Distribution and Supply Logistics

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ISBN (10): 1-5275-3607-6 ISBN (13): 978-1-5275-3607-4 Any meaningful activity or work that is a product of a mental or physical nature requires long-term effort and a large amount of time, not only from those directly involved, but the people around them must also give further, not less important support too.

That is why I would like to thank my family, my friends and all those who helped with the design and production of this book, especially my wife, my daughter and my son for their patience and mental support while I was writing this book.

This publication is dedicated to my family.

"I do the very best I know how – the very best I can; I mean to keep going. If the end brings me out all right, what's said against me won't matter."

Abraham Lincoln

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FOREWORD

Just as a company progressively undergoes various stages of development, development equally affects the spheres of trade, industry, transport, tourism and so on. At each stage of development, a company searches for the means to enhance and improve particular processes and activities to ensure they are implemented optimally. Whether it is the invention of the wheel, the engine, the telephone or their greater implementation in the lives of people, companies and businesses, it is all closely related to arranging the transport of people as well as goods, animals and things.

This monograph, "Distribution and Supply Logistics", seeks to draw attention to areas that form part of distribution logistics. It shows a number of methods that can be used in this area to solve specific problems and it points to the possibility of optimizing the cost, time, distance, use of vehicles and other criteria.

The impulse for the creation of this publication has come from a definite need for solutions to problems in distribution and supply. Since the field of distribution logistics is a broad science it is not possible to solve all the problems in a few pages of text, nor is it possible to offer a universal and comprehensive solution to eliminate the shortcomings identified.

What is logistics? What is distribution and supply? What is supply chain management? Which elements create the distribution and supply space? What rules need to be followed when designing distribution and supply systems? Which aspects affect storage design? Which information technologies are suitable for distribution and supply systems? What costs affect distribution and supply systems? How to manage inventories in warehouses? How to select a suitable location for building a warehouse? How to design efficient systems of distribution and supply? How to design logistics systems? How to use various methods to solve the problems of distribution and supply in practice?

These are just some of the questions explored in this book. In addition to providing theoretical analysis of the problems of distribution and supply, it practically demonstrates the many ways of using heuristics to solve specific tasks. It brings together eight case studies to investigate facets such as designing distribution systems, solving location problems, solving problems for the distribution and collection of goods, and inventory management solutions in particular companies. As such, it will appeal to students in the field of logistics, as well as logistics managers, designers and planners.

There are several rules about distribution and supply which illustrate the importance of them:

- Without distribution and supply, goods cannot exist on the market!
- Distribution and supply costs can comprise up to one third of the total cost of the goods!
- Distribution and supply form an integral whole!
- Distribution and supply exist throughout the world in various forms!

The ambition of this monograph is to show the most common problems addressed by distribution and supply logistics, to encapsulate them with concrete examples and to highlight the methods by which it is possible to achieve a solution to them. Definitions, terms, names and expressions used in the following text are the author's perspective on the particular subject matter from his long experience of work in science, education and practice in this area and they will probably, or certainly, provoke heated discussion by some interested readers. If the publication stimulates readers, whether in the positive or negative sense, I will be satisfied that it has met my expectations. As the whole world develops rapidly, so do the fields of logistics, supply and distribution and it is not possible to accept definitions, concepts and views in this area from a few decades ago or even from a few years ago as something fixed and stable. For this reason, I bring my own perspective into this area, which may be contrary in some cases to traditional views.

I hope that this monograph will contribute to the increased knowledge of workers, researchers and students from different disciplines or professional branches and it will be a guide to help them solve their specific problems and tasks in the field of distribution and supply logistics.

I wish you a pleasant journey through the field of logistics of distribution and supply.

The Author

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INTRODUCTION

Economic changes, alternation of periods of crisis (economic, social, moral) and periods of prosperity, the rapid development of technology, industry, business, rising energy costs and increased demands on products, product quality and services lead and force a company to continuously improve the quality and efficiency of production, the efficiency of distribution and of the activities related to it in order to optimize costs and profit with the maximum satisfaction of customer requirements. The goal is to find at least a 'minor' saving or savings that might mean survival for the company in difficult times and provide some competitive advantage relative to other competitors. Several years of experience in the practical solution of many problems in distribution logistics have been decisive in leading me to create an integrated work of logistics with a focus on distribution logistics.

Distribution and supply logistics, with its range of solutions, is focused on the following tasks:

- design of distribution and supply systems for industrial concerns and other companies,
- location and placement of companies, warehouses and distribution centres,
- storage and technical equipment,
- improving the efficiency and dimensioning the elements of distribution and supply systems,
- improving the efficiency of and the development of distribution plans and inventory management,
- selection and improving the efficiency of modern information and expert systems in the area of distribution and supply,
- defining distribution and supply routes.

Distribution, as a part of distribution logistics and supply, and as a part of supply logistics, makes contact with the real market; in other words it connects the end of the manufacturing process with the beginning of fulfilling consumer needs. Distribution additionally enables the needs of customers to be fulfilled. It is also a kind of link between the different parts of the world and it enables the connection of regions with a different culture.

For each solution area, distribution and supply logistics suitably combines and uses the necessary methodology, methods, processes and tools specific to the field of logistics but also methods from other fields. The variation of certain solutions in distribution and supply logistics clearly predetermines the use of methods based on the principle of a multicriteria decision-making process and heuristic principles that are close to human behaviour.

The monograph is divided into four thematic parts:

- The first thematic area is dedicated to the methodological basis of distribution and supply logistics.
- The second thematic area is focused on support processes in distribution and supply logistics.
- The third thematic area introduces methods, models and tools of distribution and supply logistics.
- The final thematic area of the monograph is dedicated to specific applications of the method of logistics to solutions of problems, projects and reviews from the areas of distribution and supply logistics.

The case studies are records of an appropriate combination of creativity, logical thinking, experience and methods to reduce deficiencies and to achieve the defined objectives of tasks in distribution and supply logistics. For reasons of confidentiality, in some cases I have fictionalised the names of businesses where problems were solved and where approaches and methods of logistics were applied, however the approaches used in their solutions remain original.

THE METHODOLOGICAL BASIS OF DISTRIBUTION AND SUPPLY LOGISTICS

CHAPTER ONE

THE POSITION OF DISTRIBUTION AND SUPPLY LOGISTICS IN THE LOGISTICS SYSTEM OF A COMPANY

What you will learn: In order to solve problems from the area of logistics, it is necessary to become familiar with the basic terms, classification and levels of logistics. This chapter addresses definitions and concepts in logistics in general, with a focus on distribution logistics. It refers to the elements which create distribution logistics. It defines flow, distribution function and distribution policy. It highlights the importance of storage, packaging and preparation of goods for loading and transport and it defines the basic chain which forms the distribution channel.

Basic terms: logistics, distribution, distribution channel, distribution system.

During the reign of the Byzantine Emperor Leontos VI (886 - 911) the term "logistics" began to be used for the first time. The Swiss General H. Jomini (1799 - 1869) used the term "logistics" as specific military terminology. He understood logistics as the science of moving and accommodating soldiers. At the beginning of the twentieth century, the term logistics entered use in the field of economics and in economic literature. At the beginning of the seventies, experts started to apply the theory of logistics in practical use. According to some authors, logistics can be understood as the branch of science which deals with comprehensive planning, management, implementation and control of material flows, creating the necessary material flows and information systems for material processing. Logistics is a summary of all activities for the comprehensive management and implementation of goods (Viestova 1993, Straka 2004).

To achieve the highest performance while maximizing production efficiency, logistics defines or proposes actions on the strategic, tactical and operational levels that lead to achieving the required results using all the available means of science and technology, economics and computer science. Businesses try to reduce and minimize costs by applying a logistical approach to secure their competitiveness in the market.

The aim of logistics is to create a united, integrated, optimized material flow, which arises from different part0ts of the system in such a way as to ensure a continuous exchange of goods and services. Logistics has developed gradually and many definitions were also developed together with it (Table 1), at the same time, new perspectives on its scope and its level of activity are still being formed.

Table 1 – Definitions of logistics from the different points of view of many authors

Author	Year	Views of logistics
Council of	1963	Logistics is the process of planning,
Logistics		management and implementation of the
Management ¹		effective and powerful flow and storage of
		goods and related information from the point
		of origin to the point of consumption, the
		aim of which is to satisfy customer
		requirements.
J.L. Hesket,	1973	Logistics is the management of all activities
N.A.		that facilitate the movement and
Glaskowsky,		coordination of supply and demand to create
R.M. Ivie ²		benefits of time and place.
Ch. Schulte ³	1991	Logistics is the integrated, market-oriented
		planning, creation, implementation and
		control of flows of material, goods and
		information from suppliers to businesses,
		within businesses and from businesses to
		clients with optimal costs.
I. Gross ⁴	1995	Logistics is the organization, planning,
		management and execution of flows of goods,
		starting with development and purchasing

¹ Council of Logistics Management, 1963

² Hesket, J.L., Glaskowsky, N.A., Ivie, R.M.: Business Logistics, 2nd edition, The Ronald Press Company, 1973

³ Schulte, Ch.: Logistik, München, 1991

⁴ Gros, I.: Logistics yes or not?, Logistika, Mesicnik Hospodarskych novin, No. 3, p. 58, 1995

		through production and distribution depending on the final customer so that all market requirements are fulfilled at minimum cost and minimum capital expenditures.
D. Malindzak ³	1996	Logistics is the means and philosophy of flow (material, information and financial) management, to which there are applied: a systematic approach, methods of planning, algorithmic thinking and coordination in order to achieve global optimization.
P. Pernica ⁶	1998	Logistics is the discipline that addresses the overall optimization, coordination and synchronization of all activities in self-organizing systems, their combination is essential to achieve a flexible and cost-effective final (synergistic) effect.
Council of Supply Chain Management Professionals ⁷	2005	Logistics is the process of planning, implementing and monitoring the efficiency and effectiveness of the direct and reverse flow and storage of raw materials, materials in processes, products and services, and related information between the point of origin and point of consumption in order to satisfy customer requirements.
R. Lenort ⁸	2012	Logistics deals with the management of the entire supply chain, i.e. the chain with the initial link being primary suppliers of raw materials and the final link being the final consumers.
M. Straka ⁹	2013	Logistics is a system in which there is an effect on elements in order to set up coordinated material, information and financial flows, resulting in, or aiming to,

 ⁵ Malindzak, D.: Production logistics I, 1st ed., Stroffek, Kosice, 1996
 ⁶ Pernica, P.: Logistický management, Radix Praha, Praha, 1998

⁷ Council of Supply Chain Management Professionals (CSCMP),

http://cscmp.org/aboutcscmp/definitions.asp, 2005

⁸ Lenort, R.: Industrial logistics, 1st ed., p. 98, VSB-Technical university of Ostrava, Ostrava, 2012

⁹ Straka, M.: Distribution logistics, 1st ed., p. 400, EPOS Bratislava, Bratislava, 2013

		satisfy customer requirements, and the
		related economic effect.
Council of	2013	Logistics is the process of planning,
Supply Chain		implementing, and controlling procedures
Management		for the efficient and effective transportation
Professionals ¹⁰		and storage of goods including services, and
		related information from the point of origin
		to the point of consumption for the purpose
		of conforming to customer requirements.
		This definition includes inbound, outbound,
		internal, and external movement.
APICS, ©	2016	Logistics – 1) In the context of supply chain
APICS, Inc. All		management this is the subset of supply
rights reserved		chain management that controls the forward
– the		and reverse movement, handling, and storage
association for		of goods between the origin and distribution
supply chain		points. 2) In an industrial context, the art and
management ¹¹		science of obtaining, producing and
		distributing material and products in the
		proper place and in the proper quantities. 3)
		In a military sense (where it has greater
		usage), its meaning can also include the
		movement of personnel. © APICS, Inc. All
		rights reserved.

1.1 Logistics Divisions

In terms of the development of logistics over time, various streams have been and are still being created that understand Supply Chain Management (SCM) from their point of view (Larson et al. 2007).

From the "traditionalist" point of view (Figure 1a) logistics is considered to be a system of which a part or a special function is Supply

¹⁰ Council of Supply Chain Management Professionals, Vitasek, K.: CSCMP Glossary, cscmp-glossary.pdf, Definitions compiled by Vitasek K, Available online:

http://cscmp.org/imis0/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx?hkey=6087 9588-f65f-4ab5-8c4b-6878815ef921 (accessed on 05.jan.2018), 2013.

¹¹ Pittman, P.H., Atwater, J.B.: APICS Dictionary, © *APICS, Inc. All rights reserved*, The essential supply chain reference, 15th ed., p. 204, APICS Chicago, 2016

Chain Management. SCM provides the link between suppliers and customers to ensure a business performance.

From the *"identicalist"* point of view (Figure 1b) logistics is identical to SCM. This direction perceives SCM as equivalent to logistics and it tends to cancel the term of logistics and fully replaces it with SCM.

From the "*unionist*" point of view (Figure 1c) logistics is part of Supply Chain Management. SCM arranges the purchase of raw materials for a company, logistics activities in the manufacturing process, sales, which includes marketing and advertising, product development and order fulfilment.

For protagonists of the philosophy of "conjunction", (Figure 1d) logistics and SCM are understood as two separate units which complement each other and they have separate as well as common parts.

All these philosophies have some common elements. All the philosophies work with flows (material, financial, monetary, etc.) and manage them in relation to the elements that make up the system.

Among the main organizations that also deal with terminology of SCM and logistics can be included APICS, CSCMP and ELA.

The American Production and Inventory Control Society¹² (APICS) is the association for supply chain management founded in 1952 by 20 production control managers.

The Council of Supply Chain Management Professionals¹³ (CSCMP) is an association which has been covering logistics and SCM since 1963.

The European Logistics Association¹⁴ (ELA) is a federation of 30 national organisations, covering almost every country in Central and Western Europe. ELA was founded in 1984.

In terms of market and enterprise it can be said that it does not matter what philosophy is applied, what is important is helping businesses gain a competitive advantage in the market, reducing costs, securing resources for running various businesses, securing consumers and correspondingly increasing profits.

¹² http://www.apics.org

¹³ http://cscmp.org

¹⁴ http://www.elalog.eu

The Position of Distribution and Supply Logistics in the Logistics System of a Company



Figure 1 - The perception of "philosophical currents" of logistics and SCM

In terms of hierarchical levels and systems theory, logistics can be classified as (Figure 2):

- macrologistics (a business is an item in the logistics network, logistics chain),
- metalogistics (logistics at the level of a region),
- micrologistics (logistics of a business).

Under the term **macrologistics** it is possible to understand distinctive logistics at the supply chain level, where the elements are industrial concerns, other companies and the government, and the links between them represent materials, information and financial flows (Figure 2).

Under the term **metalogistics** it is possible to understand cooperation at different levels among micrologistics systems and regional specialized entities.

Under the term **micrologistics** it is possible to understand distinctive logistics at the level of an industrial concern or another company, the elements of which are the basic and supporting subsystems of the business (Figure 3).



Figure 2 - Hierarchical levels of logistics

If we assume the micrologistics model of an industrial concern and consider a systemic approach, the logistics of a company can be divided in terms of sub-processes (Figure 3) (Straka 2012):

- purchase logistics,
- supply logistics,
- logistics of manufacturing,
- sales logistics,
- distribution logistics,
- strategy logistics,
- reverse logistics.

- logistics of service processes,
- logistics of orders,
- information logistics,
- logistics of finance,
- personnel logistics,
- business service,



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Figure 3 - Basic and supporting parts of the micrologistics model of a company

1.2 Distribution and Supply Logistics

Distribution logistics provides physical, organizational and informational links between the source (the output warehouse of a manufacturing enterprise) and consumers, the input warehouse or point of acceptance (Straka 2007).

Distribution logistics (Table 2) can be understood as the subsystem of logistics, where elements are the means of storing and packaging, the product, the service personnel and the links among the elements providing management of means of transport, information and financial flows related to distribution.

Author	Year	Views of distribution logistics
G.B. Ihde ¹⁵	1978	Distribution logistics deals with problems
		relating to time and spatial bridged transfers of
		real goods and among the systems of division of
		labour.
Ch. Schulte ¹⁶	1991	Distribution logistics is responsible for all
		storing and transport movements of goods to
		consumers and related information, management
		and control activities.
M. Straka ¹⁷	2004	Distribution logistics has to ensure the most
		appropriate manner, selection and analysis of
		transport most suitable for transfer of products
		manufactured by producers to achieve the failure-
		free operation of the market.
DHL	2008	Distribution logistics includes all activities
Logbook ¹⁸		related to the provision of finished goods and
		products to the customer. These products may
		be shipped directly from the manufacturing
		process or dispatch warehouse to a space for
		further processing or, where appropriate,
		through other regional distribution warehouses.
M. Straka ¹⁹	2013	Distribution logistics has to ensure the most
		appropriate manner of analysis, selection and
		implementation of all activities and strategic and
		other decisions related to the provision of
		products to a customer so as to achieve the
		failure-free operation of the market.

Table 2 – Definitions of distribution logistics from the different points of view from many authors

¹⁵ Ihde, G.B.: Distributions Logistik, Gustav Fisher Verlag Stuttgart, New York, 1978

¹⁶ Schulte, Ch.: Logistik, München, 1991

¹⁷ Straka, M.: Contribution to the modelling of problems in distribution logistics, TU of Kosice, 2004

¹⁸ DHL Logbook:

http://www.dhldiscoverlogistics.com/cms/en/course/processes/distribution_logistic s/definition.jsp, 2012

¹⁹ Straka, M.: Distribution logistics, 1st ed., p. 400, EPOS Bratislava, Bratislava, 2013