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CONTROL, SYSTEMS AND INDUSTRIAL ENGINEERING SERIES

Supply Chain Performance and Evaluation Models

Dominique Estampe

ISTE WILEY

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Series Editor
Jean-Paul Bourrières

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ISTE

WILEY

First published 2014 in Great Britain and the United States by ISTE Ltd and John Wiley & Sons, Inc.

ISTE Ltd
27-37 St George's Road
London SW19 4EU
UK

www.iste.co.uk

John Wiley & Sons, Inc.
111 River Street
Hoboken, NJ 07030
USA

www.wiley.com

Library of Congress Control Number: 2014947877

British Library Cataloguing-in-Publication Data
A CIP record for this book is available from the British Library
ISSN 2051-2481 (Print)
ISSN 2051-249X (Online)
ISBN 978-1-84821-667-9

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Preface

What is the best way to evaluate supply chain performance? This may seem like a simple question, but the answer to it can be quite complex, given that the supply chain can be regarded from many points of view, such as financial, information, strategic, operational, suppliers, clients, shareholders and societal. The complexity of the systems involved can be best understood through systemic analysis and modeling; in this way, an insight can be gained into all of the interactions in each of the subsystems. Performance evaluation cannot be conducted without the use of modeling or an approach which identifies the values created for all of the supply chain. Performance is linked to value created. This book aims to explain the requirements for modeling, to show how managers can model an organization's supply chain and, in this way, through the understanding they have gained of value creation and its attributes, they can take the performance evaluation into consideration more effectively.

Models for evaluating performance are management tools which allow strategic changes to occur [NEE 95]. One of their characteristics is that they show several points of view regarding the organization of the supply chain (financial, strategic, operational, etc.) in order to make analysis over time and space possible. This book presents the different supply chain performance evaluation models. It explains why it is necessary to evaluate the contribution of the supply chain to the value creation objectives throughout the chain, and why this is necessary in order to respond to customer demands in terms of time, responsiveness and reliability. This book shows how to choose an evaluation model as a function of criteria such

as the maturity levels of the organization, the decision-making and the value creation required. Finally, this book should help managers to understand how to implement supply chain performance evaluation, through the use of an illustrative case study.

Dominique ESTAMPE
September 2014

Acknowledgments

This book might never have seen the light of day were it not for the support, the advice and the experiments conducted alongside all those who have worked on the subject of this book.

First, I would like to thank Samir Lamouri, Professor at ParisTech Arts et Métiers, for his encouragement and support during my research and Jean Luc Paris, Professor at IFMA, for his expert contributions.

I would also like to thank Michel Favre Bertin, who initiated the SCALE model and has contributed his experience with evaluation frameworks throughout the many years that we have worked together, for helping with the implementation of new supply chain audit approaches and his partnership in conducting company audits.

Next, I would like to thank all the ISLI students at KEDGE Business School, who were involved in the studies designing and implementing the company auditing tools. Through their innovative ideas and capacity for hard work, I gained further insights and ideas, without which this book might not have been possible.

Finally, I would like to offer particular thanks to my wife Laurence and my two sons Théo and Timothé for their unfailing support.

Introduction

Companies define their new internal or external modes of organization using organizational models learned through management experience (empirical models), or gained through predefined concepts and framework (reference models). These reference models are tools for the analysis or creation of processes which offer managers the possibility of implementing various “best practices”. Depending on the management modes, these “best practices” are different for each company.

In this book, we will address supply chain management, which is defined as “the integration of key operational processes from the end user to the original suppliers of products, services and information, which bring added value to customers and other stakeholders” [CSC 98].

“Best practices” for supply chain management are characterized by the quest for improvement in the collaboration between all of the companies. This collaboration usually takes the form of the introduction of common management tools (e.g. Vendor Management Inventory, Collaborative Planning, Forecasting and Replenishment), the use of inter-company information technologies (e.g. Web Data Interchange and Internet of Things), or by sharing experience in product design or in manufacture.

We will return in detail to the definitions of supply chain management and will analyze the notion of performance, using systemic modeling. We will show that supply chain management has its basis in a systemic approach where each sub-element of the system is involved in global optimization.

In order to better understand the notion of performance, we will show that it is maybe situated within a larger vision associated with value creation; we will recall the principles of value creation. Value creation for supply chain management will thus be viewed from the perspective of the chain as a whole.

Reference has often been made to an important question: how can a company identify value creation, and what method can it use to look for it? We suggest a framework for identifying value creation and, through an analysis covering a panel of companies, we will aim to establish correlations between the implementation of supply chain best practices and value creation. This analysis will raise the question of current supply chain performance evaluation systems and how suitable they are for seeking and creating value. To achieve this, we will characterize the various existing models in order to gain a better understanding of their domains of use. We will show that these are not strongly oriented toward value creation for the entire chain, and we will suggest a new model that is focused on this type of value creation. We will identify a general framework for reflection on the implementation of supply chain management performance evaluation models.

Finally, we will suggest a model which identifies not only value creation for a single company, but also a value creation that is associated with all of the actors in the chain.

The book is organized into several chapters. In Chapter 1, entitled "Supply Chain Management Modeling", our goal is to define supply chain management and identify the tools for modeling supply chain management. We suggest a definition for the concept of performance and present the main principles of supply chain management performance. Following this, we will link supply chain management performance with value creation and suggest a definition for the concept of value associated with supply chain management.

In Chapter 2, entitled "Value Creation and Supply Chain Performance", we will show that the implementation of supply chain management best practices is strongly correlated with value creation. We will first suggest indicators associated with value creation and then will identify the links between supply chain management performance levels and value creation throughout the chain.

In Chapter 3, entitled “Help in Choosing Supply Chain Performance Evaluation Models”, we will compare the various existing supply chain performance evaluation models in order to help companies choose models suitable for their needs. To this end, we will characterize the models using a range of criteria.

We will see that value creation is not always taken into consideration in all the models, and we will provide, in Chapter 4, entitled “Performance Evaluation Model for Value Creation”, a detailed analysis for some models in relation to value creation. In Chapter 5, we suggest a new evaluation model and put it into practice in a case study.

Finally, in the Conclusion, we will suggest other possible useful areas for future study regarding performance evaluation tools.

1

Supply Chain Management Modeling

1.1. Supply chain management

Historically, the management of flows was mainly concerned with internal company processes, aiming to optimize material, information and financial flows. The concept of logistics defined this early stage in the development of the management of flows [COL 96]. With logistics management, the purchasing, production and distribution were not considered separately; they were managed as part of an overall view of flows within the company.

In 1986, the Council of Logistics Management (CLM), which is now the Council of Supply Chain Management Professionals (CSCMP), defined logistics management as *"The process of planning, implementing, and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished good, and related information flow from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements"* [COO 97].

The consideration of distribution points and production plants within the management of flows led to the evolution of the concept of logistics from a company-centered approach toward a more global logistics approach [COL 96].

This marked a turning point in supply chain management: from this time onward, all the partners in the chain were taken into account. They were no longer seen as being independent of each other, but rather as needing to learn to coordinate and synchronize their activities.

Study of the supply chain management has come into being as a result of this need to coordinate the activities of various companies and their flows, from the suppliers' suppliers to the end customer.

It aims to achieve coherence between the various actors in the chain, even where their end goals do not match.

Forrester has clearly illustrated the intraorganizational nature of logistics: *"Management is on the verge of a major breakthrough in understanding how industrial company success depends on the interactions between the flows of information, materials, money, manpower, and capital equipment. The way these five flow systems interlock to amplify one another and to cause change and fluctuation will form the basis for anticipating the effects of decisions, policies, organizational forms, and investment choices."* [FOR 61] cited in [MEN 01b].

During the 1990s, supply chain management was seen as being a systemic approach that viewed the chain as one unique whole rather than a set of disparate elements working toward their own individual goals. [MEN 01b] provides a pertinent overview of the different definitions of supply chain management.

"The objective of managing the supply chain is to synchronize the requirements *of the customer with the flow of materials from suppliers in order to effect a balance between what are often seen as conflicting goals of high customer service, low inventory management, and low unit cost."* [STE 89].

Supply chain strategic management involves *"... two or more firms in a supply chain entering into a long-term agreement; ... the development of trust and commitment to the relationship; ... the integration of logistics activities involving the sharing of demand and sales data; ... the potential for a shift in the locus of control of the logistics process"* [LA 94].

Supply chain management is "an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user" [COO 97].

Supply chain management is a concept, "whose primary objective is to integrate and manage the sourcing, flow, and control of materials using a

total systems perspective across multiple functions and multiple tiers of suppliers*"* [MON 98].

Supply chain management is the integration of key business processes from end user through to original suppliers that provides products, services and information that add value for customers and other stakeholders [LAM 00b].

By definition, supply chain management requires companies to [MEN 01b]:

– extend the integration of behaviors, to customers and suppliers;

– mutually share information between the partners of a chain;

– mutually share risks and rewards, while creating a competitive advantage;

– cooperate with their partners, conducting joint operations within the context of close relationships;

– share goals with their partners, serving customers;

– integrate processes, from purchasing to distribution, including manufacturing.

Where companies need to share and integrate processes, this of course implies coplanning, sharing of profits and risks, systematic exchange of information and building bridges between the cultures of the companies involved. To achieve a level of balance between the actors, a relationship needs to become established over a relatively long period [EST 98b]. The initiatives required combine strategic and tactical modifications; successful achievement of these is attained by following three essential stages:

– *intraorganizational integration*: design, purchasing, production, distribution and sales;

– *interorganizational integration* with the company's partners: *suppliers, suppliers of suppliers, customers and customers of customers*;

– *the development of a flexible network* of companies, ensuring a significant degree of responsiveness to the market [EST 98b].

As a result, companies that design value-creating supply chain organizations have generally created common processes with their customers. These companies define jointly shared processes that involve

several actors. For example, for Vendor-Managed Inventory (VMI) processes , the actors codefine the procurement process, the inventory levels and the information systems suited to the aims and constraints of each of them. The goal of Collaborative Planning Forecasting (CPFR) is to develop a process of sharing forecasts between the actors in the chain. The collective development of processes by the actors in the chain guarantees perfect synchronization and also mutual exchange of information and/or resources [MEN 01b, EST 98a].

Companies may meet with certain difficulties when creating common processes; these have been highlighted by Balmes: "the length of processes and the disparity in management are such that it is difficult to ensure that the implemented process is sufficiently reactive when faced with fluctuations in demand" [BAL 00b]. It is not easy to achieve the involvement of every actor in this dynamics of synchronization and adding value. There are many limiting factors for each actor in the chain: organizations may be quite different from each other, and they may also have different supply chain management maturity levels. There are also strong internal limiting factors within each company, for example, the powers of commercial and purchasing functions do not favor the sharing of resources between each actor in the chain. Differences in economic scale between the companies involved in the chain may also hinder the creation of frameworks for reciprocity and mutual exchange. Technical limiting factors linked to the heterogeneity of information exchanged or of different management tools mean that common systems for exchange will need to be put in place.

On the plus side, once common processes have been developed, then it is possible to identify and counteract delays in information transmission, activities that do not add value, and any local deoptimizations that may hinder progress.

This broad global vision of the whole chain would seem to be an important factor in success, in that it can enable the improvement of performance over the entire organization in a network of companies, including through better sharing of resources (stock, transport, warehousing, etc.), more rapid response to customers and creating the dynamics for common design of products and services.

Supply chain management is an interorganizational approach, and refers to an extended company or network of companies (Figure 1.1).

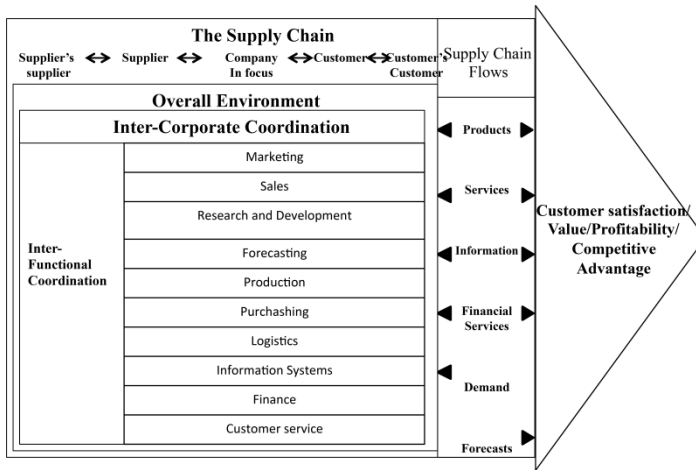

Figure 1.1. *An interorganizational approach [MEN 01b]*

When these multiple aspects are combined, supply chain management can be defined as the systemic and strategic coordination of classic operational functions within a company and between partners within the chain, with a long-term view to improving performance for each company and for the chain as a whole [MEN 01b].

Through all these definitions, it is apparent that the supply chain is, in fact, a set of subsystems that interact with each other. To make further progress with analysis and development, it is important to know how to model a supply chain, so that a conceptual reference framework is available. Through such a framework, the best management practices to implement can be identified, and the performance of the supply chain can be evaluated.

There are various modeling tools that have been developed in the context of systemic analysis; these can be adapted for the use in supply chain management.

1.2. Supply chain management and modeling

1.2.1. *Systemic modeling*

The modeling of organizations proceeds largely through representation of their systems; this representation then makes it possible to gain a better

understanding of the complex interactions between the different actors in the organization, and between the organization and its environment.

Forrester and Le Moigne have given us the following insights into modeling:

"The system is a set of interrelated elements whose interactions make new properties emerge, properties which are not present in the elements themselves" [LE 99].

"The system is an object which, in an environment with an end goal, carries out an activity while its internal structure evolves over time, without, however, any loss of its unique identity" [LE 94].

"The system is a process of retroaction which has a specific, ordered structure" [FOR 61].

> A system is a set of elements which work towards the same end goal, interacting with each other and with the environment.

Several authors have developed a variety of approaches for modeling systems, where an organizational model is understood as having *"the aim of formalizing all or part of the company with a view to understanding or explaining an existing situation or to carrying out and then validating a design project*" [BRA 95, VAL 03].

There are three distinctive modeling approaches:

1) *The functional approach*, which describes the functions that the system fulfills. This approach is essentially a static description of the system, achieved through breaking it down into elements or processes, usually hierarchically. Thus, this approach describes the organizations in a descending order, in terms of processes and interaction, and may be described by the systemic paradigm [LE 99]:

i) the end goal, specifying the reason for the system's existence;

ii) the environment;

iii) the system values;

iv) the organizational vision;

v) the operational elements in the value chains;

vi) the structural resource elements necessary to the value chain [JAU 04].

The supply chain model, i.e. Supply Chain Operation Model (SCOR) [BOL 11], is an example of this approach where the model is constructed around processes. It emphasizes "action" processes: "I am making forecasts", "I am developing a production plan".

2) *The informational approach*, which describes the data and information exchanged within the system. To monitor a completed action, the circulation of the necessary information must form a closed loop, allowing the organization to evaluate the effects of the actions. This approach is linked to the feedback loop and the emergence of cybernetics [WIE 65].

3) *The dynamic approach*, which characterizes the operation and development of the model. This approach describes how suited the system is to the defined end goal, and in particular:

i) describes the controlling loop, which ensures that information is collected;

ii) measures of the gap between the current state and required result;

iii) regulates new parameters by definition [NOY 07].

This approach is based on the concepts of [JAU 04]:

– stocks (human, material and financial resources, etc.);

– flows that represent the system;

– causality and feedback loops;

– lead time.

The dynamic approach emphasizes the interactions of the processes: "I increase the level of my inventory in order to adjust the flow of customer orders".

The beer game developed by MIT [FOR 61] is a good illustration of how the dynamic approach can be implemented, and particularly of the impact of information transfer lead time within the decision chain.

Each of the approaches listed above is linked to a specific model.

1) Functional and informational approaches are based on a structured approach, which is usually hierarchical and based on a graphic formalism [BER 03a].

i) Structure Analysis and Design Techniques (SADT) [LIS 90];

ii) Structured Analysis (SA), Structured Analysis On Real Time (SA-RT) [BRE 01];

iii) Method For The Analysis, Design And Creation Of Information Systems (MERISE) [TAR 83];

iv) Unified Modeling Language (UML) [TER 05];

v) Computer Integrated Manufacturing Open System Architecture (CIMOSA) [KOS 90];

vi) Graph With Results And Activities Interlinked (GRAI) [DOU 95];

vii) Purdue Enterprise Reference Architecture (PERA) [WIL 94];

viii) Unified Enterprise Modeling Language (UEML) [VER 02];

ix) Model For The Design Of The Information System (OLYMPIOS) [THE 01];

x) SCOR [BOL 11].

2) The dynamic approach is based on other tools that describe the relationships between the system actions over time, for example, Grafcet, StateCharts, Gemma, Petri Net, Markov Graph or Simulation [BRE 01].

1.2.2. *Supply chain modeling*

Definitions from systemic modeling correspond closely to the definition of supply chain management, and both highlight how important it is to manage a group of interacting elements, grouped together by a system of end goals.

It should also be noted that the approach for modeling systems is also applicable to modeling the supply chain, and that both categories of systemic approaches, functional and dynamic, may be used.

However, supply chain modeling tools must not only involve the processes used by each of a network's companies, but, importantly, must

also include the processes for exchange between each of the actors in the chain.

The approach used here is based on functional modeling, in order to model the supply chain processes that are the basic "bricks" of the organization (designing, financing, buying, producing, etc.). These processes are associated with the lifecycle of the product, from the implementation of the idea of a product, to its sale to the customer.

With each modeling tool, there is an associated logically ordered set of principles, rules and stages that leads to a useable result. This set is known as the associated method for the modeling tool.

Some models operate with experimental rules and others with more conceptual rules.

Writings on this subject associate performance and value creation with these modeling approaches.

1.3. Supply chain management – performance and value creation

1.3.1. *Assessing a system's performance*

Performance is a complex notion. Its three main assessment criteria are efficacy, efficiency and effectiveness [GIL 99]:

– *Efficacy* is the relationship between the results achieved by a system and the goals set. Efficacy is the best possible relationship between the level of customer satisfaction and resources employed to achieve it [LON 94].

– *Efficiency* is the relationship between the effort and the total resources deployed on an activity, on the one hand, and the real unit value that people receive from it in the form of usage value, on the other hand. It is the degree to which the objectives are obtained at a lesser cost.

– *Effectiveness* is the degree to which the objectives are obtained at a lesser cost, while satisfaction and motivation of the organization's members are improved. The concept of effectiveness is tightly linked to satisfaction with the results obtained [COL 05].

According to Lorino, if it is conceded that a company's performance is fundamentally economic in nature, it then becomes associated with the net

creation of wealth (creation less destruction), because the company consumes resources (personnel time, capital, material, space, etc.) to produce the end results [LOR 00]. Thus, performance appears as a ratio, which cannot always be measured, between the value C of destroyed resources (the "costs" linked to the company's operation) and the value V of the end results obtained.

According to Mendoza and Bescos [MEN 01a], the concept of performance within a company is that which contributes to:

– improving the *value and cost*;

– reaching the *strategic objectives*.

Therefore, performance is based on value, cost and strategic actions.

Systemic analysis suggests a model for the assessment of performance based on the control model; control by action levers using setpoints or objectives (Figure 1.2).

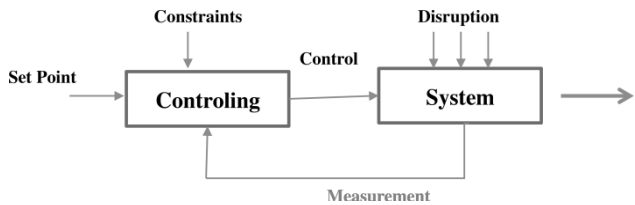

Figure 1.2. *Control model [NOY 07]*

A system's performance is thus defined by:

– a characteristic that qualifies and/or quantifies the system's result [NOY 07];

– a capacity to reach the goals set, expressed in terms of socio-economic efficacy, service quality and efficiency;

– a contribution to net value creation [LOR 03].

There are several types of performance assessment [BUR 03]:

– *A posteriori* assessment (Figure 1.3) assumes that the system has already been designed and the objective is to monitor it by performance,

comparing the measurement with the intended goal. Through comparison, the actions to be taken in the system can be defined.

– *A priori* assessment aims to design the system and then to define its behavior, generally by using simulation tools to analyze its performance.

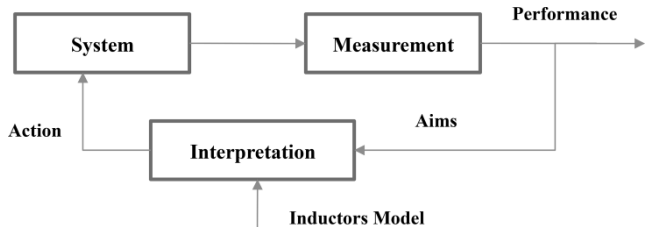

Figure 1.3. *A posteriori performance assessment [BUR 03]*

1.3.2. *Performance indicators*

Performance is measured using indicators that are defined in different ways by different authors:

"A performance indicator provides information which should help an individual or a collective to steer their course of action so that they achieve a certain result, or which should help them evaluate the results of an action" [LOR 03].

"A performance indicator is quantified data which measures the efficacy of variables within a decision for reaching goals defined at the decision level, considered in the context of the overall aims of the organization" [RAV 09].

"Performance indicators are quantitative data. They characterize a changing situation or action, or the consequences of an action, evaluating them and making comparisons over time" [NOY 07].

"Performance indicators provide information chosen to correspond to certain criteria, showing the changes in these over a pre-defined time period" [AFN 14a].

> A performance indicator is written in figures; it measures the achievement of goals and assesses progress in meeting a performance level.

Lorino suggests a typology of indicators (Figure 1.4) [LOR 03]:

– An indicator of *result*, which provides information on progress toward goals. However, the information given by the indicator does not describe the cause or the way in which the goal has been reached, nor does it show what needs to be changed [MEY 99].

– An indicator of *control*, which guides the actor to manage its activities. This indicator does not necessarily oversee actions in progress, an action must be operationally pertinent to be shown by it.

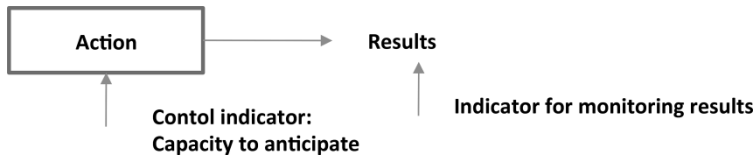

Figure 1.4. *Categories of indicators (adapted from [LOR 03])*

Recent work has associated performance with indicators in a dynamics of progress [AFN 14b]:

> A company's performance is the result of a generalized dynamic of progress, based on a system of indicators linked to objectives and decision-making variables. This system enables the company continually and systematically to understand the current situation and to see the path that it should follow, all the while measuring progress.

1.3.3. *The different models of performance assessment*

Meyer cites the example of General Motors, where the manufacturing of a door handle created conflict between design and purchasing over the product cost and its guarantee. The purchasing department wanted to buy the lowest cost product with the most standard characteristics in order to make it easy to replace the product, while the design department wanted the door handle to be an element that would differentiate its product from other vehicles. The issue at stake was neither simply economic, nor solely related to the beauty of the product, but rather it was a more global issue linked to

the market value of the product and the profits that it might have allowed the company to obtain in terms of increased turnover [MEY 99].

This example shows that it is important to pay attention to the wider picture, by analyzing all the possible impacts of the decisions of each of the actors on the overall performance of the organization.

In fact, a performance assessment system should be implemented transversally, creating a *common language* to obtain a common definition of objectives and problems to be avoided, in this way avoiding opportunist behavior [MEY 99].

Systems for assessing performance are management tools that allow strategic changes to occur [NEE 95]. They are characterized by their ability to represent several viewpoints within the organization (financial, strategical, tactical, operational, etc.) and to facilitate analysis of the organization over time/in space [BIT 95, FOL 05].

Since the beginning of the industrial age, performance assessment models have evolved in line with the development of new patterns of thought [LON 94].

In 1920, Sloan used financial control models in General Motors, particularly the DuPont model [SLO 64]. After the end of the Second World War, operational research began to be developed for use, with a view to optimizing strategic decisions.

In the 1970s, performance evaluation extended beyond the production function to encompass all of a company's activities, due to the growing availability of information technology and systems. Performance driving became generalized, with the introduction of the first scoreboards.

During the 1980s, performance driving was centered on company activities, with methods such as Activity Based Costing (ABC) and Activity Based Management (ABM) [LA 96].

In the 1990s, performance management became a multicriteria operation, using performance indicators linked to aims, results and means associated with these [KER 06].

There are many assessment models currently in existence, based on characteristics that often differ between models [TAH 03, BUR 03]:

– balanced scorecard [KAP 96] was the first model to include, in addition to financial performance, other performance indicators such as those linked to customers and organizational resources;

– SCANDIA browser [EDV 97] places people at the center of performance and driving;

– the ECOGRAI model is based on the GRAI model and takes decision variables into account [DOU 01];

– the prism performance model positions all of the actors in the company's environment as an integral part of its strategy [NEE 02].

1.3.4. *Performance of supply chain management*

Some authors have developed and suggested other concepts focused on the performance of supply chain management, and have demonstrated that an effective supply chain approach should have the following capacities:

– *internal reconfiguration* linked to the complexity of the flows. Mesnard emphasizes that the successful performance of a supply chain depends upon the simplification of complex activities and concentrating on key processes: in this way, the reconfiguration of all the resources of each of the chain's actors is achieved more rapidly [MES 00];

– *collaboration and exchange between the companies*. Collaborative processes and exchange processes should have as their foundation a shared aim, and a shared vision of both the product and service delivered to the customer, and they should have common modalities for change [EST 98b];

– *acceleration of flows* throughout the whole of the chain [MES 00];

– *fluidity and reactivity* toward customers, through putting structured organizational frameworks in place that are concerned with processes and not functions. Hammer and Champy identified the notion of a value-added process, which should directly provide the customers with the service they require [HAM 93];

– *evolution of roles* in the organization of work, not only by the implementation of new processes or by changing software or technology in use, but also by making changes within the decision-making mechanisms, evolving managerial roles so as to install other sense-making mechanisms within the company and with other companies [COR 03].

Each actor in the supply chain should be aware that performance also involves a set of principles:

– *sharing the same vision of the product/services pair expected* by the customer, independently of any organizational consideration within each of the companies;

– *decision-making that is coherent between all of the chain's actors* in the context of the same understanding of the product/services pair;

– *processes created together* that make it possible for exchanges to occur between the partners in the chain, all the while bearing in mind the ultimate goal of customer satisfaction at the end of the chain;

– *installation of tools that allow effective information synchronization to take place* (common databases, Electronic Data Interchange (EDI) exchanges, WEB, etc.) should favor speed of exchange and visibility of information between the actors, with the goal of serving the end customer [EST 98a].

However, despite these elements linked to characteristics of the performance of supply chain management, there is no commonly accepted mechanism for identifying whether a supply chain is performing effectively or not. In addition, the elements for analysis of the performance of supply chain management vary widely between authors; however, systematic analysis has made it possible to define the generic concepts related to performance.

1.3.5. *Value creation and supply chain performance*

Fabbe-Costes recalls different dictionary definitions of value (Table 1.1), which show the great variety of possible interpretations for the word [FAB 02].

Definitions	Notes
Measurable characteristic of (an object's) propensity to be exchanged or desired	Is related in particular to price
Quality of an object based on its objective or subjective usefulness (usage value), on the relationship between the offering and demand (exchange value) or on the quantity of work required to produce it Quality (of a good or service) based on its usefulness (usage value), on the relationship between the offering and demand (exchange value) or on the quantity of factors necessary to produce it (labor value)	Relative, contingent, perceptual notion Linked to usefulness, to relative rarity
That characteristic, which means that something meets the ideal standards for its type and that makes it more or less worthy of respect and admiration	Referential notion for evaluating
That characteristic, which means that something fulfills the required conditions to be valuable, valid and acceptable	Notion of standard
Quality deemed to have been achieved by an act of judgment	Relates to an "individual judgment", the point of view is relative
Quality of something that produces the desired effect, of something that fulfills its intended function That characteristic, which means that something satisfies a particular end	Relates to efficacy, usefulness Assumes a comparison with the required aims, with expectations
Importance, price attached subjectively to something	Relates to the perception of the person who attributes "value"
That which is said to be true, beautiful, good, from a personal point of view or according to the criteria of a society, and that is given as an ideal to be sought after, as something that should be defended	Is inscribed in a local/global dialectics, suggesting the existence of a value paradigm
Preference shown by a living being, in function of the demands of its self and conditions of existence (Nietzsche)	As above
Measurement of variable quantity	Relates to the result of a measurement, but may be absolute, relative or conventional
Added value: value added to products by operations aiming to create, produce and distribute them. Measures the specific contribution of a whole group of agents to the total production	Value is created by agents

Table 1.1. *Definitions of value [BOG 00, FAB 02]*

Strategic attributes make it possible to gain a better understanding of the factors that determine the long-term performance of the supply chain [CHO 95]. These attributes depend on the creation of the added value that was wished for by the company and its chain (end customer, shareholder, company, environment, etc.). Chow has suggested a certain number of attributes, such as:

– growth;

– asset valuation;

– consolidation of links with the chain's partners, from the supplier to the customer;

– differentiation through innovation;

– increasing speed to market;

– enhancement of the environment;

– the ability to implement sustainable development.

The concept of value is defined in function of the company's and supply chain management expectations: value creation for the customer, the shareholder and within a larger vision of sustainable development.

Value for the customer

Supply chain management was initially defined as bringing different product and service attributes to the customer. These attributes could be characterized, for example, by the concepts of price, lead time and quality, and thus each member in the chain participates in creating and optimizing these characteristics. The customer is the reference point in any value creation; in fact, Balmes defined the supply chain as the process of satisfying demand, and it is on this basis that all the processes of a chain are built [BAL 00b]. This approach is reminiscent of Porter's approaches on the value chain [POR 08], and that of Kaplan [KAP 96], who emphasizes that value for the customer is a key strategic element for the company and can be built around different characteristics not only linked to attributes of products and services (lead time, price, quality, functionality, etc.), but also linked to the brand image and relationships that have been established with customers (e.g. trust or responsiveness) (Figure 1.5).

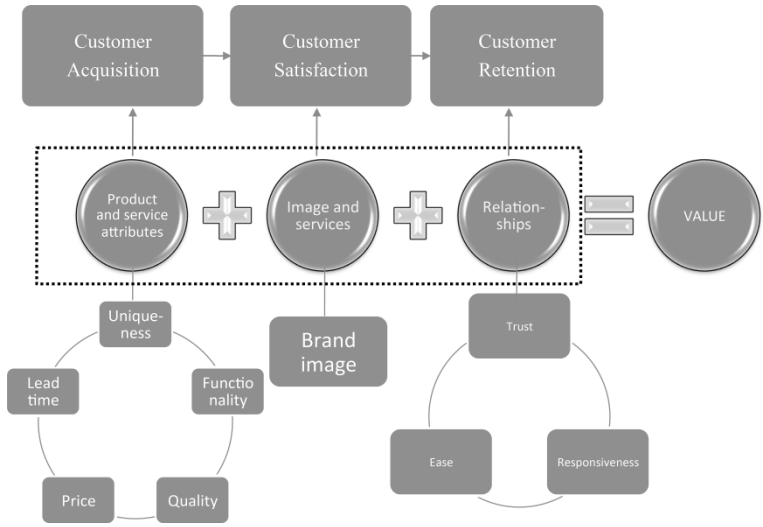

Figure 1.5. *Value perceived by the customer and causal links [KAP 96]*

Value for the customer is a group of elements that result in either the acquisition of new customers, or in the satisfaction and retention of existing customers. The company's aim is to increase its turnover in this way [KAP 96].

However, the concept of a value chain is focused on the company, and the customer may be seen as outside the company, as a consumer who is not associated with the process of value creation. The traditional point of view is not to consider the interactions between companies and customers as a source of value creation. Prahalad and Ramaswamy highlight, pertinently, that customers can choose the companies with which they wish to enter into a relationship, and that it is necessary for the company conjointly to create value with customers by cocreating unique relationships [PRA 04]. A supply chain process that is involved in common value creation with the customer is a process, the performance of which is directly measured by the customer, and where this performance corresponds to expectations. This process aims to create value for the customer. For example, the process "involve customers in the development of new products" will create value for customers if they can measure and check that what the company offers is in line with what they require.

This value is not identical for all chains, and Fabbe-Costes indicates that the value created by the supply chain for each customer is not the same, and takes as an example the very different values hoped for by hospital patients or by consumers at a hypermarket [FAB 02].

The aims of supply chain management can be accurately defined as the capacity to create value for and with the end customer over an entire chain that goes from the very first supplier to the end customer, and where each member of the chain is involved in this value creation [CHR 92].

Value for the company

The financial dimension was quickly integrated into supply chain management, by building upon the classic definitions of logistics as optimizing customer service while minimizing costs [FAB 02]. Christopher highlights that supply chain management is the "management of upstream and downstream relationships in order to deliver superior value to customers, at the lowest possible cost" [CHR 92].

> Supply chain management considers the chain from one end to the other, orchestrating the efforts of each of the partners, such that the overall financial gain is greater than the sum of the gains made by each of the partners *[EST 98a]*.

Supply chain management seeks to act on two axes; *controlling cost price*, making it possible to improve the net margin directly: reducing transport, production and purchasing costs, among others, and *controlling capital engaged* by reducing current and fixed assets. The strategic profit model (Figure 1.6), described by Lambert and Burduroglu, established links between profits and actions to be taken on the supply chain [LAM 00a].

Bertrand emphasizes that value creation for the company is a concept that implies an increase of shareholder wealth, and an additional guarantee for the creditor lending financial funds. Value creation is defined by a company receiving return on investment that is more than the level of return required by the lenders providing their funds (shareholders and financial creditors), taking into account the risk run by these investors [BER 03b]. However, many authors have highlighted that *"performance cannot be measured simply in terms of shareholder financial gain"* [BUG 06].

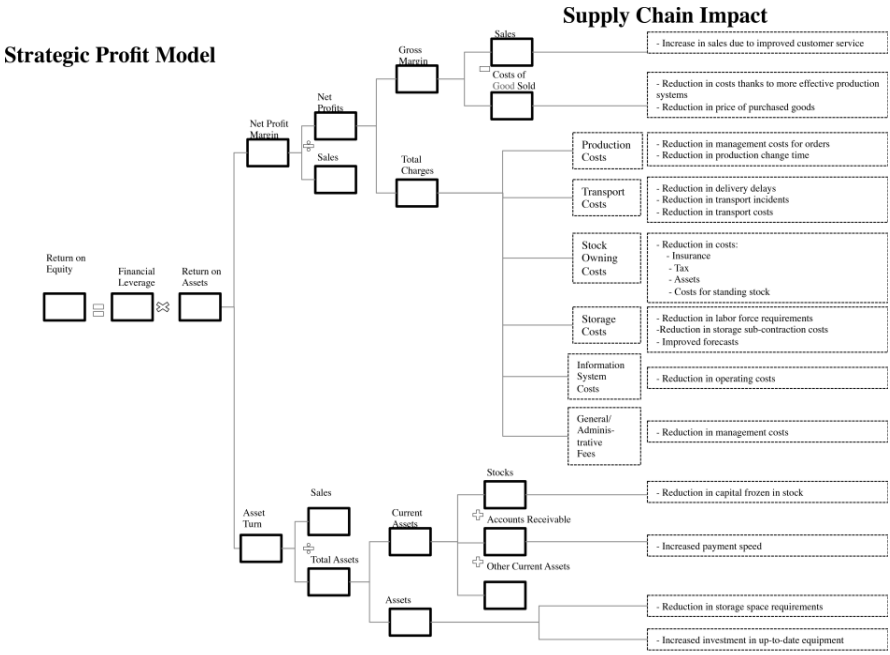

Figure 1.6. *The strategic profit model [LAM 00a]*

Value creation is optimal for the company if all of the chain's actors (manufacturers, distributors, service providers, etc.) manage to synchronize the physical, information and decision-making processes [LAM 96, COO 93].

> Value creation for the company is thus strongly dependent on value creation for the entire chain. Suppliers, customers, and each partner in the chain, are intimately connected and interdependent when it comes to global value creation. This global value creation results in value creation for each actor in the chain

There are also two important factors that are involved in value creation for companies, innovation [HIT 96], and the creation and sharing of knowledge within the organization. The best known example of sharing knowledge is the case of Toyota. Toyota distributed all of its organizational practices related to the famous Toyota Production System, not only within the company, but also within its network of collaborative companies. The result of distributing the practices in this way was that productivity and the

strong points in terms of the company's quality were maintained over the long-term [DYE 00].

Shared value for all the actors in the chain

The supply chain is characterized by a set of actors who interact with each other while working toward the same value-creating endpoint.

Supply chain management considers the chain from one end to the other, orchestrating the efforts of each of the actors, such that the overall financial profit is higher than the sum of the gains made by each of the partners [EST 98a]; in this way, the reduction in total costs for the chain makes it possible to improve the profitability of all of the actors, indeed, the profitability of each is an essential element in value creation [LAM 00a].

The acceleration of financial flows throughout the entire chain is a major driver for value creation for each of the chain's actors; in particular, improvement of the speed of financial flows by reducing the "cash to cash" complete cycle for the whole chain from the supplier's supplier to the customer's customer is an important driver for performance [BOS 03, HOF 05].

As for the management of assets, the choice of pooling resources between the chain's actors ensures efficiency and global profitability. The pooling of capacities and resources is one of the key points of supply chain financial optimization [BAL 00b].

Sharing value makes it possible to begin a process of confidence and engagement between the chain's actors, which leads to improved performance for each of the actors in the supply chain [PAN 09]. The stakeholders who cooperate benefit from a competitive advantage over those who do not wish to do so.

Therefore, it is necessary that all the actors in a chain do not individually pursue their own aims, because value creation throughout the chain would be decreased if this were to be the case.

When the chain's actors share the same aims in terms of value creation, it is not necessary to redistribute profits, because the benefits are shared. If one of the members of the chain is not benefitting alongside the others, a formal

or informal mechanism for redistributing value will need to be introduced [BAL 00a].

> The added value variables that enable supply chain partners to achieve synergies and create superior performance: information sharing, synchronization of decisions, pooling resources, sharing risks and profits, creating shared knowledge, and shared innovation [CAO 11].

To broaden the concept of actors, Clarkson classifies the stakeholders into two categories: primary actors, who are subject to contractual or regulatory links and are associated with the value chain (suppliers, customers, employees and owners), and secondary actors, who do not have contractual links with the companies in the chain (public authorities, public opinion, NGOs, civil society, etc.) [CLA 95]. The stakeholders, in a general sense, contribute, whether voluntarily or not, to value creation for the company, and are the main beneficiaries of it, or are subject to its risks.

Post *et al.* highlight that the company will not be able to survive if it does not take into consideration, in the area in which it operates, secondary actors, and in particular the general public and their well-being [POS 02].

> The aim of value creation requires that the interests and preoccupations of the various actors in civil society which might be affected by the activity of the company are taken into account by the company.

Thus, approaches linked to the concepts of sustainable development have added supplementary dimensions for value creation for society and the environment. External stakeholders view supply chain organizations that strive to integrate sustainable development in their goals as organizations that add value. These approaches have made it possible to regard elements associated with the external environment in a new light, and they play a fundamental role in the life of society as a whole. The three pillars of environmental, social and economic considerations should be taken into account together in order to develop sustainable organizations.

Porter and Kramer emphasize the importance of viewing value creation in both economic and societal terms. Shared value creation between the economic world and society leads to a virtuous circle of increased wealth [POR 11].

Fabbe-Costes suggests discussing values, and suggests the following definition of value associated with supply chain management: *"value is the judgment* made *by the stakeholders of a supply chain regarding the utility of the system as an overall offering in response to needs. This judgment is made real through business relationships, the effects of which may be measured using qualitative or quantitative variables"* [FAB 02].

Fabbe-Costes highlights that *"the ideal, in the context of academic investigation, would be to test empirically the causality relationships between the factors in supply chain management (processes, activities) which are considered to add value, and the "values" identified, in order to validate in this way their ability to explain and above all predict events"* [FAB 02].

The attributes associated with each type of value creation (Table 1.2) contribute to define the aims of any value creation process implemented in a supply chain.

Customer (C)	Lead time (C1) Price (C2) Quality (C3) Functionality (C4) Brand image (C5) Trust (C6) Responsiveness (C7)	[POR 08] [KAP 96] [LEP 07] [PAN 09]
Company (Co)	Profitability (Co1) Innovation (Co2) Creating and sharing knowledge (Co3) Invention (Co4) Growth (C05)	[CHR 92] [HIT 96] [DYE 00] [KAP 96] [CHO 95]
Actors in the chain (A)	Sharing information (A1) Synchronizing decisions (A2) Sharing resources (A3) Sharing risks and profits (A4) Creation of common knowledge (A5) Shared innovation (A6) Speed of the chain (A7) Global profitability (A8) Trust (A9) Sustainable development (A10)	[CAO 11] [LAM 96] [COO 93] [BAL 00b] [PAN 09] [DYE 00] [CAO 11] [CHO 95] [EST 98b] [HOF 05] [POS 02]

Table 1.2. *Value attributes*

Measurement of supply chain performance must include these dimensions of value creation and associate indicators to these value creation attributes [CHO].

The procedure for the assessment of company performance must take into account the attributes for value creation for all of the actors in the chain.

> Choosing value creation attributes aligned with supply chain strategy allows an organization to define an orientation for supply chain management which is coherent and consistent with forecast performance.

The assessment of the performance of these attributes is carried out through measurement of the associated indicators and makes it possible to position the company on a level of performance or a level of maturity. The choice of the type of maturity model is closely linked to the defined value creation attributes. Evolution in the company's performance is achieved through progress on the maturity scale.

1.4. Maturity models and supply chain performance

The first maturity models emerged from studies on management by quality and clearly display several levels of company performance [CRO 79]. Thus, the clear evidencing of these levels goes hand in hand with procedures aimed at improving company performance. From this point of view, "silo" organization (lowest level) performs worse than organization that takes a larger, transversal view of the company.

The best known maturity model derived from these procedures is the Capability Maturity Model Integration (CMMI), which has been developed by the Software Engineering Institute (SEI) [PAU 93] from the beginning of the 1990s onward, in order to improve the efficacy and efficiency of the processes of activities of development and maintenance for products and services, and which covers practices associated with the whole lifecycle of the product or service, from design to maintenance. This model is most widely used in engineering activities. The maturity model is based on the description of the process that needs to be implemented to attain the level of excellence that corresponds to the maximum maturity level. When each maturity level is reached, this leads to an incremental and sustainable improvement in performance.

The CMMI model has five maturity levels:

*Level 1 initial***:** processes have not been defined or standardized, and there is no regular assessment of performance.

Level 2 managed: the processes in place have been planned, carried out, monitored, checked, reviewed and evaluated. The resources associated with the use of these processes are fit for purpose and have the means necessary to conduct them.

Level 3 defined: processes have been standardized. They have been improved upon and are used by the entire organization. The organization's goals have been defined.

Level 4 quantitatively managed: the organization has fixed performance goals to the processes. The goals are associated with the organization's and the customers' expectations. The results are measured quantitatively.

Level 5 optimizing: processes are continually improved through analysis of the causes for variations in performance.

These maturity models, originating from management by quality, are oriented toward implementing processes and good practices that will improve the organization's performance.

In the field of supply chain management, many authors have shown that there are links between maturity level and supply chain performance [SIM 04, LOC 04, COH 13, TRK 07]. However, others are not so sure that these links exist [LAP 06], taking the view that supply chain performance comes from an evolving mode of application of practices that are "made to measure", and which are founded on an understanding of the principles of value creation that stimulate the improvement of performance.

> Therefore, it is important that the supply chain processes and practices are brought about by the value creation goals.

The maturity levels may be defined in function of these defined processes, and advancement from one maturity level to the next is associated with the implementation of better practices.

The capacity of the supply chain management to integrate better practices in part defines its level of maturity [PAC 07].

Many authors have defined different classifications of maturity linked to supply chain performance, and which are not uniquely centered on good implementation of intraorganizational processes, as is the case with quality approaches, but also on the capacity of a company to integrate these practices into an interorganizational vision.

The maturity classification suggested by the SCOR model is constructed around the ability of a company to manage the full range of the supply chain [COH 13].

Level 1: functional orientation

The aim is to respond to improvement in the performance of an internal process without seeking the optimum with other associated processes.

Level 2: internal integration

The aim is to implement transversal tools for measuring performance within the company and in this way to validate overall performance while seeking the optimum between demand and the management of resources.

Level 3: external integration

The aim is to expand measurement of performance to key external company actors to involve them in a quest for shared performance.

Level 4: intercompany collaboration

There is a shared common organizational strategy (design, management modes, shared risks, etc.), making it possible to choose common performance goals.

The approach of Paché and Spanlanzi makes it possible to evaluate companies on a larger scale reading grid. They suggest developing a maturity grid in five maturity levels centered on interorganization relationships within the supply chain, and that includes societal aspects [PAC 07].

Level 1 intraorganizational

The aim is to drive performance by associating it with the various functions of the company (design, marketing, production, etc.).

Level 2 interorganizational

Performance is driven more globally, through integrating the actors who are close to the company (suppliers, service providers, direct customers, etc.).

Level 3 extended interorganizational

All of the actors in a chain are involved in seeking improved performance; this extended approach to the chain matches definitions of the supply chain.

Level 4 multichain

The company is involved in a complex network of relationships where each company in the network can be the "pivot" of the relationship. This "multi-company" level makes it possible for each company to command authority by suggesting value-creating procedures based on intersector sharing of activities.

Pooling resources between several of the actors in the chain, from different economic sectors, is a practice that has become frequent, particularly for consumer products [ECR 13].

Level 5 societal

The companies are part of a larger network and use this to refine performance in areas associated with the higher good of society as a whole, particularly in terms of sustainable development. The work in France of the Club Déméter, which brings together various actors in industry and distribution with the goal of improving global and societal performance, is an example of this level of maturity [DEM 13].

> When supply chain performance is being measured, it is important to define a company's maturity level, because the strategies adopted, the implementation of organization, and the approaches used to measure performance differ between the different maturity levels.

The supply chain maturity grid (Figure 1.7) shows the main principles for applying each level to attain improved performance.

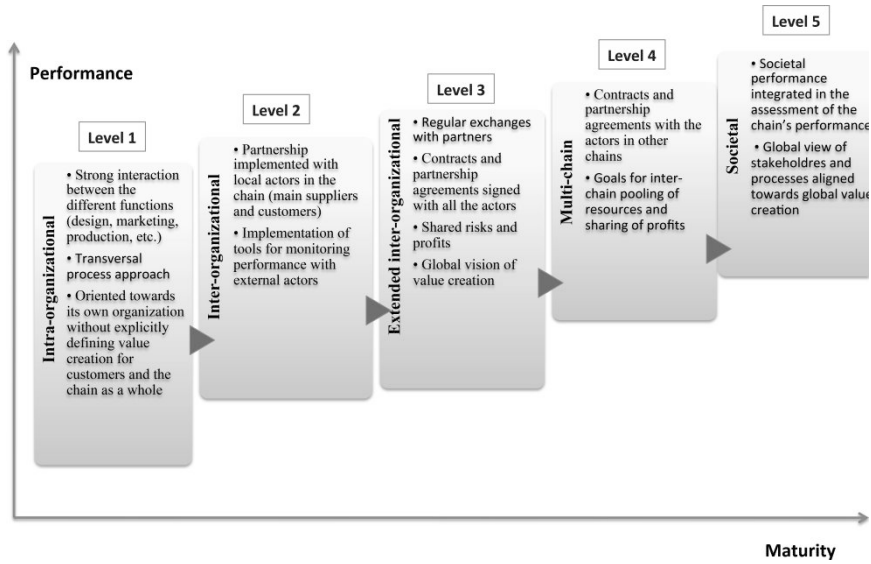

Figure 1.7. *Supply chain maturity grid*

1.5. Summary

Supply chain management aims to manage and drive a group of actors within an organization whose actors may have different aims but are working toward the same ends (or values). There are several models for conceptualizing this chain. However, all of these require systemic analysis, and most of them make it possible, depending on their theoretical basis, to define the "best practices" to implement.

The best practices suggested in supply chain management, whether based on this same theoretical basis or not, have not been systematically evaluated to check if they really improve performance and add value to the entire chain.

It, therefore, has not been established whether excellent supply chain management really does make it possible to reach a high level of performance leading to value creation for all of the actors in the organization (customer, shareholder, society, etc.) (Figure 1.8).

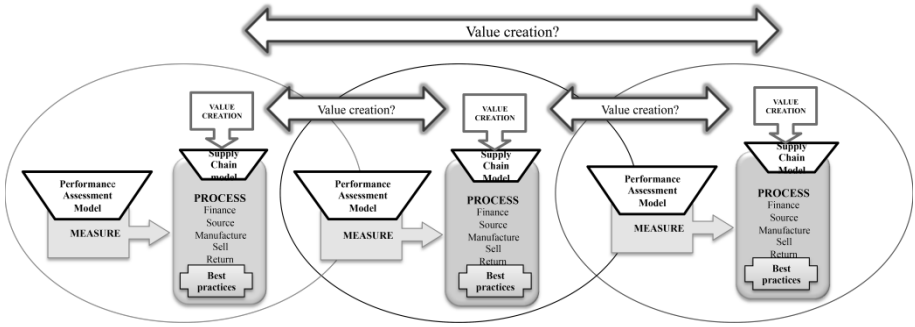

Figure 1.8. *Evaluating value creation among the actors in the supply chain*

In the next chapter, we suggest a procedure for analyzing supply chain performance, based on a study of several companies, which clearly displays the links between the implementation of better supply chain practices and value creation.

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2

Value Creation and Supply Chain Performance

2.1. Introduction

In this chapter, we will suggest a framework for global measurement of supply chain performance, based on the identification of the attributes for value creation and the identification of the associated performance indicators. The comparison of performance with other companies makes it possible to position the company on a level of maturity and in this way to clarify what the best practices to put in place are (Figure 2.1).

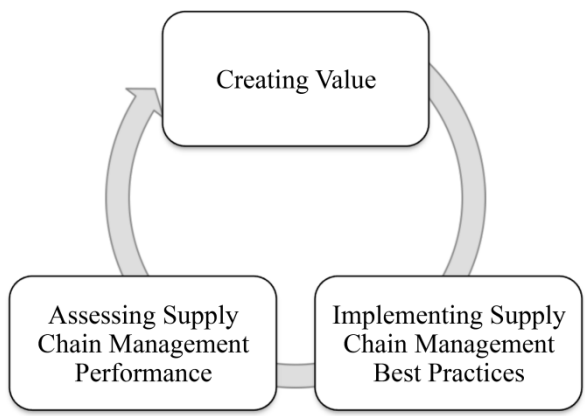

Figure 2.1. *Performance and value creation*

This framework is based on a study of 88 companies which represent the following sectors: automobile, textile/clothing, electronics, agri-food and pharmaceutical.

The aim is to:

– define the attributes for value creation in each of these sectors, and also define the common attributes;

– choose the associated measurable performance indicators;

– choose a maturity model;

– assess performance and classify companies into the groups;

– associate the groups with maturity levels and thus with levels of performance.

The analysis will also make it possible to identify potential correlations between the attributes; in other words: does performance on a few attributes result in performance for other attributes? The position of the company on the levels of maturity, which is decided through measurement of performance for the attributes, defines the supply chain best practices that should be implemented, and identifies the elements of company progress.

2.2. The companies analyzed

The panel of companies studied is taken from a study carried out by Michrafy *et al.*, and takes 88 selected European companies into account, which make up over 85% of the turnover for each of the selected sectors (Renault, Volkswagen, Daimler, Michelin, Valeo, Danone, Nestlé, Nokia, Philips, Siemens, Zara, Gap, H&M, Sanofi, GSK, Astra Zeneca, etc.)[1] [MIC 06].

2.3. Definition of value creation attributes

The choice of value-creating attributes for a company defines the supply chain management orientation that it would need to take to achieve expected performance levels.

1 The complete list of the companies is given in the Appendix.

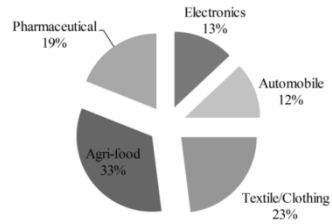

Figure 2.2. *Distribution of companies depending on their activity sector*

Several studies carried out within the context of the use of the supply chain operations reference (SCOR) model [BOS 03] have made it possible to identify a certain number of value-creating attributes specific to the sectors, and to associate supply chain performance drivers with them (Table 2.1).

Sector	Major value creation attributes	Drivers for achieving expected supply chain performance
Automobile	Customer: Price (C2) Quality (C3) Functionality (C4) Brand image (C5) Trust (C6) Responsiveness (C7) Company: Profitability (Co1) Innovation (Co2) Creating and sharing knowledge (Co3) Invention (Co4) Growth (C05) Actors in the chain: Sharing information (A1) Synchronizing decisions (A2) Sharing resources (A3) Sharing risks and profits (A4) Creation of common knowledge base (A5) Shared innovation (A6) Speed of the chain (A7) Global profitability (A8) Trust (A9) Sustainable development (A10)	Product diversity Short time to market for new models Robust and flexible supply chain Speed of flows and short cycles Collaboration over the chain to shorten cycles

Sector	Major value creation attributes	Drivers for achieving expected supply chain performance
Electronics	Customer: Lead time (C1) Price (C2) Quality (C3) Functionality (C4) Brand image (C5) Trust (C6) Responsiveness (C7) Company: Profitability (Co1) Innovation (Co2) Invention (Co4) Growth (C05) Actors in the chain: Sharing information (A1) Sharing risks and profits (A4) Creation of common knowledge base (A5) Shared innovation (A6) Speed of the chain (A7) Global profitability (A8) Trust (A9) Sustainable development (A10)	Short time to market for new products Quick response to customer demands Differentiation through innovation Speed of flows and short cycles Managing complexity
Textile/ Clothing	Customer: Price (C2) Quality (C3) Brand image (C5) Trust (C6) Company: Profitability (Co1) Innovation (Co2) Growth (C05) Actors in the chain: Sharing risks and profits (A4) Speed of the chain (A7) Global profitability (A8) Sustainable development (A10)	Brand/price differentiation Short time to market for new products Product diversity Control added value Control distribution channel Speed of flows and short cycles Optimization of distribution resources Strong collaboration with points of sale

Agri-food	Customer: Lead time (C1) Price (C2) Quality (C3) Functionality (C4) Brand image (C5) Trust (C6) Responsiveness (C7) Company: Profitability (Co1) Innovation (Co2) Growth (C05) Actors in the chain: Sharing information (A1) Synchronizing decisions (A2) Sharing resources (A3) Sharing risks and profits (A4) Speed of the chain (A7) Global profitability (A8) Trust (A9) Sustainable development (A10)	Product availability Ensuring perfect customer service Product diversity Brand/price differentiation Optimization of costs Collaboration throughout the chain Shortening cycles
Pharmaceuticals	Customer: Lead time (C1) Quality (C3) Functionality (C4) Trust (C6) Responsiveness (C7) Company: Profitability (Co1) Innovation (Co2) Invention (Co4) Growth (C05) Actors in the chain: Sharing information (A1) Sharing risks and profits (A4) Speed of the chain (A7) Global profitability (A8) Trust (A9) Sustainable development (A10)	Rapid introduction of new products Critical size for concentrating research and development resources Responding to product safety requirements Protecting the chain Speed of flows and short cycles

Table 2.1. *Value creation attributes and supply chain performance drivers [EST 08]*

We can highlight generic value creation attributes that are common to all sectors or to the different types of chain.

First, those attributes associated with the actors in the chain, and which make it possible to measure the overall performance of the chain:

– Value creation attribute 1: the *rapidity of the chain* and the capacity to transform, as quickly as possible, a customer demand, through the entire chain, into a product or service. This rapidity requires the implementation, for all of those involved in the chain, synchronization and collaboration.

– Value creation attribute 2: *global profitability throughout the chain* including the sharing of risks and profit by cooperation and collaboration throughout the chain, with the goal of sharing mutual values. This cooperation includes suppliers, those involved in the chain, and customers.

Second, there are the attributes associated within a company and which measure its performance:

– Value creation attribute 3: *company profitability* to ensure not only that there are sufficient funds for its development, but also that its investments in innovation or even invention are covered.

– Value creation attribute 4: *growth*, which results in either the acquisition of new customers, or the satisfaction and retention of existing customers.

2.4. Choice of indicators associated with value creation attributes

Value creation attributes are assessed by measurement of their associated indicators, and this assessment makes it possible to position the company on a performance or maturity level.

The attributes of chain *rapidity* and *global profitability* are the long-term performance determinates which are defined in a supply chain strategy, and the attributes of *profitability and growth of the company* are very important for the company and its continuation within the chain.

Measurement of these attributes is made possible by the choice of a selection of indicators for each of them.

Value creation attribute 1: rapidity of the chain

Approaches on the rapidity of the flows in a chain refer to the "lean supply chain" approaches [WOM 03]. The priority aim of these approaches is to reduce operations which do not add value in order to limit the time that products spend in the chain. This minimization in stopping points along the chain is effected principally through reduction in inventory levels, where these may be considered as stopping or slowing flows [LEE 92].

One of the fundamental measurement indicators to validate that products move quickly over the whole chain without stopping is the inventory days of supply at all stages of the chain [COH 13].

The inventory days of supply calculate what time is necessary for converting an investment in stock into a sold good. From a financial point of view, the higher the inventory level of a company, the more of its money is capital tied up. Indicator: inventory days of supply.

Value creation attribute 2: chain global profitability

The creation of collaborations must be based on trust between the partners, which is founded in:

– codesign of products;

– common management of flows;

– balanced financial management founded on the notion of sharing.

If the indicators of the days of sales outstanding and the days of payables outstanding are optimized, it shows that this search for a balanced relationship has been successful.

The aim is to decrease the level of these indicators in order to create a relationship of trust with customers and suppliers [HOF 05]. In this way, the search for opportunities for profit is not conducted with the sole goal of making back a part of the investment of one of the actors of the chain, but rather as a search for long-term financial benefits which are shared by all of the chain.

A balanced customer–supplier relationship is a relationship of trust where the customer and the supplier support each other and share risks and

benefits. Companies that negotiate high levels of outstanding debt are not engaged in a logic of complete supply chain collaboration.

The 2 indicators: days of sales outstanding and days of payables outstanding

Value creation attribute 3: company profitability

The most widely used method is the Economic Value Added (EVA) method [STE 90, STE 91], because it measures the level of value created by a company. It allows the shareholders to determine if the directors are creating or destroying value. Added economic value is calculated on the basis of the net operating profit after sales (NOPAT), less a capital charge. This measurement method reminds companies that a short-term increase in share price is not enough to justify seeking an increase in turnover at any cost. However, increase in profits must be achieved more quickly than increase in capital value. Even if the figures are excellent, a company does not create value for shareholders if it does not generate profits which are greater than its capital cost.

Company performance is assessed on the basis of elements which indicate value creation.

Operating results

First, the highest NOPAT possible should be obtained. The result of operation is the difference between the revenue and the expenses. The higher the net tax use result, the greater the value created (if wealth is created).

However, operating results are not in themselves enough to create wealth, no matter how high they might be.

Asset management

The company should also seek to optimize assets. Minimization of assets interprets company efficacy in terms of fixed assets and working capital. Fixed assets include manufacturing and distribution installations, transportation and maintenance equipment and IT equipment. Working capital requirements reflect investment in stock and differential investment in customer accounts in comparison to supplier accounts.

Asset management may in particular be assessed by the asset turn that measures the efficacy with which a company uses its assets, making it possible to determine the level of turnover a company achieves for each euro invested. It is calculated using the ration net sales/total assets.

Cost of capital and management of risks

Capital cost describes the minimum return required by investors (shareholders and debtors), taking into account the level of risk taken. The repayment required by the shareholders and debtors should be as low as possible. This means that the economic assets as well as the mean weighted capital cost or minimum return required should be as low as possible. This is possible if the risk premiums required by the investors, and thus the risks run by the company, are low. The more the company is in control of what it does and satisfies its economic environment (customers, state, suppliers, etc.), the more the investors will have the feeling that they are running minimal risk and will require low return on capital invested.

The two indicators that summarize performance of the company with regard to asset management and financing capacity are the following:

– ***Indicator: asset turn***:

This indicator measures the total rotation of the assets of a company over a year. Obviously, the level of investment in assets depends on many factors, such as the sector of operation and the seasonal or cyclical nature of the operation.

– ***Indicator: debt/equity ratio***:

This ratio gives an indication of the financial health of the company. It measures its general solvency and its financial autonomy. It should be analyzed alongside asset turn indicators.

– ***Value creation attribute 4: growth:***

The indicator that best measures growth is the level in growth of the turnover; this provides a good measurement of the acquisition or retention of customers.

– ***Indicator: Level of growth in turnover***.

2.5. Choice of maturity model

The choice of the type of maturity model must be suited to the defined value creation attributes. The grid suggested by Paché and Spalanzani provides a good illustration of the value creation attributes of a chain because it includes interorganizational aspects and also multichain aspects, which are important drivers for global return on investment for the entire chain. The maturity levels the grid describes are: level 1 – intraorganizational maturity, level 2 – interorganizational maturity, level 3 – extended interorganizational maturity, level 4 – multichain maturity and level 5 – societal maturity. This approach is the one that makes it possible to include the wider consequences of a supply chain level of performance.

2.6. Analysis of performance and classification

Measurement of these indicators for each company makes it possible to identify its performance level. As a function of this level of performance, the company may be classified at a level, known as a maturity level, which takes account of its abilities to adopt the practices and processes which are used to situate it at this level.

Calculation of these indicators is on the basis of financial reports (balance sheet, income return statement and notes) gathered from companies.

2.6.1. *Identification of performance levels relative to value creation attributes for actors in the chain*

On the basis of measurement of indicators for each company, we can classify companies into different groups which have low, medium or high performance levels. This identification of performance groups is conducted by typological analysis,[2] and it defines three groups of companies with very distinct results, and where each company in the same group has similar results.

2 This typological analysis is described in more detail in [MIC 06].

Table 2.2 identifies these three groups and the average value for the indicators for each of these groups. Analysis of the performance of these groups makes it possible to define belonging to a group at a certain level of supply chain maturity.

	Rapidity of the chain	Global profitability	
	Inventory days of supply	Days of sales outstanding	Days of payables outstanding
Group 1	171	98	127
Group 2	62	57	106
Group 3	52	35	77
Overall	81	59	102

Table 2.2. *Classification of companies on the basis of value creation attributes of the chain actors*

Description of the three identified groups is on the basis of their resources for each indicator (Table 2.3).

Group 1 is characterized by poor performance, principally on the inventory days of supply and the days of payables outstanding. Companies in this group have a low supply chain maturity level (level 1 of the Paché maturity scale). Optimization of stock is not a major deciding factor in the organizational policy of the supply chain, and the use of all of the assets is not fully under control. Policies between actors in the chain (suppliers and customers) are not characterized by strong partnership relationships. The aim of companies in this group is not to seek value for its customers and suppliers, but rather only to take the optimization of their own company into account, without striving for a more global optimum.

Group 2, to which most companies belong, has average supply chain performance levels. It is characterized by an intermediate level supply chain maturity (level 2 in the Paché maturity scale). Companies in this group are usually at the beginning of a process for optimizing their supply chain, which applies both to inventory level, where they wish to shorten cycles, and to their policies for partnership with suppliers or customers.

Group 3 has the best performance levels for the three supply chain indicators. It is linked with an advanced level of maturity for managing its supply chain, which corresponds to levels 3 and 4 of the Paché maturity scale. Its performance is characterized by a rapidity of flows with excellent control of inventory levels, and effective collaboration with its customer and supplier partnerships, which allow the company to consolidate its finances over time and facilitate the exchange of information between the actors.

Supply chain Maturity/value creation attributes	Group 1 Low – level 1	Group 2 Intermediate – level 2	Group 3 Advanced – levels 3 and 4
Rapidity of the chain	– High inventory levels show difficulties in controlling flows and slow the chain	+ Desire to optimize cycles by reducing inventory levels	++ Operations based on the rapidity of cycles and anticipation of or control over events
Global profitability	– Operations based on relationships of force between those involved, with a short-term vision of return on investment	+ Desire for intermittent exchanges between those involved in the chain	++ Regular exchanges including financial flows, leading to shared financial gain throughout the chain.

Table 2.3. *Company supply chain maturity*

This framework makes it possible to situate each company within a group and identify its maturity level and the supply chain practices it employs.

2.6.2. *Identification of performance levels relative to value creation attributes for the company*

Groups of companies created previously, which resulted from the assessment of performance regarding the value creation attributes for actors in a chain, have been maintained. Measurement of the performance of these groups as concerns the value creation attributes, this time for the companies, makes it possible to verify that there is a similarity and correlation between

the performance of the chain and the performance of each company in the chain.

Table 2.4. identifies the average values for profitability and growth indicators for each group.

	Company return on investment		Growth
	Asset turn level	Debt on equity	Growth in turnover
Group 1: Low maturity – level 1	0.78	1.07	+ 3.1%
Group 2: Intermediate maturity – level 2	0.95	0.96	+ 8.1%
Group 3: Advanced maturity – level 3 and 4	1.85	0.62	+ 12.0%
Overall	1.15	0.89	+ 8.1%

Table 2.4. *Classification of companies according to value creating attributes*

The company's level of profitability is tightly linked to its level of supply chain maturity.

The average asset turn for the entire sample is 1.15. Group 3 attains a remarkable level of asset turn (1.85), which is around 2.4 times higher than that of Group 1. The level for Group 2 is closer to that of Group 1 than of Group 3.

Group 3, which has high supply chain maturity, is the group which has the lowest level of equity debt (0.62). Groups 1 and 2 are below the average for the sample (0.89).

Company profitability increases as its level of supply chain maturity increases

The analysis clearly shows correlation between increase in value for all of the actors in the chain and increase in value of the company. In fact, we can

see that those companies that are more mature in their supply chain strategies (Group 3), and which apply procedures oriented toward collaboration between the actors in the chain, are the companies with the highest levels of profitability.

This analysis plainly shows a strong correlation between supply chain maturity and profitability.

Thus, this correlation should favor the emergence of true collaboration between supply chain and financial strategies. In fact, although many companies still believe that the optimization of financial flows is achieved by increase in days of payables outstanding and decrease in days of sales outstanding, a supply chain strategy based on a more balanced management path and partnership, where the days of payables outstanding is decreased without demanding rapid payments from customers, is strongly correlated with substantially strong financial performance levels.

Company growth is linked to its level of supply chain maturity

Analysis of the level of growth for the companies in the panel shows that the average level of growth in company turnover for the sample is 8.1%. The level is the same for companies in Group 2. Growth is highest for the companies in Group 3. The lowest level of growth can be observed for the companies in Group 1 (Table 2.4).

The companies with the highest level of supply chain maturity are also those which have the highest level of growth in turnover

This analysis shows the close relationship between growth in turnover and level of supply chain maturity. In other words, the performance of a supply chain organization shows strong correlation with growth in the supply chain turnover.

2.7. Summary: supply chain performance and value creation

The process of identifying value creating attributes, the measurement of indicators, and the classification of a company into a maturity group make it possible for a company to compare its supply chain performance with that of its competitors.

The framework to achieve this is as follows. First, the attributes for value creation are chosen. These are specific to the performance of the chain in the company's sector of operation, and should match the strategy of the chain. Then, the indicators associated with these attributes are measured. Following this, performance groups are established, which identify the maturity levels, and the company is placed on a level within these, indicating to it the best practices to implement. These supply chain better practices generate improved performances throughout the chain and increase value creation for the actors in the chain and for the company.

The companies with higher maturity levels are those which may observe stronger value creation levels.

Are current systems for evaluating supply chain performance suited to the search for value creation as a function of the maturity level of the supply chain under study? More importantly, what are the best practices which generate value that should be implemented?

We propose, in the next chapter, to compare assessment models for supply chain performance using a reading grid which will allow the people responsible for each company to choose the correct model for their company. Following this, we will also clearly show the areas where each model is lacking, in order to suggest a broader model focused on value creation.

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3

Help in Choosing Supply Chain Performance Evaluation Models

3.1. Introduction

The aim of this chapter is to suggest a grid for choosing between existing models for evaluating supply chain performance, enabling decision makers to better understand the various models.

First, we will describe 15 commonly used supply chain performance evaluation models, taking as our basis experience of these models in the context of different chains. We will characterize these using eight analysis criteria, showing how these models can be used by those in charge of companies to better evaluate their own supply chain organization. Through this characterization, we will see the possible shortcomings of these various models, in particular regarding accounting for value created throughout the chain.

Performance evaluation models should be suited to the organizational design models, relevant for evaluating a performance that aims toward the value creation objectives, and should be easy and quick to implement for all actors. These performance evaluation models should also take value creation throughout the chain into account (Figure 3.1).

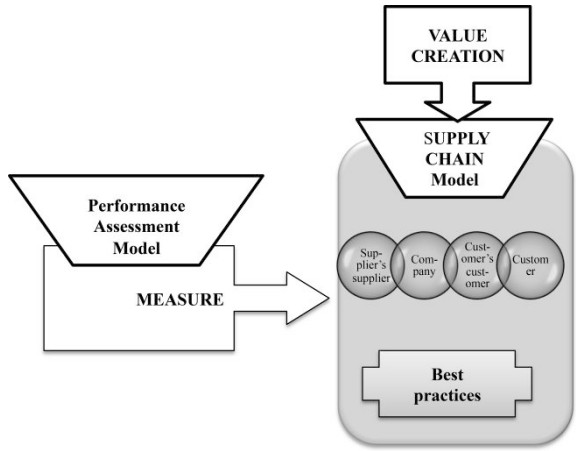


Figure 3.1. *Global value creation throughout the chain*

With supply chain management, there are several reasons why it is necessary to evaluate a company's supply chain performance, on a local, international or global level. The most obvious of these are linked to the need to evaluate the contribution of the supply chain to the attainment of value creation objectives for the entire chain; they are also linked to the need to satisfy customer requirements in terms of timeframe, responsiveness and reliability.

In order to address or follow the changes dictated by the market, companies must be able to increase production and distribution flexibility (for example, by reducing production time, modifying delivery dates, enacting a given reconfiguration, reducing the time it takes to bring a good or service to the market, or reassigning or renewing logistics partners). For these changes to be successfully achieved, they need to be supported by appropriate supply chain performance levels. If logistics activities are outsourced, the performance levels of logistics service providers must be in line with the requirements laid out in the contract and should be measured by one or both of the parties. The effective management of chain coordination requires internal and external performance measurements, in particular at the level of interfaces between the actors involved in the supply chain process.

Thus, it is as essential to measure supply chain performance as it is to understand how it operates. Measurement needs to be linked to company aims, it needs to be repeatable, it needs to give an insight into how the

supply chain might be managed more effectively and it needs to be suited to the activities that are being measured.

3.2. The different models of supply chain management performance evaluation

Much work has been done on summarizing literature on the performance evaluation models that apply to companies ([BIT 95, NEE 05, BIT 05, FOL 05]. The clear establishment of a performance evaluation system was widely pursued during the 1990s. The basic aim was to put a measurement system in place that mainly aimed to make strategy alignment possible for companies [NEE 05]. There are a wide variety of measurement systems available, from the balanced scorecard [KAP 96], to the European Foundation for Quality Management (EFQM) Excellence Model [EFQ 14].

These models, which were essentially oriented toward measurement of an autonomous entity (company, filial or business unit, etc.), did not account for the complexity of the value creating company chain. A few measurement models were defined in the 2000s; these made it possible to analyze supply chains for all or a part of their components (collaboration, human resource management, sustainability, etc.) [BEA 98, GUN 04].

Some of the supply chain performance measurement models that have been developed over the last few years are: Supply Chain Operation Model (SCOR) [LOC 04], Global Supply Chain Forum (GSCF) [COO 97] and Efficient Consumer Response (ECR) [ECR 13].

We present 15 existing supply chain performance measurement models, showing what is specific to each of them[1].

Some key characteristics, useful for understanding each model, are discussed:

– origins of the model;

– the type of analysis conducted (calculations of indicators, interviews, structure questionnaires, etc.);

– conditions and constraints for application;

1 Our description of these models has largely been taken from [EST 13].

– the conceptualization level of the model (what are the underlying concepts: processes, activity, etc.);

– indicators put in place (quantitative or qualitative).

3.2.1. *Framework for Logistics Research (FLR) [CHO 95, GEL 02]*

Origins of the model

This model, developed in the 1990s, evaluates the impact of decisions for the organization of the supply chain on the attainment of the company's strategic goals.

The type of analysis conducted

It illustrates the codependency that is between the level of performance attained, the logistic organization and the competition strategy of the company.

It places emphasis on the relative, non-absolute character of performance evaluation.

Conditions and constraints for application

It applies to organizational and strategic levels.

The conceptualization level of the model

It structures logistics function into several aspects: centralization, formalization, integration and domains of control.

Indicators put in place

It allows internal benchmarking.

3.2.2. *GSCF framework [COO 97]*

Origins of the model

This model was created by Ohio State University (OSU) in 1994 on the basis of an analysis of company practices and research conducted on the supply chain.

The type of analysis conducted

This model allows the user to choose, at the outset, from three decisional levels (strategic, tactical and operational).

It clearly shows the link between the processes and structure of a supply chain.

Conditions and constraints for application

This model is suited to all types of company.

The conceptualization level of the model

The model is organized around seven processes: management of the customer relationship, management of customer service, management of customer requirements, the taking of customer orders and its level of suitability for the resources available, management of industrial flows, supply, and the development and marketing of products.

Indicators put in place

The model makes internal benchmarking possible.

3.2.3. *Strategic Audit Supply Chain (SASC) [GIL 99]*

Origins of the model

This model was developed in 1999 on the basis of an observed lack of available skill for managing the supply chain.

The type of analysis conducted

It analyzes the supply chain according to its processes, IT technologies and organization.

It breaks the supply chain down into six skill areas: customer orientation, distribution, planning sales, lean production, partnership with suppliers and integrated management of the chain.

Conditions and constraints for application

It does not define links between the organization of the supply chain and its performance.

It applies to the organizational level.

The conceptualization level of the model

It links competencies to the IT technology and organization of the chain.

Establishment of indicators

It applies to the analysis of company internal performance.

3.2.4. *World Class Logistics model (WCL model) [BOW 95, EST 98, MOR 00, EST 00]*

Origins of the model

The WCL model was developed by Michigan State University during the 1990s.

The type of analysis conducted

This model evaluates company performance on the basis of its ability to take stock of inter organizational relationships.

It evaluates supply chain management performance using 68 questions. Analysis of the answers to these questions shows the level of integration of the actors in the chain and evaluates mastery of the concepts that characterize the supply chain. Following this, the results are consolidated between the companies studied within the same chain.

This model makes it possible to:

– analyze several types of companies on the same supply chain (from the supplier's supplier to the end customer);

– compare the practices of several actors on the same chain;

– classify the performance of actors in terms of homogenous performance "types".

The key factors in the success of a supply chain are assembled into four areas of competency (Table 3.1).

1) *Positioning*

Positioning is defined by the choice of strategic and structural orientations for optimizing logistics operations. It includes the following capabilities:

– *Logistics strategy* is defined by the implementation of financial and commercial objectives and choice of location, as well as the means of achieving these.

– *Supply chain* is the synchronization of resources through partnerships throughout the supply chain.

– *Infrastructures/network* involve the structuring and distribution of physical resources.

– *Human organization* relates to the structuring and involvement of human resources.

2) *Integration*

Integration is defined by the resources implemented to achieve synchronization throughout the supply chain. Integration brings the following capabilities together:

– *Unification of the supply chain* demonstrates ability to develop cooperative relationships with other companies through the supply chain.

– *IT systems* bring together investment in equipment, software and networks and their level of suitability to the job of facilitating processes and exchanges.

– *Information sharing* shows the desire to exchange essential technical, financial, operational and strategic data.

– *Compatibility* shows the company's ability to exchange information in an appropriate format, which is responsive and easy to use throughout the supply chain.

– *Standardization* involves implementing common policies and procedures to facilitate and improve logistic operations.

– *Simplification* consists of re-engineering procedures to improve their effectiveness.

– *Personnel agreement* shows their level of acceptance of operational policies and procedures.

3) *Agility*

Agility is the capacity to keep a good balance between the company's performance and adapting in order to meet customer needs. Three capabilities are involved in this domain:

– *Relevancy* is the ability to continuously listen to customers' changing needs.

– *Adaptability* allows the company to reduce response time for exceptional customer demands.

– *Flexibility* shows the company's ability to adapt to unexpected circumstances.

4) *Measurement* Measurement makes it possible to evaluate the performance of the supply chain. It includes the following capabilities: – The *choice of indicators* for internal metrics is related to the management of assets, customer service, productivity and quality. – *Process assessment* allows the company to refine the implementation of indicators throughout the supply chain. – *Benchmarking* allows the company to compare measurements and processes with the capabilities of those who are best at them.

Table 3.1. *Characteristics of the WCL model [EST 98]*

Conditions and constraints for application

This model has been tested on several supply chain configurations [EST 98] and in particular on the wine chain [CHA 03]. Measurement of the performance of "references" on a chain makes it possible to measure the differences for each of the actors in reaching the maximum level of maturity over the chain.

The conceptualization level of the model

The model is based on research works analyzing the chain's performance.

Indicators put in place

It evaluates the integration level for the actors and their degree of mastery of the supply chain concepts. It makes external benchmarking possible.

3.2.5. *ASLOG framework: French Logistics Association – Association française pour la logistique [ASL 14]*

Origins of the model

Created in 1997 by the Association, the framework takes as its basis models used in the automobile industry (Galia), and is a tool that aids evaluation of logistics performance capacity for industrial and commercial companies.

It was designed and created by a group of experts, with support from the French Ministry of Industry.

The type of analysis conducted

The model is made up of 200 questions that make it possible to measure logistics performance for the following points: management, strategy and planning, project design, supply, production, movement, storage, sales, returns and after-sales, monitoring and continuous progress indicator.

It evaluates logistic procedures and analyzes their strengths and weaknesses.

It is a transversal tool whose role is to build a process of continual improvement that aims to reach a level of excellence, and the implementation of logistics best practices.

Conditions and constraints for application

It is especially focused on small companies and is aimed at companies with a low to intermediate level of logistics maturity.

The conceptualization level of the model

There are no clearly expressed underlying concepts; performance evaluations are built on the basis of experience in various industries or services.

Indicators implemented

The measurements carried out mean that the company can perform internal benchmarking.

3.2.6. *Global Evaluation Logistics (EVALOG) (Materials Management Operations Guidelines/Logistics Evaluation (MMOG/LE)) [ODE 14, AIA 14]*

Origins of the model

Published in 1999, the aim of this evaluation model was to suggest a language within the automobile industry. It was developed through a collaboration between Odette International Limited and the Automobile Industry Action Group.

The type of analysis conducted

It is centered on six domains: strategy, work organization, production planning, customer interface, process supervision and supplier interface. The model involves 50 processes.

It makes it possible to evaluate the processes, to make a comparison with regard to best practices, to evaluate the performance of partner sites and to conduct a continuous process of improvement.

It is built around a questionnaire divided into six chapters, which are: strategy, work organization, production planning, customer interface, process supervision and supplier interface.

Conditions and constraints for application

It was developed especially for the automobile industry, but it has also been used for other associated sectors (metallurgy, chemistry, etc.).

The conceptualization level of the model

The concepts are not identified; performance evaluations are constructed on the basis of experimentation in the automobile industry.

Indicators put in place

The model is structured around six standard indicators and allows the company to evaluate operational performance in the supplier–customer relationship. These indicators measure the quality of exchange of information, the service level, the quality of supply within the context of vendor management inventory, logistics quality in terms of conditioning and labeling, the impact of supplier breakdowns on the flows and the level of supplier cooperation in the customer–supplier relationship.

3.2.7. *AFNOR FD X50-605 [AFN 14b]*

Origins of the model

The model was developed in 2008 in a collaboration between a group of academic and industrial experts. It suggests a structured analysis procedure, from company strategy up to the implementation of performance indicators.

The type of analysis conducted

The model suggests a general framework for reflection without providing much detail regarding the analyses that need to be conducted.

It is based on Porter's approaches to the strategic level, and is founded on definitions of the different logistics processes, developing performance drivers linked to each process [POR 08].

Conditions and constraints for application

The model provides a procedure that needs to be applied and there are no particular constraints.

The conceptualization level of the model

The logistics processes are defined on the basis of the standard AFNOR FD X50-604 [AFN 14a] from supply to final distribution to the customer.

Indicators put in place

The model makes it possible to measure logistics performance through certain suggested indicators.

3.2.8. *SCM/PME [JOU 08]*

Origins of the model

This model was developed in 2007 in an SME context.

The type of analysis conducted

The model is made up of an audit questionnaire covering 25 modules (company strategy, organization and development of logistics skills, processes and measurements for performance, IT system, etc.).

Conditions and constraints for application

The framework is largely aimed at SMEs for consumer products.

The conceptualization level of the model

It is constructed around the following functional components of logistics: managing demand, distribution, import/export flows, stock, production, supply, returns, after-sales support and traceability.

Indicators put in place

The model makes internal benchmarking possible.

3.2.9. *Balanced Scorecard (BSC) [KAP 96]*

Origins of the model

This model was developed in the 1990s, in opposition to purely financial models, and aims to supplement financial performance indicators with functional indicators (customer and organizational vision, etc.), in an approach that aspires to balance (Table 3.2).

Financial point of view	Development of shareholder value (ROCE)
Customer point of view	Value proposition for customers (customer acquisition and customer retention)
Internal process point of view	Innovation of processes, management of customer processes, operations and logistics processes, and regulation and environmental processes
Learning and innovation point of view	Prepared, motivated teams Strategic capabilities, strategic technologies, a climate that favors action

Table 3.2. *Dimensions taken into account by the BSC*

The type of analysis conducted

– Analysis is conducted essentially by consensus at the directorial level, seeking measures that work toward the company strategy.

– The model suggests four axes for analysis (customers, financial, internal process and innovation-growth).

– The model is concerned with the human dimension in the measurement of company performance.

Conditions and constraints for application

The approach is of the classic top-down type; the model is specifically targeted at the general management and is applied at the strategic level, which is realized through the organizational level.

The conceptualization level of the model

The model suggests a procedure for establishing causal links between the performance of each axis for analysis, mainly between the customer and financial axis.

Indicators put in place

The indicators are chosen according to the company's aims; however, the measurement should be balanced in relation to the aspirations of all the internal company functions and in relation to the external environment.

3.2.10. *Strategic Profit Model (SPM) [LAM 00, STA 02]*

Origins of the model

The origins of the model lie in work undertaken at Ohio State University in 2000, which used the DuPont model as a starting point, and broadened its range to include the actors in the supply chain.

The type of analysis conducted

It shows the pre-existing interactions between the strategic and operation levels, on the basis of financial ratios.

Conditions and constraints for application

The application of this model is principally strategic and financial, and is founded on the cost drivers (return on assets and net value).

The conceptualization level of the model

It is based on the DuPont model.

Indicators put in place

It makes external benchmarking possible through financial ratios.

3.2.11. *Activity-Based Costing: ABC [KAP 92, KAP 96, LA 96]*

Origins of the model

The model was created in the 1980s, and involves breaking the company down into activities, bringing the strategic aims into play to evaluate the results achieved.

The type of analysis conducted

The analysis conducted as a part of this model enables the company to obtain precise information on costs and margins.

It is a variation on the full costing method that goes beyond a simple calculation of the production cost.

Conditions and constraints for application

This model demands in-depth knowledge of the company, its activities and processes.

The conceptualization level of the model

It links accountancy data to the activity concept and then brings these together in line with the process logics.

Indicators put in place

The model establishes monitoring indicators that are coherent with the company's strategy and suggests a benchmarking procedure for improving performance.

3.2.12. *SCOR (version 11.0) [SCO 14, COH 13, LOC 04, BOL 11]*

Origins of the model

The model was developed in 1996 by the Supply Chain Council (SCC), which is an association of supply chain practitioners. The SCOR model is a standardized methodology for describing and evaluating the processes within a supply chain.

The type of analysis conducted

The SCOR model describes the operation of the supply chain in four levels (Table 3.3.):

– The first level distinguishes between five generic processes: plan, source, make, deliver and return.

– The second level defines categories of processes that reflect the strategy put in place by the company for its operations, as well as for direct or indirect distribution, make to order or to stock.

– The third level details each process category identified at the second level, with their inputs and outputs.

– The fourth level describes the procedures specific to each company.

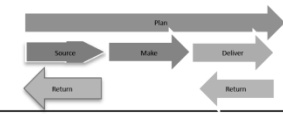
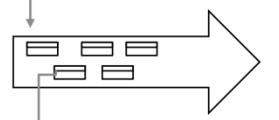
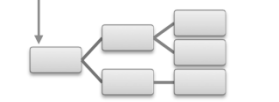
	Level	Type	Modeling	Description
SCOR Model	1	Global level		• Modeling the processes between the supply chain actors. • Defining the performance objectives to be reached.
	2	Configuration level		• Configuration of the processes in function of management mode. • Makes it possible to implement operational strategies in function of the supply chain configuration.
	3	Decomposition level		• Breaking the processes down into operational sub-processes •Defining the capacity of the companies to be competitive on the market
	4	Implementat-ion level		• Description of management rules and practices • Identifies the practices which provide a competitive advantage and make the company flexible

Table 3.3. *The levels of the SCOR model [LAV 07]*

The model evaluates four fields: reliability of commercial performance, flexibility/responsiveness, supply chain cost and capital turn.

Conditions and constraints for application

The model applies to all companies, in manufacturing or the service industries.

It applies to the tactical and operational level, and aims toward the implementation of decisions made during the company's strategic planning.

It makes a contribution to operations that integrate the different actors in the chain.

The conceptualization level of the model

It allows those using it to obtain a common and standardized language for use between the different actors in the chain, because the basic concepts are defined (processes, typology of processes and modes of management).

Indicators put in place

The indicators are explicitly defined, and so are the methods used to calculate them.

There are indicators associated with each process, allowing the company to compare their results with those of other companies or other sites (external and internal benchmarking).

A reference "Best in class" model is offered.

3.2.13. *APICS model (Association for Operation Management) [API 14]*

Origins of the model

The APICS model recommends an organizational management model according to management based on anticipation and resource planning.

The type of analysis conducted

It emphasizes the keys to competitive advantage: strategic innovation management, customer service, lead times and costs, and also the strategic management of mechanisms that bolster efficiency, agility, risk control and sustainable development.

Conditions and constraints for application

It mainly applies to companies involved in manufacturing.

The conceptualization level of the model

The model is based on the structuring of processes, and focuses largely on production.

Indicators put in place

It brings together multiple performance management indicators in the fields of production and logistics.

3.2.14. *ECR model – Global Scorecard [GSC 14]*

Origins of the model

This model was established in 1994 by industrial and distribution practitioners who were interested in pooling better practices and indicators. It is built around an interorganizational approach to the supply chain.

The type of analysis conducted

The model suggests tools for autoevaluating best practices: management of consumer demand, optimization of the supply chain and technological equipment in use.

Conditions and constraints for application

It is concerned with collaboration between manufacturers and distributors for consumer products.

The conceptualization level of the model

The model aims to obtain a common language, essentially based on shared evaluation of performance.

Indicators put in place

Thirteen indicators for measuring performance are provided, in order to make it possible to draw comparisons between different sectors (Table 3.4.).

Annual sales growth rate
Supplier service level/unit fill rate to customer distribution centre
Store service level/unit fill rate
On-time delivery
Raw materials inventory cover
Manufacturer/supplier's finished goods inventory cover
Retail distribution centre inventory cover
Retail store inventory cover
On-shelf/point-of-sale out-of-stocks
Order to delivery cycle time
Distribution costs (% of sales value)
Invoice accuracy
Retail shrinkage rate

Table 3.4. *ECR indicators*

3.2.15. *EFQM Excellence Model [EFQ 14]*

Origins of the model

This model was introduced in 1992 in order to help companies improve their performance levels. The EFQM model (model for evaluation based on total quality) is intended to evaluate organizational excellence level with respect to the implementation of strategy.

The type of analysis conducted

Excellence level is measured using factors and results. The factors define what the company does, and the results determine what it has achieved (Figure 3.2.).

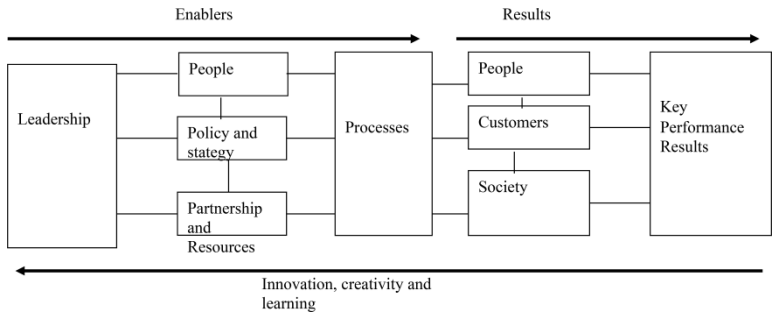


Figure 3.2. *EFQM evaluation of performance*

Evaluation is based on eight principles: attentiveness to customers, leadership and definition of goals, management by processes, level of personnel involvement, continuous innovation, development of partnership and society responsibility.

The questionnaire, which contains 50 questions, is designed to help the company position itself on a scale of excellence, covering fields linked to the efficacy of processes, continuous improvement of products and services, and human resource management and progression.

Conditions and constraints for application

It is well-suited to any company that seeks continuous improvement.

The conceptualization level of the model

The model is based on processes.

Indicators implemented

The company's results are measured by operational results that are calculated using general indicators (margin, cash flow, stock turn level, etc.), and also using indicators linked to customer and personnel satisfaction, and the company's level of integration within society.

3.3. Use of the models

This presentation has illustrated how complex it is to understand the origin and scope for each of the supply chain performance evaluation models, whether for the decisional level required (strategic, tactical or operational), the typology of the flows and the processes analyzed, or the fields of activity studied.

The models presented have been applied in many supply chains, without, however, any evaluation having been made of the usefulness of each of the models for application in the wider supply chain management context [CHA 03, ULU 03].

Shepherd and Günter carried out quite a broad review of research literature relative to measurement systems for supply chain performance [SHE 06]. They emphasize that the authors of these studies have been concerned with finding what is lacking for some measurement systems (e.g. a low level of connectedness to strategy, a measurement that is essentially oriented toward costs and does not take other indicators sufficiently into account, unbalanced approach, in particular in relation to customers or competitors, low level of interorganizational vision, or an unsystematic approach).

Fabbe-Costes highlights that the founding concept of supply chain management is to create value for all of the actors in the chain, but also that each of the stakeholders have differing performance evaluation systems, which are too varied and are difficult to operate in harmony [FAB 02].

It is thus important to characterize or classify the models according to criteria, enabling managers to choose models in line with the company's position on the chain.

What is the maturity level of each of the actors on the chain; is the chosen model suited to each of these levels? What is the decision-making level suited to use of the model? What types of benchmarking do each of the actors in the chain require?

> The choice of an evaluation model is a basic essential in an organizational network where each of those involved must make clear not only what value is created by their company, what value is created for the customers, and what value is created between the actors in the chain, but also what value is created for society as a whole.

All of the models presented do not apply to all types of companies; in fact, the choice of one model over another will depend to a large extent on the logistics maturity level of the company. A company that has an integrated or extended organization at its disposal would certainly not use the same performance model as an organization that has a functional-type organization. This is because it might be enough for the functionally organized company to use indicators for each function in isolation, however, the company with integrated or extended organization would need to combine indicators in order to obtain a more global vision.

Alongside surveying the most widely used performance models for measuring supply chain performance, it would also be useful to classify them according to criteria matching managerial requirements.

3.4. Grid summarizing the models studied

The differences and similarities between the various evaluation models can be identified using several criteria [EST 13].

Nine layers of analysis, which are interdependent to a certain extent, make it possible to identify the characteristics of each model more accurately.

3.4.1. *The decisional level concerned by evaluation frameworks*

The characteristics of decisional levels are taken from studies on time spaces (horizon and period of decisions) and hierarchical positions, and have led to the separation of strategic decisions that are mainly oriented around long-term management of resource (investments, manager contracts, etc.), and of tactical decisions, which include medium-term planning decisions on programming resources, and those that are linked to short-term controlling operational decisions [ANT 65].

Various modeling methods for managing organizations have been developed in order to take the different decision-making levels into account [VER 01, DOU 98].

Among the performance evaluation models, it would be useful to gain a more in-depth understanding of those that aim to take a particular level into account.

3.4.2. *The types of flow analyzed (physical, information and financial)*

In its commonly accepted definition, logistics makes a distinction between flows of materials (physical flows) and information flows [COL 96]. Initially, optimization of physical flows played a dominant role in implementing effective logistics management, and performance measurement tools were entirely dedicated to this field [KOL 72, BAL 98]. Controlling information flows with information systems has made it possible to make savings for two classic drivers of performance: costs and service levels [FAB 97, COL 05]. Controlling financial flows has made it possible to evaluate the value creation of the supply chain [AUR 97].

3.4.3. *The level of logistics maturity and its interaction with the performance level obtained*

Paché and Spalanzani's approach, as we have seen, makes it possible to evaluate the company over a broader reading grid [PAC 07]. They suggest the following maturity grid with five levels of maturity, built around interorganizational supply chain relationships and including societal aspects:

– Level 1: intraorganizational maturity;

– Level 2: interorganizational maturity;

– Level 3: extended interorganizational maturity;

– Level 4: multichain/multicompany maturity;

– Level 5: societal maturity.

3.4.4. *The type of benchmarking (internal or external)*

Benchmarking is the search for the most effective methods for performing a given activity, which can help an organization to attain superiority [CAM 92].

Benchmarking is the continuous action of comparing processes, products or services with a similar activity that is reputed to be the best, in order to set objectives and actions for improvement that are ambitious but realistic, with a goal to become and remain the best of the best within a reasonable amount of time [BAL 94].

The aim of benchmarking is to create a continuous improvement in the performance levels of a function, a job or a process. There are two types of benchmarking:

– *Internal benchmarking:* this involves analyzing and comparing concepts, methods, processes, products and services within an organization. In this case, the information is easily obtainable; however, the company benchmarking in this way does not have any insight into exterior events.

– *External benchmarking*: there are several types of external benchmarking:

- Competitive benchmarking: this is performed between the company and its direct competitors. This type of procedure allows the company to discover efficient methods applied by its competitors and to determine their competitive advantages. With competitive benchmarking, the company must ensure that comparison is possible. For example, it is not possible to compare two logistics departments for companies that are at different stages of the logistics maturity matrix. In addition to the issue of comparability, it should be noted that it is not always easy to obtain information about the methods used by direct competitors.

- Functional benchmarking: this involves a company analyzing its own functions in comparison with companies in the same activity sector but

which are not necessarily competitors. The benchmarking procedure is simpler to apply because the question of confidentiality is less pressing than with benchmarking against direct competitors.

- Organizational benchmarking: the company compares activities that have a high impact on the organization with those of non-competitor companies from the same sector of activity. This comparison is mainly limited to administrative management.

- Generic benchmarking: the company analyzes the best practices of organizations that are the leaders in various sectors of activity. This type of benchmarking is the most relevant, given that it shows new performance levels in new environments.

- Strategic benchmarking: for the company, this involves adapting winning strategies together with partners with which it has an established collaboration, in order to put strategic reflections in place that aim toward new directions for improvement.

Supply chain management is one of the functions to which benchmarking and the staging of performances is relevant. Companies adopt these procedures, making reference to either an "internal" or an "external" benchmarking in order to gain better awareness of their strengths and weaknesses, to position themselves in relation to their competitors, and to discover the best practices to put in place in order to set the measurements for improvement that would allow them to attain excellence and to outstrip their competitors.

Following this viewpoint, supply chain evaluation reference frameworks have been developed for use as bases for benchmarking studies. For this reason, it is necessary to identify, within the framework models studied, those that are used with external benchmarking, and those that are used for internal benchmarking.

3.4.5. *Contextualization (activity sector and typology of the organization)*

Many approaches consider that performance evaluation should be contextualized by the activity sector of the organization environment of the supply chain. In this way, it becomes possible to adapt the model more rapidly [DAV 90]. However, putting such evaluation models in place makes

it impossible to validate the comparisons or references to practices in other organizations that could provide breakthroughs or important progress.

3.4.6. *Value creation*

A distinction should be made between three typologies of value creation:

– *Value for the company*: this value is structured in order mainly to satisfy the profitability criteria (reduction in internal costs, optimization of internal resources, accounting for the standardization of products, pooling resources, etc.).

– *Value for the customer*: this value is focused on the customer (improvement in service and product quality, addition of new services, enriching the value of the service provision, etc.).

– *Value for all actors in the chain*: this value aims to take into account all of the actors in the chain and to define the characteristics that would enable global optimization of the system (optimization of the relationships between the various links in the chain and reduction in overall costs).

3.4.7. *Quality*

Current management systems aim for total quality, which is based on the principles of customer and collaborator satisfaction. This is achieved through the development of an aspiration toward quality shared by all of the personnel. It should be noted that companies operate not only with an aim of achieving quality, but also of achieving excellence, which is a wider vision of quality in continual improvement.

Quality has an impact on the organization and its performance, and this leads companies to adopt a quality management approach in their supply chain vision and to include quality in this, for all actors in the chain, whether these are upstream or downstream from them.

3.4.8. *Human capital*

Human capital plays a major role in the organization and performance of a supply chain. It brings together the value of the knowledge and the experience from which competencies are built.

The management of personnel as a company resource has gained in importance, and several models have described precisely this aspect [SHU 09, BEC 01]. As a result, supply chain performance needs to be evaluated with the support of indicators linked to the management of human resources and the management of competencies.

3.4.9. *Sustainability*

The concepts of sustainable development are value creating elements for society, but also for the actors in the supply chain. They play a role that is not solely linked to economic development, but which adds, for all the actors, key elements orientated toward the medium and long term.

Table 3.5 classifies the 15 models following these criteria and provides a more in-depth reading grid that makes it possible to choose supply chain performance evaluation models that are suited to the criteria identified by each company as being relevant in their evaluation of performance.

Comparison criteria		FLR	GSCF	SASC	WCL	ASLOG	EVALOG-MMOG/LE	AFNOR	SCM/PME	BSC	SPM	ABC	SCOR	APICS	ECR /Global	EFQM
Decisional level	Strategic level	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓	✓
	Tactical level	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
	Operational level	✓	✓			✓	✓					✓	✓	✓		
Analyzed flows	Physical flows		✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓
	Information flows	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
	Financial flows				✓			✓		✓	✓	✓	✓			
Supply chain maturity	Intraorganizational (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓

	Interorganizational (2)		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	
	Extended interorganizational (3)				✓		✓				✓		✓			
	Multichain (4)										✓		✓			
	Societal (5)							✓	✓	✓			✓			✓
Benchmarking	Internal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	External				✓		✓				✓		✓		✓	
Sector of operation	SME								✓							
	Retail														✓	
	Industrial						✓							✓	✓	
	Service															
	All sectors	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓			✓
Value creation	Company	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
	Customer		✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	
	Actors involved in the chain				✓		✓				✓		✓			
Quality					✓			✓					✓			✓
Human capital					✓					✓			✓			✓
Sustainability								✓	✓	✓			✓	✓		✓

Table 3.5. *Comparison of the various performance evaluation models, according to [EST 13]*

3.5. Analysis resulting from the characterization of performance evaluation models

The characteristics of the different evaluation models for supply chain management are the decisional level, the flows analyzed, the relationship between performance and logistics maturity, the interest with which the quality dimension is addressed, personnel skills and sustainable development.

This comparative analysis does not aim to define which evaluation model is most relevant, but rather to find, in function of the criteria that are important and the maturity of the supply chain under study, the model that would provide the best analysis in relationship to the quest for the desired performance levels.

A distinction may be made between two categories of models, following Summary Table 18:

– *Category 1* – models oriented toward internal analysis of the company, including mostly measurements of organizational performance (ASLOG, ABC and SCM /PME).

– *Category 2* – models taking a broader view of the supply chain: from the supplier's supplier to the customer's customer, taking in financial, organizational and societal aspects of performance (SCOR, WCL, SPM and GlobalEVALOG).

These two large categories may be associated with a certain degree of company maturity, which is linked with the choice of development that the company will seek.

The first category is aimed at companies at maturity levels 1 and 2. These companies wish to put internal logistics procedures in place to improve performance within their own organization. They provide intraorganizational evaluation that means measuring the performance of existing relationships between logistics and the other company functions, e.g. after-sales service, marketing, finances production, purchasing, supply and IT systems.

Measurement of internal logistics is important but is not in itself alone enough, because it only takes the individual performance of each link into

account, without being concerned with the interferences that may exist between different parties involved in the supply chain.

These internal measurements do not provide a global vision of logistics performance; sometimes, optimization of individual performance may be to the detriment of other actors and eventually may harm the global value of the chain.

The second category is targeted at companies with a maturity level of 3, 4 or 5, or those which wish to develop toward these levels. These performance evaluation models are also benchmarking tools, since they aim to refer to best practices, and to put the focus on the companies which are best in class.

Morana and Paché also made a contribution to the choices available to supply chain managers when they suggested some combined choices of models [MOR 00]. The suggested "coupling" BSC with the WCL model, emphasizing that coupling these two was one of the major challenges for the 2000s. They also highlighted the importance of the choice of a unique measurement model for each actor in the chain in order to be able to make value "objective" in the context of a "win-win" relationship. They remind us that one of the principles of the definition of supply chain management is to recognize profits that come from procedure, as well as to recognize the principles of sharing value.

3.6. Summary

Models for the evaluation of supply chain performance do not give prominence to value creation for the entire chain as one of the important elements to take into account in the evaluation of the organization.

The models from category 2 are most suited to the consideration of these aspects. The key question is to find out which processes or practices to implement in order to generate value creation for the chain of actors. It is thus essential to link the choice of the model for representation of the supply chain processes with its model for the evaluation of performance, in function of the specific value creation sought. In the next chapter, we will analyze these supply chain performance evaluation models that integrate value creation.

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4

Performance Evaluation Model for Value Creation

4.1. Introduction

The aim of this chapter is to identify supply chain performance evaluation models which include the creation of value. First, we analyze some supply chain performance evaluation models in order to identify their ability to measure value creation across the whole chain. Subsequently, we offer a reflection on the value creation evaluation model Supply Chain Advisor Level Evaluation (SCALE). This model evaluates the supply chain processes that create value throughout the chain and highlight the processes to be improved to promote best supply chain practices.

4.2. Comparison of models in terms of value creation

The creation of value for all of the actors in the chain is a key element which justifies the implementation of supply chain management in order to achieve a better performance. It is necessary to be able to evaluate this value creation, not only in relation to the customer or within the company, but also across the whole of the chain with an appropriate evaluation tool.

We analyzed four supply chain models in detail (Global Evaluation Logistics-Materials Management Operations Guidelines/Logistics Evaluation (EVALOG-MMOG/LE), Supply Chain Operation Model (SCOR), AFNOR and ASLOG). All of these models define supply chain processes (via reference models) whose full implementation must ensure the

best supply chain performance. The question is whether these models clearly integrate value creation and, if so, of what kind.

Therefore, we identified the processes of each model following three categories, those which create value for either the company, the customer or across the whole of the chain. We calculated the percentage of processes for each category according to the total number of processes in a model in order to ascertain which models take which category of processes into account the most (Figure 4.1).

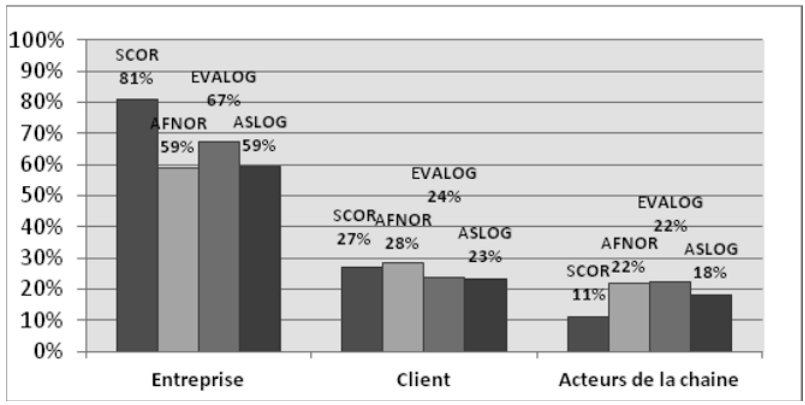

Figure 4.1. *Number of processes (%) linked to attributes of value creation*

This comparison helps us to show that, among the four evaluation performance models for supply chain management, none is truly oriented toward value creation across the whole chain and, therefore, no model truly considers all of the actors involved.

These models were designed essentially to foster performance evaluation approaches to create intraorganizational value for the company and, to a much lesser extent, for the customer and other supply chain actors.

The definition of supply chain management according to Lambert and Cooper is “the integration of key operational processes from the end user back to the original supplier of products, services and information which create added value for the customer and other actors”. It is clear that these models have not integrated value creation for all actors in one or several supply chains.

4.3. Model characteristics

> The creation of value for all of the actors in the chain is a key element which justifies the implementation of supply chain management in order to achieve a better performance.

It is necessary to be able to evaluate this value creation not only in relation to the customer or within the company but also for the whole of the chain as an appropriate evaluation tool.

The SCALE model analyzed in this chapter identifies the supply chain processes which create value for the chain and offers an approach to evaluate these processes.

The SCALE model was developed by Michel Favre Bertin and Dominique Estampe as part of research being carried out at the Institute for Supply Chain Excellence (ISLI) in KEDGE BS. The model has been used in a large number of companies and has also been adapted into different versions for widely varying industries, both in terms of field and size of company.

The SCALE model includes processes which take the following criteria, as described in Table 4.2, into account:

– strategic, tactical and operational decision-making levels;

– creation of value for the company, customer and actor;

– physical, information and financial flows;

– maturity level;

– internal or external benchmarking;

– quality factor;

– human competence;

– sustainable development.

The *level of decision-making criterion* classifies processes in terms of:

– *strategic* decisions proposing long term organizational *orientations and scenarios* (1) which are then transformed into *objectives* (2) for the

implementation of long term resource management and organization methods;

– *tactical* decisions enabling *planning decisions* (3);

– *operational* decisions linked to *implementation of procedures* (4) for short-term management control.

Thus, the criterion defines four categories of processes following these decision-making levels:

– strategic for categories “define a supply chain strategy” (1) and “define objectives” (2);

– tactical for category “plan resources” (3);

– operational for category “establish procedures” (4).

The need to *synchronize* both *the strategic decisions* throughout the whole chain and their *implementation* for all *actors of the chain* is included in a final category “coordinate different links in the chain” (5).

Moreover, the systemic modeling of the processes shows the need to *evaluate the evolution* of the organization (6) in order to implement the correctional elements necessary to ensure both its *management* and its *optimization* in relation to the objectives defined (7). Therefore, two categories are integrated into the model for evaluation (6) by “assess and monitor the performance of each partner throughout the supply chain” and to manage and optimize (7) by “optimize the supply chain”.

The processes in the SCALE model are grouped into seven categories:

– Category 1: define a supply chain strategy;

– Category 2: define objectives;

– Category 3: establish procedures;

– Category 4: plan resources;

– Category 5: coordinate different links in the chain;

– Category 6: assess and monitor performance of each partner throughout the supply chain;

– Category 7: optimize the whole of the supply chain.

Taking the various attributes of value creation into account (Table 4.1) helps us to describe the processes involved in each category. The processes are undertaken with the aim to create value for the company (internal cost reduction, optimization of internal resources, product standardization, pooling of resources, etc.), for the customer (improving quality of the service and product, offering new services, adding value to the service, etc.) and for the chain as a whole (optimizing relations between different links in the chain, reducing overall costs, etc.).

Customer (C)	Delivery period (C1) Price (C2) Quality (C3) Functionality (C4) Brand image (C5) Trust (C6) Reactivity (C7)
Company (Co)	Profitability (Co1) Innovation (Co2) Knowledge creation and sharing (Co3) Invention (Co4) Growth (Co5)
Chain actors (A)	Information sharing (A1) Synchronization of decision-making (A2) Pooling of resources (A3) Risk/profit sharing (A4) Creation of shared knowledge (A5) Joint innovation (A6) Speed of the chain (A7) Overall profitability (A8) Trust (A9) Sustainable development (A10)

Table 4.1. *Attributes of value creation*

The SCALE model consists of 57 processes aimed at creating value (Table 4.2).

	Attributes of value creation affected		
	Customer	Company	Chain actors
Category 1: define a supply chain strategy			
Process 1.1: define supply chain policy and elements of value creation	✔	✔	✔
Process 1.2: define principles of supply chain management for the whole of the chain	✔	✔	✔
Process 1.3: choose suppliers according to customer value creation criteria	✔	✔	✔
Process 1.4: participate in choice and/or modifications of production site depending on supply chain criteria		✔	✔
Process 1.5: define distribution network according to supply chain criteria	✔	✔	
Process 1.6: define assortment policy according to supply chain criteria	✔	✔	✔
Process 1.7: define transportation policy		✔	
Process 1.8: define packaging policy		✔	
Category 2: define objectives			
Process 2.1: identify the value expected by customers in supply chain terms, implement it and continue to monitor them	✔		
Process 2.2: define objectives in terms of customer service during and after purchase	✔		
Process 2.3: define supply objectives		✔	✔
Process 2.4: define production objectives		✔	
Process 2.5: define distribution objectives	✔	✔	
Process 2.6: Define supply chain characteristics of the products	✔	✔	✔

Category 3: establish procedures			
Process 3.1: establish supply procedures		✔	✔
Process 3.2: establish production procedures		✔	
Process 3.3: establish distribution procedures	✔	✔	
Process 3.4: establish protocols between distributors, transporters and suppliers	✔	✔	✔
Process 3.5: establish supply chain procedures for customer management	✔	✔	
Process 3.6: establish supply chain procedures for promotional sales	✔	✔	
Process 3.7: establish new product introduction procedures	✔	✔	
Process 3.8: establish customer and supplier returns procedures	✔		✔
Process 3.9: plan procedures for returns, exchanges, de-consignment or packaging processes	✔		✔
Process 3.10: assess main risks and implement safety procedures to avoid threats	✔	✔	✔
Category 4: Plan resources			
Process 4.1: establish sales forecasts	✔	✔	
Process 4.2: plan supply chain investments		✔	
Process 4.3: establish the sales and operations plan and master production program		✔	✔
Process 4.4: establish the master distribution plan		✔	
Process 4.5: plan promotional operations	✔	✔	
Process 4.6: plan transportation	✔	✔	✔
Process 4.7: plan after-sales service	✔	✔	
Process 4.8: map customer networks	✔		

	Attributes of value creation affected		
	Customer	Company	Chain actors
Category 5: coordinate the various links of the chain			
Process 5.1: implement communication methods between partners for both day-to-day work and emergency situations	✔		✔
Process 5.2: exchange information with customers	✔		✔
Process 5.3: implement customer–supplier relationship agreements	✔		✔
Process 5.4: define inventory policy with main suppliers and customers	✔	✔	✔
Process 5.5: involve suppliers and/or customers in the development of new products	✔	✔	✔
Process 5.6: incorporate after-sales function into product design and/or referencing	✔	✔	
Process 5.7: optimize sales and production plans with a range of partners	✔	✔	
Process 5.8: ensure the traceability of products across the whole of the supply chain	✔	✔	✔
Category 6: assess and monitor the performance of each partner throughout the supply chain			
Process 6.1: choose and implement indicators to measure value in the chain.	✔	✔	✔
Process 6.2: monitor the supply chain performance of each partner with evaluation models	✔		✔
Process 6.3: create a supply chain financial report		✔	
Process 6.4: implement system for monitoring risk		✔	✔
Process 6.5: implement continuous improvement approach		✔	✔

Category 7: optimize the supply chain			
Process 7.1: analyze supply chain networks	✔	✔	✔
Process 7.2: make supply chain assets flexible		✔	
Process 7.3: optimize facilities		✔	
Process 7.4: optimize transportation	✔	✔	✔
Process 7.5: optimize stocks		✔	✔
Process 7.6: optimize distribution resources	✔	✔	
Process 7.7: plan reception function		✔	
Process 7.8: develop human resources and competencies		✔	✔
Process 7.9: control and improve health and safety standards in supply chain procedures	✔	✔	✔
Process 7.10: optimize information exchange between the various links of the chain	✔		✔
Process 7.11: optimize relations between partners	✔		✔
Process 7.12: implement and maintain a continual improvement system		✔	✔

Table 4.2. *Processes of the SCALE model*

The SCALE model has the characteristics defined in category 2 of the evaluation models of supply chain performance giving a wider picture of the supply chain including suppliers' suppliers and customers' customers and also includes attributes of value creation for actors in the chain. It is relevant for medium to high maturity level companies which are looking to increase the performance of their supply chain.

The comparison of the SCALE model with other evaluation models such as EVALOG, SCOR, AFNOR and ASLOG shows that the SCALE model focuses more on the attributes of value creation through the whole chain (Figure 4.2).

The comparison demonstrates that in 56% of the cases, the SCALE model takes into account processes which analyze value creation throughout the chain compared to an average of 20% for the other models.

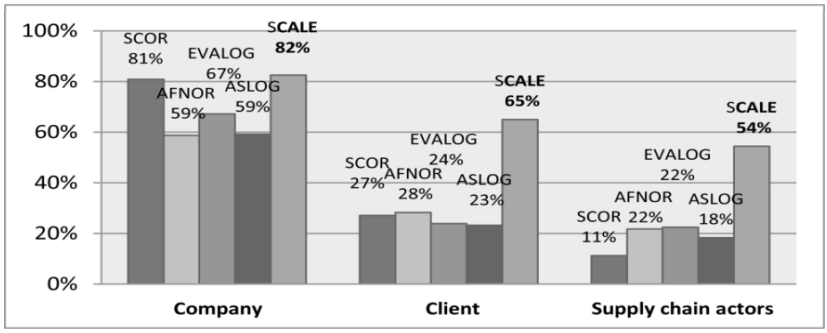

Figure 4.2. *Number of processes (%) linked to aspects of value creation*

4.4. Performance evaluation

The SCALE model enables the performance evaluation of 57 processes and directs the company toward the best practices to implement to achieve the best performances.

Measurement of performance

Measuring the performance of companies' processes with the SCALE model is carried out using the evaluation of a range of aspects.

An initial evaluation of performance regards the *will* of the company to *enact each process* in its organization. This is followed by an evaluation to ascertain whether the processes have been well integrated into the chain by evaluating the *frequencies of exchange* with the other processes and actors. A third evaluation qualifies the process implemented in terms of *its ability to create value*.

The *first evaluation* of performance regards the will of the company to enact each process of the SCALE model. Rating scales with several criteria have been developed to measure the process implementation. The Capability Maturity Model [PAU 93] gives a five level scale (initial, repeatable, defined, managed and optimizing), which measures the capability of an organization to integrate continual improvement procedures for the processes enacted. The SCALE model has a simplified three-level scale which equates to, for the first level, the absence of a process or

unwillingness of the company to implement the process (0 points), for the second level, the willingness of the company to implement the process but has yet to enact it (1 point) and, for the third level, the process has been enacted and its results measured (2 points).

The *second evaluation* of the performance aims to measure the level of information exchange between the actors of the chain. The sharing of information between the chain's actors is highlighted by most authors as an essential aspect and the basis of integration. They underline the fact that information exchange between the processes is an important performance criterion since it defines the link between the various activities which take place along the chain [SAH 02, BIT 97]. Authors argue that the frequency of exchanges is a key aspect in the evaluation process.

The model evaluates the processes by monitoring the frequency of exchanges between the various actors in the chain. For exchanges which take place less than once a month, a rating of 0 is given. For occasional exchanges which occur less than once a week, a rating of 1 is given, while for regular exchanges which take place several times every week, a rating of 2 is awarded.

The *third evaluation* of the performance looks at to what extent a process creates value. If the process creates value mainly for the company, a rating of 1 is given during the evaluation. For a process that creates value for the customer, a rating of 2 is given. For a process which creates value for the various supply chain actors, a rating of 3 is awarded.

Therefore, the performances of the various processes are evaluated using the following criteria:

– the enactment of the process;

– the frequency of exchanges between various links in the chain;

– the extent to which value is created for the company, the customer or the supply chain actors.

The evaluation of the performance of each of the company's processes is carried out using these three criteria and the score obtained for the process corresponds to the total number of points obtained.

Score weighting

Score weighting aims to prioritize certain processes implemented within a company and is used in many performance evaluation models. This should not be left up to the free choice of each individual user since this would not allow the model to be used to compare companies in the same chain with the same data because weighting is interpreted differently depending on the organization of each company [ESK 00].

The weighting of the SCALE model enables the importance given by each company to the creation of value throughout the supply chain to be highlighted more clearly. A weighting coefficient is applied to each process by taking into account the decision-making level (strategic, tactical or operational) where the process takes place and the type of value created (for the company, customer or the entirety of the chain). The weighting matrix aims to prioritize strategic processes and those which create value for the whole of the supply chain (Table 4.3).

		Decision-making level		
		Operational	Tactical	Strategic
Value creation	Company	1	2	3
	Customer	2	3	4
	Supply chain actors	3	4	5

Table 4.3. *Weighting coefficient for the SCALE model processes*

The rating given for each process is calculated by multiplying the score after the three evaluation stages by the weighting coefficient defined for each process.

The best rating can be obtained for each process when the maximum score possible is multiplied by the weighting coefficient. This maximum score corresponds to the implementation of best practices in terms of value creation.

The rating obtained by the company is compared to the maximum score and the difference is expressed either in terms of value or in percentage. The comparison provides a figure which enables a better understanding of the

improvements to be made in order to reach the maximum performance level. Therefore, the measurement of this figure represents the "step" that needs to be taken in order to achieve top quality supply chain organization.

Consequently, this rating system helps to better establish the strategic positioning of each process and the importance of value creation throughout the whole of the supply chain.

Example of an evaluation

For illustrative purposes, the performance evaluation is shown in the following way for each company. Figure 4.3 shows the overall rating for each of the seven process categories and this measurement gives a general overview of the processes which need to be implemented or improved upon.

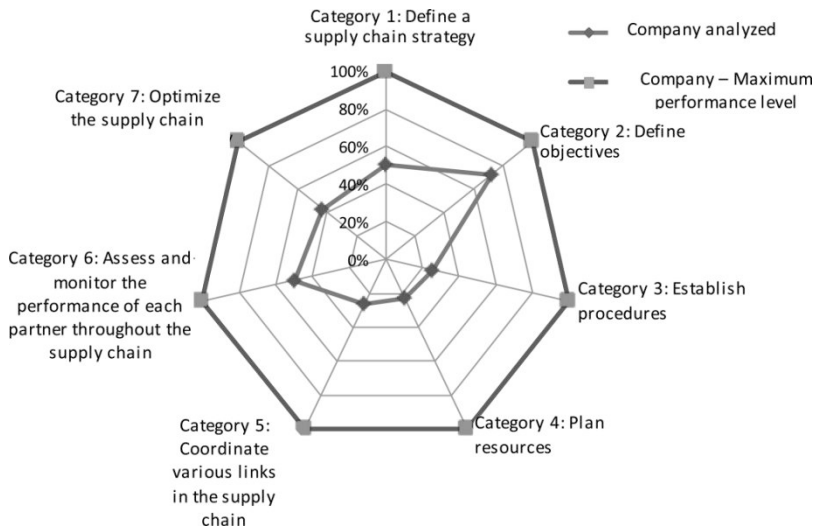

Figure 4.3. *Evaluation of the performance of processes by the SCALE model*

In this example, the company achieved less than 50% of the performances in all of the categories. The managers are looking to develop objectives for all of the supply chain functions but the strategies, tools and

operational resources necessary to achieve these objectives have not been implemented.

The objective of the performance evaluation is also to analyze the processes of each category in detail. The gaps measured help us to identify for each process in each category those which need to be improved. The analysis of the performance of the processes in category 6 (Figure 4.4) shows that the company has an economic value control policy (process 6.3) but has not implemented an assessment and monitoring process for all the actors of the supply chain (processes 6.2 and 6.5).

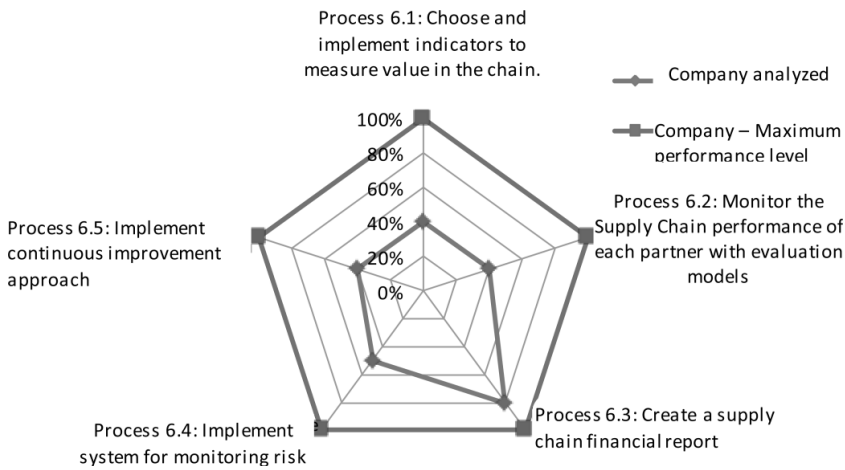

Figure 4.4. *Analysis of category 6 processes: assess and monitor the performance of each partner throughout the Supply Chain*

Moreover, the model helps us to identify the processes to be implemented or improved in order to increase the frequency of exchanges along the chain between the various actors and also to ensure that these processes are correctly implemented so as to create value for the whole of the supply chain.

4.5. Maturity matrix – creation of value/frequency of exchanges

It is interesting to place a company's performance on a maturity matrix which takes into account the degree of value creation for the company and

its frequency of exchanges with actors in the chain. Each segment shows the company's level of maturity and the practices implemented. An evolution toward more mature segments shows the company other practices which may be implemented in order to further improve its performance (Table 4.4).

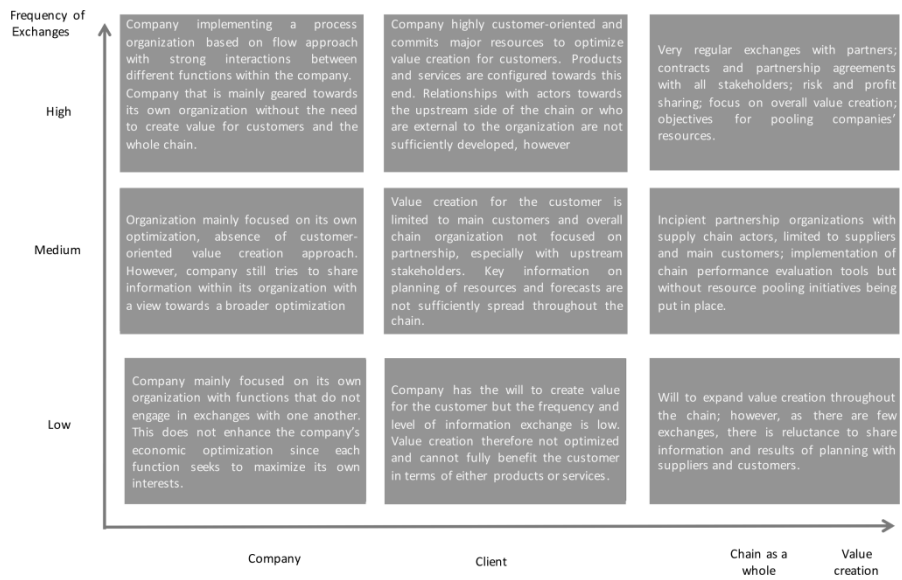

Table 4.4. *Maturity matrix – creation of value/frequency of exchanges*

4.6. Advocating auditing procedures

An audit with the SCALE model is run over a two-week period once the objectives of the company and the domain in question have been defined.

A two-day period is spent on-site interviewing the people involved in the various supply chain processes. These interviews are carried out by two assessors so that their perspectives can then be correlated.

A preparation document is sent to the interviewees one week beforehand so they could better understand the model and collect the necessary documents and information. In turn, this helps the assessors to evaluate the processes to the best of their abilities

After compiling information following the interviews, the assessors analyze and summarize the data before creating easy-to-read radar graphs illustrating variances between the company's current situation and the optimum. The objective is then to ascertain the most important processes which need to be improved as a priority. The auditors first determine the categories which are furthest from the optimum scores then, in each category, find the individual processes which are furthest from the optimum.

A priority improvements plan, by category and process, is drawn up and presented to the company's executive committee. According to its market positioning strategy, its supply chain and its organization, the company must decide the direction to take going forward. The SCALE model shows the key areas where efforts should be concentrated in order to increase value creation within the company and throughout the supply chain.

4.7. Summary

The evaluation of value creating processes is an important characteristic of evaluation models of supply chain performance. A company looking to implement a supply chain must be able to assess its level of maturity by measuring the performance of value creation processes, for the company, its customers and all actors in the chain. The SCALE evaluation model highlights the processes which need to be improved and proposes best practices for supply chain management.

The implementation of such an approach within a company is described in detail in the following chapter and shows the evaluation of value creation processes for the entirety of the supply chain.

4.8. Bibliography

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5

Case Study

5.1. Introduction

This case study illustrates how a performance evaluation model aimed at creating value is applied. It shows the results of the first phase of measurements and performance analysis of the company. Positioning a company on a maturity level helps to define best practices in order to create value. In this case, the SCALE model is applied to a retailer in the agri-food sector.

5.2. Presentation of the company

5.2.1. *Analysis of the sector in Europe*

Agri-food is the fifth largest sector in Europe in terms of turnover. This sector must deal with market globalization, tight margins and increasing regulations. The agri-food sector is dominated by a few big traders, with most retail business occurring in medium or large supermarkets owned by chains whose power has increased as the sector has consolidated.

The implementation of traceability systems covering the whole of the chain has reinforced supply chain approaches in this sector. To improve their margins, many companies are now deploying new value-creating levers and cost-cutting programs, based mainly on supply chain management principles.

5.2.2. *The agri-food supply chain and value creation features*

The organization of the supply chain in the agri-food sector is characterized by three main actors: producers, manufacturers and wholesalers-retailers (Figure 5.1) whose characteristics are detailed along market, product and customer aspect lines as shown in Table 5.1.

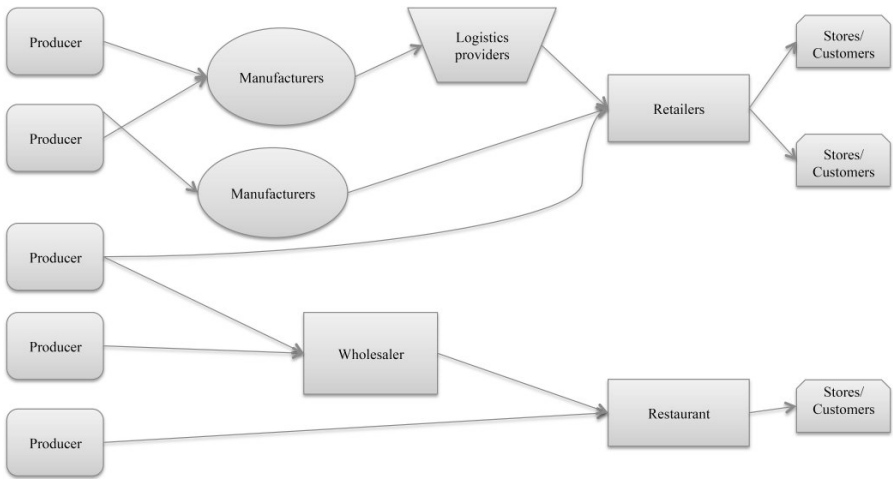

Figure 5.1. *Organization of the supply chain in the agri-food sector*

The creation of value in the agri-food sector (Table 5.2) is characterized by customer expectations in a wide range of areas (price, lead time, quality, functionality, brand image, etc.). The sector has highly diversified elements of value creation. In this context, the whole supply chain must work toward creating shared value in order to satisfy these demands and develop value creation in a number of attributes (decision synchronization, pooling of resources, trust, risk and profit sharing, etc.) while maintaining profitability for each individual actor in the chain as well as overall.

The supply chain aims to provide a service to a demanding customer base with availability of a diverse range of products. Cooperation across the chain is essential in order to optimize stocks and resources and reduce cycles.

Criterion	Characteristics	Supply chain constraints	Criterion	Characteristics	Supply chain constraints	Criterion	Characteristics	Supply chain constraints
Market	Market growth either stagnant or very weak	Strong competition	Customers	Changed geographical structure of the population	Adapted network structure (facilities	Products	Customer lead time very short	Allocation of resources
				Changed age composition of the population	Increase in types of services		Very high level of diversity	Need for specific logistics systems
	Sector characterized by an increase in cost of raw materials	Increased production costs		Demanding behavior	Improved quality of offer		Increasingly specific products	Ever increasing number of products
				Collection of a large amount of information (loyalty cards, etc.)			Increased development of retailers' brands	Increased packaging
		Increased distribution costs			Achieving service level close to 100%			Need for upstream and downstream integration
	Strong manufacturer–retailer relations							
	Highly regulated framework	Need to control costs and anticipate market reactions			Adjusting production lead time and promotional sales			
		Consumer protection						
		Employee protection						

Table 5.1. *Specificities of retail supply chain adapted from [EUR 03, EUR 05]*

5.2.3. *Presentation of GEMDIST group*

The GEMDIST group is a retailer operating on an international level in 11 countries with 250,000 workers achieving a turnover of over € 50 billion.

Independence is one of the founding principles of the organization and the group's operations. Each point-of-sale has its own executive (or "member") responsible for investments in terms of time, risks and capital.

Major value creation factors	Anticipated levers for supply chain performance
Customer:	
Lead time (C1)	Product availability
Price (C2)	Ensure perfect customer service
Quality (C3)	Diversity of products
Functionality (C4)	Brand/price differentiation
Brand image (C5)	Cost optimization
Trust (C6)	Cooperation along supply chain
Reactivity (C7)	Shorten cycles
Company:	
Profitability (Co1)	
Innovation (Co2)	
Growth (Co5)	
Supply chain actors:	
Information sharing (A1)	
Decision-making synchronization (A2)	
Resource pooling (A3)	
Profit/risk sharing (A4)	
Speed of supply chain (A7)	
Overall profitability (A8)	
Trust (A9)	
Sustainable development (A10)	

Table 5.2. *Value creation factors in the agri-food sector*

Independence relies on a two-way system of support:

– Each member commits 2 days a week to joint structures (regional or national sales, logistics, production units, human resources, legal affairs, etc.).

– The rest of the time they are present at their point-of-sale and in daily contact with the frontline day-to-day operations and the consumers. This enables better circulation of crucial information on product development, marketing strategies, store layout or pricing policy.

Currently, the GEMDIST group has 3,000 members who own their business and develop their own purchasing and sales strategies.

The group and all of its projects have always been based on the value of low (discount) prices. This initially manifests itself by simplicity in store layout and efficiency in supply chain systems. It soon became apparent that other aspects were necessary for this policy to work in what had become a highly competitive environment:

– low overheads;

– rapid stock turnover;

– purchasing centralized at a European level.

Mindful of the changes in people's lifestyles, the group focuses on smaller, local stores. Indeed, in terms of size, stores do not exceed 2,000 m², and the group has significant coverage on a geographical level.

5.2.4. *The GEMDIST group's purchasing policy*

The group's supply relies on three key elements:

– international purchasing policy;

– industrial strategy;

– partnerships.

The group has an international food and non-food purchasing unit that negotiates with (and purchases from) multinational suppliers working for major brands.

On a national level, purchases are organized into categories and divisions. This structure improves GEMDIST's sectorial knowledge – from production to sales – allowing it to optimize purchases.

On a regional level, purchasing is carried out in close cooperation with local producers. This proximity helps to establish privileged relations and ensures a better insight orders and volumes.

The group quickly developed a range of own-brand products for two key reasons:

– to control costs;

– to guarantee independent sourcing.

Of these own-brand products, 75% come from partnerships with SMEs and 25% come from the group's own production units (meat, water, bread and pastries).

5.2.5. *The organization of the GEMDIST group's supply chain*

In order to control stock and transport, as well as to ensure daily deliveries to stores, GEMDIST created its own organization (Figure 5.2) which is made up of:

– regional warehouses or crossdocks for fresh produce located next to main road links, and often in zones of agricultural production;

– a directly owned transport fleet;

– an IT base to optimize transport systems.

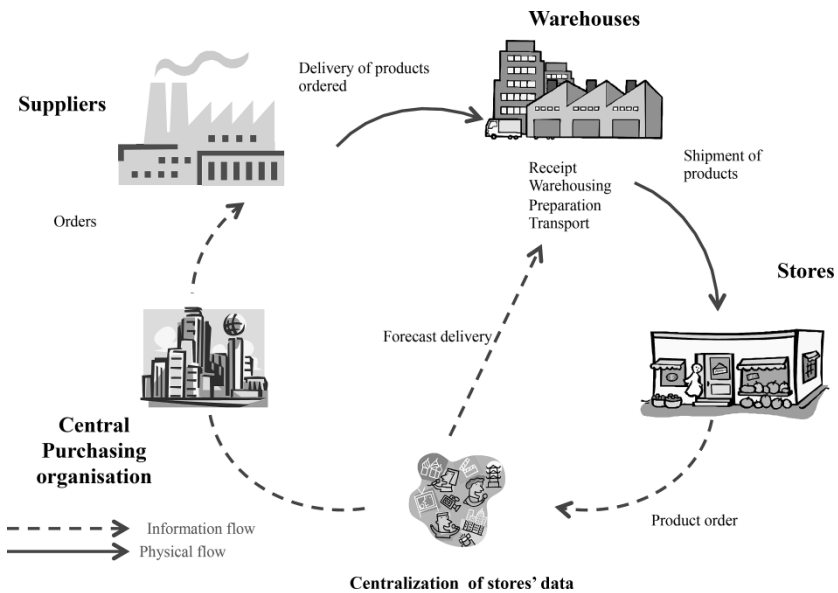

Figure 5.2. *Organization of flows*

5.3. Use of SCALE model to evaluate the performance of the supply chain

5.3.1. *Overall assessment of supply chain categories*

Using interviews conducted with the supply chain managers, each process in the SCALE model can be assessed. Marking according to the established categories provides an overall evaluation of the seven supply chain categories (Figure 5.3).

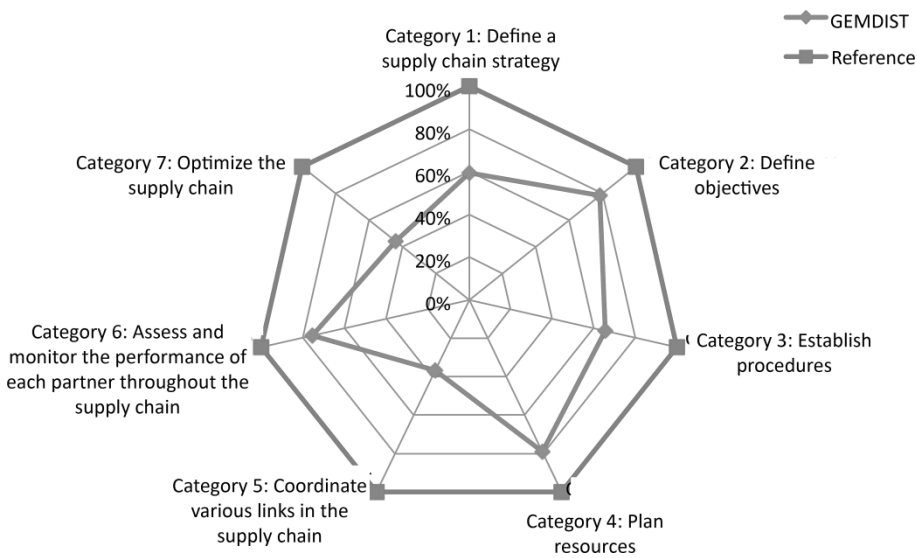

Figure 5.3. *Evaluation of the GEMDIST group's performance*

This assessment has been benchmarked against the top marks for the various categories. The outcomes show that the company has started an approach by proposing a supply chain strategy for the whole of the chain (category 1) followed by a policy to put this in place (category 2).

These goals have been achieved through the implementation of procedures (category 3) that has bolstered supply chain approach and management processes. Planning is carried out in order to optimize resources (category 4). Performance (category 6), in terms of both stores and suppliers, is assessed and monitored in order to guarantee both economic optimization (purchasing price) and reliable customer service (on the shelves).

Indeed, economic optimization takes place within the company so as to implement the margins necessary for its development, but wider optimization for all actors in the supply chain (category 7) is not yet being dealt with. By highlighting this category process-by-process in the following section, we will define the key additional value creation areas that the company can initiate.

This initial assessment is also corroborated by the analysis of category 5 that illustrates the process of coordinating various links in the chain. Indeed, the upstream links (directly owned production units) and downstream links (independent and autonomous members) are not coordinated.

5.3.2. *Detailed evaluation of categories 5 and 7*

Categories 5 and 7 have the weakest scores, and an analysis of these categories can help to identify the organizational practices which can be improved.

5.3.2.1. *Analysis of category 5: coordinate the various links in the chain*

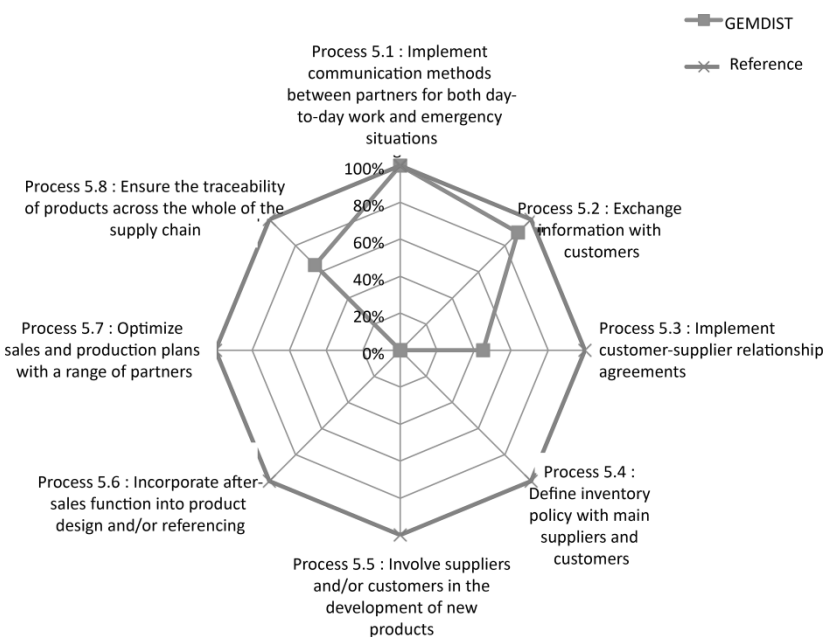

Figure 5.4. *Category 5 processes: coordinate the various links in the chain*

The company has not implemented the following processes that constitute areas of improvement (Figure 5.4):

– 5.4 “Define inventory policy with main suppliers and customers”;

– 5.5 “Involve suppliers and/or customers in the development of new products”;

– 5.6 “Incorporate after-sales function into product design and/or referencing”;

– 5.7 “Optimize sales and production plans with a range of partners”.

The assessment shows that the information exchanges are largely coordinated with customers with a planning focused on the organization’s internal resources [5.2]. The aim is not to share information in order to optimize the whole chain (shared inventory policy, pooling of resources, suppliers integrated into supply-side developments, etc.). The processes are currently geared toward optimizing the organization’s internal resources.

5.3.2.2. *Analysis of category 7: optimize the supply chain*

According to the assessment of category 7 solely based on the criteria of value creation (Figure 5.5), the company is mainly focused on internal value creation. Only daily information exchange via EDI (process 7.10) allows a link to be established with other actors in the supply chain (customers and suppliers). The company took the decision to control and optimize its own organization first and foremost (processes 7.3–7.5).

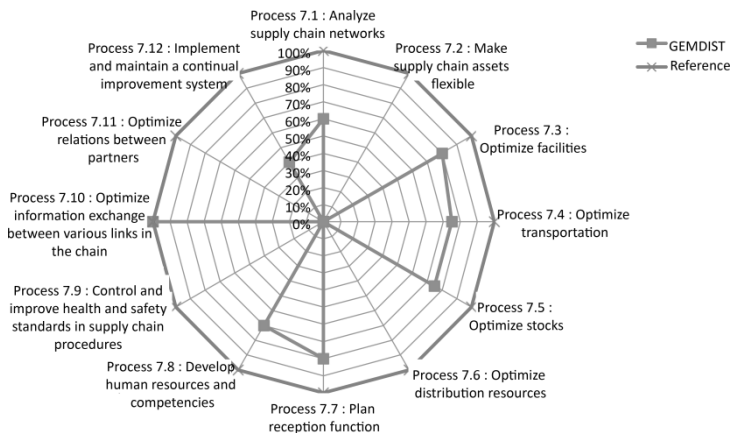

Figure 5.5. *Category 7 processes: optimize the supply chain*

Management tools are not shared across the supply chain, and information exchanges with customers and suppliers (process 7.10) are used only on an operational level in order to optimize the organization of resources and satisfy the customer demands.

5.4. Overview of performance evaluation and suggestions for improvement

The positioning of GEMDIST on the value creation/frequency maturity matrix gives a global measurement of its supply chain management (Figure 5.6). GEMDIST's organization is mainly focused on its own economic optimization. Indeed, it seeks to reduce the costs associated with the use of its various assets and inputs. Despite this, the company has very frequent information exchanges with its customers and suppliers but largely at an operational level in order to carry out common management processes (taking orders, delivery, etc.).

The organization's structure has not been conducive to the extension of its exchanges at a more tactical or strategic level across the whole chain that could foster long-term partnerships and expand value creation to encompass the whole chain.

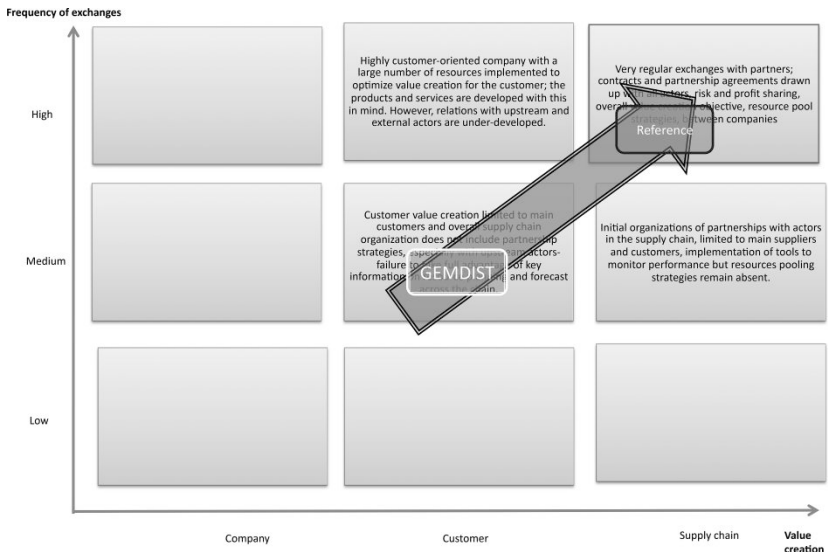

Figure 5.6. *Positioning of GEMDIST on the value creation maturity matrix*

The sources of progress are mainly the engagement of a supply chain management strategy geared toward a shared resource management logic involving all actors of the chain: synchronized medium-term planning, development of shared inventory strategies, pooling of transportation resources by upstream and downstream actors, product co-development, etc.

GEMDIST must adapt its supply chain management in order to create value across the whole chain, aiming for improved performance based on current best practices in a sector with marked by a clear desire for shared value creation. Some examples of such practices are higher volume of transport flows, pooling of supplies and multichain resources.

5.4.1. *Transport consolidation flows*

The ECR Europe association suggests mapping the transport flow of each actor in the distribution chain. This can then be used as a cooperative tool to simplify the flows of goods between different partners in the sector. The map can be used to show expedition and reception locations and warehouses for a large majority of the manufacturers and distributors.

Since GEMDIST has a directly owned transport fleet, it can include the gains derived from this pooled transport arrangement in its contracts with suppliers.

The best practices of shared management that have already been implemented with the main suppliers can be extended to the smaller suppliers who struggle to deliver with extremely high frequency to regional warehouses.

5.4.2. *Pooling multichain sourcing and resources*

In its 2013 survey, the ECR showed that 62% of companies have a pooling strategy covering the next 2 years [ECR 13]. In recent years, several pooling projects have brought a number of competing actors together with a view to optimize truck loading and pool the use of distribution platforms. One of the most well-known projects involves Kimberly-Clark, Kellogg's, Maison du Café, Pastacorp, Heinz, Intersnack and Nutrimaine with FM Logistic.

The organization of a shared warehouse is usually entrusted to a logistics provider. The goods remain the property of each supplier and the warehouse provider charges each supplier for storage and warehouse management according to flow volumes.

The cooperation is managed by the suppliers aiming to reduce distribution costs. Transport to the retailer's warehouse is the responsibility of the retailer. This type of cooperation is used by the retailer giving its suppliers the responsibility of entering into shared inventory agreements with predefined providers.

The goal is to offer GEMDIST suppliers the opportunity to use consolidation platforms. These are, in fact, shared by a number of manufacturers, which may be competitors, organized by a provider. The volumes can then be ensured by the manufacturers instead of the retailers.

For managing the flows of high-turnover goods (beverages, milk, biscuits, sugar, etc.), optimization lies in exploitation of regional platforms that can be construed as "proximity inventory" located in a central position for the stores being served, supplied directly by fully loaded lorries from the suppliers' plant.

Low-turnover items are managed by the so-called primary sites located in a central position for several suppliers' production units. This configuration enables a commingled reception of merchandise coming from multiple locations.

5.5. Summary

The application of the SCALE model shows that it can establish new avenues for value creation both for the company and the whole supply chain. By analyzing the scores obtained, we have been able to gain an accurate vision of companies' current practices and performances. The categories used to group the various processes of the model can be easily applied in practice and also are simple to understand.

The model was applied to a large company with an intermediate maturity level that already had an understanding of value creation concepts. It remains uncertain whether the model would be appropriate for a company with a low or very low maturity level and little understanding of value

creation concepts across the whole of the chain. For a small company, the model can only be applied as it is if training is given to its managers on supply chain approaches and concepts of value creation. This leads to the question of how the model can be applied to all actors of the same supply chain. When the organization, size and strategy of each actor are not identical, it is essential to apply the model to each of the actors so that they can move toward a shared or common identification of value creation. If companies' maturity levels are not the same, the key company or companies in the chain must provide training on the methods and tools of supply chain management in order to ensure that the same objectives of value creation are shared across the whole chain.

The application of the model in other areas which manage not only product flows but also services, such as the hospital and banking sectors, requires adjustments to certain processes in order to satisfy the different concerns regarding value creation for all of the actors in the chain. The identification of value creation attributes is a prerequisite to all evaluations.

The model can be enhanced by identifying, for each process and related value creation attribute, the operational indicators that managers can implement to measure the effectiveness of the value creation.

The SCALE model can also be supplemented by including the processes for value creation on a social level.

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Conclusion

We have shown that the goal of supply chain management is to steer the actors of one or several supply chains in order to optimize their performance and thus offer the creation of common value, especially for the customer.

An evaluation of supply chain performance can only be carried out with prior identification of value creation for the customer, the company itself and all actors across the chain. Although all supply chains have great disparity between their actors, often related to different maturity levels, objectives and constraints, seeking to improve performance across the whole supply chain is essential. The value creation approach is a key element in achieving a high-quality supply chain for the company and the entirety of the chain.

Highlighting this element with value creation attributes is fundamental for any manager looking to direct the various actors in a supply chain. Performance can be measured by using indicators related to value creation attributes, which can then establish a company's maturity or performance level. Implementing processes within an organization and evaluating their performance using models focused on value creation can help to guide the company in identifying those practices that are closely related to their performance.

The current models are not all focused on analyzing value creation. They can be classified into two general categories:

– models focused on analyzing a company's internal performance, mainly measuring operational performance;

– models with a broader view of the supply chain, including the supplier's supplier and the customer's customer while measuring performance in terms of financial, organizational and even social aspects.

The SCALE model defines 58 "best practice" processes focused on value creation across the supply chain. The marking grid for each process evaluates the performance of these processes within the company. This evaluation can be used to identify the company's maturity level based on its value creation processes. Therefore, the model is able to suggest areas for improvement for overall value creation by implementing the best practices contained in the processes.

The SCALE model helps the managers of a company in the supply chain to better steer their organizations by taking account of each individual actor and the environment.

A company's problems in implementing its supply chain operations and strategies can be easily resolved by using evaluation models that take account of their interests and final objectives, especially if they are ultimately focused on value creation.

Appendix : List of Companies

Agri-food	Allied Domecq	Automobile	Faurecia	Pharmaceutical	Ricordati
Agri-food	Bahlsen	Automobile	FIAT	Pharmaceutical	Sanofi
Agri-food	Barilla	Automobile	Michelin	Pharmaceutical	Schering
Agri-food	Beghin Say	Automobile	Peugeot	Pharmaceutical	Schwartz
Agri-food	Bonduelle	Automobile	Plasticomnium	Pharmaceutical	Solvay
Agri-food	Bongrain	Automobile	Renault	Pharmaceutical	UCB
Agri-food	Cadbury	Automobile	SmarTire		
Agri-food	Campina	Automobile	ThyssenKrupp	Textile-Clothing	Aigle
Agri-food	Carlsberg	Automobile	Valeo	Textile-Clothing	Armani
Agri-food	Cereol	Automobile	Volkswagen	Textile-Clothing	Armorlux
Agri-food	Dairy Crest			Textile-Clothing	Benetton

Agri-food	Danone	Electronics	Alcatel	Textile-Clothing	Calvin Klein
Agri-food	Delhaize	Electronics	Ericson	Textile-Clothing	Camaieu
Agri-food	Diageo	Electronics	Gemplus	Textile-Clothing	Damart
Agri-food	Distriborg	Electronics	Infineon	Textile-Clothing	Du Pareil Au Meme
Agri-food	Interbrew	Electronics	Nokia	Textile-Clothing	Etam
Agri-food	Kerry Group	Electronics	Philips	Textile-Clothing	Faconnable
Agri-food	Lindt & Sprüngli Group	Electronics	SAGEM	Textile-Clothing	GAP
Agri-food	Nestle	Electronics	Siemens	Textile-Clothing	H&M
Agri-food	Nutreco	Electronics	STMicro electronics	Textile-Clothing	Jennyfer
Agri-food	Pernod Ricard	Electronics	Thomson Multimédia	Textile-Clothing	Kenzo
Agri-food	Remy Cointreau			Textile-Clothing	Lafuma
Agri-food	Royal Numico	Pharmaceutical	Akzo Nobel	Textile-Clothing	Les Complices
Agri-food	Scottish Newcastle	Pharmaceutical	Alcon	Textile-Clothing	Manoukian
Agri-food	Sudzucker	Pharmaceutical	Astra Zeneca	Textile-Clothing	Miroglio
Agri-food	Teisseire	Pharmaceutical	Aventis	Textile-Clothing	Naf Naf

Agri-food	Uniq Plc	Pharmaceutical	Boehringer	Textile-Clothing	New Man
Agri-food	United Biscuits	Pharmaceutical	GSK	Textile-Clothing	Petit Bateau
Agri-food	Wessanen	Pharmaceutical	NovoNordisk	Textile-Clothing	Petit Boy
		Pharmaceutical	Omega	Textile-Clothing	Vivarte
Automobile	BMW	Pharmaceutical	Rhodia	Textile-Clothing	Zannier
Automobile	Daimler			Textile-Clothing	Zara

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