Chapter 1

The Economic Aspect of Sustainable Supply Chain Management

1.1. Introduction

Globalization and increasingly fierce competition, among the most frequently cited factors, have led managers to begin to examine the question of more efficient logistics. Thus, from the 1980s onwards, we see a move away from logistics with an "operations-oriented" status (we speak of "logistical strategy") towards one with a "strategy-oriented" status (we speak of "strategic logistics"). Yet in modern-day language, the term "supply chain management" is predominantly used.

A review of the literature advocating supply chain management illustrates the important role that it plays in companies' decision-making and in the thinking of researchers in this field. By way of example, we can cite the many works which give an overview of the reviews and/or conferences which highlight the prolific recourse to supply chain management and to the aspects which make it up: the analysis of 20 years of the *Journal of Business Logistics* [MIY 99], that of the first 10 and the first 16 years of the journal *Logistique et Management* [MOR 04a; MOR 05; MOR 10][1], the bibliometric

1 The analysis of the first 16 years of the journal *Logistique et Management* [MOR 10] highlights eight themes which seem to dominate the thinking of logistical

review of the first four and first five *Rencontres Internationales de Recherche en Logistique* (International Conferences on Research in Logistics) [BOI 04; BOI 06] or indeed the analysis of the 124 articles and conferences in *Strategy*[2] referring to logistics and supply chain management [CHE 06]. From these analyses, we see the transversality of supply chain management in all the fields relating to management of an organization.

Thus, the use of supply chain management has become an absolute necessity for companies. It can in fact be classed as a *raison d'être* for any organization that is part of a supply chain. To overlook it is a risk that no company is willing to take.

1.1.1. *The emergence of supply chain management*

Although the term "supply chain management" was introduced by Christopher [CHR 92], there are strong parallels to be drawn with the concept of "*logistique*" (strategic logistics) developed by a French school of thought [MOR 02]. The difference, if any, lies in the fact that supply chain management includes a "manifest and mutual" quest for alliance and cooperation, and the risks and rewards are shared between the participants [MEN 01]. According to Harland [HAR 96], we can distinguish supply chain management by the number of firms involved in the logistical project [JOS 83]. For Harland [HAR 96], (p. 64), supply chain management – in its purest form – is to be considered as "the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers".

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researchers. These are, successively: (1) supply chain management, with all the elements relating to intra- and inter-organizational structure; (2) logistics providers/services; (3) logistical practices where we find discussions about upstream, production and downstream logistics; (4) management of information and communication technology; (5) transport, which includes problems relating to zoning laws, for instance; (6) performance evaluation; (7) human resource management; and (8) sustainable development, with particular focus on ecology/the environment.

2 *Strategic Management Journal*, *Academy of Management Journal*, *Management Science*, *Organization Science*, *Administrative Science Quarterly* and the conference of the Academy of Management.

By a review of the literature relating to logistics, we are able to extract the definitions attached to supply chain management. Of the various definitions advanced in this body of literature, we shall choose three which appear to reflect the salient elements.

Historically, the definition put forward by Christopher [CHR 92] has served as a reference point:

> Supply chain management is a network of organizations that are involved through upstream and downstream linkages in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer.

However, the definitions which are most widely used appear to be those stemming from the work of Mentzer *et al.* [MEN 01] and that of the Council of Supply Chain Management Professionals (CSCMP).

Mentzer *et al.*'s definition [MEN 01] is presented thus:

> Supply chain management is the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

The CSCMP's definition is the result of an in-depth study put to the members of the council (sample = 744 usable responses from the 6,422 members questioned [GIB 05]):

> Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management

> integrates supply and demand management within and across companies.

This definition is supplemented by the following statement on the Council of Supply Chain Management Professionals (CSCMP) website (www.cscmp.org):

> Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance and information technology.

Council of Supply Chain Management Professionals (CSCMP)

On 15 July 2004, the executive committee of the Council of Logistics Management voted to change the name of the organization. On 1 January 2005, it became the Council of Supply Chain Management Professionals.

This is a not-for-profit professional organization whose goal is to develop and diffuse as much information as possible relating to supply chain management.

In 2012, the CSCMP had over 8,500 members – professionals from 65 countries, covering six of the seven continents.

1.1.2. *The aspects of supply chain management*

Many schools and many authors define the component aspects of supply chain management. Here, we present three of these schools/works, which we deem to be influential in this discussion: Michigan State University's "supply chain structure 2000" [GRL 95; BOW 99]; Ohio State University [COO 97; LAM 98; LAM 05] and

the publications by Mentzer *et al.*'s working group [MEN 01] followed by the research of Min and Mentzer [MIN 04].

In the view of Michigan State University [GRL 95; BOW 99], three "contexts" are associated with supply chain management:

– the "operational" context recommends the integration of the stakeholders in a joint project. The aim is to maximize the forces of standardization between the upstream, midstream and downstream actors in the supply chain;

– the "planning and control" context strives for compatibility of the ICT elements. By means of optimal technology, planning and control, the goal is to enable the various stakeholders to be aware of the status of the systems and to make the various resources that are present consistent;

– the "behavioral" context highlights the coordination between the actors, defining the roles of each one and sharing the risks and rewards.

In the work published by Ohio State University [COO 97; LAM 98], there are three elements which make up supply chain management:

– the "relational structure of the supply chain network": the aim here is to identify the number and critical positioning of the actors involved in the chain;

– the "managerial processes of the supply chain": the goal is to identify and analyze the processes for each activity;

– the "component management": this is divided into:

- a "physical and technical component" which includes: (1) planning and control methods; (2) the work patterns/structure of the activity; (3) the structure of the organization; (4) communication and information flow of the technical structure; and (5) the product flow of the technical structure,

- a "managerial and behavioral component", which includes: (1) management methods; (2) the power and leadership structure; (3) the structure of risks and rewards; and (4) the culture and attitude.

Finally, in the third group of work, we find the writings of Mentzer *et al.* [MEN 01]. These authors structure supply chain management with two additional elements:

– "Supply Chain Orientation" (SCO): "the recognition by an organization of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain"; and

– "Supply Chain Management" (SCM): "Supply chain management is the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole" (p. 18).

SCM can come into play when SCO is applied. On the basis of these two definitions, Min and Mentzer [MIN 04] put forward a list of items that can be used to evaluate SCM (in the broadest sense of the term) in the different dimensions which make it up. Thus:

– the first scale, SCO, includes six factors: credibility, benevolence, commitment, norms, compatibility and top management support;

– the second scale, SCM, includes seven factors: agreed vision and goals, information-sharing, risk and reward sharing, cooperation, process integration, long-term relationship and agreed supply chain leadership;

– the third scale, PERF (performance), includes five factors: availability, product and service offerings, timeliness, profitability and growth.

1.1.3. *Overview of the dimensions of supply chain management: proposition*

Finally, Tables 1.1, 1.2 and 1.3 give an overview of the thinking of the three schools/works discussed above. This layout constitutes an analytical grid which enables us to easily see the common threads

running through these models. However, it should be pointed out that these tables do not highlight the item "transport", which has not been widely discussed in the body of literature on logistics, but whose importance in inter-organizational linkages is stressed by Cheng and Grimm [CHE 06], for instance.

Michigan State University: GRLT (1995); [BOW 99]
Operational context
1. Customer integration
- segmentation of the customers
- relevance of each demand
- response to each demand
- flexibility in unforeseen circumstances
2. Internal integration
- union of departmental functions
- standard, simple and consistent procedures
- structural adaptation
3. Integration of the goods and service provider
- on a strategic, financial, operational and managerial level
Planning and control context
4. Technology and planning
- management of information and of internal communication
- linkage between actors
- estimated budget/planning collaboration
5. Measurement
- functional evaluation
- evaluation methodologies
- metrics
- financial impact

Table 1.1. *The elements of supply chain management according to Michigan State University (source: adapted from GRLT (1995) and [BOW 99]: reprinted from [MOR 07])*

Behavioral context
6. Relational integration
- clearly defined roles for everyone involved
- conduct standard
- information-sharing
- risk- and reward-sharing

Table 1.1.(continued) *The elements of supply chain management according to Michigan State University (source: adapted from GRLT (1995) and [BOW 99]: reprinted from [MOR 07])*

Ohio State University: [COO 97; LAM 98; LAM 05]
1. Components of supply chain management
- physical and technical (planning and control methods, work patterns/structure of the activity, structure of the organization, communication and information flow of the technical structure, product flow of the technical structure)
- managerial and behavioral (management method, power and leadership structure, risk and reward structure, culture and attitude)
2. Value creation
3. Managerial processes in the supply chain
- improving efficacy and decreasing friction
- identifying and analyzing the processes of each activity
4. Extended
- strategy
- activities
5. Relational structure
- number of tiers along the chain
- number of suppliers and customers within each of these tiers
- identification of the primary and support members
- positioning of society on the supply chain
6. Intra- and inter-organizational connections

Table 1.2. *The elements of supply chain management according to Ohio State University (source: adapted from [COO 97] and [LAM 98; LAM 05]: reprinted from [MOR 07])*

[MEN 01; MIN 04]
1. Supply chain orientation (SCO) - credibility: concepts of reliability, recognition of the company, no false claims; - benevolence: "health" of the company, answers to questions, risks and rewards shared; - commitment: cooperation, technical support; - Top Management Support: communication of objectives, long-term contracts, training; - compatibility: shared strategy and culture; - norms: cooperation, value creation.
2. Supply chain management (SCM) - agreed vision and goals: standardization of practices, definition of roles; - information-sharing (IS): exchange of predictions, of planning; - risk and reward sharing: financial aid, shared R&D; - cooperation, integration of processes: reports, indicators, quality, ideas box, communication about new products, stock management; - long-term relationships: reduction of complexity, audits; - appropriate leadership of the supply chain: audit, benchmarking.
3. Performance (PERF) - availability: stock, backup stock; - supply of products and services: variety, quality in comparison to competitors; - timeliness: just-in-time delivery and information; - profitability: financial return; - growth: revenue, market share.

Table 1.3. *The elements of supply chain management according to Mentzer et al. (source: adapted from [MEN 01] and [MIN 04]: reprinted from [MOR 07])*

In summary, the execution of a SuSCM in its economic aspect is based mainly on intra- and inter-organizational collaboration/coopetition. Thus, the question of whether to use the term "collaboration" which, in general, manifests itself by the practice of work in a spirit of general benefit, or "coopetition", which

amalgamates the notions of cooperation and competition, now arises. In actual fact, we have chosen to employ a term which we feel is broader and more flexible: *connection* (granted, a term found more often in the field of electronics!). Some near synonyms are: consistency, cohesion, linkage, link and relation[3], and therefore the term has a parallel in supply chain management. It goes without saying that these intra- and inter-organizational connections must first be recognized as preponderant by the general management team (MT) of each organization involved in a supply chain.

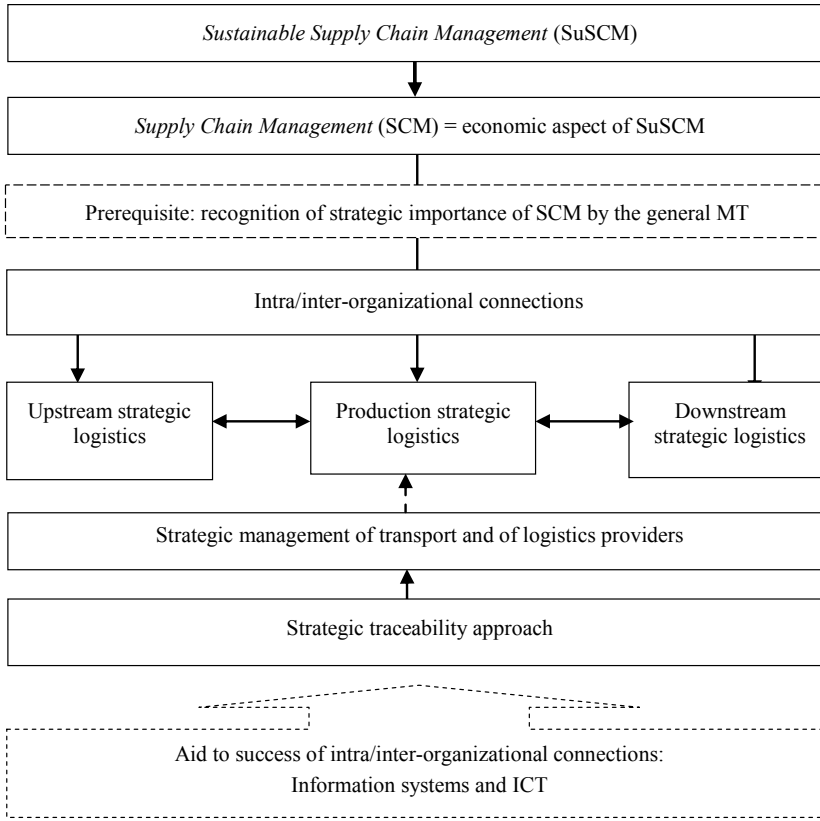

Figure 1.1. *Sustainable supply chain management in its economic aspect*

3 http://thesaurus.com/browse/connection?s=t.

The connections have an impact on the "three logistics" which are often outlined in the description of the logistical strategy of each company involved in the supply chain. Thus, any logistics – be it upstream at the supply and production stage (internal), or downstream at the distribution stage – must be devised and reflected upon strategically. Similarly, in this long-term framework, other elements need to be developed – namely strategic transport management, the role of the logistics providers and the traceability approach. Finally, it must be understood that information and its supports facilitate these connections (see Figure 1.1).

The next part of this chapter is given over to the discussion of each aspect.

1.2. Intra- and inter-organizational connections

Today's society is characterized by new relations between the social actors. Large groups tend no longer to be able to act with total autonomy. In order to manage the distribution circuit of a product, from the extraction of the raw material to the delivery of the finished product, companies need to group together in networks. To facilitate this task, a "destructuration" of all the intra-organizational logistics in an upstream, production/internal or downstream process – all other things being equal – aids decision-making. The aim of the following sections is to put forward tools, matrices and methods which are not widely covered by the literature currently available and which are relevant for these three types of logistics. This section is therefore positioned with a deliberate intention to go further, to put forward elements that can be strategically integrated into the intra- and also inter-organizational connections.

1.2.1. *Strategically upstream or supply logistics*

A properly-controlled beginning provides solid bases to fulfill the objectives defined in advance by the directors as fully as possible. Upstream strategic logistics (also referred to as "supply logistics") guarantees success thanks to the decision-making role of the buyer,

who comes to hold an increasing amount of sway in his transactions with a supplier.

Thus, by putting in place new so-called "just in time (JIT)" procedural practices [CAL 98], deciding to outsource [CAL 99], discussing the development of new products [CAL 00a] or indeed constructing common management tools [CAL 00b], we are able to "constrain" the buyer to (accrued) sets of skills in technical and interpersonal relations [CAL 00a; SAU 00].

In the everyday sense of the term, purchasing (of raw materials, processed material, supplies, etc.) is considered to be a supporting activity, in the eyes of Porter [POR 85]. However, in a systemic vision of the company, as is advocated in companies nowadays, the "integrative and strategic" role of the purchasing function becomes critical.

In his strategic musings on the role of the purchasing department, Calvi [CAL 99] raises the question of outsourcing of purchasing activities. In his view, it is helpful to answer two types of question when it is a question of "give-and-take":

– to which types of purchases can we apply this outsourcing?

– which activities in the process of purchasing/supply are involved?

In terms of the types of purchase, there are two categories which could be outsourced. To begin with, we can outsource complex, unusual and non-repetitive purchases, in which case it may be advantageous to draw on outside purchasing skills. Then, we can outsource so-called "tactical" purchases, which are simple and repetitive, and therefore liable to take up a great deal of administrators' time. When deciding to outsource certain operations, there are two elements or hurdles which need to be considered: the risk of loss of confidentiality and the loss of control of the costs relating to the purchase. Hence, as part of a policy of outsourcing, the purchasing activity which can most easily be outsourced is "order-processing".

In general, the buyer tends to play three main roles [CAL 99], ranging from an operational to a strategic role:

– "purchasing management", which covers all the activities of directing, organizing and monitoring the purchasing service;

– "purchasing marketing", which prepares for the act of purchase in the normal sense of the term;[4]

– "supplier portfolio management", where the activities are connected with the act of purchase (order-processing) and the monitoring and development of current relationships with suppliers.

These three activities influence the purchasing/supply process.

1.2.1.1. *The seven stages of the purchasing/supply process*

Seven stages make up the operational process of purchasing and supply:

– first stage: specification of requirements, wherein the buyer:

- brings his knowledge of the market to the table,

- provides information about the prices, the risks involved in the supply, and innovations,

4 Barriol [BAR 98] analyzes the history of "purchasing marketing" over a period of 25 years. The author presents three phases:

– the emergence, between 1973 and 1980, where four aspects are highlighted – namely:

- a state of mind: improving the buyer's position by adopting a more aggressive stance toward the supplier,

- an incentive approach: making the buyer company attractive,

- internal and external marketing,

- the definition of tools shared between marketing and purchasing, such as the concept of *purchasing-mix* (price, product, communication, market);

– a phase of development between 1980 and 1990, where purchasing marketing moved from being a commercial issue to being a purchasing strategy for the company, with the dawn of informational, organizational and communicational tools;

– from 1990 onwards, a conceptual stability which highlights the fact that purchasing marketing combines internal aspects (the company's needs), external aspects (prior situation of the market), analysis and action (adjustment of the needs and of the market).

- suggests substitute products,

- advocates standardization of the products;

– second, third and fourth stages, which are, respectively, the "search for suppliers", the "choice of suppliers" and "negotiation". Here, the buyer:

- analyzes the offers using a multi-criterion approach,

- selects the best offer,

- negotiates and contractualizes the relationship,

- defines the general framework for the exchange,

- feeds information to the other internal functions involved;

– fifth, sixth and seventh stages, which are "order issuing", "receipt" and "payment". These three stages constitute the "order-processing" phase, which is one of the tasks that can easily be outsourced. For these last three stages of the process, the buyer will first:

- design the order,

- create the order,

- send the order,

- track the order,

- control the supply [order issuing stage].

Then perform:

– recording,

– storage,

– quality control [receipt stage];

and, finally:

– pay the bill,

– examine the invoice,

– deal with any disputes [payment stage].

1.2.1.2. *Purchasing marketing*

Purchasing marketing takes place at the tactical level, and involves four actions:

– analysis of the offer;

– technological monitoring;

– communication with the suppliers;

– viewing and analysis of the purchasing portfolio.

Throughout the process of purchasing/supply, the buyer acts at the first two stages, i.e. "specification of requirements" and "search for suppliers". In order to correctly define the "specification of requirements", the buyer makes contact with and takes account of the opinion of the company's "internal customers".

1.2.1.3. *Management of the supplier portfolio*

Calvi's [CAL 99] third main activity, management of the supplier portfolio, includes seven actions:

– measuring of the suppliers' performances;

– economic analysis of the suppliers;

– contractualization;

– auditing of the suppliers;

– negotiation;

– mapping of the suppliers' progress;

– order-processing and dispute-resolution.

Throughout the process of purchasing/supply, the buyer acts at the third, fourth and fifth stages, i.e. "choice of suppliers", "negotiation" and "order-issuing".

1.2.1.4. *Purchasing management*

Purchasing management is located at the strategic level of the purchasing process. It supports the activities of purchasing marketing and supplier portfolio management.

This process involves five elements:

– definition of purchasing policy (objectives, strategic guidelines, etc.);

– organization of the service;

– make or buy decisions;

– interactions with the other departments;

– measurement of the performance of the purchasing department, and budgeting.

1.2.1.5. *Purchasing maturity matrix*

The process of management of the purchasing function cannot be fully appreciated without reference to the overall strategy chosen. Its role is influenced by the level of maturity of this function within the company [VAN 96]. In this context, we speak of the "maturity matrix" principle, which enables us to model the purchasing function in a number of domains [POT 98]. From the recent works relating to this, we can cite the maturity matrix advanced by Bruel [BRU 04], Bruel and Petit [BRU 05] and Bruel again [BRU 07], which identifies five levels of maturity and highlights the increasing importance of the purchasing function in the organization's overall performance: "at stage 1, the Board of Directors practically only uses and pays attention to the productivity indicators and flow indicators. However, as the company grows and progresses vertically, the more complex the range of results indicators and processes should become. For instance, we would see the move from the notion of purchasing price to that of purchasing cost, and then to that of overall cost of acquisition. Stage 4 will justify indicators of upstream purchasing and joint performance indicators between purchasing and other functions, illustrating the breakthrough in nature relating to the passage between stages 3 and 4"

[BRU 05]. Each level is associated with seven internal and external actions (see Tables 1.4–1.8).

Level 1	**"Basic" approach**
General contribution	Supply management "Passive" purchasing (execution)
Purchasing policy/ internal levers	Focus on purchase order (PO) processing Technical categories approach to purchasing Pareto 20/80 with no segmentation
Supplier policy/levers	Approach to "supply" Negotiation for a certain amount > $XK
Processes/procedures /practices	Implementation and respect of a standard PO procedure No direct formal relations with the users
IDSSs (information and decision-support systems)	Basic bureaucracy Specific applications/ERP (Enterprise Resource Planning) modules for purchasing PO- and order-processing
Human resources for purchasing (collaborators)	Identification of buyers (best use of existing skills)
Internal and external communication (user relations)	Simple identification of internal customers

Table 1.4. *Purchasing maturity matrix: level 1 (source: [BRU 05; BRU 07])*

Level 2	**"Internal" optimization of purchasing**
General contribution	Upstream levers identified beginning to be used Reproducible purchasing processes
Purchasing policy/ internal levers	Formal segmentation of portfolio Definition of general purchasing policy Globalization Requirement planning

Table 1.5. *Purchasing maturity matrix: level 2 (source: [BRU 05; BRU 07])*

Supplier policy/levers	Competition and medium-term framework agreements (cat. A suppliers) (price, horizon, delivery conditions)
Processes/procedures /practices	Delegation (if OK) Formal rules for drawing up of specifications Follow-up with suppliers
IDSSs (information and decision-support systems)	Centralized internal purchasing database (capitalization on experiences from category-based purchasing) Supplier database
Human resources for purchasing (collaborators)	Definition and sharing of principles of HR management (job profiles, skills analysis) Buyer training plan
Internal and external communication (user relations)	Systematic needs analysis Committed contractual approach to "customers"

Table 1.5.(continued) *Purchasing maturity matrix: level 2 (source: [BRU 05; BRU 07])*

Level 3	**"Internal" optimization of purchasing**
General contribution	Widespread use of the upstream purchasing approach Recognized purchasing function
Purchasing policy/ internal levers	Segmentation (including out of production) Differentiated purchasing policy Analysis of purchasing markets External globalization Partial outsourcing Progressive internationalization
Supplier policy/levers	Systematic competition Construction of a (core) panel of suppliers Framework agreements/operational partnership (overall cost approach) Planned decrease in number of suppliers

Table 1.6. *Purchasing maturity matrix: level 3 (source: [BRU 05; BRU 07])*

Processes/procedures /practices	Purchasing manual Procedure sheets distributed and applied Internal audits Audits and suppliers' management (supplier quality assurance)
IDSSs (information and decision-support systems)	Generalized rational database (purchasing intranet) Dedicated market/sourcing database Use of Internet sites
Human resources for purchasing (collaborators)	Two-thirds of actors correspond to profiles Recruitment training Purchasing marketers put in place
Internal and external communication (user relations)	The procedures prescribed by the Procurement Manual distributed Purchasing policy distributed (CEO, users, partner suppliers) "Test sites" for specifications defined in communication with users

Table 1.6. (continued) *Purchasing maturity matrix: level 3 (source: [BRU 05; BRU 07])*

Level 4	**Optimization of the "buyer" company (all departments)**
General contribution	Integration of purchases into product design/business plan Contractual approach Participation of Purchasing Dept. in the "business" aspect
Purchasing policy/ internal levers	Action with upstream levers Standardization Design to total cost object approach Make or Buy Participation of Purchasing Dept. in project teams Technological sourcing International approach: e-sourcing
Supplier policy/levers	As above plus formalized progress plans Partnership on product development Generalized "panel"-based approach

Table 1.7. *Purchasing maturity matrix: level 4 (source: [BRU 05; BRU 07])*

Processes/procedures /practices	Periodic systemic audits – both internal and external Detailed procedures for product design and development: business (all Depts.)
IDSSs (information and decision-support systems)	Contribution to the database by all the actors not involved in purchasing: e-procurement
Human resources for purchasing (collaborators)	80% of purchasing actors conform to standard Training/information to users and purchasing advisors Upstream buyers put in place Internal mobility
Internal and external communication (user relations)	Test sites (upstream buying (next stage)) Active participation of Purchasing Dept. in project/business groups Formal communication plan "Motivating" actions

Table 1.7.(continued) *Purchasing maturity matrix: level 4 (source: [BRU 05; BRU 07])*

Level 5	**Optimization of the "buyer" company (all departments)**
General contribution	Company's purchasing performance "shared" Purchasing Dept. "leads" Purchases recognized and in demand
Purchasing policy/ internal levers	Full comprehension and appropriate use of all the levers Internal customers and advisors involved Purchasing strategy part of general strategy
Supplier policy/levers	80% of suppliers in partnership Co-development Innovation Strategic alliances
Processes/procedures /practices	Certification (e.g. ISO certification) of all purchasing processes (including purchasing and other services)

Table 1.8. *Purchasing maturity matrix: level 5 (source: [BRU 05; BRU 07])*

IDSSs (information and decision-support systems)	Generalized extranet and Internet system (use of Web applications)
Human resources for purchasing (collaborators)	Collaboration of all services Generalized contractual approach
Internal and external communication (user relations)	Generalized communication plan (all targets including suppliers on the panel)

Table 1.8. (continued) *Purchasing maturity matrix: level 5 (source: [BRU 05; BRU 07])*

Thus, the role of the purchaser is no longer limited – or, more accurately, can no longer be limited – to administrative routines. As highlighted in the French norm AFNOR NF X 50-128 (1990), he is an actor who is able to "instill in the suppliers a spirit of creative competition, to promote the suppliers' propositions and their suggestions to reduce costs and/or improve performances, and liaise with the other departments, informing them of any changes which affect their environment". His action extends over two levels [CAL 00], relating to the drafting of the contract which constitutes the pivotal point of the exchange:

– *ex-ante*, throughout the process of selection of suppliers, he verifies the knowhow, respect of commitments and reliability of the partner. In order to do so, he performs audits, establishes quotations, and considers the supplier's commitment by obtaining ISO standards. This painstaking work relates to the upstream-to-downstream supply chain;

– *ex-post*, by the monitoring of the relationship: this monitoring benefits a "win–win" relationship in which there is a transactional and relational dynamic based on trust.

Thus, the role of the purchaser expands, changing from simple participation to effective power "in each of the phases of the decision-making process" [CAL 00]. As Muller [MUL 04] points out, the

purchaser has a significant positive effect on the performance of the purchasing department if four initial factors are in place. Thus, the purchaser has to reconcile efficacy (accomplishment of the task), effort (which the purchaser agrees to make in all the tasks relating to his function), skillfulness ("skills […] to find the solutions that correspond to the needs formulated by the company") and precision of the role ("extent to which the perception of the individual's role, as formulated by the company's directors, is clear") – both quotes from p. 115 of [MUL 04].

1.2.2. *Internal or production strategic logistics*

The "need for speed" is accompanied by lean production[5] processes. This lean production is the preserve of the discourse of the logistics coordinator in production: maximization of the load of the equipment with running down of inventories of intermediary products [GIA 03; PAC 06]. Commonly, these two elements are rooted in the quality approach, with the example of Toyota. Thus, working with the basic idea of total elimination of waste, Ohno [OHN 89] combines individual talent and team tasks. Indeed, two main factors predominate:

– just-in-time production, which requires talent on the part of all those involved;[6]

– auto-activation of production. Auto-activation can be explained as the stopping of the production line in case of an anomaly,

5 Lean production logistics is practiced by maximum depletion or elimination of stock. It is similar to a just-in-time or *lean manufacturing* logic.

6 In the eyes of Bigras *et al.* [BIG 95], the just-in-time approach is explained by way of four fundamental principles which are:

– producing in exact quantities;

– producing uniformly;

– respecting individuals;

– retaining a long-term vision.

The objective being targeted is located on three levels: elimination of waste, constant improvement and elimination of unforeseen circumstances.

performed entirely at the responsibility of each of the factory operators.

Below, we present a number of decision-support tools/approaches which enable us to appreciate the various aspects of a production logistical strategy.

1.2.2.1. *A decision-support tool: the product/process matrix*

The product/process matrix is a decision-support tool for production. Developed in the 1970s, the product/process matrix characterizes the lifecycle of the production process [HAY 79a; HAY 79b; HIL 94; MIL 95; AHM 02].

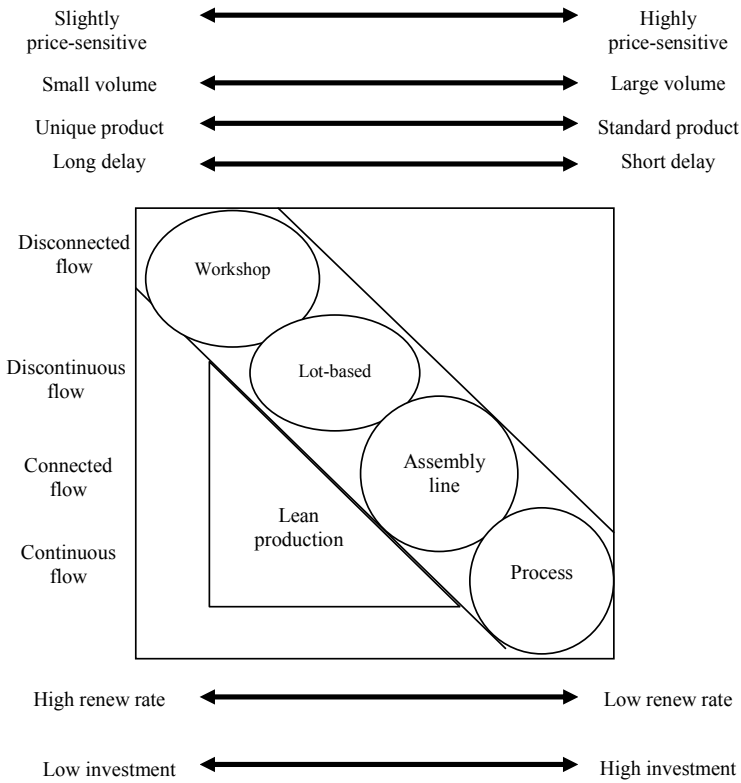

Figure 1.2. *The product/process matrix revisited (source: [BEA 08])*

According to Beaulieu and Landry [BEA 08], based on this matrix, the company chooses the best possible "alignment" with its partners, in order to reduce uncertainty and cater as best possible for the market being served. This market is arranged as shown in Figure 1.2.

In the top left-hand corner of the diagram, the factory functions with a fluid and flexible process. Conversely, in the bottom right-hand corner, it is faced with more rigid procedures. In general, an industrial sector begins its mode of production with a "disconnected flow", an emerging product with a small group of customers (a niche-based strategy [POR 82]). On the other hand, "continuous flow" results in a strategy of volume or domination by price, where the product becomes standardized and where the competitive edges are gained by a maximum of sales to a maximum of customers. However, above all, the process is chosen in relation to the market which is to be served. Drawing inspiration from this matrix, Ahmed and Schroeder [AHM 02] stress – firstly – a link with discontinuous- and connected-flow processes, and – secondly – the notion of *lean production* or *lean manufacturing*.

1.2.2.2. *One approach: lean manufacturing*

EXAMPLE.– "*Le lean, c'est de la compétitivité*" (Lean methods are tantamount to competitiveness) – *L'usine nouvelle*, 31 May 2012 (extract) [USI 12]:

> For its 2012 edition, the *Trophée des usines* (Factories Award) organized by *l'Usine Nouvelle* and *Insead* rewards two industrialists who have been able to launch ambitious projects of organization in order to enhance their competitiveness. And the winner is… lean manufacturing! More than ever this year, the method inspired by the Toyota Production System has become the number one weapon of industrialists for gaining in competitiveness. At Continental and Smart, the winners of our 18th *Trophée des usines*, it is indeed this method of industrial excellence which enables them to keep up production in France. In Foix (in Ariège), where Continental has its headquarters, or in Hambach (in

> Moselle), in "Smartville" (which covers Smart and its main suppliers), the very workshops breathe efficiency. Small islands where the flows are studied in order to reduce transition times, parts from suppliers which are put directly onto the assembly lines, workstations optimized with the help of expert ergonomists, production latency that adapts to demand… One can also sense the commitment of the operators. These two industrialists have put systems in place to reward ideas put forward by their employees. Continental's system was able to save the company nearly €550,000 in 2011.

Petitqueux [PET 06] establishes an overview of the implementation of the lean method in the industrial sector. Lean practice involves producing as accurately as possible. This approach was developed by Toyota and made public by the Massachusetts Institute of Technology (MIT) in the 1980s. The principles of the Toyota Production System (TPS) have become known by the umbrella term "lean manufacturing":

> Lean manufacturing is a generic name which denotes a production system originally developed by Toyota and used thereafter all over the world in all industrial sectors. Lean manufacturing is defined as a systematic approach aimed at identifying and eliminating all waste (non added-value activities) by constant improvement with a view to attaining industrial excellence. [PET 06], (p. 3)

Among the founding principles of lean manufacturing, we find [PET 06]:

– "industrial excellence, based on stable resources (products, costs, processes, trust, management, etc.);

– the notion of waste, with elimination of the 3Ms (Muri: irrational situations, Mura: variations, and Muda: non added-value tasks);

– *Kaizen*, by constant improvement;

– *Heijunka*, which advocates the division of the task of production into small lots, in order to limit inventories of "works-in-progress" and finished products;

– Just-in-time, which corresponds to the "ideal rhythm at which the production system should work in order to satisfy demand in a minimum period of time";

– *Jidoka*, the aim of which is to develop machines and processes which are able to detect any anomaly".

A number of tools are recommended in the context of lean manufacturing [PET 06]:

– Value Stream Mapping, which maps the processes, ranging from production to the whole of the supply chain;

> Value Stream Mapping (VSM) or Material and Information Flow Analysis. As it maps the processes and flows, VSM assesses the present state and determines a situation to aim for. This is one of the first operations to be performed when we are using an approach to transform these processes. VSM opens the door to the use of the following (more operational) tools.

– the operations diagram, which focuses in particular on non-added-value tasks, with a view to doing away with them;

– the 5S approach, which aims for general standardization by way of sorting (*Seiri*), setting in order (*Seiton*), systematic cleaning (*Seiso*), standardizing (*Seiketsu*) and sustaining (*Shitsuke*);

– delayed differentiation, which involves adjusting push-flow (standardization of the product) and pull-flow (personalization of the product) in order to gain time on production and therefore delivery;

– the SMED (Single Minute Exchange of Die) method, which requires the production line to be changed from one product to the next in less than a minute;

– the assembly line, where a thought relates to decreasing wastage such as waiting times, transport or indeed movements;

– ergonomics of the workstation;

– synchronization of the stations with the Takt Time, i.e. the quest to limit bottleneck situations;

– unitary production flow, where each upstream operation continuously feeds into the next operation;

– *Poka-Yoke*, which consists of determining any technique which limits errors owing to the weariness caused by standardization;

– *Kanban* or label, with a view to lean manufacture;

– "little train", which refers to the time gained by the movement of the warehousemen, using its warehouse trolley;

– "short-delay encouragement", which puts in place frequent reports, the goal of which is to stay abreast of the desired and actual levels of performance.

1.2.3. *Upstream or distribution strategic logistics*

For many companies, their major concern is to guarantee durability whilst ensuring that the customer, who has become "volatile", proves to be a partner in the long term. The satisfaction of the end consumer is one of the major concerns for any company, and therefore of downstream or distribution logistics.

This is one of the reasons for which this field of thinking was one of the first to be the subject of research [COL 88]. In its practices, distribution logistics exhibits parallels with marketing. On this link between marketing and logistics, Senkel [SEN 02] details four main evolutions, highlighting a thought process which has moved from the opposing interests of marketing and logistics (marketing is interested in the customer, whilst logistics coordinates activities so as to minimize the cost-to-market of the product) [CHR 85], to a convergence between the two fields (marketing and logistics both contribute, in parallel, to customer satisfaction) [RIN 89]. Thus, we see the interface between marketing, logistics and production [LAM 94] and, finally, come to consider logistics as a necessary condition for the elaboration of a marketing strategy [AUR 97].

1.2.3.1. *The Efficient Consumer Response approach*

In downstream logistics, it is the company's objective to satisfy the customer, rather than *vice versa*, so here we do not find evaluation matrices such as those demonstrated for upstream logistics. In fact, downstream logistics is a key part of the very definition of logistics in the general sense: delivering the right product, at the right time, in the right amount and at the right place. For this reason, it is primarily the approach known as ECR (Efficient Consumer Response) which is favored in this link in the supply chain.

ECR is testament to an increased willingness for logistical cooperation [BON 99; BON 05]. Founded in the United States in the 1990s, ECR "echoes the idea whereby it is in the interests of the members of a channel to cooperate in order to improve its efficacy, evaluated on the basis of criteria such as the improvement of the service rate or the lowering of the number of breakdowns" [PAC 97] (p. 67). While the implementation of this general model of partnership saves costs all along the chain, which runs from the food distributor to the industrial supplier [VAN 98], Des Garets [DES 00] points out that the primary goal of ECR is the application of the following five basic principles:

– "(…) to provide the consumers with an added value in terms of products, quality, range, availability and rate of service, whilst reducing the cost of operating the supply chain;

– to adopt a logic of cooperation rather than one of transactional confrontation;

– to facilitate [the marketing, logistical and production choices] by way of rapid and reliable information exchange through the EDI (Electronic Data Interchange);

– to guarantee the availability of the right product at the right time;

– to distribute [by a measurement of overall efficacy] the benefits obtained by the partners" (p. 113).

Hence, ultimately, we find significant implicit convergences between the expectations of distribution logistics and overall logistics. Coordination by one and by the other underlies a process of

interactions between those involved in the operations chain from downstream (the demand to be served) to upstream (supply), i.e. the manufacturing company, its suppliers and its logistics providers, but also its distributors who, by creating common distribution platforms and combined road networks, play an important role in the making of large-scale savings.

1.2.3.2. *From e-commerce to u-commerce*

E-commerce, for electronic commerce, is part of the business to consumer relationship. In his own right, the consumer defines and places his order via his computer. Thus, FEVAD (*Fédération des Entreprises de Vente A Distance* – Federation of Remote Sales Companies) reports a 22% increase in online sales in France between 2010 and 2012. In other European countries, we note the following increases: Germany: +17%; Belgium: +24%; Denmark: +14%; Italy: +19%; and the Netherlands: +9%. To cite another statistic reflecting this trend, in 2011, 43% of private customers in Europe said they had made purchases over the Internet. In terms of logistics, this has consequences for the ways in which orders are prepared and delivered. As regards the delivery method, the logic comes under the same issue as urban logistics, which is discussed later on in this book. With regard to the means of preparation of orders placed online, two basic models are chosen [PAC 08; DUR 10]:

– preparation on a purpose-specific site located at a warehouse. This type of preparation is used when the trader's activity mainly rotates around digital materials;

– preparation in store, where electronic activity plays a lesser role.

Thus, increasingly, logistical approaches are being devised to cater for the RoPo (Research Online, Purchase Offline) effect [VIN 12]. Amongst these approaches, we can cite the drive points at Carrefour stores in France, which offer delivery "to the trunk of your car" for heavy purchases, so as to leave you free for "leisure shopping" in the store. In summary, a great deal of in-depth thinking has gone into making e-commerce as close as possible to the new telecommunications technologies, and making the consumer co-authors in their own purchases. Here, we speak of

u-commerce, meaning ubiquitous-commerce, where computer technology becomes omnipresent in the consumer's act of buying.

EXAMPLE.– "*L'e-commerce, c'est dépassé"* (e-commerce is a thing of the past) – C. Vincent, *Enjeux Les Echos*, June 2012, p. 32-41 [ENJ 12].

> M, T, F, U… the many avatars of e-commerce. Yesterday, it was all so simple. We had e-commerce. Yet now, good old "electronic commerce" is no longer sufficient to express the multiplicity of the digitalized mercantile world. Recently, we have begun to witness the triumphant entrance of m-commerce – "mobile" commerce, conducted through a smartphone or tablet. Anyway, some would draw parallels between these devices – often used as a second screen in the home – and the Internet-connected televisions which are beginning to break through, and form the family of "t-commerce", which combines TV and tablets. An untimely *t* which enters the arena to compete with another so-called t-commerce: that conducted *via*… Twitter. For let us not forget social networks, and Facebook in particular. Thus, we have f-commerce, so we can buy things that our friends have "Liked". Finally, let us pay homage to King Google. G-commerce would be guaranteed a bright future by its exegetes. Let us simplify the situation a little. Ladies and Gentlemen, we give you… u-commerce: ubiquitous commerce. Or everything is in everything, everywhere, all the time.

1.2.4. *Strategic transport management*

The last three sections have dealt with so-called intra-organizational logistics (although this still entails links with the outside world). However, this type of logistics, which is present in every (industrial) firm, requires us to use forms of transport (road, sea, river, air, rail) in order to ensure the flow of goods and documentation.

In this section on the notion of coordination of modes of transport, we focus particularly on transport pooling.

1.2.4.1. *The extended transport service*

Long before the notion of transport pooling, Colin and Paché [COL 88] pointed out that the question of an extended transport service was arising. Such extended transport requires skills which go beyond the "simple" transport of goods.

The extended transport service [COL 88] is divided into seven components:

– transport operations (supply; inter-factory transport; physical distribution to depots, platforms, points of sale) which include consolidation/deconsolidation operations, organization of delivery rounds and rent of vehicles, with or without a truck driver, for a long or short period;

– auxiliary transport operations, with transit, customs duty and transport commission;

– physical distribution operations, which include 17 actions – namely:

- various handling operations and sometimes management of a pallet pool,
- receipt of the goods,
- quality and quantity control,
- placing on reserve,
- withdrawal,
- division,
- assortment and allotting[7],
- labeling and price marking,
- creation of barcode labels for the management of internal flows and/or transport,

7 Allotting consists of grouping packages together by their destination.

- reconditioning,

- preparation of order,

- weighing,

- packaging, outer packing (palletizing, film wrapping and shrink-wrapping[8]),

- preparation of cargo,

- pre-billing,

- dispatch,

- final delivery;

– management operations with:

- warehousing, stock management,

- computerized management of products by the carrier, processing of orders to be delivered,

- management of expiration dates,

- sometimes, and increasingly, management of stocks of raw materials, supplies, semi-finished products and finished products, for industrial units working on the "lean manufacturing" model and which do not have any storage capacities; and connection of the supplier's computer system with that of the dispatchers and addressees;

– commercial operations, which are based on six actions:

- billing,

- merchandising, line management at the points of sale,

- sometimes installation and after-sales service (maintenance) for certain products,

- offices and logistical and computer resources being made available for the carrier at the transporter's headquarters,

- construction of modular and hierarchized rates for the different modular components of the services offered,

- management and regulation of complaints;

8 Shrink-wrapping consists of wrapping groups of (usually identical) products in a cocoon of retractable film.

– "production finishing" operations, which include the final construction of testing banks (for certain mass-consumption manufactured goods such as bulky home electrical goods);

– advice and logistical engineering operations, in transport and physical distribution, sometimes in stock management, and less frequently even in production management, defining means and procedures to be implemented to optimize logistical operations (for the dispatcher, the supplier, the addressee).

It can be said that since the creation of this list in 1988, these components have changed little. Certainly, the creation of barcode labels (third point) is still common practice, but it has evolved toward the use of RFID (Radio Frequency Identification) tags, depending on the value of the products. Similarly, we are witnessing an enrichment of certain tasks, which tend towards advice-giving and accompaniment, as happens in the case of logistics services.

1.2.4.2. *Toward a quest for transport pooling*

Nowadays, in the writings about collaboration in transport management, we often find mention of transport pooling. Transport pooling is defined as:

> "a type of inter-company collaboration characterized by a pooling of resources between two or more actors (who may or may not be competitors) with the aim of better rationalization of transport flows. By rationalization of transport flows, we mean any means (economic, technological, human, organizational, etc.) by which one can improve the delivery of a good or service to the point of its final consumption" [GON 10A; GON 10B].

For these authors, there are two possible modes for the operation of transport pooling:

– multilateral collaboration, which consists of pooling the resources of a multiple actors, with or without an intermediary party;

– partnership of transporters whereby, through a cooperative association or society, a computer platform is put in place to federate supply and demand.

1.2.4.3. *Urban logistics spaces*

Finally, in transport management, we must point out the importance of urban logistics, or "last-mile logistics". Thus, we shall discuss the pilot project set up in France by the Sustainable Development Ministry, known as *espaces logistiques urbains* ((ELU) urban logistics spaces). These ELUs constitute logistical installations whose aim is to improve the transport of goods between the highway network and the destination site, and between cities and their (more or less distant) peripheries [BOU 06]. There are different kinds of ELU:

– on the outskirts of urban areas, we have *zones logistiques urbaines* ((ZLU) urban logistics zones) which bring a number of transportation companies. The aim of the ZLUs is not to mutualize the flows of goods between these companies, but rather they adhere to the regional logistical policy. Consequently, the presence of a ZLU does not alter the delivery and collection practices of any of the companies involved;

– usually a few miles from the city centers, we have *centres de distribution urbain* ((CDU) urban distribution centers), which are platforms for consolidation/deconsolidation operations, the intention behind which is to manage flows bound for densely trafficked areas;

– in the neighborhoods and the city streets, we have *points d'accueil de véhicules* ((PAV) vehicle stopping points or loading bays). These are infrastructures which take the form of mini logistical platforms, where part of the road is set aside for goods transport vehicles to park. In this category, we observe a number of sub-categories such as:

- *espaces logistiques de proximité* ((ELP) local logistics spaces),

- *points d'accueil de marchandises* ((PAM) goods-receiving points),

- delivery areas.

Of these PAVs, the ELPs might be able to alter logistical policies in order to enhance the delivery of the actors involved. Thus, they may offer services similar to those of a CDU, but on a smaller scale;

– *boîtes logistiques urbaines* ((BLU) urban logistics boxes), which are installed at the level of a street or even a building. These are small structures, either moveable or fixed, which offer an interface and a temporary storage space for goods so as to optimize the performance of delivery rounds. This category includes purpose-built hatches, lockers and new points for collection of delivered goods close to the place of consumption.

Name	Creation date	Number of people	Turnover
Adrexo Colis	1979	23,000	€330M
Chronopost	1985	3,500	€665M
Coliposte	1996	7,500	€1.4Bn
Colizen	2008	20	€1M
Exapaq	1995	2,000	Undisclosed
Fedex Express France	1985	2,700	€38Bn
France Express	1971	4,200	€306M
Kiala	2001	110	€47M
La Petite Reine	2001	70	€1.5M
Mondial Relay	1997	550	€100M
Pickup Services	2000	70	€9-10M estimated
Relais Colis	1983	750	Undisclosed
Morin logic	1954	380	€34M
SLS – GCI	2010*	750	€82M
TNT Express France	1973	5,000	Undisclosed
Top Chrono	1984	140	€10M
UPS Europe	1976	40,000	€40.9Bn

* date of merger between SLS and GCI

Table 1.9. *The actors in last-mile logistics in France (source: data taken from Logistiques Magazine, May 2011, no. 259 [LOG 11])*

As we can see, the different ELUs do not serve the same function or have the same scope for action. For our discussion, we shall focus in particular on the consolidation/deconsolidation platforms, the CDUs, which have an appreciable effect on the organization of the transport of goods in last mile logistics.

1.2.4.3.1. *The important role of CDUs*

Rationalization of the flows of goods is founded in the notion of an urban distribution center (CDU). The CDU is generally appreciated as a platform where (high-tonnage) transport flows coming into a city are concentrated, to be put into lighter vehicles, which emit less pollution and have less difficulty in accessing denser areas.

There are three types of CDU [BRO 05]:

– "private" or "semi-private" CDUs. Their purpose is essentially economic, and they form part of the development strategy of the operator or carrier;

– "mutualized" CDUs, which are generally associated with a service promoted and/or supported by the authorities. The aim behind the mutualization is to pool resources in order to manage flows bound for the city as closely as possible;

– "specific" CDUs are associated with particular activities. They may be temporary (platforms attached to work sites or large-scale moves) or permanent (airports, seaports or river ports). Yet, unlike the previous two types of CDU, their activity may not necessarily be geared towards urban distribution.

In itself, this last-mile logistics appears to be an important factor in companies' thinking. Indeed, it represents the trickiest and most costly link in the supply chain: trucks above a certain tonnage cannot enter urban areas, there are frequent stops involved, which drives up the costs, and there is the issue of whether the buyer will be there to receive the goods. In one of the rare examples of success of this strategy, Morana and Gonzalez-Feliu [MOR 11] (p. 24) stress two criteria which all private companies need to consider:

– "co-funding [public-and-private] of vehicles and use of one's own infrastructures, in order to minimize the costs of implementation of the service, using regional and European funds for the development of 'green' strategies;

– operational management, which combines outsourcing of common operations with a highly dynamic commercial strategy, so as to seek out new customers at any time. In addition, the use of an information system accepted by the main transport operators […] means that a diversification of services can also be envisaged".

EXAMPLE.– "Denis Badré: *Réapprovisionnement du centre-ville, un regain d'énergie ?*" (Restocking City Centers: energy recovered?), *News Press*, 19 October 2010 [NEW 10].

The city of Bordeaux has been awarded the first "Urban Logistics Prize" for its CDU. Last-mile delivery is done by electrical vehicles or delivery tricycles.

EXAMPLE.– "*Création du Centre multimodal de distribution urbaine (CMDU) à Lille*" (Creation of the multimodal urban distribution center in Lille), *Transports & Logistique*, April 2012, p. 26 [TRA 12].

On 27 March 2012, the GIE-CMDU was formed when Ports de Lille, CCI Grand Lille, Generix Group, MIN de Lomme, TLF and Véolia Propreté joined forces to test out the urban logistics of the future, in Lille.

The aim is to reduce the problems thrown up by the transport of goods in a city environment, and primarily road congestion and pollution. Using the infrastructures of the city of Lille, located near to the city center, the CMDU will receive goods by sea, road or rail. After optimization of the delivery rounds, the goods will be delivered by the transporters themselves to their recipients, with preference given to clean modes of transport – particularly electrical vehicles.

1.2.5. *The increasingly strategic role of logistics providers*

In talking about the extended transport service, it is natural to speak of the role of logistics services. This is the subject of many discussions: first, in terms of the service provided; then in terms of the place of that service within a "conventional" supply chain approach (definition, role, power, etc.). Nevertheless, logistics services are garnering support. In evidence of this, we wish to hold up the appreciation of this activity on several levels. Thus, Artous [ART 03] presents the evolution of the role of a logistics provider. At that time, four levels of expertise were referenced:

– 1PL: for First Party Logistics (Provider), which consists of sub-contracting of transport or warehousing;

– 2PL: for Second Party Logistics (Provider), which includes both the outsourcing of transport and warehousing;

– 3PL: for Third Party Logistics (Provider), logistics providers who handle the various different flows stemming from logistics and who have at their disposal means of transport, warehousing, etc. to carry out this function;

– 4PL: for Fourth Party Logistics (Provider), who are providers whose service of handling of logistical flows takes place only at an informational level. The 4PL plays the role of a link between the company, the market and the other providers.

Less frequently, in the world of logistics providers, we also speak of 5PL, for Fifth Party Logistics (Provider), whose role is to coordinate the activities of the various subcontractors, but also to design new computer-based logistical solutions[9].

Finally, LLP – Lead Logistics Provider – who are on the boundary between 3PLs and 4PLs, as they provide a service for goods that they themselves own, but also for those of other companies. Thus, as Fulconis *et al.* [FUL 11] put it, "the time has now come to view

9 www.olf.gouv.qc.ca/ressources/bibliotheque/dictionnaires/terminologie_logistique/prestataire_services_logistiques.html.

logistics provision through a very different lens, enabling us finally to see the exceptional potential for technical and organizational innovation that logistics providers offer" (p. 257).

N°	Name	Logistical turnover	Warehouse surface area	Ware-houses	Logistic al staff
1	Kuehne+Nagel	€527M	1,500,000m²	58	6,000
2	Norbert Dentressangle	€517M	5,300,000m²	193	13,836
3	Géodis	€450M*	Undisclosed	Undiscl.	Undiscl.
4	DHL Supply Chain	€400M	1,000,000m²	85	4,500
5	STEF-TFE	€361M	4,052,000m²	85	3,057
6	Bolloré Logistics	€300M	506,000m²	84	60
7	FM Logistics	€291M	>2,000,000m²	>70	12,000
8	ID Logistics	€191M	1,975,700m²	69	6,250
9	Soflog-Telis	€155M	300,000m²	50	1,200
10	Mory **	€136M	574,000m²	49	67

* estimation; ** In 2011, Mory's logistical infrastructure was bought up by ID Logistics.

Table 1.10. *Logistics providers – taken from the breakdown of the Top 10 in France (source: Logistiques Magazine, no. 255, 2010 [LOG 10]*

1.2.6. *The strategic approach of traceability*

In order to firm up the intra- and inter-organizational connections upon which SCM is founded, we cannot overlook the role and weight of traceability in the pursuit of logistical exchanges. The notion of traceability arose in the wake of the food crises and has been growing in importance ever since in all business management. The ISO 8402 standard from 1994 defines traceability as follows:

> Traceability is the aptitude to find the history, the use or the localization of a product by means of recorded identification.

The goal behind traceability is to be able to withdraw the product in case of a problem – as quickly as possible, and only for the contaminated lot, so that the problem does not affect all articles of a product. Traceability also has a part to play in the war on counterfeiting, because *tracking* (real-time monitoring of the flows)

and *tracing* (memorization of the product) make it possible to verify its origin.

The functions of "*tracking*" and "*tracing*" (taken from [ROM 00]):

> The function of "tracking" consists of being aware of an object's location at any given time *t*. The objective associated with this […] function of traceability is twofold:
>
> – on the one hand, the aim is to demonstrate reactivity in the face of a problem which transpires, such as the stopping of a defective product, and to be able to rapidly determine the cause of the problem and the exact location of the lot in question;
>
> – and, on the other hand, the aim is to have better control over the whole of the supply chain, by way of real-time monitoring of the physical flows. This control involves, e.g., better stock management, better quality in order preparation, etc.
>
> In order to implement the function of 'tracking', we need to:
>
> – identify the objects by way of a coding system and gather data by means of an appropriate information system: most often, this is done automatically, by a barcode system with an optical reader or electronic tags with a radio-frequency system;
>
> – have a tool which is able to observe and analyze the flows in real time and communication information about them. The means for this may range from the simplest to the most advanced tools: telephone, fax, EDI, a software package, the Internet or indeed radios, or onboard computers installed in the vehicle transporting the object being tracked, or a satellite location system.
>
> The function of "tracing", for its part, involves providing an overall view of all the flows in which we are

> interested, i.e. retracing the prior history of the object's actual circulation. The objective here is to be able to go back to the origins of the products, and monitor each stage of their production. This requires us first to have recorded the data produced by the 'tracking' function, and then to have a system capable of combining these data so as to reconstruct the overall image of the flow in question.

Traceability is considered to be a strategic management approach, requiring three main stages: the organization of the project, the implementation of the approach and the use of the information [KAR 10]:

– the organization of the project is divided into seven "standard" stages, which:

- define the context of the project,
- puts the working structure in place,
- determines the requirements,
- evaluates what is already in existence,
- suggests solutions,
- executes the project effectively,
- ensures tracking and evaluation;

– the implementation of the approach requires four stages, i.e.:

- identification of the products,
- management of the connections,
- recording of the data,
- communication.

The link between the organization of the project and the implementation of the approach is made by ICT with barcodes, RFID, EDI, etc.:

– the use of the information includes:

- monitoring of the product's safety, origin and integrity,

- strengthening of the company's competitive advantage,

- constant control and evaluation,

- redefinition of the relationships between the different actors whom traceability concerns.

For the same author, there are four dimensions which define the strategic approach to traceability:

– the characteristics of traceability;

– the characteristics of the environment;

– the characteristics of the organization;

– the transversal factors.

For each of these aspects, it is possible to specify the factors which will help the adoption of a traceability approach.

1.2.6.1. *The characteristics of traceability*

In order for traceability to succeed within the company and with its partners, the approach needs to exhibit a certain number of characteristics. These characteristics of traceability are based on three factors:

– observability, which is the extent to which the results of the traceability are visible and observable;

– compatibility, which involves common values, requirements and past innovations. The past innovations here refer to partnerships between actors and to the practice of a quality approach;

– the relative advantage combines the following ten elements:

- the survival of the company, in the sense that no company can survive unless it adopts a traceability approach,

- the relations between actors, founded upon transparency and trust, selection of suppliers, coordination and cooperation,

- the internal organization, which involves management of information and of documentation,

- the image of the country,

- the image of the company,

- the time gain,

- the development of the company,

- control and evaluation, which involve having an overall vision, management of risks through customer complaints, targeted withdrawal and causal links between complaints and withdrawal,

- competitive advantages, which involve customer satisfaction, cost reduction and consumer confidence,

- quality control.

1.2.6.2. *The characteristics of the environment in traceability*

The second dimension in the traceability approach takes account of three factors:

– the role of the stakeholders, in the broadest sense of the term. Here, particular attention will be paid not only to the staff (adoption and understanding of the approach) and the upper management (project owners), but also to external actors such as the supporting organizations which facilitate the implementation of a traceability approach: the State, the consumers (national and international), the media, the suppliers, etc.;

– the champion, who is the person that uses his/her position and sway within the organization to influence an organization's ability to participate in new technological and/or organizational innovations such as traceability;

– the competitive environment which corresponds – all other things being equal – to the high level of competition on the market.

1.2.6.3. *The transversal factors of traceability*

Finally, the third dimension examines three factors:

– the motivation to put in place financial subsidies (internal and external, in the case of support from outside organizations) for the success of this approach;

– the level of partnership, which corresponds to the degree of maturity of the partners in traceability within the same supply chain;

– the relations between partners, whereby cooperation is considered to be of prime importance.

Often, traceability is seen as a tool, a means for supply chain management [ROM 00; FAB 01; COL 05]. Sometimes, it is viewed as an approach in its own right [VIR 04; PEL 07]. The results presented here are the feedback on doctoral research into the understanding of traceability in a country just beginning to practice this approach. It should be noted that all the elements cited tend to stress the fact that traceability should be perceived as an approach in the same sense as supply chain management.

1.3. Information, information systems and ICT: an aid to the success of intra- and inter-organizational connections

Intra- and inter-organizational connections such as those seen above require increasing amounts of information in order to function. For this reason, it is necessary to put information systems (ISs) in place. An information system is defined as "an organized set of resources: hardware, software, HR, data and procedures, to acquire, process, store and communicate information (in the form of data, texts, images, sounds, etc.) in organizations" [REI 95] (p. 67). The goal is to achieve governance of the ISs, with the aim of "encouraging actors to rethink and alter their practices of coordination and learning, to actively contribute to an innovative dynamics which requires trust, information sharing but also confidentiality" [ELA 08].

In logistics, there are many software tools which serve many different functions. Here we shall present some of the most common of these tools.

For Fabbe-Costes [FAB 00], the typology of SCM technologies can be thought of by way of three axes:

– decision-support technologies, which organize decisional flows into a coherent form. These include APS (Advanced Planning and Scheduling system), SCM tools, databases, datawarehouses, etc.;

> APS, standing for Advanced Planning and Scheduling system, is a software package relating to production management. It draws the balance between the customers' demands and the companies' capacity to cater for these demands.

– interface technologies, which set up monitoring of cooperative commitments and communications between each partner in the chain. These technologies include EDI (Electronic Data Interchange), the Internet, intra- and extranet, ECR (Efficient Consumer Response), GPA (*gestion partagée des approvisionnements*, or shared supply management), call centers, etc.;

> EDI is a tool which transmits structured data between computers, in accordance with pre-established and standardized messages (see the appendix to this chapter for a view of the elements in the construction of an EDI guide).

> GPA: "*Gestion partagée des approvisionnements* (GPA) is a form of collaboration between distributors and their industrial suppliers, which is rapidly gaining popularity at present. GPA is based on intense electronic data interchange (EDI). The distributor, or the logistical service provider entrusted with the management of the warehouses, sends data on a daily basis to the supplier, concerning outgoing stock for the categories of product in question. These data enable the supplier to make informed predictions and create a suggested order which is sent to the distributor's purchasing center for validation. Hence, the

flows are "pulled" by the demand. This technique is highly appropriate for mass-consumption products which are frequently delivered (one or more times a week)." [FEN 05] (p. 206).

In the same vein as GPA, we also have collaborative supply management, better known by the acronym CPFR, for Collaborative Planning, Forecasting and Replenishment. In comparison to GPA, CPFR includes promotional campaigns.

Similarly, at this level we find the concept of Vendor Managed Inventory (VMI) or Supplier Managed Inventory, whereby the supplier manages the stock on behalf of their client.

Finally, by extension, we speak of GMA (*gestion mutualisée des approvisionnements* – Mutualized Supply Management) which is defined as "a means of supply management where a number of industrialists agree to make combined deliveries, departing from the same logistics site (warehouse or platform), one or more distributors, notably so as to optimize storage costs (reducing the number of storage sites in the industrialist-to-distributor supply chain) and transport costs (extent to which the vehicles are filled and the number of rounds" [LIV 06].

– piloting technologies which monitor, evaluate and integrate the major processes in Supply Chain Management. These include ERP (enterprise resource planning), and Manufacturing and Logistics Execution systems.

ERP is a program which handles the operational functions of an organization, such as finance, accounting, marketing, production, etc. Essentially, its objective is to deal with the concerns of analytic division by function and by monitoring of the flows.

In a continuing train of thought, Fabbe-Costes [FAB 07] lists the systems which are able to take account of transport as a link in logistical chains. These systems are distributed around three axes:

– document exchange systems, which include the transportation order, the delivery note, the transport receipt, the bill of lading (B/L)[10], the packing list, etc. The tools used here are automatic fax, EDI, the Internet (email, Web-EDI, online communication);

– communication systems including onboard radio, embeddable/portable terminals, telephones, mobile telephones, the Internet (email, online communication) and multi-functional portable terminals;

– traceability systems, including identification/coding, marking, electronic readers, tags, voice systems, recorders and memorization.

> Identification/coding is established by two means: a barcode, which has a unique use, and RFID (Radio Frequency Identification) which can be used many times.
>
> The barcode system dates from 1952. It was created by two American engineers, N.J. Woodland and B. Silver. To this day, it remains the most widely used system for product identification and coding.
>
> RFID dates from the late 1940s. It was initially used by the Royal Air Force in the Identify Friend or Foe (IFF) system. Its use in industry dates back to the 1970s. Its flexibility (multiple use of each chip) gives it an advantage over the "single use" barcode system. However, its cost as yet remains an obstacle to its expansion.

Besides the examples given above, other software tools help improve the efficiency of a supply chain. One might cite:

– CRM – Customer Relationship Management;

> CRM can be understood as an approach as well as a software tool. Its keyword is *optimization*: optimization of customer relations, whether present, future or prospective.

10 The bill of lading (B/L) is the document which embodies the maritime transport contract agreed between the cargo handler and the maritime transporter. It is also a certification of the ownership of the goods.

– DRP – Distribution Replenishment Planning – which helps manage inventory of stocks of finished products, whilst taking account of the complexity of distribution networks;

– MES – Manufacturing Execution System. This term denotes systems which provide information in real time about the execution of manufacturing orders. The objective is controlling of the production process, from its beginning to the delivery of the finished products. Thus, the MES seeks to optimize production activities;

– MRP – Material Requirements Planning – was created in 1975 by Orlicky, and is a program for managing production and supply which calculates the net requirements with infinite capacity. It corresponds to a set of techniques using the nomenclatures, the stock status and the production control program, so as to calculate the material requirements. It is viewed as a planning technique intended to establish and maintain correct due dates. Its extension is MRP2, standing for Manufacturing Resources Planning;

– SCE – Supply Chain Execution – denotes a category of software packages for the purpose of operational management of the supply chain. It includes:

- WMS – Warehouse Management System – which is an information system for preparation, tracking and execution of activities in warehouses,

- TMS – Transport Management System;

– SRM: Supplier Relationship Management, which involves everything relating to the handling of the supplier relationships.

1.4. Conclusion

We are able to gain an appreciation of the economic aspect of sustainable supply chain management from the publications associated with supply chain management. In particular, it is the intra- and inter-organizational connections which are highlighted. Thus, companies are no longer isolated, and can go further in information-sharing and exchange. They are supported in this aim by information and

communication technology, which represents crucial support mechanisms in any supply chain.

The goal of this chapter was to present a number of strategic tools (matrices, guides, approaches, etc.) which accompany the economic implementation of sustainable supply chain management. Here, the intention is to show how this strategy fits into an upstream approach to the implementation of sustainable supply chain management, by setting out the (few) focal elements necessary to ensure its success.

1.5. Appendix – technical specifications for electronic data interchange

Arbaoui and Morana [ARB 04] propose the construction of a set of technical specifications for EDI, specifying and/or adding elements of construction drawn from management sciences [ROL 99] and process engineering [ARB 03]. As such, the basic structure of these technical specifications includes eight clauses.

1st clause: the aim of the description of the problem is to introduce the context, give background for the service and specify the "malfunction" needing to be dealt with:

– taken from management sciences, two elements in particular need to be taken into account:

- the organizational/resources potential,

- the organizational/activities potential;

– taken from process engineering, two elements in particular need to be taken into account:

- the description of the process in a formal/semi-formal notation, and construction of reusable models,

- the environments for the use of the models when commercialized (Workflows, Merise).

2nd clause: the constraints section aims to present:

– material constraints, including:

- taken from management sciences, two elements in particular need to be taken into account: (1) the technical/resources potential and (2) the technical/activities potential,

- taken from process engineering, the following elements in particular need to be taken into account: graphic languages to model the processes in terms of tasks, roles and objects;

– social constraints (adaptation at the level of the users), including:

- taken from management sciences, two elements in particular need to be taken into account: (1) the human/resources potential and (2) the human/activities potential;

– access security constraints, including:

- taken from management sciences, four elements in particular need to be taken into account: (1) the nearby environment, (2) the measurement of the pressure on the company, (3) the move from an organizational form to a market logic and (4) the evolution from partner relationships to a concept of electronic hierarchy,

- taken from process engineering, the following elements in particular need to be taken into account: the modeling languages and implementation environments, taking account of the geographic distribution of the processes and the interoperability of the systems.

3rd clause: the functionalities clause aims to describe the existing and desired functions:

– taken from management sciences, four elements in particular need to be taken into account: (1) the logistics, (2) the organization, (3) the relationships with the surrounding environment and (4) the company's strategy;

– taken from process engineering, two elements in particular need to be taken into account: (1) evaluation and improvement of the processes and (2) analysis, control and quality of the processes.

4th clause: execution time.

5th clause: the "who does what" at the level of the project manager and the contractor:

– taken from process engineering, one element in particular needs to be taken into account: knowledge of the processes and modeling capabilities.

6th clause: confidentiality:

– taken from process engineering, one element in particular needs to be taken into account: the mechanisms for the implementation of the distribution and cooperation. The objective is to manage accesses and configurations, and to synchronize the data.

7th clause: the modes of reception, which encompass the pre-recipe, the definitive recipe, the guarantees, unpacking/installation and security.

8th clause: the particular clauses with after-sales service and training.