

A theoretical framework of the new approach to logistics: supply chain management

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1 Introduction

Even though the term logistics has been part of everyday language for several years, the real meaning of logistics is not completely understood, especially in countries such as Italy where the implementation of logistics concepts began later than elsewhere. Thus, this term is frequently used in an incorrect way or it is subject to different interpretations.

In the most recent Italian research carried out on this issue by Censis (Censis, 1998), twenty per cent of the 600 Italian manufacturing firms interviewed still think that logistics is nothing more than freight transportation (9%) or transportation and some other services (13%).

It is the task of academy to fill this gap, to diffuse a universal definition of logistics, making possible a general further understanding of its last developments, such as the supply chain management. One of the reasons for the

lack of a common definition of logistics and supply chain management is the multidisciplinary origin and rapid evolution of the concept (Croom, Romano, Giannakis, 2000), which, as it will be explained, has often followed the evolution of business management strategy.

This paper aims to set a theoretical framework on the issue of logistics and supply chain management, in an attempt to clarify and to better trace the boundaries of these concepts.

It is organised in four more sections than the introduction. The section two provides a landscape of the logistics concept before the supply chain management development. It looks at the evolution of logistics, from the origin to today, identifying the main phases of its growth and the causes of its evolution. It ends by defining the logistics objectives.

The third part examines the new management philosophy known as supply chain management and presents, in a graphical model developed by the authors, its structure.

Section four identifies the driving forces that should, in our opinion, push the implementation of the supply chain management approach in the business world.

Logistics is gaining day by day more attention in the business world and in the fields of interest of policy makers. Even so the same people who use this term frequently declare that the concept of logistics is not completely clear to them. The aim of the paper is to clarify this concept, focusing on supply chain management, a new approach that has been developed in recent years. After a brief introduction, the steps of logistics evolution are presented in section two, as well as the definition of logistics system in the integrated logistics and the objectives of this system. Then, the supply chain management approach is explained, underlining where it differs from the previous approach of integrated logistics. Its structure is shown with the aid of a diagram. In the last part of the paper the driving forces behind a faster implementation of supply chain management are identified.

Keywords: logistics evolution, integrated logistics, logistics system, supply chain management

Finally, in section five some conclusions are drawn.

2 Overview of the logistics concept

2.1 The origin of logistics

In order to better understand the latest development in logistics – supply chain management – the historical background has to be perfectly clear.

To give an updated framework of a complex and dynamic issue such as logistics is not an easy task. To clarify the steps of evolution of this concept, we have summarised them in table 1 and we have drawn in figure 1 the logistics system structure, pointing out its changes in the different phases of logistics evolution. In the same table and figure we have also introduced the *supply chain management*, which will be discussed in section three.

The origin of the term “logistics” is military¹: the Webster dictionary since 1963² has defined logistics as a branch of military science dealing with “the

procurement, maintenance and transportation of military material, facilities and personnel” (Marini, 1990). Similarly, USAF, Institute of Technology, in 1981 (Barros, Riley and Brown, 2001) defines logistics as “the science of planning and carrying out the movement and maintenance of forces...(and aspects of military operations dealing with) design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of material....personnel....facilities; and services”.

Actually, firms have always and everywhere carried out typical activities today included in the concept of logistics, such as inventory and transportation. “Almost every sphere of human activity is affected directly or indirectly by the logistics process” (Lambert and Stock, 1993). However, before the development of the discipline of logistics, the historical practice was to manage them separately, without any co-ordination (Ballou, 1999).

Lambert and Stock (1993) observe that some principles of logistics were taken into consideration by the economic theory even then at the beginning of the 1990s but they were

not applied by the companies until the 1960s. Initially, logistics was considered to be just one of the centres of cost in a firm. It is only in recent years – earlier in USA and later in Europe – that business organisations have recognised the strategic contribution of logistics in achievement of competitive advantage (Christopher, 1992).

2.2 Phases of evolution of the logistics concept

The allied forces during the Second World War successfully used logistics models and techniques developed by military science in the invasion of Europe. After the war, in the USA it became clear that military logistics problems have many similarities with the problems of materials movement and storage that companies have. As a consequence, the field of *business logistics* began to grow.

More specifically, logistics did not gain attention immediately after the end of the war. At the beginning of the 1950s, firms concentrated their efforts on production, in response to high post-war demand.

Only when management thinking had begun to place emphasis on selling strategy, a cause of demand drop and products proliferation on the market, enterprises started to examine and to find the way to improve their physical distribution management. Thus, *outbound logistics* or *distribution logistics* or *physical distribution* (Johnson and Wood, 1993) born as an autonomous function (stage one of table 1). The aim of this field, as mentioned in the first manual of physical distribution written in 1961 (Lambert and Stock, 1993), is to apply a systemic approach to distribution activities, such as final products' warehousing, distribution centre location, transportation and delivery to the clients.

N° of phase	Logistics definition	Logistics system to be optimised	Level of logistics integration	Focus on
1	Outbound logistics	Distribution system	Functional	Distribution area
2	Inbound logistics	Procurement system	Functional	Procurement area
3	Production logistics	Manufacturing system	Functional	Production area
4	Integrated logistics	Internal logistics system	Internal	Firm
5	Supply chain management	Channel logistics system	Channel	Channel

Tab. 1 Evolution of the logistics concept

In the 1970s, the oil crisis and the increasing production costs, the diffusion of the JIT concept led the management to devote much attention to the procurement system. The *inbound logistics* or *materials management*³ function, which has the objective to optimise the procurement system, began to develop (phase two of table 1), integrating the activities of purchasing, inbound transportation, location of depots, warehousing of raw materials and components.

Immediately after, a cause of the growing market globalisation and the frequent production de-locations, logistics extended its area of intervention to the in-process inventory flows within the manufacturing system (stage three of table 1). This type of

logistics has been called with different terms: *production logistics* or *manufacturing logistics* or *interplant logistics* (Johnson and Wood, 1993). It is concerned mainly with the in process-inventory movement and storage.

The above framework highlights that initially the logistics activities were dispersed throughout the firm within the procurement system, the production system and the distribution system. In other terms outbound logistics, inbound logistics and production logistics started to develop separately, aiming to optimise their single systems (see figure 1).

Only with the implementation of the *integrated logistics*⁴ concept (phase four of table 1), these functional logistics activities began to be incorporated in a single logistics entity, responsible for the entire logistics system of a firm, eliminating duplicate activities. The internal logistics system integrates the three above indicated sub-systems (procurement, manufacturing and distribution).

Actually, the concept of integrated logistics was anticipated by Magee ever since in 1968 who has described logistics as a "system to manage the flow of materials" (Magee, 1968). But only in recent years – in the 1980s in USA and in the 1990s in Italy – a great number of firms have begun to manage all the logistics activities in an integrated way.

One of the most widespread definitions of integrated logistics which appears in several logistics manuals (e.g.: Johnson and Wood, 1993; Lambert and Stock, 1993; Ballou, 1999) has been promulgated by the Council of Logistics Management. In our opinion, it explains very well the concept of integrated logistics:

"Logistics is the process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information flow from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements" (Council of Logistics Management, 1986).

The systemic approach (Di Meo, 1985) is the basic element of integrated logistics.

The logistics system integrates in a single entity all the constituent activities of procurement, production and distribution sub-systems. These activities are mainly the following: purchasing, inventory management and control, transport issues such as mode decisions and scheduling, warehousing, plant and depot location, materials handling, transformation (manufacturing, assembly, packaging, etc.), unitisation, delivery, after-sales and post-delivery services, return goods handling and information management.

As the previous definition indicates, the task of integrated logistics is to plan, implement and control both physical and virtual flows moved by the listed activities from the suppliers of raw materials (point-of-origin) to the point-of-consumption of finished products, i.e. the end users, throughout the units of production and assembly (see figure 1). The virtual flows concern with information needs such as, processing of purchase, production, inventory replenishment, distribution and customer orders, production scheduling and demand forecasting.

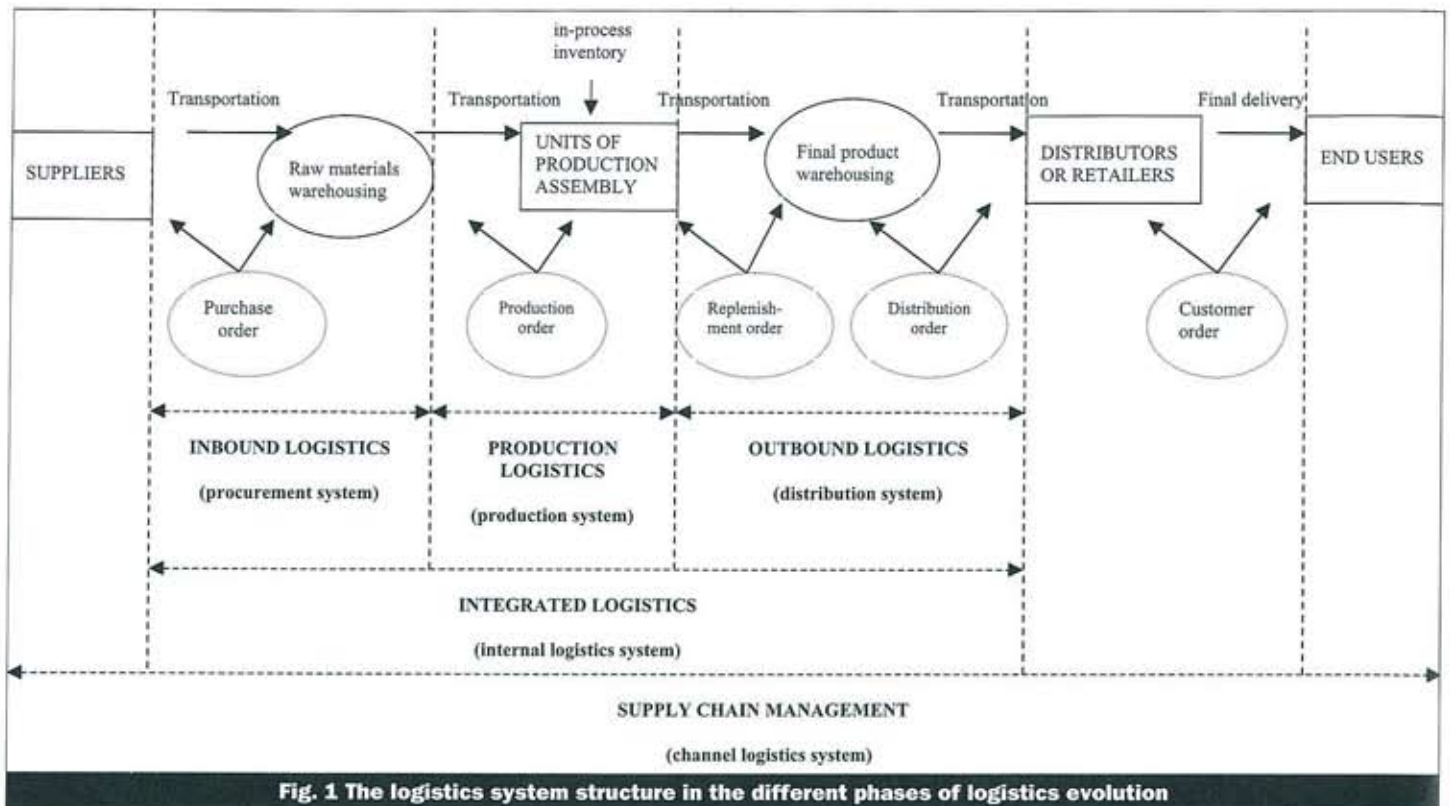


Fig. 1 The logistics system structure in the different phases of logistics evolution

2.3 The aim of the logistics system

The above mentioned task has to be performed with the double aim of efficiency, i.e. minimisation of total logistics costs (of materials and information), and effectiveness, i.e. maximisation of final customer satisfaction. These two opposite objectives, potentially conflicting with each other, have to be balanced in a strategic way.

The purpose of logistics can also be described by adopting the expression of the Society of Logistics Engineering (SOLE), which has been called the "Eight R". It is to provide availability of (Ferrozzi and Shapiro, 1992; Kobayashi, 1998):

1. the Right product,
2. in the Right quantity,
3. with the Right quality,
4. in the Right place,
5. at the Right time,
6. with the Right method,
7. with the Right impression,
8. at the Right (least) cost.

In the 1980s and 1990s, when the business strategy began to focus on the customer satisfaction mission, logistics has been transformed from a necessary cost to a competitive and strategic element. It became clear that integrated logistics plays a key role in satisfying the firm's customers and providing a competitive advantage.

Logistics has to be considered by the companies as a value-added process that directly supports the aim of the firm to be competitive in terms of high level of customer service and

price (Slats, Bhola, Evers, Dijkhuizen, 1995).

Moreover, a logistics system, which is service-driven (Christopher, 1993), adds value and in this way logistics becomes a significant component of GNP of each country.

Value in logistics is expressed by the above "Eight R" but its main contribution is in terms of time and place (Ballou, 1999; Lambert and Stock, 1993), because logistics is concerned with movement of flows. A product doesn't have value (utility) if it doesn't arrive in the place where the consumers are and in the moment in which they require it.

As previously noted, the real innovation introduced by the integrative approach is that logistics is not a fragmented and uncoordinated set of activities.

In a system each logistics function (i.e.: transportation, warehousing, storage, etc.) can not pursue an individual goal but must be subordinated to the global logistics aim, which consists in achieving the customer's satisfaction in the most cost-effective way. It doesn't consist in, for example, minimising the transport cost or inventory cost. The total cost analysis (Ballou, 1999; Christopher, 1992; Lambert and Stock, 1993; Johnson and Wood, 1993), which includes in the total logistics cost the cost of lost sales, is the key to manage the entire logistics process.

Responsibility is not fragmented in the functional areas but is integrated in a single entity, which we have called "internal logistics system", to distinguish it from the "channel logistics system" (see table 1 and figure 1).

More recently, in fact, the above-described concept of integration has been extended beyond the single firm to all the firms in the supply chain. The term *supply chain management* has come into use.

3 A new approach to logistics: supply chain management

3.1 From intra-firm integration to inter-firm integration

Barros' definition of what he called "industrial logistics" could be proposed to introduce the concept of supply chain management. In 1997 he wrote: "Industrial logistics is concerned with the physical inflow and outflow of goods and associated services which link the firm to the external world before and after production takes place" (Barros, Riley and Brown, 2001). Even if Barros doesn't speak of supply chain management, in our opinion, this definition highlights a fundamental aspect: the opportunity of logistics to cross the boundaries of a single firm, involving in the process of integration all the members of the supply chain.

As many authors have pointed out, there is not a universally accepted definition of Supply Chain Management (SCM) in literature (Tan, 2000; Cooper, Lambert, Pagh, 1997): for some academics it is the same as logistics, for others an extension of logistics in a new management discipline (Croom, Romano, Giannakis, 2000).

According to the second approach – as most of the recent literature –, we argue that supply chain management can be seen as a new approach to logistics problems. We agree with the definition developed by the International Center for Competitive Excellence in 1994 (Cooper, Lambert, Pagh, 1997):

"the supply chain management is the integration of business processes from end user through original suppliers that provides products, services and information that add value for customer".

As previously noted, integrated logistics is a process crossing the departmental boundaries and co-ordinating the single functional activities as a single operating unit. It focuses on the physical material and product flows and the correlative information flows within a single firm.

"The supply chain encompasses logistics, but it is more" (Schary and Larsen, 1995).

According to the above definition, the supply chain management extends across organisational boundaries to include all organisational units involved in the flow of products and materials.

In reference to figure 1, while integrated logistics is concerned with the internal logistics system of a firm and co-ordinates the single sub-systems of procurement, production and distribution intra-firm, supply chain management is concerned with the entire channel logistics system. Supply chain management co-ordinates all actors, from the original material suppliers, through to manufacturing and assembly units, wholesalers, retailers and the final consumer within a single supply chain, linking their internal logistics sub-systems as a whole and creating value. So, the co-ordination is inter-firm.

The supply chain can be defined as the channel that represents a sequence of manufacturing steps through which

raw materials are converted into finished goods and value is added for the customers (Ballou, 1999). Each supply activity contributes to the process of adding value along the value chain.

Supply chain management, such as integrated logistics, has the role of planning, execution and control of logistics activities with the difference that this is done for all the members of the chain, linking them in an integrated network. Supply chain management supports three types of flows within a business activity:

- flow of products or services
- flow of information regarding the product or service
- financial transactions relating to the product or service.

The supply chain manager has the scope to integrate all the operation and strategic processes across single members of the chain and, in a global world, across national boundaries.

Inter-organisational interactions between actors in the supply chain take place at strategic, tactical and operational management levels (Slats, Bhola, Evers, Dijkhuizen, 1995).

Supply chain management is a lateral and traversal entity, which takes responsibility for the entire supply process and links operating units in separate organisations across time and space.

The management and the organisation of the supply chain determines how well customer requirements are satisfied and, at the same time, how well the use of resources is minimised and "balanced in each area, through trade-offs to achieve integrated performance" (Schary and Larsen, 1995).

Supply chain, such as integrated logistics, performs a crucial role in support of the company competitive advantage, by the ability to deliver products to the final users more effectively and efficiently than the competitors through a dispersed production-distribution network. It supports the strategic goals of the global corporation of effectiveness and efficiency. The supply chain strategy becomes an integral part of the branding strategy of each channel member.

The supply chain "is driven by customer demand and service requirements. The focus is meeting current and potential customer requirements, delivering products at the precise times and locations where they are needed" (Schary and Larsen, 1995). In other words, each actor of the supply chain contributes together with the others to achieve the above described "Eight R".

The chain has to be flexible in order to anticipate the changing market demand, faster reacting.

Applying the supply chain management approach, JIT is realised by reducing the inventory levels throughout the supply chain, instead of simply pushing back inventories on suppliers (Tan, 2000). The cost reduction is not achieved at the expense of the supply chain partners.

Oliver and Webber (1992) and Houlihan (1992) argue that supply chain management differs significantly from a "classic" logistics management in four main elements:

1. the supply chain is viewed as a single unified entity in which the responsibility is not fragmented in the various

- links of the chain but it is centralised;
- 2. the strategic decision making, which plans the objectives of efficiency and effectiveness, is also centralised;
- 3. inventories are used as a balancing system of last resort;
- 4. integration, not simply interface between firms, is the key.

In the supply chain a mutually advantageous relationships have to be established to make its work more smoothly and at lower costs.

As the supply chain is too complex to achieve a full integration of all organisations, a practical approach should be to consider only strategically important suppliers in the chain (Tan, 2000).

3.2 The structure of supply chain management

To describe a complex concept such as supply chain management is not an easy task. Thus, a graphical representation should make the idea clearer. In figure 2 we have schematised the supply chain management framework in three main parts (Maggi, 1999):

1. the tools used to the inter-firm integration;
2. an example of chain, whose links consist of the integrated members;
3. the typical integrated logistics activities.

At the top of the figure the instruments of integration are indicated, which concern mainly with tools of planning and control, tools of information technology and inter-organisational structure (Bechtel, Jayaram, 1997).

As previously noted, in the supply chain the co-ordination of mission and strategies has to be centralised, in order to pursue the systemic objectives of efficiency and effectiveness of the chain as a single entity. This is realised by the planning and control tools such as:

- total quality management philosophy (Bessant, Levy, Sang, Lamming, 1994), which is achieved mainly by an increasing collaboration between suppliers and manufacturers in terms of processes, procedures, skills, etc.;
- systems thinking (Di Meo, 1985), by which the strategic and tactical decisions are taken with the aim of optimising the supply chain system;
- total cost analysis (see section 2.3), which pursues the minimisation of total logistics costs of the entire chain;
- business process re-engineering (Evans, Towill, Naim, 1995), i.e. "the fundamental rethinking and radical redesign of business processes – within the supply chain – to achieve dramatic improvements in critical, contemporary measures of performance" (Burgess, 1998).

The management and co-ordination of information flows can be done by the tools of information technology:

- data storage tool, in terms of the development of a centralised database, which can be used by each member of

the supply chain and may help managers in establishing common and systemic strategies;

- decision support tool (e.g.: tools of simulation of different scenarios), supporting a systemic decision making;
- EDI or Internet (see section 4.3), i.e. tools used to move information throughout the chain.

Physical co-ordination and co-operative relationships have to be realised by developing a virtual or real inter-organisational structure. Different solutions can be exploited: commodity relationships, partnerships, joint ventures, strategic alliances, virtual integration or outsourcing.

The commodity relationships (Meade, Sarkis, 1998) among enterprises are based on price, quality and reliability offered to the final customers.

Ellram and Cooper (1990) defined partnership as a channel relationship with the intent to provide intermediate or long-term benefit to both parties.

Partnership is the preferred choice, such as strategic alliances, which are more strategically oriented than partnerships. The inter-organisational co-ordination is focused on a specific goal, pursued by all chain members.

To better exploit the competitive advantage associated with inter-firm integration, some leading companies have begun to develop strategic alliances with suppliers, distributors and logistics providers instead of vertical integration, such as mergers and acquisitions.

Virtual integration (van Hoek, 1998; Evans, Towill, Naim, 1995) of the supply chain is not based on direct ownership but rather on connectivity in the flow of information. A "virtual enterprise", that is formed by several independent enterprises, is developed. It should be able to compete in a given market for a specific product or service (Meade, Sarkis, 1998).

Finally, the co-ordination can be outsourced to a logistics service provider (Johnson and Wood, 1993).

The high level of complexity of supply chain forces a centralisation of its control and a decentralisation of operations (Schary and Larsen, 1995). Centralised control can be managed by the member with the higher contractual power between the chain (the lead firm) which is in general the manufacturer or, in the case of outsourcing, the logistics service provider. Actually this last option is increasingly chosen (see section 4.2).

The tools of integration manage both physical and information flows, which move along and throughout the chain. In figure 2, an arrow with a double direction indicates them. Typically the physical flow moves from the sources of supply to the points of the product consumption, but also an opposite flow does exist. It is the flow of reverse logistics (see section 4.1), originating beside the customers, which includes the post-sale services.

The information flow directs and follows the material flow from the first to the final link but manages also the feed-back created by the consumers, orienting the planning and control process (e.g.: the customer satisfaction control, the demand forecasting, the production scheduling or re-scheduling and

the control of inventory availability).

Some authors (PRTM, 1998) also distinguish a third type of flow: the financial flow.

In the central part of figure 2 we have designed an example of a supply chain: the extension, in both horizontal and vertical dimension, can differ from product to product. However, the chain links represent all the firms, which are involved in the above-cited sub-systems of procurement, production and distribution. Thus, the first link is always the original supplier of raw material or component; the last link corresponds to the final user of the product or service. The other links concern with the production or assembly units and all the intermediate firms between production and sale of final products (wholesalers, retailers).

Finally, in the lower part of the figure we have summarised the main functional areas forming the sub-systems, which are integrated by the channel logistics system as a whole entity. Each indicated area (procurement, transport, storage, etc.) includes several correlative activities, which we have not written in order to avoid a too complicate view of the diagram. For example, the function of storage also includes the location and layout of depots, the inventory management and control, the safety stock determination, the picking of the stocks, the packaging, the customisation, etc. The function of transportation includes the choice of transport mode, supplier and vehicles, the routing, the delivery and load planning, etc.

4 The driving forces behind a supply chain management implementation

Actually, very few supply chains are linked and co-ordinated in the described way today. Only a few manufacturers and retailers has embraced the concept of supply chain management. This is true especially in Italy where the evolution of the logistics concept is developing more slowly. But the trend towards full integration is growing, as companies understand its benefits such as lower operating costs, reduced assets, fewer errors, faster and more flexible supply to the market and so more competitive advantages.

More in recent times, several factors have increased the attention devoted to logistics by firms and have led to the development of supply chain management (Ballou, 1999; Schary and Larsen, 1995; Christopher, 1992):

- increased deregulation of the business;
- proliferation of free-trade agreements;
- increased foreign competition;
- increased globalisation of the industry;
- increased requirements for faster and more certain logistics performance, caused by customer service explosion;
- pressure to reduce inventory, applying the JIT concept for the purpose of saving inventory holding costs and stocking costs and to make the production more flexible and, in general, the entire chain;
- development of the time compression concept, i.e. need to compress the total time of the supply processes (lead time and range time);

- as a consequence of the last two factors, opportunity to reduce the supply chain, which becomes more direct to the customer.

Furthermore, we have identified some driving forces, which can accelerate or facilitate the spreading of the supply chain management approach: the reverse logistics, the phenomenon of logistics outsourcing and e-business.

4.1 The reverse logistics

Growing environmental concern, an higher customer sensibility to the environment and the development of specific legislation, concerning the environment have led firms to devote much attention to the industrial recovery of used products and materials (Bloemhof-Ruwaard, Fleischmann, van Nunen, 1999), taking responsibility for the entire lifecycle of their products.

In particular, the public interest in recycling and reuse of materials has began to grown when it was discovered that the use of recycled materials could reduce significantly the use of energy.

This has led companies to recognise three main things (Johnson and Wood, 1993):

- a product's ability to be recycled adds to its value;
- new channels in supply, distribution and new return movement networks must be managed;
- recycling influences the choice of materials for product packaging.

The branch of logistics which deals with the management of physical return flows, is called *reverse logistics*.

As shown in figure 2, the supply chain management includes the reverse logistics, the flows of packages and end-life products, which are devoted to recovery, i.e. reuse, re-manufacturing and recycling. The activities of collection, transport and return of materials to processing centres are integrated by the supply chain management into the channel logistics system.

Thus, the implementation of a channel systemic approach can facilitate the firms in accomplishing the tasks required by the reverse logistics and in developing or redesigning logistics networks for return flows.

4.2 The process of outsourcing logistics activities

The phenomenon of business globalisation, which leads to the development of a world-wide network, of production delocation, of final market internalisation together with increasing competition make, day by day, more difficult the governance of logistics operations. As a consequence, many enterprises have focused their activities on core business and contracted out other activities such as logistics one. The process of outsourcing began many years ago with single logistics functions, such as transportation or warehousing. Then it moved, following the evolution of the logistics concept (described in the previous paragraphs) towards

distribution, purchasing and manufacturing and integrated logistics, in that order.

Today, the high level of complexity in managing the supply chain in a way which meets the strategic corporate objectives and the more widespread orientation toward core competencies are driving enterprises to outsource all or part of the supply chain management to specialist firms, third-party providers.

This complexity consists of firstly in the fact that the supply chain must co-ordinate both procurement, production and distribution in different environments. Secondly, it must overcome the barriers to the international business concerning mainly different trade barriers, regulation of exchange rates, transportation services and infrastructure, production requirements, consumer segmentation, etc. (Schary and Larsen, 1995).

Thus, a rapid development of Logistics Service Provider supply, in a form of new economic industry, has been led (Boscacci, Pesaro, 2001). In accordance with the other members of the chain and their corporate strategic objectives, they have the task to achieve both the effective service and the efficiency in the supply chain.

Outsourcing the management of logistics activities should consist of developing strategic alliances or partnerships or other inter-organisational structures (see section 3.2).

Traditionally the relationships between shippers and logistics service providers have been based on competition, in which each organisation attempts to maximise its own interests, even if it penalises the other actors (Lambert and Stock, 1993). The supply chain management concept, which instead is based on the maximisation of the performance of the global chain, has led companies to recognise the benefits that can result from developing partnerships or alliances and from working in concert rather than independently. The aim to achieve consists in the competitive advantage of the chain, not of the single entity (Ferrozzi and Shapiro, 2000).

It is clear that the process of outsourcing logistics makes easier the implementation of the new approach to logistics and so, it facilitates the spreading of supply chain management.

4.3 The development of e-business

Supply chain management needs a high level of co-ordination and co-operation between firms with differing and even conflicting goals and management practises. But "co-ordination places heavy demand on information flows" (Schary and Larsen, 1995). E-business⁵ in terms of business-to-business, provides a perfect answer to this demand, reducing transaction costs and facilitating the communication between different firms or units. It gives the opportunity to increase productivity and to better satisfy logistics goals.

As shown in figure 2, the flow of information and so the information system are crucial elements of a chain logistics system just as they are a key part of the internal logistics system. But achieving the integration of information between all members of the supply chain is a more difficult task than

integration in a single firm. Furthermore it is now seen as a key factor in gaining competitive advantage.

Each step of supply chain management, planning, execution and control is driven by data. Order placement, order processing, credit control, payment, order delivery advice to customer and special sales offers can all be automated by internet.

The potential impacts of internet on the supply chain are the following:

- integrating information flow throughout the supply chain
- reducing the number of intermediates
- as a consequence of the previous impact, decreasing costs
- reducing lead-time
- improving flexibility and, so, reducing the time of reaction to global business changes.

Internet improves the integration of the individual processes, leading to a reduction in extra stocks and resources and to a better overall performance of the total supply chain (Slats, Bhola, Evers, Dijkhuizen, 1995). Thus, each involved partner gains competitive advantages.

To conclude, internet, overlapping the difficulties in the adoption of the Electronic Data Interchange (EDI), such as the lack of standards (Schary and Larsen, 1995), makes the links easier within the supply chain and facilitates the chain reengineering to optimise its efficiency and effectiveness. In such a way, e-business development should push the implementation of supply chain management.

5 Conclusions

Dealing with a topic as large and significant as logistics and its development is daunting. Nevertheless, we have tried in section two to describe, with the support of a table and figure, the evolution of the concept over the years, before introducing what we have named the new approach to logistics: supply chain management.

In section three we have highlighted the main factors which characterise this approach, distinguishing it from integrated logistics.

First of all, supply chain management extends integration to all logistics activities across the boundaries of a single firm, linking all the members of the supply chain.

Secondly, within the supply chain all enterprises' goals have to be synchronised to achieve the aim of efficiency and effectiveness of the entire channel logistics system.

The main advantage of this approach is that a supply chain has a quick response capability. By a faster supply of products and services to the customer, it also enhances the competitive position of all the firms by cutting their costs. Shorter lead-time means less safety stock, inventory, storage space, waste and fewer staff and fixed assets. Integrated relationships among the chain actors are essential for a quick response.

With the help of figure two, we have explained the framework of supply chain management.

This new approach should have a very strong impact on the business world, transforming inter-firm competition to inter-supply competition.

Even if supply chain management is not applied very frequently, we have identified, in section four, some driving forces which could accelerate its implementation.

The management of reverse logistics flow could be better carried out a supply chain management approach.

In the current business scenario, increasingly companies review their skill base and specialise in their core competence, outsourcing logistics activities. Strategic partnership agreements among the members of the chain and the logistics service providers are the key to building the inter-organisational structure, which we have shown in figure 2.

Finally, information accuracy and flow are critical to the success of supply in terms of providing proactive customer service and to react more quickly to abnormal demand. Incorrect or incomplete data causes delays or rework in the chain. This is one reason why e-business is a key focus of supply chain management implementation.

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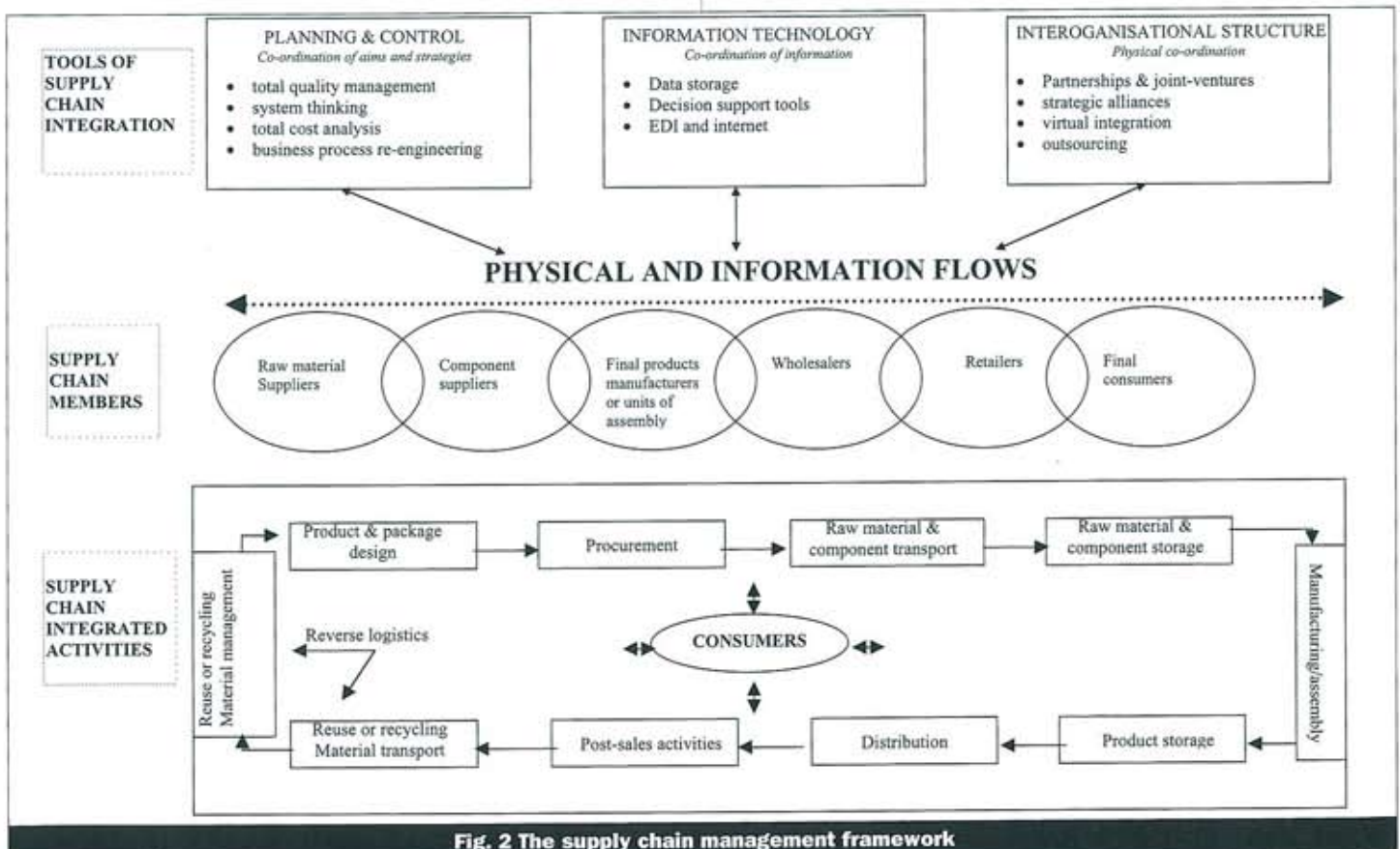


Fig. 2 The supply chain management framework

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NOTES

¹ More specifically, logistics derives from the ancient Greek word "logizomai", the art of calculation.

² Actually, even then in 1905 Major Chauncey B. Baker wrote: "The branch of the Art of War pertaining to the movement and supply of armies is called logistics." (Johnson and Wood, 1993).

³ Some authors use the expression "materials management" or "production logistics" (Di Meo, 1985; Andriano, 1993; Rushton and Oxley, 1993; Ballou, 1999) to indicate both inbound logistics and production logistics. Instead, Johnson and Wood (1993) use the term "material management" to indicate production logistics, distinguishing it from inbound logistics. Evans, Towill, Naim (1995) write of manufacturing management in the meaning of production logistics.

⁴ Someone calls the integrated logistics with the term of business logistics (e.g.: Johnson and Wood, 1993; Schary and Larsen, 1995) or simply logistics management (Cooper, Lambert, Pagh, 1997). Ballou (1999) uses the term "business logistics management". In Italian language, the universally accepted word is "logistica integrata".

⁵ In the next issue of *Trasporti Europei* a specific paper, which develops in depth the field of e-business and e-logistics (e-supply chain management), will be published.