Introduction

Reverse logistics is booming. This expression is not even 20 years old yet! As a teenager, reverse logistics is still being defined and is still maturing. Ongoing research into this subject brings out appropriate methods to be implemented. Much remains to be said, much remains to be suggested.

In this introduction, we will look back at the changes in the design and management methods of production systems of goods and services. This historical perspective will provide us with a better understanding of where the preoccupation about logistics aspects comes from. Changes in the make-up of our society have brought us to notice that reverse logistics answer current concerns and that businesses cannot really avoid it. This brief review of the events that had a great impact on business design and management throughout the last few decades are examined in this book which also gives the author's point of view and positioning of perspectives.

The core mission of any business producing goods and services is focused on profitability. Profitability can be achieved in two ways: increasing the profit margin or reducing costs. Increasing the profit margin can be successful in monopoly situations, but not within a competitive market. The first industrial engineering tools (1940–1946) [HAM 71], such as operation process charts, flow process charts, and assembly charts, can be analyzed with the help of the interrogation technique (who, what, how, where, and why). These tools were mainly developed in order to reduce costs. Simplifying methods, organizing the workload, stopping wasting human, material and financial resources, and choosing the most productive processes were the first contributions of industrial engineering. The value analysis technique that was developed by Miles in 1945 [LAC 80] is another example. Miles worked on how to focus only on the product or service functions that are expected by consumers and on the value that consumers attach to the solutions suggested answering their needs.

During each economic crisis, new techniques are proposed to systematically hunt down waste. Therefore, some variants are emerging, but all of them are based on work simplification techniques. Some will tell you that they are not the same, but it is tempting to say, for example, that value-added production advocates the same philosophy as an updated value analysis. Productivity gains of a few percentages become significant in times of crisis and for some this is often a matter of survival.

These methods have been suggested and used to optimize production systems with an economic perspective and by an optimization-based analytical approach. This is called an insular approach, i.e. when businesses try to optimize their processes, they reduce their costs and indirectly their production lead time. This approach is focused on the business, on its entity.

In the 1990s [BRE 99], some quality-based approaches appeared. The *Total quality*, *5S method*, *Six sigma quality*, *activity-based costing (ABC)*, and *Quality costs* have brought new dimensions. Some concepts, such as total quality, have shown that a business is a link in a chain. A business offers a product or a service to another business and so on until it reaches the end consumer. If we take the example of a simple pencil, the number of "actors" taking part in its production is quite impressive, including a mining business to extract graphite, a forest enterprise to get wood, and a retail store to sell pencils. This example underlines the extent of the supply chain. The ISO 9000 certification was very popular in the 1990s, which fits with this approach, because it suggests a corporate image, which is synonymous with process control. This is supposed to be a guarantee, going beyond the good functioning of the products at the time of purchase and beyond the compliance with specifications. This is a guarantee to ensure a promising partnership with the various supply chain actors. In parallel, business computerization was spreading and accessibility to information technologies offered new possibilities and practices.

The emergence of the Internet has enabled businesses, which were geographically isolated, to become known worldwide. Distances are not obstacles anymore. Marketing budgets do not have to be excessive anymore to ensure the marketing of its range of products. Market globalization has arrived. Information technologies help in the integration of various stakeholders. We can now dream of high-level partnerships with the exchange of information reducing again the reaction and delivery times expected by customers.

The Web has led to electronic commerce. It comprises four stages: *brochureware*, *e-commerce*, *e-business*, and *e-enterprise*. Figure I.1 shows the relationship between those four stages of electronic commerce. The brochureware and e-commerce stages are widespread, and there are more and more successful implementations of the other two stages, even if they are not yet generalized. Table I.1 presents the characteristics of electronic commerce.

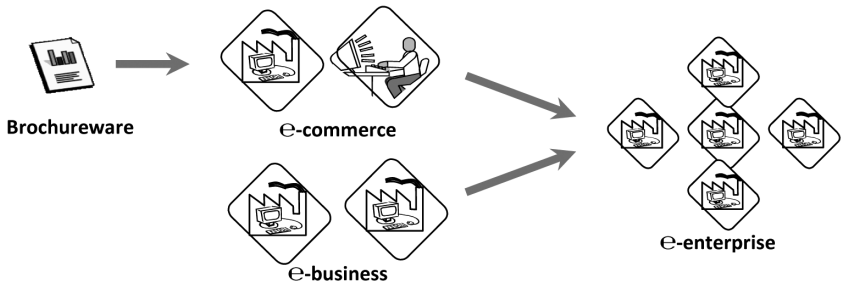

Figure I.1. *Relationships between the electronic commerce stages [MAR 05]*

Brochureware. At this stage, visitors can access via the website a static display of information that could be of interest to them, including contacts, information on products, and the description of the business.
E-commerce. At this stage, customers can buy the products sold by businesses online. Most of the time, this stage is applicable for retail businesses.
E-business. This stage consists of exchanging data between businesses. They can also make transactions among themselves.
E-enterprise. The integration of their business processes with the processes of the three other stages.

Table I.1. *Description of the four stages [VAL 05]*

First, the emergence of the Internet has transformed the commercial relationships between businesses and customers, and second, the business relationships between partners (stage 3 of electronic commerce). Distance is not limiting the possibilities of relationships anymore, nor is it restricting the choice to local businesses with a good reputation. With globalization, customers have access to a larger supply of products and services and to an increased number of potential suppliers. In this context, businesses must differentiate themselves with a better customer service. We thought that the ISO 9000:1994 standard would allow us to distinguish the businesses on which we should focus, but this norm showed many loopholes. We have quickly noticed that it was not enough for a business to demonstrate its mastering of its processes to ensure the required quality. Indeed, one thing was forgotten in this version, one of the main *raison d'être* of the businesses (if not the main reason): customers and their expectations. The ISO 9000:2000 version puts customers and their requirements back at the center of the standard.

Market globalization has also been materialized by the implementation of free-trade agreements between countries. World associations (World Trade Organization and World Bank) and free-trade agreements (NAFTA: Canada and the USA, which were joined in 1973 by Mexico and by the "Inner Six of Europe", and now by the European Union with its 27 member states) have all contributed to accelerate the circulation of goods. All barriers are removed with these organizations and agreements and everyone seems to be favorable to collaboration. Global supply chains were thus facilitated. This process was stimulated by the emergence of the Web. The vertical integration of businesses has helped refocusing on business core competencies. After having reduced costs, controlled processes, reduced delays, ensured the quality, and reduced waste of any kind, supply chains are in an era of global optimization. The chain implementation enables a specialization of the business core competencies; each business being a link of the chain. Insular optimization is outdated.

Since the 1990s, it is understood that businesses differentiate themselves not only with the price, but by quality, and delivery times of their products. A fourth aspect should be taken into account: customer service (technical support and maintenance). Customers need to be guaranteed the proper operation of the product. Online technical support has appeared with electronic commerce. With customer service spreading, business practices have changed.

The pressure of competition is strong in the context of globalization. The right product must reach the right customer's (taking into account the fact that products are more and more customized), in the right place, and at the right time. Supply is considered complete when the product is installed and is operational at the customer location or point of use. The supply chain design and monitoring have, therefore, become key elements to reach profitability objectives.

The supply chain must create value for the business. Each step of the value creation process must contribute to reach the customer's expectations. Businesses interrogate themselves on their products, while trying to anticipate customer expectations in line with technological developments. On the other hand, with the accelerated emergence of China and India, the beginning of the 2000s has led to an explosion in the prices of raw materials because of their scarcity. Sustainable development has awakened people to the importance of consuming without jeopardizing the capacity of the future generations to meet their own requirements, while meeting current needs [WCE 87]. The collective awareness of the fragility of our planet has increased with the Kyoto Summit of 1997.

With the concept of sustainable development, a regulatory framework was born to minimize the environmental impacts of business activities. The European Commission has passed and implemented a law giving a sense of responsibility to businesses. One

of the directives is about Waste Electrical and Electronic Equipment. This waste is constantly increasing because of the new applications and technological developments that are tremendously facilitating the daily tasks of modern life.

Sustainable development increases the need to systematically implement reverse logistics, even though this logistic function has been present within a few businesses for longer than we would expect. Up until very recently, only catalog sales shopping service businesses were struggling with this problem. Retail shops were accepting returns, but very often there was no policy to take care of these returns. Products were simply destroyed. Pricing was consequently set. Nowadays, there are more and more returned products, because the return policies of competitors are very liberal, to satisfy customers fully.

As mentioned above, the customer service activity is now omnipresent in businesses. Their core mission is no longer only focused on satisfying customers. We are quite removed from the simple concept of warranty return that manufacturers must provide. This redefines their mission and the concept of responsible business is emerging. It must answer to customer expectations, while customers are nowadays demanding from businesses an environmental and social awareness. Paradoxically, consumers are nowadays little inclined to carry out the necessary changes in their consumption habits. And yet, we need to contribute towards the development of new methods and tools, which will materialize these new responsibilities. Customers have more and more expectations from the products and services supplied by all the actors of the supply chain. The time when businesses were "running the show" is over.

The future has always belonged to the businesses outstripping regulations and modifying their processes to offer customers a little extra in comparison to their competitors. Proactive versus reactive approaches have often won strategically. Reverse logistics can be useful for businesses to differentiate themselves from others that have not already integrated it. However, many questions have not yet been answered, such as:

– How can we make the reverse logistics of all the currently offered products profitable?

– How can we make the reverse logistics of older products profitable?

– How can we ensure the traceability of products while respecting the customer's private life?

– How can we control unknown costs?

– How can we be sure when we start up these operations that costs will be significant?

– How can we justify this investment and identify its opportunities?

Such interesting challenges!

The book is organized as follows. Chapter 1 presents the forward logistics progression about the flows from suppliers to end consumers. It tackles cash, material and information flows, actors, as well as the main activities of the forward supply chain. Then, it shows how chains are evolving in more complex structures that become networks, where the link customer–supplier is no longer as clearly defined and where the game leader is changing. Moreover, customers are not only scattered throughout the world, but also have increasingly varying tastes and characteristics for each specific region. This leads to a multiplication of flows and thus to more complex transport networks, as well as to a widespread use of natural resources. The chapter highlights the impact of this massive consumption and tackles some insights that will be developed in the following chapters.

Chapter 2 presents reverse logistics, as well as the various types of products that can be returned. The organization of reverse logistics is shown in the form of processes that businesses can use. The generic process we have chosen to present is widely known and well established. Each stage is detailed. The objective is to increase practitioner awareness to challenges they will have to face during the deployment of this logistic function within the business. Strategic, tactical, and operational stakes are reviewed, without forgetting potential income sources and the invested costs. We also list which decisions should be taken to implement reverse logistics within a business. We will attach much importance to the potential processing of the returned products. Businesses do not have to implement all these processes, because they generally depend on the nature of the products, on the salvaged quantities, and on the age of the products when they are returned. We have tried to establish an exhaustive inventory of processes to provide a strategic plan within a reasonable time frame. The implementation of the processes could be spread out over time and some of these processes could be removed one day, if the concepts mentioned in Chapter 3 are implemented.

Chapter 3 presents the context in which reverse logistics in businesses is carried out, i.e. the increasing interest toward sustainable development in their logistic networks. Sustainable development leads businesses to include “triple bottomline” in their decision-making process, which leads to new economic, environmental, and social considerations. Taking into account these considerations raises some questions about the engineering and management of products, processes, and logistic networks. Businesses have various motivations to take them into account. They are usually tackled in a voluntary approach or under outside pressures. Various solutions are available depending on motivations. Several concepts, methods, and tools are available to tackle specific aspects of sustainable development. These are the basics for a smart and responsible usage of the resources at the disposal of logistic networks.

Chapter 4 is about the main changes to be tackled in preparation for the suitable integration of reverse logistics into a supply chain in a sustainable development context. The resulting network is represented in the form of a value loop. The concept of a loop is used to underline the impact of the decisions that can occur throughout the life cycle of the activities, products, and services. The value is the valve perceived by the various stakeholders involved, i.e. businesses and their business partners, consumers, and society. It represents the economic, environmental, and social opportunities resulting from it. First, the chapter presents various engineering and management decisions. It then sheds light on the definition of this value, on the mechanisms to be implemented in order to monitor and control it, and finally on the necessary collaboration between stakeholders to ensure this value in everybody's eyes. It presents ideas of solution for the deployment of sustainable networks.

We wanted throughout the book to provide examples, actual cases of application and questioning to illustrate our subject. They are found in the text in boxes. Each box summarizes a specific idea from the current section. We have made them short and concise to help the reader understand the stakes and challenges. Some of them are inspired from our research projects and others from our own experience as consumers.

The objective of this book is to supply an educational tool for engineering schools and a management tool for an efficient implementation of the reverse logistics function. It brings together the knowledge acquired by the scientific community. Even if reverse logistics has been the subject of several books in the past 15 years, very few theories have been developed and the subject is far from being exhausted.

This book proposes generic concepts and processes that can be adapted to all businesses producing goods and services and which aim to integrate reverse logistics. These processes will enable us to shed light on their complexity and to take into account all the important variables.

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