental effects on the planet of human activity and current logistics practices may not be sustainable in the long term. Many organizations and businesses are starting to measure their carbon footprints so that the environmental impact of their activities can be monitored. Governments are considering targets for reduced emissions and other environmental measures. There is therefore increasing interest in Green Logistics from companies and also governments.

Traditional logistics models for production and distribution have concentrated on minimizing costs subject to operational constraints. But consideration of the wider objectives and issues connected with green logistics leads to new methods of working and new models, some of which pose interesting new applications for operational research models of various types.

In this part, it will be examined that, the adverse effects of retail logistics operations on the environment and review a series of measures that companies can take to minimize them.

2.3.1.1. Environmental Effects of Retail Logistics

Changes which took place in the European retail legislation in the 2000s had important impacts on freight operations. Many of retailers often had very long opening hours before and in large cities it was common for some shops to open 24 hours a day. This trend together with just in time systems, reduction in stock level to minimize operating capital and reduce the risk of unsold goods, led to more frequent and smaller deliveries. This had also translated into lower loading factors and finally more vehicle kilometers. Therefore in many urban areas there was so much traffic levels and congestion affecting efficiency and increasing costs of the freight transport operations. But now with the legislations these negative issues are not available any more for the environment (Browne et al. 2007).

If it is considered that, the supply system of these retailers, suppliers of many larger retail chains make deliveries to distribution centers operating on 'quick response' principles, where goods for each store are consolidated and transported as complete lorry loads at a pre-arranged time, often before the shop opens. Advantages are also experienced by retailers'

suppliers who appreciate cost reduction associated with ability to deliver in bulk to depots offering excellent facilities and operating 24 hours a day, 7 days a week. No need for entering busy city centers is an important advantage as well since delays caused by congested roads within urban areas significantly increase companies' operating cost, affect their profitability and market competitiveness.

According to Fernie and Sparks (2009), the effects of retail logistics can be divided into six broad categories:

2.3.1.1.1. Greenhouse Gas (GHG) emissions

Numerous gases exert a global warming effect with varying degrees of intensity. Carbon dioxide, produced by the burning of fossil fuels in power generation and vehicles, is the most important GHG emitted by retailers, though heavy users of temperature control equipment also release refrigerant gases which can have global warming potential, thousands of times greater than CO₂. Some large retailers have measured their carbon-footprints and disaggregated their CO₂ emissions by activity. Marks & Spencer, for example, has estimated that its logistics operations account for roughly 11 per cent of its total CO₂ emissions (Fernie and Sparks 2009).

2.3.1.1.2. Noxious Gases

These pollutants, such as nitrogen oxide, sulphur dioxide and particulate matter (PM10), impair local air quality and are responsible for a range of negative effects on human health, vegetation and buildings. Tightening controls on exhaust emissions over the past 20 years, mainly in developed countries, have drastically reduced the release of these pollutants (Fernie and Sparks 2009).

2.3.1.1.3. Noise

This emanates mainly from vehicles and distribution centers. As a result of improvements in vehicle technology and the imposition of tougher regulations on vehicles noise, it is obvious that new trucks today are much quieter than those of 10-15 years ago. In retail logistics, noise reduction not only involves investing in newer vehicles with quieter engines. The sound of refrigeration equipment, the rattling of roll cages inside vehicles and even in-cab radios can cause annoyance. The hooter noise of these vehicles as well. The range of activities performed in and around a retail distribution centre can also disturb local residents, particularly as these premises typically operate on a 24-hour/seven-day cycle (Fernie and Sparks 2009).

2.3.1.1.4. Accidents

The involvement of freight vehicles in traffic accidents is generally considered to be an externality. The costs of personal injury/death, any damage to property and related use of emergency services are borne by the community at large and thus deemed to be environmental costs. Accidents occurring within distribution premises, on the other hand, are treated as an internal cost of the business (Fernie and Sparks 2009).

2.3.1.1.5. Waste

Retail logistics operations generate large quantities of waste, mainly in the form of packaging material, though products that are damaged or life-expired while in the supply chain and have to be rejected can also be considered a type of logistics-related waste. In the past much of this waste went into landfill sites, occupying rural land and creating serious environmental problems (such as the release of methane, a very potent green-house gas and so on), or incineration plants that release air pollutants. Today retailers must stick to strict controls on the recycling and reuse of packaging and other waste (Fernie and Sparks 2009).

2.3.1.1.6. Visual Intrusion

Many people dislike the appearance of trucks and warehouses and believe that they reduce the quality of the local environment. Large trucks are often considered out of place and even intimidating in sensitive urban and rural environments, while large warehouse 'sheds' are often criticized for dominating the landscape. It is very difficult, however, to quantify and cost these subjective judgments and so, for this reason, they tend to be excluded from formal environmental assessments (Fernie and Sparks 2009).

2.3.1.2. Environmental Standards

It is stated by McKinnon et al. (2010) that, environmental standards can be divided into two types; those that are mandatory and those that more environmentally responsible companies meet voluntarily.

Mandatory Standards

EURO emission standards

Since the early 1990s, emissions from diesel-engined Heavy Goods Vehicle (HGV) have been strictly controlled by EU legislation. New HGVs have been the subject of progressively pushing by environmental standards, known as EURO emission standards. Emissions of nitrogen oxides and particulate matter have been targeted particularly and will be almost negligible after 2013 (www.nao.org.uk 2011).

Voluntary/Management Standards

Environmental management standards (EMS)

The Institute of Environmental Management and Assessment (IEMA, 2008 cited McKinnon et al. 2010) defines an EMS as ‘a structured framework for managing an organization’s significant impact on the environment’. These impacts can include business waste, emissions, energy use, transport and consumption of materials and, increasingly, climate change factors.

ISO 14000 and 14001

For the companies that want certification of their environmental credentials there exist a series of international standards, namely the ISO 14000 series. These are a set of voluntary standards and guideline references for companies aiming to minimize their environmental impact and also give chance to prove it to their customers/consumers. ISO 14001, which was published in 1996, applicable to any organization that wishes to establish, implement, maintain and improve an environmental management system, to assure itself of conformity with its stated environmental policy, and to demonstrate conformity with ISO 14001 by;

- making a self-determination and self-declaration, or
- seeking confirmation of its conformance by parties having an interest in the organization, such as customers, or
- seeking confirmation of its self-declaration by a party external to the organization, or
- seeking certification/registration of its environmental management system by an external organization. (www.iso.org 2004).

It is the only standard in the ISO 14000 series for which certification by an external authority is available, and concerns the specification of requirements for a company’s environmental management system (McKinnon et al. 2010).

Eco-management and Audit Scheme (EMAS)

This is a voluntary European-wide standard introduced by the European Union and applied to all European countries. It was formally introduced into the UK in April 1995. According to the Institute of Environmental Management and Assessment (IEMA, 2008 cited McKinnon et al. 2010), the aim of EMAS is ‘to recognize and reward those organizations that go beyond minimum legal compliance and continuously improve their environmental performance’. Participating organizations must regularly produce a public environmental statement, checked by an independent environmental verifier that reports on their environmental performance.

2.3.2. Strategic Perspective

2.3.2.1. Transferring Freight Transport Modes to ‘Greener’ Mode

According to European Commission (2006), road transport can be most efficient, but for others combined options whether with rail, short-sea shipping or inland waterways, are better. Choosing the best option for any given journey will make transport operations more efficient, cost-effective, sustainable, and help our economies to be more competitive in a win-win environment.

The main focus of this part is on the greater use of rail and water –both inland waterway and coastal shipping- since these are the main alternatives to road for a broad range of commodity and flow types.

2.3.2.1.1. The Main Freight Transport Modes and the Characteristics

Retailers can switch traffic flows to cleaner transport modes both on inbound (primary) movements into their distribution centers (DC) and outbound (secondary) deliveries to shops. In the case of supplies sourced from other parts of the world, the main choice is between air freight and deep-sea container services. According to the Swedish Network for Transport and Environment⁶, long-haul air freight services emit on average around 30 times more CO₂ per ton-km than ocean shipping.

The main freight transport modes all have different characteristics which leads them to play different roles in the movement of goods. Rail and waterborne freight have natural advantages in the movement of bulk products, resulting mainly from their ability to carry large quantities in a single train or vessel. By contrast, the flexibility and convenience of road transportation lends itself to the movement of manufactured goods. Typically, then, rail and water come into their own for commodity movements in the early stages of the supply chain, where flow volumes tend to be larger and of relatively low value compared to their weight. Road caters for the majority of the flows that distribute products, where consignment values per ton are typically higher and flows are of smaller volumes. Rail finds it hard to compete for shorter distance flows, except when very large volumes are on offer (McKinnon et al. 2010).

⁶ The Network for Transport and Environment, NTM is a nonprofit organization, initiated in 1993 and aiming at establishing a common base of values on how to calculate the environmental performance for various modes of transport.

Source: <http://www.ntmcalc.se/index.html> (2011)

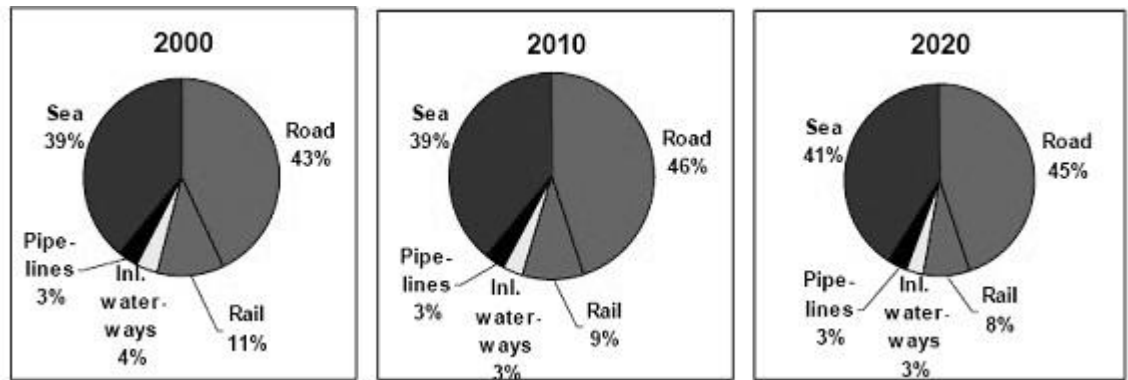


Figure 14: Modal split (%) for freight transport moved (Europe)

Source: DGTREN (Directorate-General for Transport and Energy) memo June (2006)

As it is indicated, the benefiting percentage of the transport modes is changing from road to sea. It is also predicted for the year of 2020 by European Commission. In recent years, however, major retailers have begun to make much more use of these alternative modes. In the United Kingdom, for example, Tesco, Asda and IKEA have switched significant volumes of longer-haul traffic from road to rail (Ferne and Sparks 2009).

Although air transport is significantly more expensive than movement by sea, the difference in rates does not adequately reflect the huge difference in environmental costs. This is because no tax is currently imposed on the fuel consumed by air freight and deep-sea shipping services. Being a much more energy-intensive mode, air freight derives much greater economic benefit from this tax-free status. In a world subject to accelerating climate change, it is likely to be only a matter of time before this environmental anomaly is corrected. As a first step in this direction, the European Commission is proposing to include aviation in the Emissions Trading Scheme from 2012.

In the longer term, full internalization of the environmental costs of air freight, most of which are associated with climate change, could substantially increase air freight rates per ton/km. When combined with steeply rising oil prices, the imposition of higher environmental charges will strongly discourage retailers from using air freight for all but the highest value, most time-sensitive products (Browne et al. 2007).

2.3.2.1.2. The Main Freight Transport Modes and its Environmental Impact

In addition to each of the modes having different operational characteristics, their environmental impacts also differ significantly. Various attempts have been made to assess the relative environmental impacts of freight modes, and a relatively consistent picture emerges from these different studies despite some differences in absolute values. Figure 15

presents the findings from a thorough assessment of the CO₂ emissions per ton-km for a range of transport modes (McKinnon 2007).

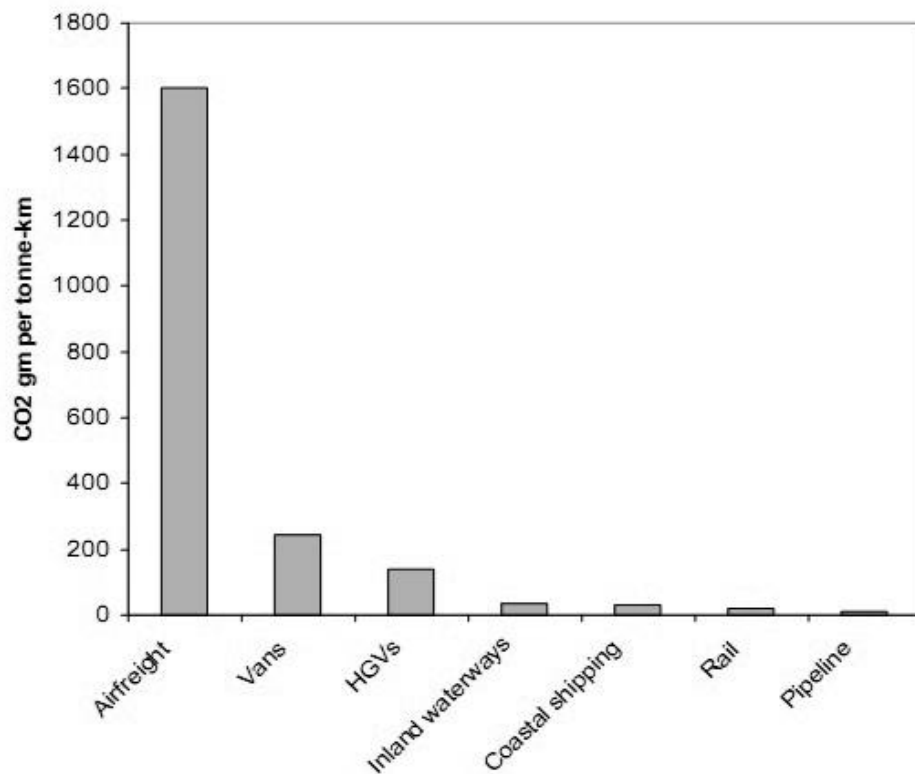


Figure 15: Estimated average CO₂ intensity values for freight transport modes
Source: McKinnon (2007)

In general, rail and waterborne modes of transport are less damaging to the environment than road haulage, with typical emissions from waterborne freight being four or five times less per ton-km than for road, and in the case of rail it is seven times lower than road haulage. At the other extreme, air freight has significantly greater CO₂ emissions at around 1600 grams per ton-km, while pipeline has the lowest emissions rate (McKinnon et al. 2010).

While most of the concern about the environmental impacts of freight transport relates to climate change, notably CO₂ emissions, the modes of transport also vary in terms of their other climate change and local air pollution impact.

2.3.2.1.3. The Policy Framework of European Union

McKinnon et al. (2010) has stated that the momentum behind the promotion of policies designed to achieve a shift from road to ‘greener’ transport modes has grown since the late 1990s, at both the national and EU levels. In 1992, the European Commission published its first White Paper on Transport. This focused mainly on the liberalization of transport markets as part of the development of the Single European Market, but led to a strengthening of road’s position in the freight market, at the expense of rail and inland

waterways which both lost market share. The 2001 White Paper recognized this imbalance in the growth of the different transport modes and the consequent impacts on the environment, congestion and accidents. This second White Paper was published at a time when a consensus was forming within the scientific community as to the strong likelihood that human activities, of which transport is key, were responsible for the changing global climate. Reducing the dependence on oil-based fuel sources also favors a switch of traffic from road to rail, where the latter may have the opportunity to use electric traction, which raises the opportunity to use renewable or other non-fossil fuel power sources. At present, the waterborne freight sector is almost entirely dependent upon oil-based sources, so does not offer the same benefit over road, but of course is typically far more fuel efficient (McKinnon et al. 2010).

The EU is developing an integrated maritime policy⁷, which will have also particular significance for the UK given its reliance on shipping for international trade and the importance of coastal traffic. According to McKinnon et al. (2010), the policy aims to balance the often-conflicting challenges of globalization, economic safety, energy security and sustainability. One specific objective is the reduction of CO₂ emissions from shipping. Other EU policies and regulations influence both freight transport mode choice and the environmental impacts of the different modes.

2.3.2.2. Development of Vehicles, Aircraft and Ships under the ‘Green’ Title

Many of the technical improvements that have been made to freight vehicles and vessels over the past few decades have reduced their environmental impact. Some of these improvements have been required to meet tightening environmental legislation, particularly on air pollution and noise. Others have been motivated mainly by commercial pressures to improve energy efficiency and vehicle loading, though they have indirectly yielded environmental benefits. The potential for future advances in vehicle technology to reduce environmental impacts further partly depends on the timescale. The Intergovernmental Panel on Climate Change⁸ notes that, as far as greenhouse gases (GHG) emissions from transport

⁷ In order to protect maritime resources, the European Commission plans to put in place an integrated, horizontal and cross-sector maritime policy, encompassing all aspects of our relationship with the seas and oceans. The management framework, the objectives and the instruments proposed by the Commission are developed in this Communication which is founded on the Lisbon and Gothenburg strategies.

Source: <http://europa.eu/> (2011)

⁸ The Intergovernmental Panel on Climate Change (IPCC) was created in 1988. IPCC is the leading international body for the assessment of climate change. It was established by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.

Source: www.ipcc.ch (2011)

are concerned, ‘the most promising strategy for the near term is incremental improvements in current vehicle techniques.’ In the longer term, however, it is likely that freight vehicles will be more radically redesigned, primarily to cut their fuel consumption and CO₂ emissions (www.ipcc.ch 2011).

The new technology will contribute to the greening of companies’ freight transport operations. It adopts a cross-modal perspective, considering the opportunities for technologically improving the environmental performance of trucks, vans, freight trains, ships and planes. While there is a strong commitment to decarbonize freight transport across all modes, individual modes can have particular environmental priorities. The shipping industry, for example, is under strong pressure to reduce sulphur emissions, while the use of ultra-low-sulphur fuels is now the norm in the trucking systems of developed countries. Research and development efforts can therefore have a different focus in particular sectors of the freight market (Browne et al. 2007).

Advances in vehicle technology in general can reduce the environmental impact of freight transport in three ways;

- Increasing vehicle carrying capacity,
- Improving energy efficiency,
- Reducing externalities.

As a result, technical innovations are adopted more rapidly in some freight modes than in others. Over 20-30 year time horizon, however, the development and diffusion of clean vehicle technology is likely to reduce substantially the externalities from all the main modes of freight transport (McKinnon et al. 2010).

2.3.2.3. Reducing the Environmental Impact of Warehousing

When considering issues of energy intensity, carbon footprints or sustainability within the supply chain, most attention has been given to understanding and mitigating the impact of transportation. By comparison little attention appears to have been given to evaluating the consequences of warehousing within the supply chain. As McKinnon et al. (2010) is stated that, the ways of reducing the environmental impact of warehousing are;

Improve energy efficiency

For the improvement of energy efficiency of warehousing, there are some emphases like warehouse temperature.

Fuel oil or gas is the primary source of energy for heating a warehouse, and electricity is used for cooling. The extent of the energy consumed is primarily determined by:

- The temperature required to maintain the stored products in a satisfactory condition. This may require intervention to maintain a maximum or minimum temperature level, as well as, to control relative humidity.
- The background temperature of the internal space required for operatives to perform their work in comfort in relation to extent of their physical exertion and location of the task being undertaken.

The sources of heating used in the warehouse depend upon the size of areas to be controlled and the extent that local zone conditions have to be maintained.

According to McKinnon et al. (2010) besides temperature of warehouse, the lightning and the mechanical handling equipments (forklift trucks ...) also have non-negligible importance for the environmental impact of warehousing.

2.3.3. Operational Perspective

2.3.3.1. Improving Vehicle Utilization

According to Eurostat⁹ (2007), in most developed countries, road transport is the dominant mode of freight movement. The efficiency of the road freight sector is therefore a major determinant of the overall environmental impact of logistics. If all trucks and vans were fully loaded on all trips, it could be decreased the environmental burden. The extent of the resulting environmental benefit is difficult to quantify at a national or international level as little official data is collected on the use of vehicle capacity, particularly in terms of floor area. Some of the available statistics, however, indicate the degree of capacity under-utilization. For example; trucks approximately 25 per cent of fullness in EU countries are run empty.

Raising vehicle load factors is one of the most attractive sustainable distribution measures to companies because it yields substantial economic as well as environmental benefits. Increasing transport costs and the prospect of oil prices rising steeply in the future are giving companies a strong incentive to improve their vehicle loading.

2.3.3.1.1. Measuring Vehicle Utilization

It is stated by McKinnon (2007) that, different indices can be used to calculate the utilization of vehicle fleets, each giving a slightly different impression of transport efficiency.

⁹ Eurostat was established in 1953. Eurostat is the statistical office of the European Union situated in Luxembourg. Its task is to provide the European Union with statistics at European level that enable comparisons between countries and regions.

Source: epp.eurostat.ec.europa.eu (2011)

Ton/kilometers per vehicle per annum

This indicator is essentially a measure of productivity, and as such, generally presents the trucking industry in a favorable light. It means how many tons of products/goods you carry and how far (McKinnon et al. 2010).

Weight-based loading factor

This measure is exclusively weight based and is generally expressed as the ratio of the actual goods moved to the maximum ton/kilometers achievable if the vehicles, whenever loaded, were loaded to their maximum carrying capacity. It gives a less favorable impression of capacity utilization in the road freight industry (McKinnon et al. 2010).

Space-utilization/vehicle fill

Vehicle fill can be measured in three dimensions by the percentage of space occupied by a load or in two dimensions by the proportion of the floor area covered. In the case of unitized loads, the actual number of units carried can be divided by the maximum number to calculate the percentage fill. This should be accompanied by an assessment of the internal loading of the units and the average height of the pallet-loads. There is no systematic collection of volumetric data for road freight flows, so assessing vehicle fill at an industry level is very problematic (McKinnon et al. 2010).

Empty running

According to Eurostat (2007) empty running is generally expressed as the proportion of vehicle-km run empty. Within the EU, the empty-running of trucks varies considerably by country and averages around 25 per cent. The level of empty running tends to be inversely proportional to the length of haul, because the longer the journey the greater the economic incentive to find a backload.

2.3.3.1.2. Utilization of Transport Capacity

Using government data it is only possible to assess the efficiency of road freight transport. Operators are sometimes unsure whether to classify as empty vehicles returning various types of handling equipment. While a truck carrying only enough wooden pallets for the next load may be considered empty, another returning empty roll cages from supermarket to a distribution centre could be considered loaded. There is a need for more rigorous definitions of what types of trip should be classified as empty. The interpretation of empty running statistics also requires some qualification. There is a common perception that empty running is the result of a prodigal use of transport capacity and clear evidence of inefficiency. In practice, it is often very difficult, if not impossible, to obtain a return load and thus

eliminate empty running. Much empty running, for example, is the result of geographical imbalances in freight traffic flows, in many countries it is illegal for companies operating trucks on an own account basis to collect a return load from another company (Browne et al. 2007).

According to Vilkelis (2011) international variations can reflect differences in the size of the country, the nature of its freight market, regulatory controls and regional imbalances in freight flows. The longer the haul the greater is the financial incentive to find a backload.

2.3.3.2. Fuel Efficiency in the Road Freight and Use of Alternative Fuels

The environmental impact of freight transport is closely related to the amount of energy consumed. This link is particularly close in the case of carbon dioxide emissions. Retailers and logistics service providers working on their behalf can improve the energy efficiency of transport and warehousing operations in many ways. According to Fernie and Sparks (2009) road freight operations can apply numerous fuel economy measures. These measures;

- Providing drivers with training in fuel-efficient driving;
- Offering incentives for fuel-efficient driving;
- Purchasing more fuel-efficient vehicles;
- Reducing vehicle tare (empty) weight;
- Improving the vehicle's aerodynamic profiling;
- Raising standards of vehicle maintenance;
- Imposing tighter speed limits;
- Ensuring correct tire pressures.

Research in the United States, for example, found average fuel savings ranging from under 1 per cent for automatic tire inflation systems to almost 8 per cent for a reduction in maximum speed from 100 km/h to 95 km/h was stated by Ang-Olsen and Schroeer (2002 cited Fernie and Sparks 2009). Some of these measures, however, are counteracting. For example, cutting maximum speed will reduce the effectiveness of improved vehicle aerodynamics. A fuel management program should not, therefore, simply comprise a loose collection of measures. These measures should be integrated into a coherent package tailored to the needs of particular types of retail distribution. While many truck fuel economy measures are generic and can be applied in any sector, some have been pioneered by retailers. For example, in the United Kingdom, retailers such as Marks & Spencer, TK Maxx and PC World have trialed the use of 'teardrop' trailers that slope both at the front and rear of the

vehicle. When combined with additional carrying capacity, they can cut full consumption per cubic meter of load by around 20 per cent relative to a standard trailer (Fernie and Sparks 2009).

Use of alternative fuels;

– Biofuels

Biofuels have attracted increased attention in recent years as a result of concern about climate change and energy security. Their appeal is obvious. They are produced from renewable plant materials (feedstock) or organic waste oils and fats, and when blended with standard diesel or petrol can, depending on the source, deliver reductions in greenhouse gases emissions (Coyle and Brown 2004).

Government policies promoting the use of biofuels and corporate commitments to switch to these fuels now appear to have been premature. Recent lifecycle (or well-to-wheel) comparisons of the environmental impacts of biofuels and conventional fuels suggest that the former are not a panacea as first thought. New evidence suggests that most forms of biodiesel, with the exception of that produced from waste vegetable oil, yield little net CO₂ benefit and, on a lifecycle basis, can potentially generate more CO₂ than conventional diesel. Other environmental and social effects of biofuel use are also being questioned (Environmental Audit Committee 2008; Royal Society 2008). The diversion of agricultural production from food to energy crops has substantially inflated food prices around the world and exacerbated food shortages. The increasing demand for biofuels is also accelerating the clearance of native tropical forests and threatening biodiversity.

Second-generation biofuels, produced mainly from agricultural waste and forest products, may alleviate these environmental and social concerns and prove a more sustainable means of cutting CO₂ emissions. According to Environmental Audit Committee (2008 cited Fernie and Sparks 2009), commercial production of these fuels is still many years away.

Electric and Hybrid Vehicles

Electric vehicles are virtually pollution-free at the point of use and extremely quiet. They are therefore particularly well suited to home delivery operations in which a large proportion of vehicle-kms are run in sensitive residential neighborhoods. The adoption of electric vehicles has traditionally been constrained by the limited distance range between battery recharges, and restrictions on vehicle carrying capacity resulting from the on-board energy-storage requirements.

A new generation of hybrid vans and rigid trucks, which can switch between battery and diesel-/petrol-fuelled engines, is now being produced commercially. Their manufacturers

claim that they can achieve fuel savings of 20–30 per cent when compared with conventional diesel/petrol vehicles. In the medium to long term they are likely to have extensive application in retail supply chains, particularly in multiple-drop deliveries to shops and homes (Ferne and Sparks 2009).

2.3.4. Key Issues

2.3.4.1. The Strategies being Sustainable for Retail City Logistics

Approximately 80 per cent of European citizens live in an urban environment. Due to their large populations and extensive commercial establishments, urban areas require large quantities of goods and services for commercial and domestic use. The growing importance of urban freight transport is related to increase in urban populations and continued economic growth in urban areas. (European Commission 2007).

Freight transport in towns and cities responds very effectively to the requirements of modern urban economies. However, it is a major contributor to environmental impacts, particularly to local air pollution and noise and, as a result, has an important impact on the health of the most vulnerable residents of cities. Urban freight activities involve economic, social and environmental issues simultaneously and can result in conflicts. Under current conditions the economic viability of urban areas might actually be benefiting from socially and environmentally damaging freight transport operations. Moving towards a more sustainable urban freight system requires changes and innovations in the public and private sectors (Allen and Wild 2008).

2.3.4.1.1. The Problems of being Efficient in Urban Freight Transport

Urban freight transport operations are responsible for a range of negative social and environmental impacts. These are relatively well understood and include fossil fuel consumption, greenhouse gas emissions, air pollution, noise, visual intrusion, road safety and accidents, and road traffic congestion/disruption as these were mentioned before.

According to Allen and Wild (2008) the problems experienced by those performing freight transport and logistics operations in urban areas are far less well understood. These include:

- Traffic flow/congestion issues caused by traffic levels, traffic incidents, inadequate road infrastructure, narrow street layouts, and poor driver behavior.
- Transport policy-related problems including neglect of freight transport issues in town and traffic planning, and other policy issues such as vehicle access restrictions based on time and/or size/weight of vehicle and bus lanes.

- Parking and loading/unloading problems including loading/unloading regulations, fines, lack of unloading space, and handling problems.
- Customer/receiver-related problems including queuing to make deliveries and collections, difficulty in finding the receiver, collection and delivery times requested by customers and receivers.

It is also stated by Allen and Wild (2008) that it is important to distinguish between the two different groups who are capable of implementing changes to the urban freight system, namely:

- Public policy makers (especially urban authorities) who make changes to urban freight transport operations through the introduction of policy measures that force or encourage companies to alter their behavior.
- Freight transport companies who implement initiatives that reduce the impact of their freight operations because they derive some internal benefit from this change in behavior. These benefits can be internal economic advantages from operating in a more environmentally or socially efficient manner, either through improved economic efficiency or through being able to enhance market share as a result of their environmental stance. Instances of company-led initiatives include increasing the vehicle load factor, making deliveries before or after normal freight delivery hours, the implementation of IT for communications or planning purposes, improvements in the fuel efficiency of vehicles.

Inefficiencies in urban freight transport can occur as a result of existing road layouts or traffic levels. They can also come about due to non-freight urban transport policies of policy makers that have unintended consequences on freight transport operations (e.g. the introduction of bus lanes). Another cause of inefficiency in urban freight transport can result from variations in urban freight transport policy measures in different urban areas or different parts of a single urban area. Such inefficiencies can have both financial and environmental impacts and are therefore best avoided from both the perspective of companies and the wider society. This suggests the need for collaboration between public policy makers with responsibility for freight transport regulations in urban areas as well as consideration of the benefits of harmonizing such regulations in order to avoid causing operational inefficiency (Allen and Wild 2008).

2.3.4.1.2. Joint Working between the Public and Private Sectors

It is stated by McKinnon et al. (2010) that, logistics activities are primarily performed by private companies. However, government (urban, regional and national) is expected to play a responsible role for many reasons – for example:

- Coping with negative externalities such as road congestion and air pollution;
- Necessary co-ordination with other public purposes such as city planning, regional economic development, environmental management, etc.;
- Cross-border administrative issues with relation to international Supply Chain Management.

According to Allen and Wild (2008) in recent years various types of public-private partnerships (PPP) have been introduced in urban freight transport. PPP can involve a range of interactions between public and private actors. In the field of urban freight transport PPP can take a variety of forms – for example:

- Private sector development of public infrastructure projects.
- Operational agreements between parties (e.g. vehicle routings, delivery times, etc.).
- Consultation based on one party requesting the others views in written form (i.e. not a conversation but feedback to ideas, comments on a proposal etc.).
- Two-way open conversation and dialogue about existing and future policies.

Early examples of such partnerships were the city logistics schemes that were heavily promoted by the public sector in some countries in the early 1990s. However, most of these city logistics schemes have since failed. The main reasons for these “failures” were that the profitability of such approaches was overestimated and the critical mass on consignments to be bundled for city distribution was never reached. Hence, most projects vanished or the activities were taken over by one private operator. The lesson learned from these city logistics experiences was that PPP which do not provide sufficient commercial benefits are not sustainable over time. Obviously, the initiation and maintenance of a PPP is a complex task. However, bringing both sides together can result in mutual benefits, large synergy effects and efficiency gains especially for tasks which are not core duties of the public sector (Allen and Wild 2008).

2.3.4.1.3. Environmental Zone of Europe

According to Eriksson (2002) an “Environmental Zone” (EZ) is a defined geographical area that can only be entered by vehicles meeting certain emissions criteria. The purpose of an EZ is to either restrict or charge the most polluting vehicles if they enter the EZ

when their emissions are over the set level. In this way, an EZ can lead to air quality improvements because it capitalizes on recent EU legislation for road vehicles, which have set progressively tighter emission limits on new vehicles manufactured over the past decade. EZs are implemented in locations in which air pollution has reached levels that are dangerous to public health. By introducing the EZ it is hoped that air quality is improved and that this will reduce the health problems and fatalities associated with poor air quality.

According to some research of Allen and Wild (2008), the main air pollution problems today in Europe are particulate matter (PM), nitrogen dioxide (NO₂) and ground level ozone (O₃). Road traffic is a significant source of both PM and NO₂. The Framework Directive¹⁰ 1996/62/EC describes the legal framework for the assessment and control of air pollution in the European Union. Directive 1999/30/EC set the limit values for PM and NO₂. If the limit values are exceeded, the air quality framework directive requires member states to develop 'plans or programs' designed to ensure that the limit values are met. An EZ offers one approach by which emissions of these pollutants can be reduced in areas where road traffic makes a significant contribution to air concentrations and thereby (together with other actions) help authorities to meet the European air quality standards.

The noise directive will also require development of action plans in some areas, and EZs may be used to address traffic noise problems in affected areas in future. An Environmental Zone (EZ) is an area that can only be entered by vehicles that meet specified emissions criteria. This can be applied to just goods vehicles, a selection of motor vehicle, or all motor vehicles. An EZ therefore differs from the following types of access restrictions that can be placed on goods vehicles in urban areas:

- weight restrictions,
- length restrictions,
- restrictions based on utilization of loading capacity,
- time restrictions,
- permanent street closures and pedestrian schemes,
- road user charging.

However, the above types of access restrictions can be implemented in addition to an EZ. EZ schemes can take many forms based on their objectives, the geographical area they

¹⁰ A set of privacy requirements that took effect in 1998 and ordered European member nations to enact compliant legislation. It deals with the establishment of Data Protection Authorities, people's rights to personal information and enforcement.

Source: <http://encyclopedia2.thefreedictionary.com> (2011)

cover, the times at which the EZ is in force, the vehicle emissions standards required for vehicles to enter the zone, the types of vehicles that need to comply with the EZ, and the implementation and enforcement approaches used.

EZs have already been successfully implemented and run for several years in Scandinavia, and are being widely considered by other European cities [Eriksson, 2002]. They are seen as one of the options for helping to improve urban air quality. The EZs that have already been implemented or which are planned to be implemented soon in European countries based on information currently available. We can see this in Table 2.

Country	Existing and planned EZs
Austria	One scheme on the A12 motorway started in 2007
Denmark	EZs planned to start in five cities (Aarhus, Aalborg, Copenhagen, Frederiksberg and Odense) in September 2010
Germany	EZs have already begun operating in 12 cities in 2008 (Cologne, Dortmund, Berlin, Hannover, Leonberg, Ilsfeld, Ludwigsburg, Pleidelsheim, Schwäbisch-Gmünd, Mannheim, Tübingen and Stuttgart). EZs are planned to start in another 10-20 German cities between late 2008 and 2010
Italy	EZs have already been implemented on the A22 motorway, in Bologna, and in towns and cities in the following regions (during winter months and specified hours per day): Emilia-Romagna, Lombardia, Piemonte, Veneto, and Bolzano.
The Netherlands	EZs have already begun operating in 9 cities in 2007 and 2008. Another 8 cities are planning to introduce EZs in 2008 and 2009.
Norway	EZs are planned in Bergen, Oslo and Trondheim in 2009 and 2010.
Spain	An EZ is planned to start in Madrid in 2008 as part of the Air Quality Strategy.
Sweden	EZs have been implemented in Stockholm, Gothenburg, Lund and Malmo.
UK	An EZ has been implemented in London in 2008.

Table 2: Planned and existing Environmental Zones in European cities and regions
Source: Allen and Wild (2008)

2.3.4.1.4. A Review of Green Logistics Schemes Used in Cities around the World

According to Geroliminis and Daganzo (2005) environmental impacts of logistical activities are most severe population densities are highest; i.e. in cities. The goal of city logistics should be to deliver and collect the goods for activities produced in a city in an efficient way, without disrupting the sustainable, mobile, liable and environmental friendly character of the city. Therefore, city logistics deserve special attention.

There are several examples of sustainable city logistics and “green logistics” schemes that have been used in various cities around the world. Table 3 summarizes that;

Category	Implemented Policy
Restriction zones	1. Copenhagen - City Goods Ordinance for capacity management
	2. Sweden - Environmental Zones
	3. UK - Low Emission Zones
	4. Brussels – Lorry dedicated routes
Clean vehicles	5. Rotterdam - Electric Vehicle City Distribution System
	6. Osaka - Electric Vans
	7. Zurich-Cargo Tram
Coordinated transport	8. Berlin - Goods Traffic Platform (Public Private Partnership)
	9. Stockholm - logistical centre for coordinated transports
Congestion mitigation	10. Barcelona - Multiple Use Lanes; on line parking information
	11. Paris, Barcelona, Rome - Night delivery schemes
Charging	12. London Congestion Charging
	13. Germany - Truck Toll System
Information systems	14. New York and Vancouver - Internet Port Information Systems
	15. Tokyo – Advanced Information Systems
Water use	16. Amsterdam - Floating Distribution Centre
	17. Venice - Waterborne traffic management decision support system

Table 3: Examples of green logistics schemes

Source: Geroliminis and Daganzo (2005)

2.3.4.2. E-Business, E-Logistics and the Environment

The fast emergence of information and communication technologies (ICT) in the 1990s dramatically transformed the way companies used their supply chains to achieve competitive advantage. This has led to the emergence of the ‘e-business’ concept. E-business refers to the use of ICT for the buying and selling of goods and services (also known as e-commerce), collaborating with business partners, and conducting electronic transactions within an organization. The impact of e-business covers both business-to-business (B2B) and business-to-consumer (B2C) transactions.

2.3.4.2.1. Business to Business (B2B)

Since the 1960s, there has been an increasing use of inter-organizational systems to improve the efficiency of information flows within business. Material requirements planning (MRP) has given way to enterprise resource planning (ERP), enabling whole businesses to

operate from a common system. Later, the extended ERP (or ERP II) system has been occurred. However, with the growth of internet access, electronic marketplaces (EMs) have become more common as they are easier to join for potential participants (Tiwari and Singh 2011).

Definitions of EM are diverse. One of the earliest and broadest definitions is offered by Bakos (1991 cited Tiwari and Singh 2011), who referred to an EM as ‘an inter-organizational system that allows the participating buyers and sellers to exchange information about price and product offerings’. Daniel et al (2004 cited Tiwari and Singh 2011) narrowed the definition and described EM as ‘web-based systems which enable automated transaction, trading or collaboration between business partners’. With the using of web, companies can reduce the complexity and cost of implementation and ease the integration with other systems. EMs are emerging quickly as a viable alternative to large-scale client-server solutions, especially where they are hosted by the technology provider. In the context of logistics, EMs can be termed electronic logistics marketplace (ELMs).

Types of Electronic Logistics Marketplace

- *Open marketplaces*: Open ELMs tend to focus on matching the supply and demand of transport with no barriers to entry. Examples are online freight exchanges for the spot trading of transport services.
- *Private marketplaces*: This closed form of marketplace usually connects only one shipper to a range of carriers and works in isolation from any other ELM. So, this ELM can only help to optimize one company’s network.
- *Shared marketplaces*: These are similar to private marketplaces. However, information can also be communicated between the different ELMs. This happens because all of the marketplaces are hosted by a single organization and share the same platform.
- *Collaborative marketplaces*: Unlike previous structures, this form of marketplaces is led by a consortium of organizations with a common interest system (McKinnon et al. 2010).

Environmental Impact of B2B Marketplace

Many of the environmental benefits from using an ELM can be associated with the economic benefits. A key feature of open and closed ELMs is the ability to make good use of backloads. With open systems, carriers can bid for return loads where the vehicle would otherwise be returning empty. This system will not necessarily generate an optimum solution

but will reduce the level of empty running by goods vehicles. With a closed system, backloading can be managed more effectively, as the opportunities can be included when the system is planning the whole transport network. Therefore, greater optimization is possible. With a private marketplace, each network will be individually optimized. However, a collaborative ELM provides a global optimum across all networks, enabling outbound and return loads to potentially be provided by different shippers.

Most of the other environmental benefits arise from the use of closed ELMs due to their limits on who can participate and the greater functionality they offer, particularly in the area of load planning. Because participation is by invitation only, it is possible for shippers to impose constraints on which carriers they use. While traditionally many of these may relate to vehicles operated, nowadays the opportunity exists to impose environmental criteria too. These could include environmental quality assurance (such as ISO 14000) or restricting vehicles to those that meet certain standards (for example; Euro IV¹¹ engines).

Finally, many closed ELMs offer the opportunity for tracking and tracing loads. Where this occurs on a real-time basis, it may be possible to identify opportunities to re-route vehicles to avoid areas of congestion, such as those associated with accidents. This may mean that the vehicle needs to travel further. Therefore, from an environmental perspective, the emissions from these extra miles need to be balanced against those arising from the vehicle sitting in congestion (McKinnon et al. 2010).

2.3.4.2.2. Business to Consumer (B2C)

Business-to-consumer (B2C) e-commerce is simply electronic retailing using the internet as a medium to place orders for goods, with the consumer interacting directly with the supplier's system. With the advent of internet shopping, the 'store-reach' boundaries of the traditional retailer have been extended literally to the global scale, as retailers are able to offer goods via the internet to the final consumer anywhere in the world, provided each has access to a computer. Such convenience and ease of transaction has resulted in the global retail industry witnessing a phenomenal growth in online shopping (Tiwari and Singh 2011).

Numerous factors (economic, infrastructure, cultural and political) apparently determine both businesses' and consumers' engagement with e-tailing. However, two main reasons for the importance of online shopping among internet users stand out. The first is the

¹¹ Euro IV is an EU emission standard that was introduced in January 2005. It limits car emissions to 0.25g/km of NOx (nitrogen oxides) and 0.02 g/km of PM (particulate matter). A Euro IV car produces less harmful emissions than pre-Euro IV car.
Source: www.dieselnit.com (2011)

readiness of retailers to establish an initial online presence (see Nikolaeva 2006 cited Tiwari and Singh 2011). The second reason is the willingness of the population to embrace this new shopping experience. Generally, consumer mistrust of online companies, the perceived quality of the merchandise they sell and online payment security issues will together partly explain low user transaction levels, although the real engagement with B2C e-commerce in many developing countries may be obscured, as few countries have comprehensive information on online sales and purchases (Tiwari and Singh 2011).

Types of e-retailers

- *Multi-channel retailers (bricks and clicks):* Most traditional retail companies have set up a multi-channel business model, whereby they have a physical store (bricks) and an online presence (clicks), running both models in parallel.
- *Pure play retailers:* These are dedicated online retailers who use the internet as their only means of trading. Many of these companies are small, and most are relatively young entrants to the retail market.
- *Mail-order companies:* Catalogue and mail-order companies have extended into the online market, seeing the potential of the internet to lure additional younger and wealthier clienteles than those who traditionally bought from catalogues.
- *Wholesalers or producers using the internet to sell directly to customers:* Additionally, inventory for online retailers may be held at wholesalers until the orders have been received, then shipped directly to the customer from the wholesaler.
- *E-auction companies:* Some companies sell through e-auction sites such as e-Bay in addition to other media. Many sell their leftover stock, returns and goods with slight defects on such sites, but increasingly companies are viewing this as just another medium through which to sell their normal goods (McKinnon et al. 2010).

2.3.4.2.3. The Environmental impact of E-commerce

It is hard to imagine the “environmental impact” of e-commerce. After all, it doesn’t emit any pollutants or uses much energy and natural resources. But according to Tiwari and Singh (2011) it would also be hard to imagine it connected to the now familiar topics of sustainability such as climate change, and biodiversity and habitat losses. But their environmental impacts are there.

Positive Impacts of e-Commerce on Environment

Transportation is responsible for a large percentage of carbon dioxide emissions. It is obvious that reducing the number of vehicle trips is one way of reducing the level carbon

emissions. E-commerce applications are the means of conducting business without actually commuting. Business may further reduce their carbon foot print, by allowing their employees work in virtual office, shopping online and working from home which reduces the number of commuters on the road. The number of commuters may further reduced if more business transactions could be conducted online.

People used to visit, search, read, write and access the material online in intra-company systems or inter-company systems. This change in the habit of the individuals avoids the use of papers and thus result in large sum of saved paper consumption. E-commerce supports to less paper resource use or paperless society when often using digital communication for placing orders, sending bills, paying bills and so on. It leads to a “paperless office” or “paperless society” story. Moving towards the paperless society would be advantageous for deforestation which contributes to global warming. There are many ways in which digital transfer of information through ecommerce could be useful.

E-commerce can potentially reduce waste and the need for inventory, warehouse space, operating cost of business. For example it is not required to have the office space on rent or to send out bills via the traditional more expensive means using papers. Further for the benefit of the environment recyclable packaging of goods must be used. E-commerce has also been alleged to prevent waste by vastly increasing the efficiency of the market for secondary materials through online auctioning on a global scale (Tiwari and Singh 2011).

Negative Impacts of e-Commerce on Environment

The imagination of the “negative environmental impact” of e-commerce is very difficult. It does not release any pollutants and also not uses much energy or natural resources.

A closer look at the environmental impacts of the Internet quickly reveals that the potential positive impacts are only one side of the story. Although the potentials of the Internet to save material and energy cannot be denied, it is too early to conclude that e-commerce has only positive impacts on environment. Each potential positive impact is coupled with a potentially overwhelming negative impact as well. For example, moving business online can reduce waste such as printed catalogues, retail space, and transportation requirements, but it is a must that more energy intensive computers manufactured. Web-based marketing may encourage prodigal rather than receptive consumption. Indeed, the Internet has already dramatically increased mass production of various products on a global scale. The ease of online shopping itself causes people to buy more. In terms of energy consumption, faster delivery requirements tend to create a situation in which trucks are moving half empty. E-commerce also tends to favor faster transportation modes, which can increase fuel

consumption exponentially. When we prefer trucks instead of boats or rail, energy use goes up by a large factor. Moving the same package by air again increases the energy use dramatically.

The environmental effects of e-commerce focus on three aspects: energy, resources and pollution. As of today the scientists or policy makers still do not have clear statements about relationship between the ecommerce and the environment. But of course it has potentials of positive environmental impacts which has been summarized as three D's for the new economy: dematerialization which reduces the material consumption by shifting books to bytes, compact disks to MP3s, check books to clicks and so on, de-carbonization by reducing the Green House Gas emissions and demobilization by reducing the transportation (Tiwari and Singh 2011).

2.3.5. Public Policy Perspective

2.3.5.1. The Role of Government in Promoting Green Logistics

Governments have to have a strong interest in 'greening' other aspects of logistics to improve the general quality of the environment. While great progress has been made over the past 20 years in cleaning exhaust emissions, cutting vehicle noise levels and reducing the involvement of freight vehicles in accidents, the potential exists to attain significantly higher environmental standards.

In most developed countries, regulatory frameworks were established to control the supply of freight transport capacity, impose obligations on carriers and/or influence the tariffs that they could charge. It is stated by McKinnon (1998 cited McKinnon et al. 2010) that, over the past 30 years most of these quantitative regulations on freight transport have been removed as part of a general process of market liberalization, to be replaced by qualitative controls designed to maintain operating standards and professionalism in the freight industry. It is over this period that environmental concerns have begun to play an increasingly important role in the formulation of freight transport policy. It is ironic that while liberalization measures have been facilitating the growth of freight movement, governments have been intensifying their efforts to reduce its impact on the environment.

Since the 1980s, environmental policies on freight transport have evolved in several respects. First, their emphasis on particular externalities has shifted, partly because of the success of earlier policy initiatives but mainly because of a general re-ordering of environmental priorities at national and international levels. Second, policy objectives have become more wide-ranging and specific, with clearer definition of targets and timescales.

Third, the policy ‘tool-kit’ has been expanded to include a broader range of measures. Some national governments, such as those of the Netherlands, the UK, the United States and France, have been more innovative than others in devising new methods of ‘greening’ the freight transport system. The more progressive ones have also recognized the need to make freight transport policies sensitive to wider logistical and supply chain trends. As companies now manage transport as an integral part of a logistics strategy, governments must understand the interrelationship between transport and other logistical activities if they are able to influence corporate behavior. Fourth, funding for sustainable distribution/logistics programs has generally increased to support this broader array of policy measures. Fifth, knowledge has accumulated in government circles of the relative cost-effectiveness of different sustainable logistics strategies. International networking through organizations like the International Transport Forum and the European Union has helped to disseminate this information and identify the most promising measure. There nevertheless remain wide international differences in the nature, scale and resourcing of government programs designed to improve the environmental performance of logistics (McKinnon et al. 2010).

Although formal policy statements on sustainable freight/distribution/logistics usually emerge from national transport ministries, the environmental impact of freight transport is influenced by a broad spectrum of governmental decisions at central and local levels. The demand for freight movement is affected by government policies on the economy, industry, regional development, energy, land-use planning and recycling, which are the responsibility of several departments.

2.3.5.1.1. Objectives of Public Policy on Sustainable Logistics in the Europe

It is stated by Geroliminis and Daganzo (2005) that, the European Countries/Cities declared a fairly comprehensive set of objectives for their ‘sustainable distribution strategy’;

Sweden-Environmental Zones

Four big cities in Sweden - Stockholm, Gothenburg, Malmö, and Lund – introduced Environmental Zones in their centers in order to improve the air quality and reduce noise from heavy duty vehicles.

Sources: (www.dieselnet.com/, www.leda.ils.nrw.de, www.clearzones.org.uk 2005)

Zurich-Cargo Tram

Within the urban area of Zurich has been identified an enormous increase of vans for city distribution with increase of number of trips and decrease mobility and accessibility in the area is indicated by Ruesch and Eugster (2001 cited Geroliminis and Daganzo 2005).

Berlin - Goods Traffic Platforms (Public Private Partnership)

Berlin (population of about 3.5 million inhabitants) has been going through a process of adaptation after the reunification and change in the economic conditions. Within the city limits 45 million tons per year are distributed by trucks and smaller delivery vans. The Federal Ministry of Transport, Construction and Housing in Germany expect for the period 1997 till 2015 an increase of 80% in the road transport of goods. This project aims at handling commercial traffic in more sustainable and environmental friendly manner. The main objective of this project is “to reduce the frequency of deliveries through co-operation between various recipients and a combination of deliveries to a single recipient”.

Sources: (www.smile-europe.org, www.stadtentwicklung.berlin.de)

Paris, Barcelona – Night delivery schemes

According to a 1999 regulation, a prohibition is imposed on trucks above 12m to circulate within Paris between 7.30 and 19.00. Major advantages of night delivery schemes are less traffic and higher road speeds during the day, improved fuel consumption and reduced emissions. Another pilot program in Barcelona is called the “silent night delivery trial” and concerns 40 tons lorries that make deliveries at night time. The lorries are equipped with anti noise systems. The lorries make two trips during the night, one at 11 pm and one at 5 am. These two trips save 7 trips in the peak hours. At 11pm, products that do not need refrigeration are unloaded, at 5am "short life" products are unloaded. (Barcelona City Council, 2002 and Dablanc 2003)

2.3.5.1.2. Policy Measures

Governments have a range of policy instruments that they can deploy to reduce the environmental impact of freight transport/logistics. It is stated by McKinnon et al. (2010) that, these can be divided into five broad categories;

Taxation: This comprises mainly fuel taxes, vehicle excise duty and road-user charges.

Financial Incentives: These can take various forms. For example, they can support capital investment by companies in new equipment or infrastructure, or subsidize the use of greener freight modes or urban consolidation depots.

Regulations: This can be applied to vehicle design and operation, the status of the freight operators, the tariffs they charge and even the capacity of the freight sector.

Infrastructure and land-use planning: This includes the construction and management of network infrastructure and terminals, controls on vehicle access to infrastructure and the zoning of land uses for logistics-related activity.

Advice and exhortation: Governments have a role in identifying and promoting best environmental practice in freight transport, often working closely with trade associations.

Under each of these headings, there are many specific measures that can be applied, giving government considerable flexibility in the way it influences the behavior of organizations involved in logistics. The policy maker must exercise considerable skill however in designing a package of measures that in combination achieve the declared objectives. This can be difficult in the field of sustainable logistics because many of the measures are relatively new and their long-term impact and relative cost-effectiveness are still uncertain. Nor is there a single optimum policy mix for all countries and regions. The package of measures will always need to be tailored to the particular circumstances of a country's geography, freight market, infrastructure and industrial strategy, as well as the weighting attached by politicians and the public to different environmental effects (McKinnon et al. 2010).

2.4. Future Prospects of Green Logistics

Facing the worldwide competition, the improvement of logistics system should be advanced by both private companies and government. Weeld and Roszemeijer (1997 cited Tseng et al. 2005) discerned three revolutions in business that have substantial impacts on the purchasing and supply strategies of the manufacturers and retailers. These three revolutions are:

- (1) The globalization of trade;
- (2) The coming of the information era;
- (3) More demanding consumers and continuously changing consumer preferences.

The main characteristics of future logistics which need to be improved developments are:

- **Government role:** To keep competitiveness of industries, the government has to lead the way to assist the logistics industries. For instance, the idea of freight village of city logistics provides the environment to promote logistics efficiency and to reduce operation costs. However it involves large of investments and some problems relating laws and national policies. Without the lead and support of government, achieving the plan is difficult.
- **Growth of international goods transport:** The up-growth of international freight transport is contributed by several factors. Firstly, the blossoming of E-commerce pushes ahead the international business activities. Secondly, the change of production strategy

needs international cooperation, e.g. importing the semi-finished products from countries with cheaper human resources to those with higher technology to assemble the final goods. Thirdly, the pressure of globalised market, such as World Trade Organization (WTO), pushes local industries to promote themselves to reach an international standard and face the worldwide competition.

- **Improvement of services:** Providing a good customer service becomes a necessary requirement of business operation with the intense competition of global market. The quality of services is the main factor to affect consuming behavior among the enterprises with high similarity. The service systems involve several developed techniques now, such as Efficient Consumer Response (ECR) and Quick Response (QR). In the near future, more new techniques would be applied in providing better services for customers.
- **Revolution of logistics operation:** IT techniques and its products bring efficiency and fluency to the logistics systems.
- **Shorter product life cycle:** With the current trend, the merchandise design is changing day by day, and therefore, the product life cycle is going shorter, especially in computer science. To confront the impacts, logistics system must improve its efficiency and reliability of goods delivery. Otherwise an inappropriate logistics system would hinder the competitiveness of new products and the business profits.
- **Improvement of logistics facilities:** The advancement and development of logistics are based on several techniques and complete theories. High-tech facilities and systems could bring more possibilities and advantages to logistics. For example, the improvement of related facilities, e.g. Forklift Trucks, is necessary for transport efficiency. In the future, factory automation is the main target for the whole supply-chain procedures. It could help to improve efficiency and also reduce the operation costs.
- **Channel cooperation between companies:** In order to save the logistics costs, a key concept is to maximize the usage of available transport capacity. Integrating the logistics demands between numerous departments helps achieve this purpose. In practice, a conglomerate could develop its own logistics service for the branches. For some medium size companies, they could co-operate transport channels with each others.
- **Logistics centers:** The development of logistics centers is good for industry promotion and the development of national economic system. Logistics centers could successfully shorten the distance between production and marketing vertically and also integrate

various industries horizontally, and thus decrease the costs. Governments can propose special areas for storehouses and logistics to reduce land acquisition.

- **Freight transport:** The alliance between middle-small size delivery companies is an important trend in the future. The strategy could help to expand service areas and increase service quality, and meanwhile raise the loads of single trips to reduce delivery costs (Tseng et al. 2005).

CHAPTER 3: METHODOLOGY

This chapter discusses and validates the choice of methodology used in the thesis, which has guided the writer in how to approach the subject, as well as how to collect and process the required information. It includes, research purpose, research approach, sampling and data collection parts.

3.1. Research Purpose

This master thesis' research purpose is to assess the role and relevance of logistics to environmental issues but to combining with supply chain. Although much of the articles focus on general topics in logistics or supply chain, the author would like to mention the environmental impact of logistics and supply chain under the consideration of sustainable aspects for European fashion retail industry.

Based on a literature search and discussions with practitioners, the following hypotheses which are assessed in the conclusion part were tried to be answered in all this study;

- *the role of logistics in supply chain management,*
- *the fashion industry and green thinking. Money or environment,*
- *the effect of supply chain logistics management to European fashion retailers and fashion industry under the title of green thinking,*
- *the role of logistics to the environment and the explanation of green logistics in the European fashion industry,*
- *governmental roles to improve green thinking.*

3.2. Research Approach: Qualitative Method

It is chosen by the author that to use “Qualitative Research Method” during writing and assessing this research study. The qualitative method involves the gathering of a lot of information from few examination units through interviews and observations. There are three

most common qualitative methods which are participant observation, in-depth interviews, and focus groups. Each method is particularly suited for obtaining a specific type of data.

- Participant observation; is appropriate for collecting data on naturally occurring behaviors in their usual contexts.
- In-depth interviews; are optimal for collecting data on individuals' personal histories, perspectives, and experiences, particularly when sensitive topics are being explored.
- Focus groups; are effective in eliciting data on the cultural norms of a group and in generating broad overviews of issues of concern to the cultural groups or subgroups represented.

From those methods, the most useful and impressive one has decided to use for this study; in-depth interviews. So the plan is to make some interviews with professional managers and perceive their point of views and opinions.

The interview is an effective method of collecting information for certain types of research questions and for addressing certain types of assumptions. There are two types of interviews: structured and semi-structured interviews. The choice depends on what the research topic is. In structured interviews, formally structured -without any adjustment and additional questions- and the same questions are asked to all of the respondents, whereas in semi-structured interviews, wordings, the level of language and the order of questions are flexible and may be adjusted. There may be also additional questions followed up (Kawamura 2011).

Considering the different types of interviews and the research goals of this study, the author decided to use structured interviews. There were no adjusted questions or deviations varying from company to company.

3.3. Sampling

To get valid findings in qualitative research, only a sample (that is, a subset) of a population is selected for any given study. The study's research objectives and the characteristics of the study population (such as size and diversity) determine which and how many people to select (Mack et al. 2005).

The interview partners, the samples of this study, were selected upon purposive sampling. Purposive sampling is stated virtually synonymous with qualitative research by Given (ed. 2008 cited Palys 2008). Purposive sampling is explained as: "It is one of the most common sampling strategies according to a criterion relevant to particular research questions. Furthermore, sample size may or may not be fixed prior to data collection, depend on the

resources and time available, as well as the study objectives. Purposive sampling is accepted to be the most successful when data review and analysis are done in conjunction with data collection” (Mack et al. 2005).

In order to have a better understanding and give a better point of view to the readers of this study, I, as the author of this thesis, selected twenty-three European fashion companies including fashion logistics ones, and sent them my interview request. Due to their lack of time and busy nature of their business, seven companies (one is a Turkish company) approved my request kindly. With the purpose of indicating the academic view toward green logistics, I sought the opportunity to have an interview also with one university professor who are related to this subject and giving lecture about logistics.

After their approval of interview, I visited them in these companies and had the possibility ask my questions and take their valuable ideas, as explained in the chapter 4. Afterwards, I was able to have usable and utilizable answers.

3.4. Data Collection Method: Interviews

To make this research more scientific and also get some concrete answers, a survey was decided to conduct with companies by the author to evaluate the research questions. This survey would be like a short-interview with the companies’ managers. In this interview, some questions were determined and would be asked. During the preparation of these questions, the intent was to get direct, concrete and assessment-easy answers. For that reason; the questions which are shown below were prepared.

Interview questions:

1. What do you think as a company about Green (Environmentally Friendly) Perspective?
2. The main objective is to make money in the business but it is obvious that the process of Green Application requires some investments which mean additional cost. Could you please explain your standpoint according to this economical aspect?
3. Have you ever applied on Green Process for any departments of your company? If no, are you planning to do and in which department? If yes, when?
4. Do you really think that logistics should be environmentally friendly first? Or, are there some other departments which are more important and have priority on logistics?
5. What do you think about the environmental effect of logistics?
6. Do you think that your company has a productive logistical management system by the ecological point of view?

7. Do you take any precautions against your possible environmental effects of warehousing such as waste, package plastic...? For example do you use recycled material?
8. Do you have as a company your own 'Code of Conducts' about logistics?
9. Could you please rank the criteria below in accordance with their importance to determine your supplier? (6=the best as an efficiency factor)
 - a. The price of goods
 - b. The distance
 - c. Image of supplier
 - d. Ensuring environmental policy (certificates, regulations...)
 - e. Punctuality
 - f. Expected quality
10. Is it important for your company to determine your supplier to consider the environmental policy of their government/country?
11. How does the government act in the face of green perspective in Germany? Is there any governmental inducement/obligation to improve your environment policy on green logistics?
12. Do your customers request/force you to have "green" logistical system?

The interviewees are;

- **M.Sc. Oliver Lübbenjans** – Sales Director of Van Laack GmbH. Mönchengladbach, Germany.
Van Laack GmbH. is a textile and clothing company and established in 1881 by Heinrich van Laack. They produce shirts for men and women, cravats, accessories, blouses. Now the company is well-armed for the global future with the flagship and partner concepts. In addition to the European and Asian markets, van Laack will focus on expanding into the United States.
- **Bjoern Koehnen** – Supply Chain Manager of TJX Europe. Düsseldorf, Germany
T.K. Maxx is a retailer with stores throughout the United Kingdom, Ireland, Germany and Poland. The company is part of the TJX Companies which also owns other 'off-price' retail chains such as T.J. Maxx and Marshalls in the United States and Winners in Canada. It offers brand name clothing, footwear, bedding, furniture, beauty products, and house wares at up to 60% off their recommended retail price.

- **Reiner Woesler** – Director Supply Chain & Quality Management of Barutti & Masterhand PEINE GmbH

PEINE GmbH is a specialist provider of high-quality men's fashion. With the brands BARUTTI and MASTERHAND, it represents international men's fashion. From its headquarters in Germany, the company controls all national and international activities in terms of design, production, marketing and sales.

- **Harald Minrath** – Market Development Manager of Avery Dennison. Sprockhövel, Germany.

Avery Dennison Retail Branding & Information Solutions is an American Company and they are passionate about the apparel industry and their mission to help the customers elevate your brands and accelerate your performance throughout the global supply chain. Avery Dennison produces every type of etiquettes even ecologically friendly. Also they give information solutions like inventory and data management, manufacturing, labeling, and identification solutions.

- **Dipl.-Ing. Andreas Schneider** – Shareholder of GCS Consulting. München, Germany
GCS Consulting, the management consulting company for the textile, apparel and footwear industry. The company gives advice and creates solution about product innovation, service, marketing & distribution.

- **Prof. Dr. rer. pol. Uwe Schlick** – Chief Financial Officer of Peek & Cloppenburg.
Peek & Cloppenburg is well-known fashion company all over the Europe and USA.

- **Prof. Dr. Mathias Freise** – Professor International Fashion Buying and Procurement- Hochschule Reutlingen. Reutlingen, Germany.

- **Özgür Sağlam** – Production Manager of Uniteks Gıda Tekstil Motorlu Araçlar San.ve Tic.A.Ş. Izmir, Turkey

Uniteks was founded in Izmir, Turkey in 1990 by a well established company whose concentration was “cotton & yarn” . The aim was to manufacture and export circular knitted garments providing both style and comfort. Uniteks, as one of the country's top circular knitted garment companies, with annual sales of approximately US \$168 million, and commitment of 2.000.000 pieces per month, has expanded its client portfolio to include world famous brands and has proved to be a reliable partner for their clients.

CHAPTER 4: ANALYSIS OF DATA

This study is based on qualitative research. The questions and the answers which were obtained through the interviews by the author are discussed separately. It means that all of the questions' answers were stated individually.

1. What do you think as a company about Green (Environmentally Friendly) Perspective?

Eight companies out of eight, which means 100 percent, are very familiar with the term of “environmentally friendly perspective”. They are very keen on green perspective, not just in business but also in their daily life in company. They think that there should be some investments in environment but the activities of being green have to end up with the profit.

Also two companies out of eight, which means 25 percent, mentioned that the daily activities should be improved in terms of green perspective. For example, in the company they are very precise and regardful about printing. They use the slogan of ‘do not print if not really necessary’.

One company, which makes up 12.5 percent of all, also answered this question with the following explanations; there are three perspectives which companies should have:

- 1- To wait for legal regulations.
- 2- To improve all the activities on a daily bases.
- 3- To become an environmental entrepreneur. The interviewee stated that: “My favorite perspective is to improve on a daily bases.”

Two companies out of eight, which means 25, see this perspective very important. According to these companies, on the one hand, the consumers expect from the companies to follow this strategy and if they do not take this green application seriously, they are likely to get negative press from the customers. On the other hand, it is important because companies can avoid certain processes with an intelligent green business model, so they can minimize the cost with the help of these avoided processes. It means that the green perspective affects the image and also the costs of activities of companies.

Another respondent as being the 12.5 percent thinks that the perspective is very important. They also try to improve themselves and calculated their own carbon footprint. They would like to control it every time not to harm the environment. They think that they have the most environmentally friendly and up-to-date warehouses in Germany. For example; they use big warehouse windows to gather the sun's energy to heat the inside without any air-conditioner or another heater. Also they use environment friendly tracks for the UK part of

the company. The company is quite new in Germany, and they are trying to grow up in Germany by the thinking of environment.

One out of eight was a Turkish company. This company makes up 12.5 percent and thinks that green perspective will be one of the most outstanding aspects regarding social responsibility in the near future.

The last 12.5 percent thinks that in the textile and clothing industry, for the production department, this perspective is not very important and it is not a must. They act by thinking of their business and mentioned that the important thing is washing, dying, printing and finishing for their business.

2. *The main objective is to make money in the business but it is obvious that the process of Green Application requires some investments, which means additional cost. Could you please explain your standpoint according to this economical aspect?*

Six companies (one of them was a Turkish company) out of eight, which means 75 percent, more or less think the same: If companies decided to be sustainable ecologist, it directly increases the value and image of the company very positively, so it brings to companies better financial results, prestige and productivity. Also the environment gives back the positive answer: If humans protect the environment, it also protects the humans. They think that the investment in green process is return on investment. According to these managers, it means that, companies should set a sprat to catch a mackerel.

One of the companies, which means 12.5 percent, finds that it will be the future needs to be sustainable. The manager thinks that there are some targets, which are waiting to be achieved and if these targets like economical, social and environmental can be balanced in the companies' all activities, they will provide companies to work effectively.

One company, 12.5 percent, stated that companies will save money if they become environment-friendly. According to this manager, if a company uses a good business model, if they use existing standards and have very stream lines, also intelligently IT supported supply chain management than this company can make a lot of savings from business activities. So companies can afford the cost of being green.

3. *Have you ever applied on Green Process for any departments of your company? If no, are you planning to do and in which department? If yes, when?*

One (12.5 percent) of the interviewees answered this question that, in the textile and clothing industry it should be one of the main tasks. It is emphasized that sourcing department

should be green and the focus of this industry should be environmental burden of raw materials. For that reason, companies should expend some energy on sourcing department.

Turkish company (other 12.5 percent) stated that their company has the Certifications of Organic Exchange 100, Organic Exchange Blended, GOTS, EU Flower and Oeko Tex 100, and also they make some parts of their production with organic cotton depending on the demands of their customers. Therefore the related processes are carried out in accordance with the necessities of these certifications and the green perspective.

One company out of eight which means another 12.5 percent stated that the Germany part of their company is still growing up. For that reason they have no example from Germany but the UK part has a lot of examples. They gave the example for the UK part, which was that they use green tracks for their logistics department and last year they were selected as having one of the most eco-friendly distribution at work in UK.

The other one (12.5 percent) applied green process on the supply chain system for the former company when he was a CEO of that company. Because he found this process logic and also wanted to save money. He stated that the applications of being environment friendly were on their production department.

One (12.5 percent) of the respondents found the word of green process quite new and he emphasized that to be environmentally friendly, they are very stick to the rules of ISO standards. Through these standards they have certain levels that should be never lower than these levels for every department. It means they apply some processes for all departments not just for one department but they are doing it step by step and with the necessary dose which is not more or less than enough.

The other two, 25 percent, also implement the same. They apply the processes to be green to all their departments.

The last 12.5 percent explained that they think too much about their customers and produce as much as possible environment friendly products. That is why they are spending their time to make a clear production.

4. Do you really think that logistics should be environmentally friendly first? Or, are there some other departments which are more important and have priority on logistics?

One of the interviewees, which means 12.5 percent, thinks that where to act first depends on the environmental exposure of the company. There are industries where products have the major environmental impact (e.g. automotive industry). However in the fashion industry companies should target the social and environmental impact of the supply chain.

The company from Turkey (other 12.5 percent) believes that the environmental impact of logistics is not a criterion that they consider in their business. It is also hard to make logistics green for the manufacturers as they import their raw materials from Asia, and for the companies exporting their goods to the customers in Europe and USA. They think that raw material procurement and production processes are of prime importance.

The other 12.5 percent agreed the idea that it depends on the kind of business and thinks that, for fashion retailers, logistics is definitely one of the key departments in supply chain. For that reason logistics should be the first.

Two companies, which means 25 percent, think that when companies have the environmental glasses on, only focusing on logistics is not enough to be green. Supply chain has much more importance than logistics. According to the understanding of this manager being green of anything is to save resources as the best way or also it can be said that to get rid of the unnecessary processes. It means the elimination. After the elimination managers can organize the remaining processes easily and more productively. So they will be green as a result automatically. It means to be green is the end of the processes not the beginning. The meaning of this conversation about the question; supply chain is more important. It is obvious that to be green is an achievement at the end of an efficient supply chain.

According to one company (12.5 percent), there are some other departments especially in textile industry like, washing, printing, dying so finishing department which have priority on logistics.

The last two companies, which generate also 25 percent of all, think that it depends on what is the main activity of a company. If it is a retailing business, the stores (heating, lightening...) have the main importance, means number one, and then logistics comes as number two. If it is a producing business, production has the main importance than logistics.

5. What do you think about the environmental effect of logistics?

The general idea which the author has assessed from the interviews is that, the environmental effect of logistics is huge but if it is compared with the other departments (production, sourcing ...) it is very low.

6. Do you think that your company has a productive logistical management system by the ecological point of view?

Four companies, which generate 50 percent, answered this question in common answer, which was that there are not many companies in the clothing industry performing an

environmental management system. Also it is common for them not to think that their companies have the productive environmental logistical management system.

One of them which is 12.5 percent has stated that they have very productive logistical management system by the ecological point of view, not in Germany part of their business but they have it in USA and in UK part. To get positive response from the environment, they optimized their transportation routes, calculated the quantity of the liter of petrol consumed and carbon footprints of the activities and so on.

Left of them, the 37.5 percent have an agreement with some logistics firms for their logistical activities. For that reason they did not answer this question.

7. Do you take any precautions against your possible environmental effects of warehousing such as waste, package plastic...? For example do you use recycled material?

Companies take use of recycled material as a precaution. Also Turkish company stated that fluorescent light bulbs, fabric wastes, plastic wastes and waste papers are collected every day. At the end of the day, they send these tools to recycle.

They added as common information that if you do not recycle the wastes which get at the end of the companies' activities, the general cost of these activities would be higher.

They also split up their daily wastes as plastics, papers, glass... from production, warehouse, and daily activities to use them for recycling.

As mentioned before, one of them gave as an example that they use big windows to exploit natural heating energy to heat the warehouse with less electric energy.

8. Do you have as a company your own 'Code of Conducts' about logistics?

62.5 percent of the interviewees' companies do not have any written 'Code of Conduct' on logistics. But they try to organize their activities as sufficient as possible and not to harm the environment. Turkish company is also in this group.

The others, which generate the 37.5 percent, have as a company their own 'Code of Conducts'. In the code of conducts, it is written for instance, what the requirements of the managers are, what the associate need to do for the environment, and so on. Their idea about this question is that almost every company in the clothing industry should have a code of conduct, binding for every business transaction, including logistics.

9. Could you please rank the criteria below in accordance with their importance to determine your supplier? (6=the best as an efficiency factor)

- # The price of goods 2
- # The distance 6
- # Image of supplier 5
- # Ensuring environmental policy (certificates, regulations...).....4
- # Punctuality 3
- # Expected quality 1

The answers are;

9. Could you please rank the criteria below in accordance with their importance to determine your supplier? (6=the best)

	6	5	4	3	2	1	Responses
a. The price of goods	2 (25.00%)	3 (37.50%)	2 (25.00%)	0 (0.00%)	1 (12.50%)	0 (0.00%)	8
b. The distance	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (25.00%)	3 (37.50%)	3 (37.50%)	8
c. Image of supplier	0 (0.00%)	1 (12.50%)	1 (12.50%)	1 (12.50%)	2 (25.00%)	3 (37.50%)	8
d. Ensuring environmental policy (certificates, regulations...)	0 (0.00%)	0 (0.00%)	2 (25.00%)	4 (50.00%)	1 (12.50%)	1 (12.50%)	8
e. Punctuality	1 (12.50%)	4 (50.00%)	2 (25.00%)	0 (0.00%)	1 (12.50%)	0 (0.00%)	8
f. Expected quality	4 (50.00%)	2 (25.00%)	1 (12.50%)	1 (12.50%)	0 (0.00%)	0 (0.00%)	8

How to calculate; the basic average value finding method was used, for example for the price of goods;

The quantity of people who has chosen this criterion multiplies with the efficiency factor (the value which is from 6 to 1), one by one. Then it is getting the new value of total average point. Finally to find the average point of the criterion the new value must be divided with 8 which is the quantity of all people.

The average point of **the price of goods**;

$$(2 \times 6) + (3 \times 5) + (2 \times 4) + (0 \times 3) + (1 \times 2) + (0 \times 1) = \\ 12 + 15 + 8 + 0 + 2 + 0 = 37 / 8 = \mathbf{4,62} \text{ is the average point.}$$

For **the distance**;

$$(0 \times 6) + (0 \times 5) + (0 \times 4) + (2 \times 3) + (3 \times 2) + (3 \times 1) = \\ 0 + 0 + 0 + 6 + 6 + 3 = 15 / 8 = \mathbf{1,97} \text{ is the average point.}$$

For **the image of supplier**;

$$(0 \times 6) + (1 \times 5) + (1 \times 4) + (1 \times 3) + (2 \times 2) + (3 \times 1) = \\ 0 + 5 + 4 + 3 + 4 + 3 = 19 / 8 = \mathbf{2,37} \text{ is the average point.}$$

For **the ensuring environmental policy**;

$$(0 \times 6) + (0 \times 5) + (2 \times 4) + (4 \times 3) + (1 \times 2) + (1 \times 1) = \\ 0 + 0 + 8 + 12 + 2 + 1 = 23 / 8 = \mathbf{2,85} \text{ is the average point.}$$

For **the punctuality**;

$$(1 \times 6) + (4 \times 5) + (2 \times 4) + (0 \times 3) + (1 \times 2) + (0 \times 1) = \\ 6 + 20 + 8 + 0 + 2 + 0 = 36 / 8 = \mathbf{4,5} \text{ is the average point.}$$

For **the expected quality**;

$$(4 \times 6) + (2 \times 5) + (1 \times 4) + (1 \times 3) + (0 \times 2) + (0 \times 1) = \\ 24 + 10 + 4 + 3 + 0 + 0 = 41 / 8 = \mathbf{5,12} \text{ is the average point.}$$

After in-detail assessment, the author has found out that, the first place was given to ‘expected quality’ by the interviewees. It means ‘the expected quality’ is the most important criterion. So the quality of supplied goods has been found the most valuable criterion to determination of supplier in the fashion industry.

The second place was given to ‘the price of goods’ by the managers. So, ‘the price of goods’ is chosen as the second most important criterion to determine the supplier in the fashion industry.

The following criterion as the third place was ‘punctuality’ selected. The third place was given to ‘punctuality’. So, ‘the punctuality’ preferences of suppliers also play very big role to be a partner as a supplier in the fashion industry.

The fourth place was given to ‘ensuring environmental policy (certificates, regulations...)’ by the managers. It means level of environmental importance was selected the fourth most important criterion by the managers in the fashion industry.

The fifth place was given to 'image of suppliers' by the professionals. Among these criteria, the image of suppliers is found the least important criterion for the supplier selection in the fashion industry.

The sixth place was given to 'the distance' between supplier and the company. It means the managers think that the distance has not big importance to determine of supplier.

10. Is it important for your company to determine your supplier to consider the environmental policy of their government/country?

For the answer of this question, there is a common idea and a common answer. The answer which eight managers of eight (100 percent) deal, is 'yes it is important'. Some of the companies also have some code of conducts to select the supplier/producer. There is an additional answer that the companies which are in Europe, if the suppliers/producers are in Europe too, they do not think about it because they have the same regulation in Europe. But they request the fulfillment of requirements in the written and signed form from the supplier/producer. If the producers/suppliers are not in Europe, they request some certificates but how they get the certificate and what are the terms and conditions to get it are also important.

11. How does the government act in the face of green perspective in Germany? Is there any governmental inducement/obligation to improve your environment policy on green logistics?

This question is answered by the European companies' managers that, there are several obligations: For instance; EU-Richtlinie 2002/61/EG Textilkennzeichnungsgesetz (TKG), Bedarfsgegenständeverordnung (BedGgstV), Lebensmittel, Bedarfsgegenstände- und Futtermittelgesetzbuch (LFGB). Also to avoid any criticism of gross carelessness, companies have to implement a risk management for environmental and social affairs. Also not all but some of the European companies deal that, the EU has one of the strictest environmental laws. They gave an example; for the production in Germany, companies have to fulfill so many requirements. If one product is not good for the environment there are some regulations to exchange this product with a better one. For example, the type of gasoline which the companies have to use or the air conditioner or they use in warehouses and so on.

One company manager is of the opinion that there should be some inducements like, if the company does some regulations to be green for the environment, the government for instance should reduce the tax or some inducements like that.

Turkish companies stated that there are lots of governmental inducements/obligations. For instance; the most famous obligation is Polluter-Pays-Principle. It means; who waste the environment, pays to clean it. The other one is User-Pays-Principle. This principle is in argue but consists of the price of this natural resources, the price of obtain-convert-usage, reproduction of this resources. The price of using it, must involve these entire prices. The inducements are for instance, tax reduction, subsidies and so on.

12. Do your customers request/force you to have “green” system?

There are some common answers that;

Some of the company managers answered this question that there is not any request or force from the customers but the customers consider when they buy for instance a t-shirt, it must not contain any treatment or some materials which are harmful for human health.

Some of them think about this question that the customers do not force but they appreciate if the customers get environmental goods from them. As an example, the store shopping bags. They have in their stores normal plastic bags which are for free and they have environmentally friendly produced (out of cotton) bags which cost 10 cents to customers. The customers allow choosing both of the bags. It means from the customers point of view it depends on them.

CHAPTER 5: CONCLUSIONS

In this part, conclusions are discussed by the author through thinking of the answers. The following titles below were analyzed according to these questions: What author gets from the interviews about the questions, how the viewpoint of the managers under the title of environment is or how they think, do they think that taking care of the universe is as easy as managing the companies or giving directions to money? So in this part there will be some critical titles about the topic and the ideas of author. The titles can be seen below.

Green Perspective and the Industry

During the interviews author found out that, according to the ideas of the managers, the companies are more or less trying to do something good for the environment. They try to spread the warning of printing. In their office or lunch rooms they split the rubbish into the categories of the paper, plastic, glass and so on. Some of them have never heard the idea of green logistics and some of them have just comprehended the idea. It means, they do not think about the logistics part to do it green obviously. However they have too much knowledge to

do the production environmental, it is also common that doing logistics green requires very up-to-date information, there is no common activities with the production to do it green. Until now, there have been a lot of study, books, articles, materials also some workshops about the green production not for the green logistics. It is obvious that day-by-day some researchers in the industry, professors in the universities are doing a lot of research and process development. For that reason, if it is said that in the production department besides products, the waste and the other things which are harmful for the environment are generated more than logistics department, it will not be a wrong assessment. So, for now, the nescience of the effects of logistics to the environment is normal.

Money or Environment or both?

One of my questions was about the investment to be green. Managers are aware of the fact that, if some investments are made to be more environmental friendly, it brings more things than money like good customer relations, profit, a good reputation and so on. They think that it is very necessary to save the planet with some investments but the investment should end up with some profit. If it brings profit than they see this situation as ‘set a sprat to catch a mackerel’. So they set the sprats. From the answers of the questions it can be predicted that they consider both, money and environment. While they consider their monetary assets, they try to save the planet as well.

Until Now...

As it has been explained in the assessment part by the author, managers in the fashion industry think that the environmental effects of logistics are huge on the downside, but it is not more than the other departments like production, marketing and/or other departments that have priority for their business targets. They see that production department needs more environmental configuration than logistics, so they spend more money on production to do it green firstly. According to the opinion of the author this approach is proper and rational, because, perhaps the customers know the company from the products and it is very important to deliver clean product to the customers. However most of them do not consider the environmental effects of the companies’ logistical activities but it is hundred percent obvious that these activities effect the environment. Something –now it is hard to mention the weak parts of all the companies- must be done to get positive results from logistical activities by the meaning of green. Also, some of the companies use third parties for the logistical activities but the third party companies must be audited on a regular basis.

So until now the proceedings are not applied on logistics department so much like production department by some companies. The others have done some proceedings which are the results of their good strategies, for the author. That approach gives the optimum importance and makes the optimum environmental investment to each department.

Precautions

Actually companies are very careful about the universe. It could be true that money has the priority like every business which runs after some profit but companies are also very keen on environment. It is obvious that they have to take some precautions against the environmental effects of their business because of the laws, regulations and so on. Accordingly, they obey these laws and have some precautions. First of all, they think about the precautions that are commercial business reasons. Therefore it is valid for all companies, if they want to be in commercial activities with the others. Because companies cannot avoid being environment friendly anymore and there are some companies which want to have partnerships with the others, they request for some environmental requirements from them. If the partners have the requirements than they accept to do business and if the requirements are not provided, it is not possible.

As precautions, for instance; they all use recycled material and they try to use these materials for all their activities, for example; fluorescent light bulbs, fabric wastes, plastic wastes and waste papers. They collect these things in every department for recycling. Recycling provides on the one hand getting rid of the wastes from the company and also from environment; on the other hand they can buy these recycled materials later with a cheaper price. The easiest example, also they gave this example, is plastic hangers, because as everybody knows in the fashion industry, a lot of hangers are needed to protect the shape of the products well. So, the hangers which are made of recycled material, as the first reason the companies get these hangers cheaper and secondly they are produced with less emitted CO₂.

Logistical Code of Conducts

As it is known, a code of conducts is a set of guidelines which are designed to set out acceptable behaviors for members of a particular group, association, or profession. Many organizations govern themselves with a code of conducts, especially when they handle sensitive issues such as environments, investments, health care, or interactions with other cultures. In addition to setting a professional standard, a code of conducts can also increase confidence in an organization by showing outsiders that members of the organization are committed to organization's ethical guidelines in the course of doing their work.

There was a question; whether companies have logistical code of conduct to get rid of the environmental effect of logistics or not. Most of them do not have any logistical code of conducts. The reason could be that they use third parties to carry out their logistical activities but it is obvious that a code of conducts for the logistics department is a must.

Supplier Selection and Environment

There was one question about the supplier selection and environment with the ranking of some criterions according to suppliers' facilities. The criterions are price, distance, quality, punctuality, image and the level of being environmentally friendly. The goal of this question is to find out how the companies think and behave before/during the selection of supplier. Which criterions they consider and which criterions they do not. For instance, if the quality or image is more important than the other factors for a fashion company, they gave better points and if not, they gave worse points to them.

Owing to this question, it is well-understood that companies in the fashion industry do not give enough importance to environment and the distance, while they determine their suppliers. However, the level of being environment friendly of the suppliers is more important, because the suppliers produce or supply the goods/products which will be used by the fashion companies. If they are environment friendly, it directly affects the fashion companies in order to be environment friendly as well. The distance is also important because the usage of transportation depends on it. It means if the distance is much than the transportation facilities should be used more, accordingly. If not, maybe some vehicles are even not needed to be used. On the contrary, according to interviewees, the quality and price have the highest importance and accuracy.

Enough Governmental Inducements/Obligations?

As it is mentioned in the assessment part, there are certainly some both inducements and obligations for companies not to harm environment. Their names and numbers can be checked from the assessment part, please see question number 11. More important is what the ideas of managers on these inducements/obligations are.

The general idea which is understood during the interviews is the obligations and also some inducements for environment and environmental activities have beyond measure importance and these rules or obligations are indispensable for the managers. Because they think that, owing to these obligations and inducements, companies regulate their business activities by the thinking of environment. They also think that sometimes government sets up some rules which are sometimes not very logical and companies are not sure whether these

rules help to improve environmental effect of companies activities or not. Nevertheless, they are happy that the governments are very keen on protecting the environment and they also think that the European Union has one of the strictest rules in the world.



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DECLARATION OF ORIGINALITY

I herewith declare, that I have completed the present thesis by myself and without the use of any aids other than those listed. All passages that were taken either directly or mutatis mutandis from published and non-published sources have been marked as such. The thesis has never been submitted to a different examination authority in the same or similar form.



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(Signature of the author)

ABSTRACT

The main goal of this research is to find out how the fashion industry acts in the face of green perspective (environment-friendly perspective). The green perspective is a very emerging idea and also has very high importance for the humanity and the universe. However it is obvious that the green perspective is very broad, it is decided to make my research in the field of supply chain management and the place of logistics in supply chain under the title of green perspective. The study mainly comprises five chapters. As an introduction of this study and to introduce this master thesis to the people whom aims this study to reach, the first chapter was written by the author. In the second chapter, while the first main title is giving more details about supply chain, like introduction, evolution, revolution and green supply chain. Logistics, role of logistics in supply chain and supply chain logistics management were also explored and represented with the supporting literature. The second main title is focusing on especially, the logistics in the fashion and fashion retailing industry. The third main title is as the main part of this study explaining the green logistics in the fashion industry, like how to prove and also improve the process of being green. Finally, the last main title tries to predict future development of green logistics applications. At the end of the study, as a survey, some face-to-face interviews were made by the author of this study with some professionals. These professionals were the managers who are responsible for the supply chain management of the European Textile Companies. In the third chapter which is the methodology, is trying to give some opinions about this survey. This chapter contains the data which were collected with the help of interviews. Through these interviews, the perceptions of these managers on green logistics were found out. The assessments of these interviews were made in the fourth chapter under the analysis title. In the last chapter which is the conclusion, the gains and the assessments of hypotheses were stated. Furthermore, possible improvements for the fashion industry and also for our universe on the behalf of green perspective were apprehended.