

SIMME DOUWE P. FLAPPER
JO A. E. E. VAN NUNEN
LUK N. VAN WASSENHOVE
Editors

Managing Closed-Loop Supply Chains

 Springer

SIMME DOUWE P. FLAPPER
JO A.E.E. VAN NUNEN
LUK N. VAN WASSENHOVE
Editors

Managing Closed-Loop Supply Chains

Managing Closed-Loop Supply Chains

Simme Douwe P. Flapper
Jo A.E.E. van Nunen
Luk N. Van Wassenhove
(Editors)

Managing Closed-Loop Supply Chains

With 41 Figures and 11 Tables

 Springer

Dr. Simme Douwe P. Flapper
Technische Universiteit Eindhoven
Department of Technology Management
P.O. Box 513
5600 MB Eindhoven
The Netherlands
s.d.p.flapper@tm.tue.nl

Professor Dr. Jo A.E.E. van Nunen
Erasmus University Rotterdam
Rotterdam School of Management
P.O. Box 1738
3000 DR Rotterdam
The Netherlands
jnunen@fbk.eur.nl

Professor Dr. Luk N. Van Wassenhove
INSEAD
77305 Fontainebleau
France
luk.van-wassenhove@insead.edu

Cataloging-in-Publication Data
Library of Congress Control Number: 2005924148

ISBN 3-540-40698-0 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media
springeronline.com

© Springer Berlin · Heidelberg 2005
Printed in Germany

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Hardcover-Design: design & production GmbH, Heidelberg

SPIN 10951743

42/3153-5 4 3 2 1 0 – Printed on acid-free paper

Preface

Introduction

Closing supply chains refers to taking care of items once they are no longer desired or can no longer be used by their user. Smart management of closed-loop supply chains means profitable recovery of value from these items (products, functional components, materials or packaging). The company closing the supply chain may be the original equipment manufacturer (OEM), a distribution partner or a third party not involved in the forward distribution.

In recent years, the management of closed-loop supply chains has gained importance because of increased legislation on producer responsibility, requiring companies to take back products from customers and to organize for proper recovery and disposal. This legislation is partially due to increased awareness of environmental issues. However, smart companies have also understood that returned products often contain lots of value to be recovered. They manage closed-loop supply chains simply because it is a profitable business proposition.

A number of books on closed-loop supply chain management have been published before. Many of them also pay some attention to industrial practice. However, they do not give much insight in: How are smart companies closing the loop? What does it take to make money in this business? The current book fills this gap in the literature by providing rich descriptions of many industrial cases in a variety of industries and for all types of product returns. More specifically, this book provides:

1. A classification of the types of physical return flows underlying closed-loop supply chains, like commercial returns, repairs, end-of-use and end-of-life returns, with their specific characteristics, opportunities and challenges,
2. A framework for analysis and design of closed-loop supply chains including technical, organizational, planning and control, information, environmental and business economic issues, as well as the interactions between them,
3. A large collection of industrial cases with rich and systematic descriptions using the classification of return types and the framework for analysis mentioned above. Books on industrial practice, co-written by managers, are very rare.

It is precisely the richness and variety of the industrial cases, combined with their systematic description using a standard classification and analysis framework that renders this book unique as well as very valuable for managers, academics and students alike.

This is the second book resulting from the TMR project called REVLOG, REVERsed LOGistics and its effects on industry, sponsored by the European Union (ERB 4061 PL 97-650), and carried out by Technische Universiteit Eindhoven University of Technology (NL), University of Piraeus (GR), Aristoteles University of Thessaloniki (GR), Erasmus University Rotterdam (NL), INSEAD (F), and Otto-von-Guericke Universität Magdeburg (D). The companion book, “Reverse Logistics: Quantitative Models for Closed-Loop Supply Chains” edited by R. Dekker, M. Fleischmann, K. Inderfurth and L.N. Van Wassenhove, Springer Verlag, Heidelberg, Germany, 2004, focuses on analytical models for the various sub-problems identified in this book and thereby provides a solid base for decision making.

For more information about the REVLOG project, the related research groups and the results obtained via this project, we refer to the REVLOG website: www.fbk.eur.nl/OZ/REVLOG.

Readership

Reading this book does not require specific domain knowledge or experience. Some basic awareness of general management concepts and experience in practice will make the book more valuable to the reader. We made a conscious attempt to make the book useful for the following groups of readers:

- Managers from companies as well as from other organizations like local and central governments (by providing them insight into the opportunities, issues and roadblocks related to closed-loop supply chains),
- Academics and functional specialists focusing on specific sub-problems (by giving them better insight into the consequences of their contribution on the overall problem of successful closed-loop supply chain management),
- Graduate students in operations, supply chain management, economics, or management science at universities or business schools.

In addition, the book should be useful for any manager or MBA student interested in important emerging general business issues of the future.

Structure of the book

The book takes a business perspective on closed-loop supply chains. In the end, this is a business issue like any other. If supply chains will need to be closed in the future, then companies will have to be able to cope with this in a profitable way. Stated differently, legislation may help, but companies will need to find a way to make it work economically, otherwise the situation will not be sustainable. This book shows, by means of many rich industrial cases, that smart companies have found ways to do so already and that we can all learn from their experience.

The book starts with an overview of different types of returns in practice. The type of return has large consequences for the design and management of the appropriate closed-loop supply chain. Subsequently, we turn our attention to specific business drivers, i.e., what determines the specific choices made in designing closed-loop supply chains for all parties involved.

We then proceed with an overview of the managerial aspects related to closed-loop supply chain design and management. This concludes the conceptual framework of the book.

The main body of the book consists of 16 industrial cases. The cases were selected on the following criteria: (1) they are innovative and interesting for a broad audience, (2) at least one member of the REVLOG research team was involved in the industrial project, and, (3) the case had not been published before. Taken together, the cases provide a rich and unique collection of the real managerial issues in closed-loop supply chain management.

The book concludes with a discussion of likely future trends in managing closed-loop supply chains.

Acknowledgements

We are grateful to the European Union for providing financial support to the REVLOG project. Our sincere thanks are also extended to all the managers in the companies and organizations that contributed their scarce time to helping us write the cases. Finally, we acknowledge the help of our colleagues and the support of our respective schools.

VIII Preface

Eindhoven, September 2004
Rotterdam, September 2004
Fontainebleau, September 2004

Simme Douwe Flapper
Jo van Nunen
Luk Van Wassenhove

Table of Contents

Part 1:

Introduction to closed-loop supply chains

- 1 Introduction..... 3**
Simme Douwe P. Flapper, Jo A.E.E. van Nunen
and Luk N. Van Wassenhove

Part 2:

Production closed-loop supply chains

- 2 Reverse logistics in a pharmaceutical company:
the Schering case..... 21**
Ruud H. Teunter, Karl Inderfurth, Stefan Minner
and Rainer Kleber
- 3 Reverse logistics in an electronics company:
the NEC-CI case..... 33**
Roland Geyer, Kumar Neeraj and Luk N. Van Wassenhove

Part 3:

Distribution closed-loop supply chains

- 4 The chip in crate: the Heineken case..... 43**
Jan van Dalen, Jo A.E.E. van Nunen and Cyril M. Wilens
- 5 Recovery and reuse of maritime containers:
the Blue Container Line case 57**
Costas P. Pappis, Nikos P. Rachaniotis and Giannis T. Tsoufas
- 6 Empty container reposition: the port of Rotterdam case..... 65**
Albert W. Veenstra

Part 4:

Commercial returns closed-loop supply chains

- 7 Commercial returns of sun-protection products:
the L'Oréal France case 79**
Roelof Kuik, Jo A.E.E. van Nunen and Job Coenen

- 8 Commercial returns of printers: the HP case..... 87**
Sylvia Davey, V. Daniel R. Guide Jr., Kumar Neeraj
and Luk N. Van Wassenhove

- 9 Commercial returns in a mail order company:
the Wehkamp case 97**
René M.B. de Koster and Joost P. Zuidema

Part 5:

Repair and replacement closed-loop supply chains

- 10 The repair of electronic equipment: the OMRON case..... 109**
Roelof Kuik, Jo A.E.E. van Nunen, Jacky Gerrits
and Marco H.P. Hogenboom

- 11 Tire recovery: the RetreadCo case 119**
Laurens G. Debo and Luk N. Van Wassenhove

- 12 The closed-loop supply chain of service parts:
the Whirlpool case..... 129**
Marc Deneijer and Simme Douwe P. Flapper

Part 6:

End-of-use closed-loop supply chains

- 13 End-of-lease asset recovery: the Océ case 141**
Rob A. Zuidwijk, Erwin A. van der Laan and Leon Hoek

- 14 Cellular telephone reuse: the ReCellular Inc. case 151**
V. Daniel R. Guide Jr., Kumar Neeraj, Charles Newman
and Luk N. Van Wassenhove

- 15 Recovery of car engines: the Mercedes-Benz case 157**
Hans-Martin Driesch, Hans E. van Oyen
and Simme Douwe P. Flapper

Part 7:**End-of-life closed-loop supply chains**

- 16 Recovering end-of-life large white goods:
the Dutch initiative..... 169**
René B.M. de Koster, Simme Douwe P. Flapper,
Harold R. Krikke and W. Sander Vermeulen
- 17 End-of-life tire recovery: the Thessaloniki initiative 183**
Sophia Panagiotidou and George Tagaras

Part 8:**Conclusions on closed-loop supply chains**

- 18 Future developments in managing
closed-loop supply chains 197**
Simme Douwe P. Flapper, Jo A.E.E. van Nunen
and Luk N. Van Wassenhove

References..... 207

Authors 211

Part 1:
Introduction to closed-loop supply chains

1 Introduction

Simme Douwe P. Flapper, Jo A.E.E. van Nunen and
Luk N. Van Wassenhove

1.1 A framework for closed-loop supply chain analysis

This introductory chapter presents the general framework used in this book to cluster and describe the industrial cases.

The first component of the framework uses a general picture of reverse flows with different types of returns. We briefly discuss this picture and argue that firms increasingly have to deal with larger streams of returns in different forms over the life-cycle of their products. We then introduce and briefly illustrate the different types of returns and point out that the book is organized in several parts, corresponding to these types of returns: commercial returns, repair and replacement returns, end-of-use returns, end-of-life returns, production return flows and, finally, distribution returns.

The second component of our framework uses a flow diagram for analysis, outlining the need to start with identifying the business drivers, followed by a thorough analysis of the technical aspects, organizational implications, planning and control issues, information system needs, environmental impacts and finally economic impacts. We note that this is just one of many possible ways of looking at a series of important issues in a reasonably logical sequence. We personally found this framework useful as an underlying structure for organizing the different chapters of the book for internal consistency and flow. We discuss each of the components of our framework, explaining briefly what we mean by them and why they are relevant.

We close this chapter by reiterating that the book is divided in parts corresponding to the different types of returns outlined in component 1 of the framework, and that each chapter roughly follows the outline of framework component 2.

Finally, we state our hope that our general framework for analysis, followed by the 16 real-life business cases, will give the reader a good understanding of the rich variety of managerial aspects of closed-loop supply chains.

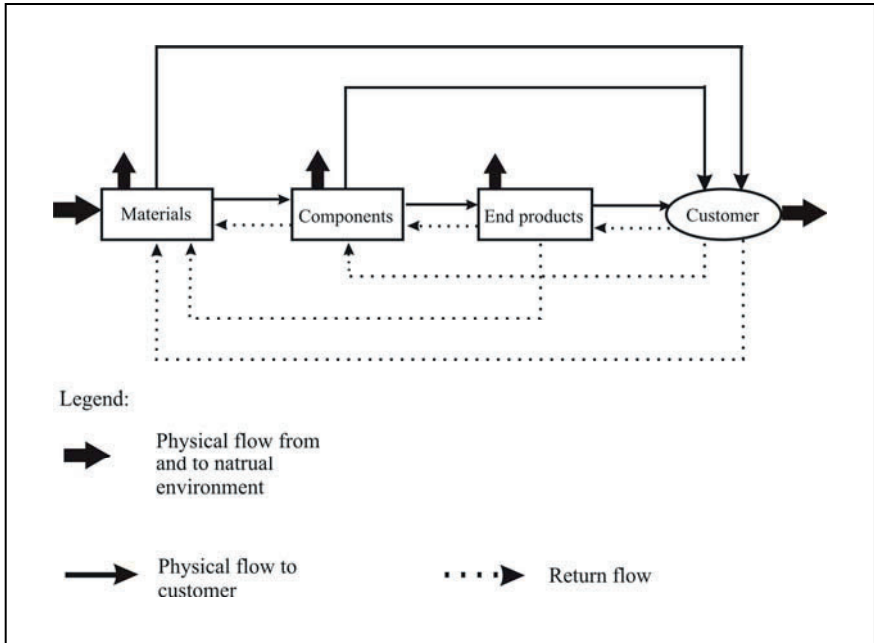


Fig. 1.1. Typical closed-loop supply chain flows

1.2 A classification of closed-loop supply chains

There are many different types of closed-loop supply chains in practice. The classification we use in this book follows the different phases in the life-cycle of a product: the *production phase*, the *distribution phase*, the *use phase*, and the *end-of-life phase* when the product loses its identity, but maybe parts of it (functional components, materials) may find further use. Companies have to decide for each of these phases whether they want to close the corresponding supply chain, i.e., to create a loop, after it or not, see Figure 1.2. Each of these phases has its own specific possibilities and requirements, depending on the type of product, the processes involved and the size of the flows.