THE HANDBOOK OF LOGISTICS & DISTRIBUTION MANAGEMENT

5TH EDITION

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Publisher's note

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PREFACE

The prime objective for writing the first edition of this book was to provide an up-to-date text at a reasonable cost. We also felt that there was a significant gap in the literature for a book that offered a broad strategic framework as well as a clear and straightforward description of the basic functions and elements related to logistics and distribution.

In the second edition of the book, published in 2000, we provided a significant revision and expansion of the original text. The continued high rate of development and change in business and logistics necessitated a third edition, published in 2006, a fourth edition in 2010 and now this fifth edition. All of these editions have included major revisions and new material.

In this fifth edition, we have added a new chapter on multichannel fulfilment and a new chapter on humanitarian logistics. In addition, all other chapters have been revised and updated, while the content in some chapters has been expanded.

The scope of logistics continues to grow rapidly, and this is reflected in the content of the book. We have included key aspects of supply chain philosophy and practice, but have retained the focus on distribution and logistics that was a feature of the first and subsequent editions. We continue to include a substantial and detailed index, which we know makes the book very attractive to students and practitioners who wish to identify specific subjects for reference. The objectives of the original book remain unchanged: to provide a text with both simplicity of style and relevance of context.

As with the previous editions of the book, it has not been possible to cover all of the associated functions in the depth that we might have liked. Shortage of space has necessitated this compromise. Thus, such elements as manufacturing and procurement are featured, but only at a fairly superficial level and only in-depth when there is a relevant interface with distribution and logistics. In addition, it should be noted that we have attempted to reflect the general principles of logistics and distribution that can be applied in any country throughout the world. Clearly, for some aspects, there are differences that can only be generalized with difficulty. Where this is the case we have tended to use the European model or approach as our foundation, but we have included some international material. Within the scope of a book of this size, it is impractical to cover all issues from a world perspective.

Some of the content of the book is based on material that has been developed for the various Master's courses in logistics and supply chain management at the Cranfield Centre for Logistics and Supply Chain Management, Cranfield School of Management, with which we have

been involved at various times. We undoubtedly owe our colleagues and our graduates many thanks – and apologies where we have included any of their ideas in the book without directly acknowledging them. Other content is drawn from the research that we have undertaken, company training courses that we have run, a multitude of consultancy assignments and from the managing of logistics operations.

The logistics industry continues to change radically and to grow in importance. The quality of logistics managers and staff has also developed with the growth in responsibility and scope that a job in logistics entails. We hope, once again, that this book will help in logistics managers' quest to improve service and reduce cost, as well as keeping them aware of the many different facets of logistics and the supply chain. It should be of interest to practising managers and supervisors, to candidates undertaking examinations for the various professional institutes, and to undergraduate and graduate students who are reading for degrees in logistics, distribution, transport and supply chain management or where these subjects are an integral part of their course. It should also provide strong support for those participating in web-based training in logistics.

This edition of the book is, once again, divided into six distinct parts, each covering a key subject area in logistics. These are:

1. Concepts of logistics and distribution;
2. Planning for logistics;
3. Procurement and inventory decisions;
4. Warehousing and storage;
5. Freight transport;
6. Operational management.

Part 1 considers the key *concepts of logistics and distribution*. The first chapter of the book provides an introduction to the subject area and some definitions are given. The main elements and functions are reviewed, together with a brief look at the historical development of distribution and logistics up to the present day. Some statistics are introduced that indicate the importance of logistics to both companies and economies. Chapter 2 concentrates on the integrated nature of logistics and the supply chain. The traditional, but still very relevant, total logistics concept is explained, and typical trade-offs are considered. A planning hierarchy for distribution and logistics is outlined. Finally, in this chapter, some of the main developments towards integration are discussed.

Customer service is a major aspect within logistics, and this is considered in Chapter 3. The components of customer service are described, and two models of service quality are introduced. An approach to developing a customer service policy is outlined. The key

elements of customer service measurement are reviewed. Chapter 4 concentrates on channels of distribution – the different types and different structures. A method of channel selection is considered. Also, the all-important question is introduced of whether to contract out logistics. The final chapter of this first part of the book reviews some of the main issues and challenges for logistics, from external influences to consumer-related developments.

Part 2 covers the ways and means of *planning for logistics*. Chapter 6 begins with an overview of the strategic planning process and then considers a specific logistics design framework. The next chapter concentrates on one of the main aspects of this design framework – the planning of logistics processes. The key logistics processes are described, and then an approach to process design or redesign is proposed. Some of the main tools and techniques are explained. Chapter 8 describes the important area of supply chain segmentation. This is used to ensure that the many different service and cost needs of the marketplace are addressed in a coordinated framework. In Chapter 9 the planning of physical distribution activities is considered, including the more traditional pastures of depot location decisions. A discussion on the role of depots and warehouses is followed by a detailed assessment of the different cost relationships that are fundamental to the physical distribution planning process. A planned approach to designing an appropriate strategy is included.

Chapter 10 is concerned with the way in which logistics and distribution are organized within the company. The relationship with other corporate functions is considered. The need to develop more process-oriented organizational structures, rather than maintaining the traditional functional perspective, is proposed. The specific role of the logistics and distribution manager is described. Some payment schemes and mechanisms that are common to the industry are outlined.

Chapter 11 is a new inclusion on multichannel fulfilment. This chapter considers the issues related to the distribution of goods that have been sold through a number of different sales channels. It reflects the challenges that arise for distribution and logistics as a consequence of the variety of new and old channels that are now available. The final chapter in this part of the book, Chapter 12, is concerned with manufacturing and materials management. Manufacturing is rarely a function that is found directly within the auspices of logistics. It is, however, a major factor within the broader context of the supply chain and is a principal interface with logistics. Thus, some of the key elements in manufacturing and materials management are introduced in this chapter.

Part 3 concentrates on those issues that are involved with *procurement and inventory decisions*. Chapter 13 covers basic inventory planning and management. The reasons for holding stock are considered, and the different types of stock are outlined. The implications of stockholding on other logistics functions are described, and the use of different inventory replenishment systems is explained. Reorder quantity decisions are discussed, and the EOQ method is outlined. Simple demand forecasting is introduced. Chapter 14 describes some of the recent developments in inventory planning, particularly the way that inventory is

viewed across the supply chain as a whole. The important relationship of inventory and time is explored. Key advances in inventory planning for manufacturing and for retailing are outlined. The final chapter in this part of the book, Chapter 15, covers some of the main principles concerned with procurement. This is another area within the supply chain that has a significant interface with logistics, so a broad overview of key elements is described.

In Part 4, consideration is given to those factors that are concerned with *warehousing and storage*. Chapter 16 introduces the main warehousing principles and also provides an outline of the main warehouse operations. Palletized storage and handling systems are considered in Chapter 17. Included here are the principles of storage as well as descriptions of the various types of storage systems and storage equipment that are available. Chapter 18 concentrates on the many different non-palletized handling systems and equipment types that are used. In Chapter 19, order picking and replenishment are reviewed in some detail. The main principles of order picking are explained, and the various order picking methods are outlined.

In Chapter 20 another key warehouse function is considered: receiving and dispatch. The major factors are outlined within the context of overall warehouse operations. An approach to warehouse and depot design and layout is described in Chapter 21. The methods described here are an essential guide to ensuring that a warehouse or depot is designed to be effective in the light of the logistics operation as a whole. Chapter 22 explores the operational management of warehouses, the associated performance measures, and the latest information technology available to support these activities.

Part 5 concentrates on those areas of logistics and distribution specifically related to *freight transport*. Chapter 23 considers international logistics and the choice of transport mode. Initially, the relative importance of the different modes is reviewed. A simple approach for modal choice selection is then proposed, including operational factors, transport mode characteristics, consignment factors and cost and service requirements. Finally, there is a brief review of some key aspects of international trade. Chapters 24, 25 and 26 provide an overview and description of the major modes of international transport: maritime, air and rail. For each of these, the basic infrastructure of the industry is reviewed, together with a variety of other aspects such as equipment, safety, pricing, security and documentation. In Chapter 26, the use of intermodal transport is also discussed.

The remaining chapters in this part of the book are concerned with aspects of road freight transport. Vehicle selection factors are described in Chapter 27. Included here are the main types of vehicle and vehicle body, different operational aspects, and load types and characteristics. In Chapter 28, vehicle and fleet costing is considered. The main transport costs are indicated, and whole life costing is described. The final chapter of Part 5 of the book, Chapter 29, concentrates on the planning and resourcing of road freight transport operations. This includes the need for planning, and the important use of vehicle routing and scheduling to aid this process. The main objectives of routing and scheduling are indicated, and the different types of problem are described. The basic characteristics of road transport delivery

are discussed, and they are related to broad data requirements. Examples of both manual and computer routing and scheduling methods are outlined.

The final part of the book, Part 6, considers a number of aspects related to the *operational management* of logistics and distribution. This begins with Chapter 30, where cost and performance monitoring of logistics and distribution operations is discussed. A description of a formal approach to logistics monitoring and control is outlined. Several different means of measurement are introduced, and a number of areas of best practice are considered. Examples of detailed key performance and cost indicators are given. Chapter 31 describes the use of benchmarking as a major technique for identifying best practice in logistics. As well as an overview of benchmarking procedures, a detailed approach to benchmarking distribution activities is outlined. Chapter 32 considers the different information systems that can be used in the supply chain. There have been, and continue to be, many major advances in information communication and technology. This chapter serves to provide an overview of some of those elements that are particularly important to logistics and the main components of distribution.

The question of whether or not to outsource logistics was introduced in Chapter 4. In Chapter 33 the various operations and services that are offered by third-party companies are reviewed and the main advantages and disadvantages of outsourcing are discussed. The actual process of selection is described in Chapter 34, including a step-by-step guide. In Chapter 35 the importance of managing an outsourced contract is explained and the key factors required in managing a successful relationship are examined. Chapter 36 covers a very important area of responsibility in logistics – that of security and safety. Many aspects that are relevant to logistics planning and operations are discussed. Another important consideration is the impact of logistics operations on the environment as well as the environmental regulations that impose on logistics operations. These elements are reviewed in Chapter 37. The final chapter, Chapter 38, is a new addition that looks at humanitarian logistics. The chapter provides an overview of humanitarian logistics and highlights some of the main differences between this field and commercial logistics.

Once again, we hope that this new edition of *The Handbook of Logistics and Distribution Management* will continue to serve as a useful aid to understanding this wide-ranging and increasingly important business area.

Alan Rushton

ABBREVIATIONS

NB: This section is designed to clarify and demystify many of the more common abbreviations and acronyms used in the industry. Most, but not all, of these appear in the text. Readers may consult this section quite independently.

2D	two-dimensional (eg 2D bar codes)
3D	three-dimensional
3PL	third-party logistics
4D	four-directional
4PL	fourth-party logistics
ABC	activity-based costing
ABC curve	Pareto or ABC inventory analysis
ADR	Accord Dangereux Routier (European agreement regarding the road transport of dangerous goods)
AFRA	average freight rate assessment (system)
AGV	automated guided vehicle
AMR	Advanced Manifest Regulations
APR	adjustable pallet racking
APS	advanced planning and scheduling
artic	articulated (vehicle)
ASEAN	Association of South East Asian Nations
ASME	American Society of Mechanical Engineers
ASN	advance shipping notice
AS/RS	automated storage and retrieval system
ATA	Air Transport Association of America
ATP	Accord relative aux transports internationaux de denrées périssables (European agreement regarding the international transport of perishable goods)
AWB	air waybill
BAF	bunker adjustment factor
B2B	business to business
B2C	business to consumer
BL	bill of lading
BOM	bill of materials
BREEAM	BRE Environmental Assessment Method

BS	British Standard
BSI	British Standards Institution
CAD	computer-aided design
CAF	currency adjustment factor
CASS	cargo accounts settlement system
CB truck	counterbalanced fork-lift truck
CBFLT	counterbalanced fork-lift truck
CBM	cubic metre
CBP	United States Bureau of Customs and Border Protection
CCTV	closed circuit television
CD	compact disc
CDC	central distribution centre
CEO	chief executive officer
CFO	chief financial officer
CFR	cost and freight
CFS	container freight station
CIF	cost, insurance and freight
CILT (UK)	The Chartered Institute of Logistics and Transport (UK)
CIM	computer integrated manufacturing; Convention internationale concernant le transport des marchandises par chemin de fer (European agreement regarding the international transport of goods by rail)
CIO	chief information officer
CIP	carriage and insurance paid to...
CIPD	Chartered Institute of Personnel and Development
CIPS	Chartered Institute of Purchasing and Supply
CM	category management
CMI	co-managed inventory
CMR	Convention relative au contrat de transport international de marchandises par route (European convention regarding international transport contracts of goods by road)
CNG	compressed natural gas
CO	certificate of origin
COD	cash on delivery
COI	cube per order index
COO	chief operating officer
COSHH	control of substances hazardous to health (regulations)
CPFR	collaborative planning, forecasting and replenishment
CPT	carriage paid to...
CRM	customer relationship management
CRP	continuous replenishment programme

CSCMP	Council of Supply Chain Management Professionals
CSI	Container Security Initiative
CT	community transit
C–TPAT	Customs–Trade Partnership against Terrorism
CV	curriculum vitae
DAP	delivered at place
DAT	delivered at terminal
dB (a)	decibel
DC	distribution centre
DCF	discounted cash flow
DCM	demand chain management
DDP	delivered duty paid
DEFRA	Department for Environment, Food and Regional Affairs (UK)
DERV	diesel-engined road vehicle
DfT	Department for Transport (UK)
DHS	Department of Homeland Security (Unites States)
DMAIC	define, measure, analyse, improve and control
DME	dimethyl ether
DO	delivery order
DPP	direct product profitability
DRP	distribution requirements planning
DSD	demand standard deviation
DVD	digital versatile/video disc
DWT	deadweight ton
EAN	European article number
EBQ	economic batch quantity
EC	European Commission
ECR	efficient consumer response
ECS	equipment control system
EDI	electronic data interchange
EDP	extended delivery point
EEE	electrical and electronic equipment
eFC	e-fulfilment centre
EFTA	European Free Trade Area
ELA	European Logistics Association
EOQ	economic order quantity
EPOS	electronic point of sale
ERP	enterprise resource planning
ES	exponential smoothing
ETA	estimated time of arrival

ETD	estimated time of departure
EU	European Union
EXW	ex works
FAS	free alongside ship
FAST	Free and Secure Trade
FCA	free carrier
FCL	full container load
FCPA	Foreign Corrupt Practices Act (USA)
FCR	forwarder's certificate of receipt
FEM	Fédération Européenne de la Manutention (European federation of material handling)
FEU	40-foot equivalent unit
FG	finished goods
FGI	finished goods inventory
FGP	factory gate pricing
FIBC	flexible intermediate bulk container
FIFO	first in first out
FILO	first in last out
FLT	fork-lift truck
FMCG	fast-moving consumer goods
FMS	flexible manufacturing systems
FOB	free on board
FOC	fire officer's committee; free of charge
FOT	free on truck
FRES	Federation of Recruitment and Employment Services
FTA	Freight Transport Association
FTL	full truck load
GA	general average (maritime shipping insurance)
GATT	General Agreement on Tariffs and Trade
GCC	Gulf Cooperation Council
GDP	gross domestic product
GHG	greenhouse gas (emissions)
GIS	geographic information systems
GMOs	genetically modified organisms
GPS	global positioning system
GRI	general rate increase
GRN	goods received note
GSM	global system for mobiles
GTIN	global trade item number

GVW	gross vehicle weight
HAP	Humanitarian Accountability Partnership
HAWB	house air waybill
HGV	heavy goods vehicle
HS	harmonized system (customs)
HSE	Health and Safety Executive; health, safety and environment
HSWA	Health and Safety at Work Act
I2M	inbound to manufacturing
IATA	International Air Transport Association
IBC	intermediate bulk container
ICT	information and communication technology
IDP	internally displaced person
IFRC	International Federation of Red Cross and Red Crescent
IGD	Institute of Grocery Distribution
IHC	International Humanitarian City (Dubai)
IJPDLM	*International Journal of Physical Distribution and Logistics Management*
IMDG	International Maritime Dangerous Goods Code
IMF	International Monetary Fund
ISO	International Standards Organization
IT	information technology
ITS	intelligent transport system
ITT	invitation to tender
IWW	inland waterways
JIC	just-in-case
JIT	just-in-time
KD	knocked down (dismantled)
KPI	key performance indicator
LC	letter of credit
LCL	less than container load
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
LGV	large goods vehicle
LIFO	last in first out
LLOP	low-level order picking truck
LLP	lead logistics provider
LNG	liquefied natural gas
LOLO	lift on lift off
LOG	Logistics Operations Guide (UN Logistics Cluster)
LPG	liquefied petroleum gas

LPN	licence plate number (eg on pallet)
LSP	logistics service provider
LT	lead time
LTL	less than truck load
LTSD	lead time standard deviation
MAD	mean absolute deviation
MAM	maximum authorized mass
MAPE	mean absolute percentage error
MAWB	master air waybill
MBO	management by objectives
MHE	materials handling equipment
MIS	management information systems
MOU	memorandum of understanding
MPE	mean percentage error
MPG	miles per gallon
MPS	master production schedule
MRO	maintenance, repair and overhaul
MRP	materials requirements planning
MRPII	manufacturing resource planning
MSDS	material safety data sheets
MSE	mean square error
NA	narrow aisle
NAFTA	North American Free Trade Association
NCPDM	National Council of Physical Distribution Management
NDC	national distribution centre
NGO	non-governmental organization
NPV	net present value
NVOCC	non vessel operating common carrier
OCR	optical character recognition
OEM	original equipment manufacturer
OLED	organic light-emitting diode
OM	Operations Management
OSD	over, short, and/or damaged (upon delivery)
OTIF	on time in full
P & D	pick-up and deposit station
PCs	personal computers
PESTEL	political, economic, socio-cultural, technological environmental and legal
PLC	product life cycle
PM	particulate matter

PO	purchase order
POD	proof of delivery
POE	point (or port) of entry
POS	point of sale
PPE	personal protective equipment
PPT	powered pallet truck
PRC	People's Republic of China
PSI	pounds per square inch
PSS	peak season surcharge
QA	quality assurance
QC	quality control
QFD	quality function deployment
QR	quick response
R & D	research and development
RDC	regional distribution centre; radio data communication
RDT	radio data terminal
REC	Recruitment and Employment Confederation
RF	radio frequency
RFI	request for information
RFID	radio frequency identification
RFP	request for proposal
RFQ	request for quotation
RFS	road-friendly suspension
RH&D	receipt, handling and dispatch
RM	raw materials
ROCE	return on capital employed
RofW	rest of world
ROI	return on investment
ROL	reorder level
RORO	roll on roll off
ROS	return on sales
RT	reach truck
SAD	single administrative document
SC	supply chain
SCEM	supply chain event management
SCM	supply chain management
SCOR model	Supply Chain Operations Reference model
SCP	supply chain planning
SED	shipper's export declaration

SEM	Single European Market
SEMA	Storage Equipment Manufacturers' Association
semi	semi-trailer (articulated truck trailer)
SFI	Secure Freight Initiative
SKU	stock-keeping unit
SLA	service level agreement
SLI	Shipper's letter of instruction
SLSC	Shipper's load, stow and count
SMC	slow-moving goods centre
SOP	sales order processing
SOW	scope of work
SRM	supplier relationship management
SSAP 21	Statement of Standard Accounting Practice 21
SSGC	ship to shore gantry crane
STC	said to contain
STGO	special types general order
SWL	safe working load
SWOT	strengths, weaknesses, opportunities and threats
tare weight	unladen or empty weight
TEU	20-foot equivalent unit
THC	terminal handling charge
TIR	Transport International Routier (international road transport convention)
TKM	tonne kilometres
TL	truck load
TLC	total logistics concept
TM	tonne miles
TQM	total quality management
TUPE	Transfer of Undertakings (Protection of Employment)
ULCC	ultra large crude carrier
ULD	unit load device
UN	United Nations
UN/EDIFACT	United Nations/Electronic Data Interchange for Administration, Commerce and Transport
UNHRD	United Nations Humanitarian Response Depots
UNOCHA	United Nations Office for the Coordination of Humanitarian Aid
UPC	universal product code
VAS	value added services
VAT	value added tax
VIN	vehicle identification number

VLCC	very large crude carrier
VMI	vendor-managed inventory
VNA	very narrow aisle
WEEE	waste electrical and electronic equipment
WFP	World Food Programme (UN)
WIP	work-in-progress
WMS	warehouse management system

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PART 1
Concepts of logistics and distribution

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Introduction to logistics and distribution

01

Introduction

The key components of logistics – transport, inventory, warehousing – have been fundamental elements of industrial and economic life for countless years, but it is only in the last 20 years or so that logistics has been recognized as a major function in its own right. The main reason that this recognition has only been relatively recent is the nature of logistics itself. It is a function made up of many sub-functions and many subsystems, each of which has been, and may still be, treated as a distinct management operation. Both the academic and the business world now accept that there is a need to adopt a more holistic view of these different operations in order to take into account how they interrelate and interact with one another.

The appreciation of the scope and importance of logistics and the supply chain has led to a more scientific approach being adopted towards the subject. This approach has been aimed at the overall concept of the logistics function as a whole but, importantly, includes the interrelationship of the individual subsystems as well. Much of this approach has addressed the need for, and means of, planning logistics and the supply chain, but has necessarily considered some of the major operational issues.

This first chapter of the book provides an introduction to some of the very basic aspects of distribution, logistics and the supply chain. Initially there is a review of the scope and definition of distribution, logistics and the supply chain. Next is a discussion of the key elements that are fundamental to the logistic function. A description of the historical growth of distribution and logistics is followed by an assessment of its importance throughout the world. Finally, a typical distribution and logistics structure is described and discussed.

Scope and definition

Parallel to the growth in the importance of distribution, logistics and the supply chain has been the growth in the number of associated names and different definitions that are used. Amongst the many different names can be found:

- physical distribution;
- logistics;
- business logistics;
- materials management;
- procurement and supply;
- product flow;
- marketing logistics;
- supply chain management;
- demand chain management;

and there are several more.

There is, realistically, no 'true' name or 'true' definition that can be pedantically applied to these different names, because the elements that are covered can be so variable. Every industry has its own characteristics, and for each company in that industry there can be major variations in strategy, size, range of product, market coverage, etc. Logistics is, therefore, a diverse and dynamic function that has to be flexible and has to change according to the various constraints and demands imposed upon it and with respect to the environment in which it works.

Thus, these many different terms are used, often interchangeably, in literature and in the business world. One quite widely respected definition also helps to describe one of the key relationships. This is as follows:

Logistics = Materials Management + Distribution

An extension to this idea helps to illustrate that the supply chain covers an even broader scope of the business area. This includes the supply of raw materials and components as well as the delivery of products to the final customer. Thus:

Supply Chain = Suppliers + Logistics + Customers

In general, it can be said that: supply and materials management represents the storage and flows *into and through the production process*; while distribution represents the storage and flows *from the final production point through to the customer or end user*.

It should also be noted that logistics and the supply chain are concerned not only with *physical* flows and storage from raw material through to the final distribution of the finished product, but also with *information* flows and storage. Indeed, major emphasis is now placed on the

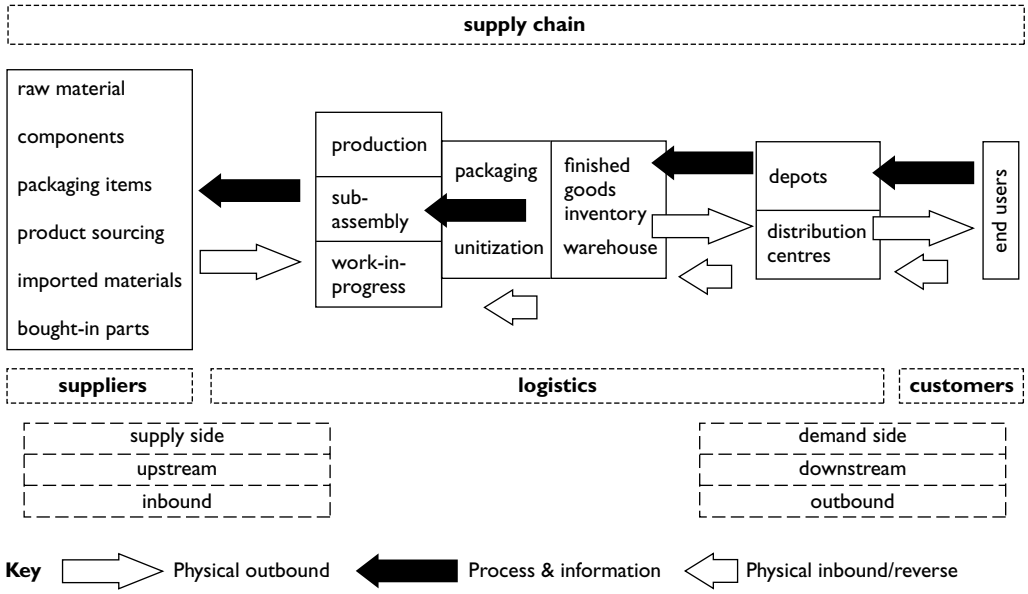


Figure 1.1 A flow representation of logistics for an FMCG manufacturer. This shows the key components, the major flows and some of the different logistics terminology

importance of information as well as physical flows and storage. An additional and very relevant factor is that of reverse logistics – the flow of used products and returnable packaging back through the system. Figure 1.1 illustrates these different elements and flows, as well as indicating how some of the associated logistics terminology can be applied.

The question of what is the most appropriate definition of logistics and its associated namesakes is always an interesting one. There are a multitude of definitions to be found in textbooks and on the internet. A selected few are:

> *Logistics is... the management of all activities which facilitate movement and the co-ordination of supply and demand in the creation of time and place utility.*
>
> (Hesket, Glaskowsky and Ivie, 1973)

> *Logistics is the management of the flow of goods and services between the point of origin and the point of consumption in order to meet the requirements of customers.*
>
> (Wikipedia, 2012)

> *Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.*
>
> (CSCMP, 2012)

> *Logistics is... the positioning of resource at the right time, in the right place, at the right cost, at the right quality.*
>
> (Chartered Institute of Logistics and Transport (UK), 2012)

It is interesting to detect the different biases – military, economic, academic, etc. An appropriate modern definition that applies to most industry might be that logistics concerns *the efficient transfer of goods from the source of supply through the place of manufacture to the point of consumption in a cost-effective way while providing an acceptable service to the customer*. This focus on cost-effectiveness and customer service will be a point of emphasis throughout this book.

A more critical consideration of the difference between logistics and the supply chain is given at the end of Chapter 2. It is developed using some of the ideas that are discussed in that chapter.

For most organizations it is possible to draw up a familiar list of key areas representing the major components of distribution and logistics. These will include transport, warehousing, inventory, packaging and information. This list can be 'exploded' once again to reveal the detailed aspects within the different components. Some typical examples are given in Figure 1.2.

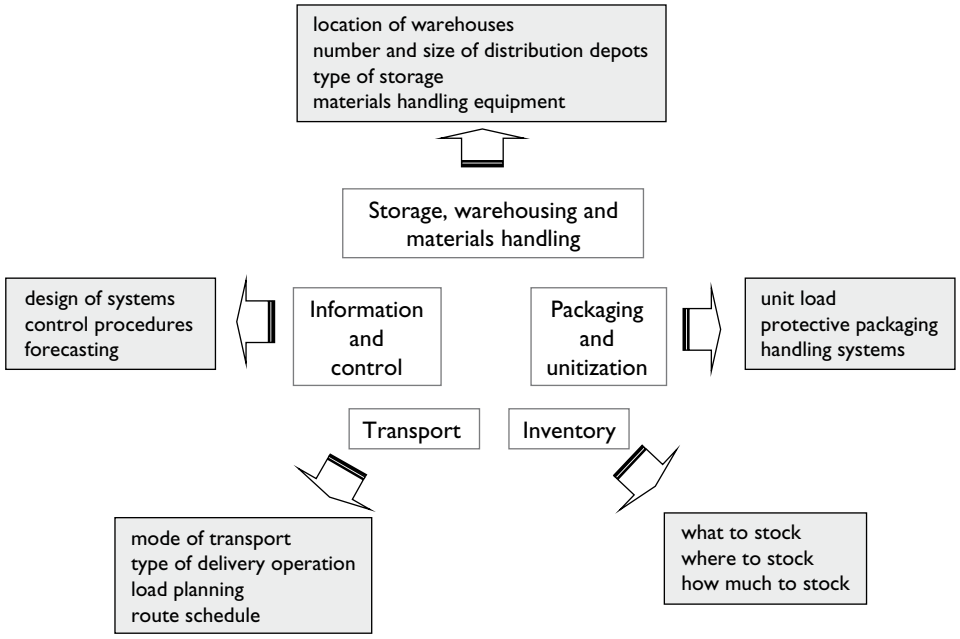


Figure 1.2 The key components of distribution and logistics, showing some of the associated detailed elements

All of these functions and sub-functions need to be planned in a systematic way, in terms both of their own local environment and of the wider scope of the distribution system as a whole. A number of questions need to be asked and decisions made. The different ways of answering these questions and making these decisions will be addressed in the chapters of this book as consideration is given to the planning and operation of the logistics and supply chain function. In addition, the total system interrelationships and the constraints of appropriate costs and service levels will be discussed.

Historical perspective

The elements of logistics and the supply chain have, of course, always been fundamental to the manufacturing, storage and movement of goods and products. It is only relatively recently, however, that they have come to be recognized as vital functions within the business and economic environment. The role of logistics has developed such that it now plays a major part in the success of many different operations and organizations. In essence, the underlying concepts and rationale for logistics are not new. They have evolved through several stages of development, but still use the basic ideas such as trade-off analysis, value chains and systems theory together with their associated techniques.

There have been several distinct stages in the development of distribution and logistics.

1950s and early 1960s

In the 1950s and early 1960s, distribution systems were unplanned and unformulated. Manufacturers manufactured, retailers retailed, and in some way or other the goods reached the shops. Distribution was broadly represented by the haulage industry and manufacturers' own-account fleets. There was little positive control and no real liaison between the various distribution-related functions.

1960s and early 1970s

In the 1960s and 1970s the concept of *physical distribution* was developed with the gradual realization that the 'dark continent' (as distribution was described in early academic literature) was indeed a valid area for managerial involvement. This consisted of the recognition that there was a series of interrelated physical activities such as transport, storage, materials handling and packaging that could be linked together and managed more effectively. In particular, there was recognition of a relationship between the various functions, which enabled a systems approach and total cost perspective to be used. Under the auspices of a physical distribution manager, a number of distribution trade-offs could be planned and managed to provide both improved service and reduced cost. Initially the benefits were

recognized by manufacturers who developed distribution operations to reflect the flow of their product through the supply chain.

1970s

The 1970s was an important decade in the development of the distribution concept. One major change was the recognition by some companies of the need to include distribution in the functional management structure of an organization. The decade also saw a change in the structure and control of the distribution chain. There was a decline in the power of the manufacturers and suppliers, and a marked increase in that of the major retailers. The larger retail chains developed their own distribution structures, based initially on the concept of regional or local distribution depots to supply their stores.

1980s

In the 1980s fairly rapid cost increases and the clearer definition of the true costs of distribution contributed to a significant increase in professionalism within distribution. With this professionalism came a move towards longer-term planning and attempts to identify and pursue cost-saving measures. These measures included centralized distribution, severe reductions in stockholding and the use of the computer to provide improved information and control. The growth of the third-party distribution service industry was also of major significance, with these companies spearheading developments in information and equipment technology. The concept of and need for integrated logistics systems were recognized by forward-looking companies that participated in distribution activities.

Late 1980s and early 1990s

In the late 1980s and early 1990s, advances in information technology enabled organizations to broaden their perspectives in terms of the functions that could be integrated. In short, this covered the combining of materials management (the inbound side) with physical distribution (the outbound side). The term 'logistics' was used to describe this concept (see Figure 1.1). Once again this led to additional opportunities to improve customer service and reduce the associated costs. One major emphasis made during this period was that informational aspects were as important as physical aspects in securing an effective logistics strategy.

1990s

In the 1990s the process of integration was developed even further to encompass not only the key functions within an organization's own boundaries but also those functions outside that also contribute to the provision of a product to a final customer. This became known as *supply chain management* (see Figure 1.1). The supply chain concept gave credence to the

fact that there may be several different organizations involved in getting a product to the marketplace. Thus, for example, manufacturers and retailers should act together in partnership to help create a logistics pipeline that enables an efficient and effective flow of the right products through to the final customer. These partnerships or alliances should also include other intermediaries within the supply chain, such as third-party contractors.

2000 to 2010

As the new millennium dawned, business organizations faced many challenges as they endeavoured to maintain or improve their position against their competitors, bring new products to market and increase the profitability of their operations. This led to the development of many new ideas for improvement, specifically recognized in the redefinition of business goals and the re-engineering of entire systems.

Logistics and the supply chain finally became recognized as an area that was key to overall business success. Indeed, for many organizations, changes in logistics have provided the catalyst for major enhancements to their business. Leading organizations recognized that there was a positive 'value added' role that logistics could offer, rather than the traditional view that the various functions within logistics were merely a cost burden that had to be minimized regardless of any other implications.

Thus, the role and importance of logistics continued to be recognized as a key enabler for business improvement.

2010 and beyond

The key recent and future issues to be faced in distribution, logistics and supply chain management are reviewed and discussed in Chapter 5.

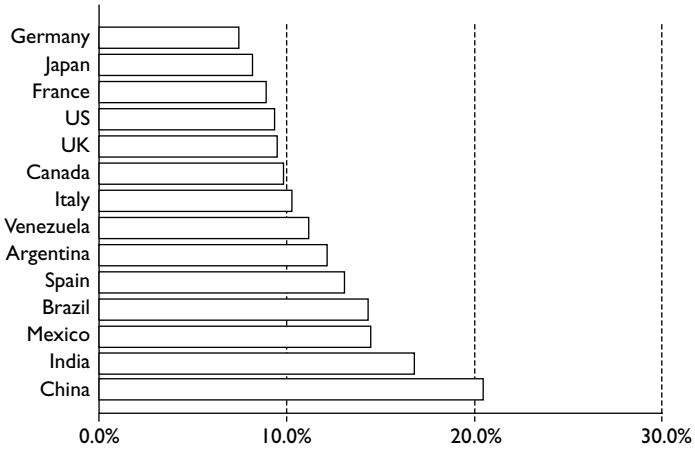
Importance of logistics and distribution

It is useful, at this point, to consider logistics in the context of business and the economy as a whole.

Importance in the economy

Logistics is an important activity making extensive use of the human and material resources that affect a national economy. Due to the difficulty of data collection, only a limited number of studies have been undertaken to try to estimate and compare the extent of the impact of logistics on the economy. Indeed, in recent years it has been very difficult to locate a study that provides this information in any detail.

One study in the UK indicated that about 30 per cent of the working population were associated with work that is related to logistics. A recent study by Capgemini Consulting (2012) found that total logistics expenditure as a percentage of sales revenues was the same for the three major trading regions of North America, Europe and Asia-Pacific – at 11 per cent; for Latin America it was 14 per cent. Another study, undertaken by Armstrong and Associates (2007), was able to present similar data at a country level, which indicated that for major economies logistics represented somewhere between 8 and 21 per cent of the gross domestic product (GDP) of that country. This information is summarized in Figure 1.3.



Source: Armstrong and Associates (2007)

Figure 1.3 Logistics costs as a percentage of GDP for selected countries

Figure 1.3 shows that, for the main European and North American economies, logistics represented between about 8 per cent and 11 per cent of Gross Domestic Product (GDP). For developing countries this range was higher at around 12 per cent to 21 per cent – with India at about 17 per cent and China at 21 per cent. These numbers represent some very substantial costs, and serve to illustrate how important it is to understand the nature of logistics costs and to identify means of keeping these costs to a minimum. Countries with the lowest costs are generally those where the importance of logistics was recognized relatively early and where there has been time to create more efficient systems. It is to be expected that the logistics costs of developing countries will decrease over the next few years as these countries are able to benefit from improvements. About 25 years ago, if the same statistics had been available, these percentage elements would undoubtedly have been a lot higher in all of these countries. In the UK, records go back for about 30 years, and logistics costs were then around the 18 to 20 per cent mark.

The Council of Supply Chain Management Professionals in the United States, in its Annual State of Logistics Report (2012), provided figures that indicated the continued reduction in

logistics costs as a percentage of GDP for the United States from 2007 to 2009. However, since 2009 percentage costs have marginally increased. This was due to the global financial crisis and the increase in the cost of fuel. A useful discussion paper presented at the International Transport Forum (2012) provides some specific figures for the measurement of national level logistics cost and performance for certain individual countries and can be used for further information.

Importance of key components

The breakdown of the costs of the different elements within logistics has been addressed in various surveys. One survey of US logistics costs undertaken by Establish/Herbert Davis (2011) indicated that transport was the most important element at 49 per cent (50 per cent in 2008), followed by storage/warehousing at 23 per cent (20 per cent in 2008), inventory carrying cost at 22 per cent (20 per cent in 2008), customer service/order entry at 4 per cent (7 per cent in 2008) and administration at 2 per cent (3 per cent in 2008).

The 2008 survey also produced a pan-European cost breakdown. This placed transport at about 40 per cent, warehousing at about 32 per cent, inventory carrying cost at about 18 per cent, customer service/order entry at about 5 per cent and administration at about 5 per cent of overall costs. In both studies the transport cost element of distribution was the major constituent part, often due to high fuel costs. US transport costs are especially affected by the long distances travelled, so the transport cost element is markedly higher there than it is in Europe.

Importance in industry

The statistics described in the previous section are useful to provide a broad perspective on the importance of the relative logistics components. When looking at industry and company level, however, it is essential to be aware that the above costs are average figures taken across a number of companies.

The relative make-up of these costs can vary quite significantly between different industries. Listed in Table 1.1 are some examples of the major logistics costs from different types of company, shown as a percentage of sales turnover. These are taken from an industry cost audit carried out in the UK by Dialog Consultants Ltd and they illustrate how extreme these variations can be. There are some quite major variations amongst the results from the various companies and there can be a number of reasons for this. One of the main reasons for these cost differences is that logistics structures can and do differ quite dramatically between one company and another, and one industry and another. Channels can be short (ie very direct) or long (ie have many intermediate stocking points). Supply chains may be operated by different players: manufacturers, retailers, specialist third-party distribution companies, or indeed by a mixture of these.

Table 1.1 Logistics costs as a percentage of sales turnover

Main Company Business	Cost as Percentage of Turnover				
	Transport Cost	Warehouse/ Depot Cost	Inventory Investment/ Holding Cost	Administration Cost	Overall Logistics Cost
	%	%	%	%	%
Office equipment	3.20	10.70	0.87		14.77
Health supplies	1.36	9.77	0.66	0.19	11.98
Soft drinks	2.53	2.71	0.44		5.68
Beer (food and drink)	8.16	2.82	0.56	2.19	13.74
Spirits distribution	0.37	0.27	0.07	0.10	0.81
Cement	25.20	9.10	7.10	4.60	46.00
Automotive parts	2.07	6.35	1.53		9.96
Gas supply (non-bulk)	9.41	2.45	0.02		11.98
Computer maintenance	0.45	0.10	0.29	0.05	0.88
Computer supply	0.65	0.78	0.09		1.52
Healthcare	0.96	1.08	1.21		3.25
Specialist chemicals	7.23	1.95	0.20	0.49	9.87
Fashion	0.38	1.31	0.33		2.02
Food packaging	3.14	3.73	0.85		7.72

Source: Benchmark survey of UK companies by Dialog Consultants Ltd

Also, it should be noted that in the examples shown in Table 1.1, the relative importance of logistics is measured in relationship to the overall value of the particular products in question, which has implications for comparing relative importance between different companies. For example, cement is a low-cost product (as well as being a very bulky one!), so the relative costs of its logistics are very high. Spirits (whisky, gin, etc) are very high-value products, so the relative logistics costs appear very low.

Two key factors related to the relative importance of logistics in industry are highlighted in the results from the 2011 Establish/Herbert Davis survey:

- Small companies tend to have proportionately higher logistics costs than large companies (about 10 per cent of the cost of sales compared to about 5 per cent). This is principally because large companies can benefit from economies of scale.
- Companies with high product values tend to have proportionately lower logistics costs than those with low product values (about 3 per cent of the cost of sales compared to about 9 per cent). This is because the high value of their goods tends to distort downwards the importance of the respective logistics costs.

These and other associated aspects are discussed in subsequent chapters.

A series of studies undertaken by Datamonitor (2008) indicate that the global logistics market (including all in-house and outsourced logistics operations) is dominated by retail logistics services (63.9 per cent). This applies globally and is reflected in all key markets (see Table 1.2). The retail sector has been at the forefront of some of the most advanced and innovative developments in logistics and supply chain thinking.

Table 1.2 Logistics market segmentation

Category	Global Percentage Share (2007)	European Percentage Share (2007)	Asia-Pacific Percentage Share (2007)
Retail	63.9	56.8	72.3
Automotive	13.2	13.2	14.5
Consumer	12.6	22.5	2.9
Hi-Tech	6.9	4.2	7.6
Pharmaceuticals	3.5	3.3	2.7
	100.0	100.0	100.0

Source: Datamonitor 0199/0200/0201 – 0143 (Dec 2008)

Logistics and supply chain structure

The discussion in the previous sections of this chapter has illustrated the major components to be found within a logistics or supply chain system. The fundamental characteristics of a physical distribution structure, illustrated in the first part of Figure 1.4, could be considered as the flow of material or product, interspersed at various points by periods when the material or product is stationary. This flow is usually some form of transportation of the product. The stationary periods are usually for storage or to allow some change to the product to take place – manufacture, assembly, packing, break-bulk, etc. This simple physical flow consists of the different types of transport (primary, local delivery, etc) and stationary functions (production, finished goods inventory, etc).

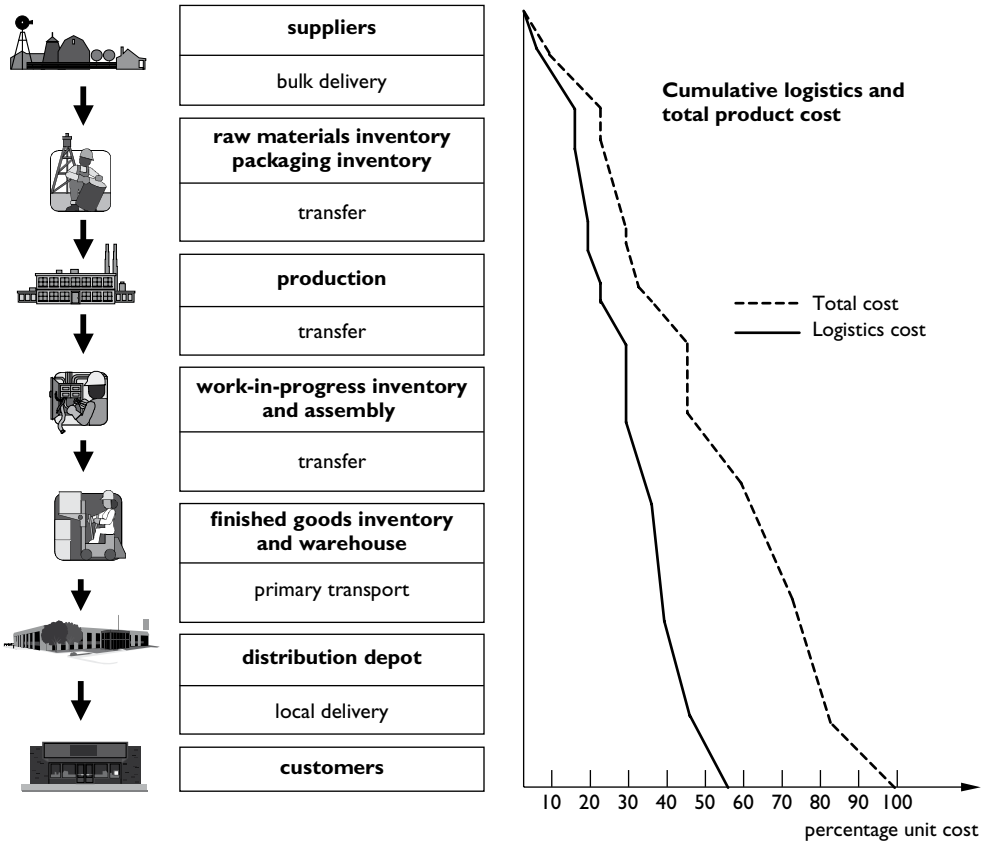


Figure 1.4 A typical physical flow of material from suppliers through to customers, showing stationary functions and movement functions, linked to a diagram that reflects the 'value added' nature of logistics

There is also, of course, a cost incurred to enable the distribution operation to take place. The importance of this distribution or logistical cost to the final cost of the product has already been highlighted. As has been noted, it can vary according to the sophistication of the distribution system used and the intrinsic value of the product itself. One idea that has been put forward in recent years is that these different elements of logistics are providing an 'added value' to a product as it is made available to the final user – rather than just imposing an additional cost. This is a more positive view of logistics and is a useful way of assessing the real contribution and importance of logistics and distribution services. Figure 1.4 also provides an example of this cost or added value for a typical low-cost product. The added value element varies considerably from one product to another.

Summary

In this initial chapter, a number of concepts and ideas have been introduced. These will be expanded in subsequent chapters of the book.

The rather confusing number of associated names and different definitions was indicated, and a few of the very many definitions were considered. No 'true' or definitive definition was offered, because logistics and the supply chain can and do differ dramatically from one industry, company or product to another.

The recent history of distribution, logistics and the supply chain was outlined, and a series of statistics served to illustrate how important logistics and the supply chain are to the economy in general and to individual companies. The breakdown between the constituent parts of distribution and logistics was given.

The basic structure of the supply chain was described, and the concepts of material and information flow and the added value of logistics were introduced.

02 Integrated logistics and the supply chain

Introduction

In Chapter 1, different definitions of logistics were introduced, and the main components of logistics were outlined. It was shown that the various logistics and supply chain functions are part of a flow process operating across many business areas. In this chapter, the emphasis is on the integration of the various logistics components into a complete working structure that enables the overall system to run at the optimum. Thus, the concept of 'total logistics' is described, and the importance of recognizing the opportunities for appropriate trade-offs is discussed. Some key aspects of planning for logistics are reviewed, and the financial impact that logistics has in a business is described. Finally, a number of key developments in logistics thinking are put forward, including the impact of the globalization of many companies, integrated planning systems, the use of logistics to help create competitive advantage and the development of supply chain management.

The total logistics concept

The total logistics concept (TLC) aims to treat the many different elements that come under the broad category of distribution and logistics as one single integrated system. It is a recognition that the interrelationships between different elements, for example delivery transport and storage, need to be considered within the context of the broader supply chain. Thus, the total system should be considered and not just an individual element or subsystem in isolation.

An understanding of the concept is especially important when planning for any aspect of distribution and logistics. A simple, practical example helps to emphasize the point:

A company produces plastic toys that are packaged in cardboard boxes. These boxes are packed on to wooden pallets that are used as the basic unit load in the warehouse and in the transport vehicles for delivery to customers.

A study indicates that the cardboard box is an unnecessary cost because it does not provide any significant additional protection to the quite robust plastic toys and it does not appear to offer any significant marketing advantage. Thus, the box is discarded, lowering the unit cost of the toy and so providing a potential advantage in the marketplace.

One unforeseen result, however, is that the toys, without their boxes, cannot be stacked on to wooden pallets, because they are unstable, but must be stored and moved instead in special trays. These trays are totally different to the unit load that is currently used in the warehouse and on the vehicles (ie the wooden pallet). The additional cost penalty in providing special trays and catering for another type of unit load for storage and delivery is a high one – much higher than the savings made on the product packaging.

This example illustrates a classic case of *sub-optimization* in a logistics system. It shows that if the concept of total logistics is ignored, this can be a significant cost to a company. As the product packaging costs have been reduced, those concerned with this company function will feel that they have done their job well. However, the overall effect on the total logistics cost is, in fact, a negative one. The company is better served by disregarding this potential saving on packaging, because the additional warehouse and transport costs mean that total costs increase.

This simple example of sub-optimization emphasizes the importance of understanding the interrelationships of the different logistics elements. A more positive action would be to measure and interpret these and other interrelationships using a planned approach to identifying and determining any *cost trade-offs*. This approach will be a benefit to the logistics system as a whole. Such a trade-off may entail additional cost in one function but will provide a greater cost saving in another. The overall achievement will be a net gain to the system.

This type of trade-off analysis is an important part of planning for logistics. Four different levels of trade-off can be identified:

1. *Within logistics components:* this refers to the trade-offs that occur within single functions (eg warehousing). One example would be the decision to use random storage locations compared to fixed storage locations in a depot. The first of these provides better storage utilization but is more difficult for picking; the second is easier for picking but does not provide such good storage utilization.
2. *Between logistics components:* these are the trade-offs that occur between the different elements in logistics. To reverse the earlier packaging example, a company might increase the strength and thus the cost of packaging but find greater savings through improvements in the warehousing and storage of the product (ie block stacking rather than a requirement for racking).

Trade-off	Finance	Production	Distribution	Marketing
Longer production runs	Lower production unit costs	Lower production unit costs	More inventory and storage required	Lower prices
Fewer depots	Reduced depot costs (though transport costs likely to increase)	No impact	Less complicated logistics structure	Service reduction due to increased distance of depots from customers
Reducing stocks of finished goods	Reduced inventory costs	Shorter production runs so higher production unit costs	No need to expand storage facilities	Poorer product availability for customers
Reducing raw material & component stocks	Reduced inventory costs	Less efficient production scheduling due to stock unavailability	Lower stock-holding requirements	No direct impact
Reducing protective transport packaging	Reduced packaging costs	No impact	Reduced transport modal choice	Increase in damaged deliveries
Reducing warehouse supervision	Cost savings through lower headcount	No impact	Reduced efficiency due to less supervision	Lost sales due to less accurate order picking

Figure 2.1 Some potential trade-offs in logistics, showing how different company functions might be affected

3. *Between company functions:* there are a number of areas of interface between company functions where trade-offs can be made. This is illustrated in Figure 2.1, which lists some potential trade-offs and indicates how the different company functions might be affected. One example is the trade-off between optimizing production run lengths and the associated warehousing costs of storing the finished product. Long production runs produce lower unit costs (and thus more cost-effective production) but mean that more product must be stored for a longer period (which is less cost-effective for warehousing).
4. *Between the company and external organizations:* there may be opportunities for a trade-off between two companies that are directly associated with each other. For example, a change from a manufacturer's products being delivered direct to a retailer's stores to delivery via the retailer's distribution depot network might lead to a cheaper solution overall for the two companies.

These types of trade-offs are thus at the heart of the total logistics concept. For the planning of distribution and logistics, it is important to take this overall view of a logistics system and its costs. The other side of the equation is, of course, the need to provide the service level that is required by the customer. This balance of total logistics cost and customer service level is essential to successful logistics.

Planning for logistics

In order to ensure that the concept of total logistics is put into practice and that suitable trade-offs are achieved, it is essential that a positive planning approach is adopted. In this section, the various planning horizons with their associated logistics decisions are described. In Chapter 6, a more formalized planning framework will be discussed. This will be developed in subsequent chapters into a more practical and detailed approach to logistics planning.

Planning should be undertaken according to a certain hierarchy that reflects different *planning time horizons*. These are generally classified as strategic, tactical and operational. They are represented on the left side of Figure 2.2. There is an overlap between the different levels, which emphasizes that there are some factors that can be considered at different stages in this planning hierarchy. The relative importance of these various elements can differ between one company and another. For example, the choice of transport mode might be a strategic decision for a company that is setting up a new global logistics operation, but might just be a tactical decision for another company that is principally a supplier to a locally based market and only occasionally exports over long distances. Choice of transport mode could even be an initial strategic decision and also a subsequent tactical decision for a single company.

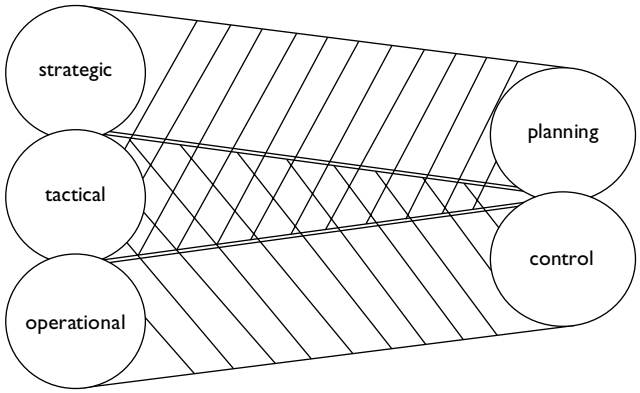


Figure 2.2 Logistics planning hierarchy

Figure 2.2 also indicates the interrelationship of *planning and control* within this hierarchy. Both of these different elements are essential to the running of an effective and efficient logistics operation. One way to envisage the difference between these two concepts is as follows: *planning* is about ensuring that the operation is set up to run properly – it is 'doing the right thing' or preparing for and planning the operation 'effectively'; *control* is about managing the operation in the right way – it is 'doing the thing right' or making sure that the operation is being run 'efficiently'.

Once again it is not relevant to define exactly which strategic, tactical and operational decisions or tasks within a company should be classified as either planning or control. Most elements need to be planned correctly in the first place, and then subsequently they need to be monitored and controlled to ensure that the operation is running as well as it should be. The practical means of monitoring and controlling logistics are described in Chapter 30.

Some of the major aspects and differences between the three time horizons are summarized in Figure 2.3. The importance and relevance of these different aspects will, of course, vary according to the type and scale of business, product, etc. It is helpful to be aware of the planning horizon and the associated implications for each major decision that is made.

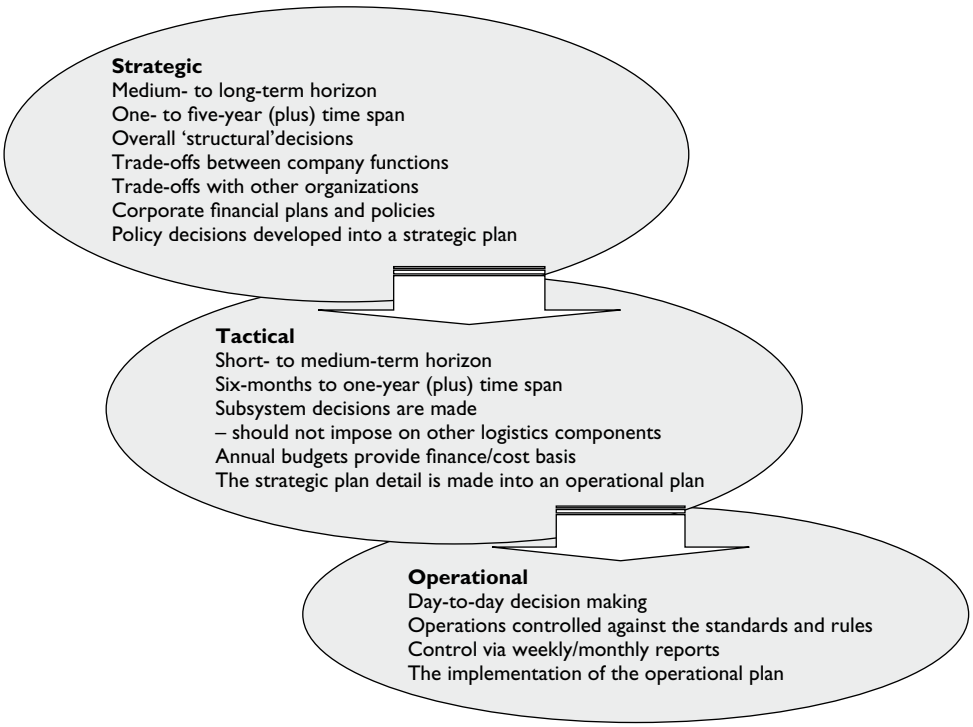


Figure 2.3 The major functions of the different planning time horizons

It is possible to identify many different elements within distribution and logistics that can be broadly categorized within this planning hierarchy. As already indicated, these may vary from one company to another and from one operation to another. Some of these – in no particular order – are as indicated in Figure 2.4.

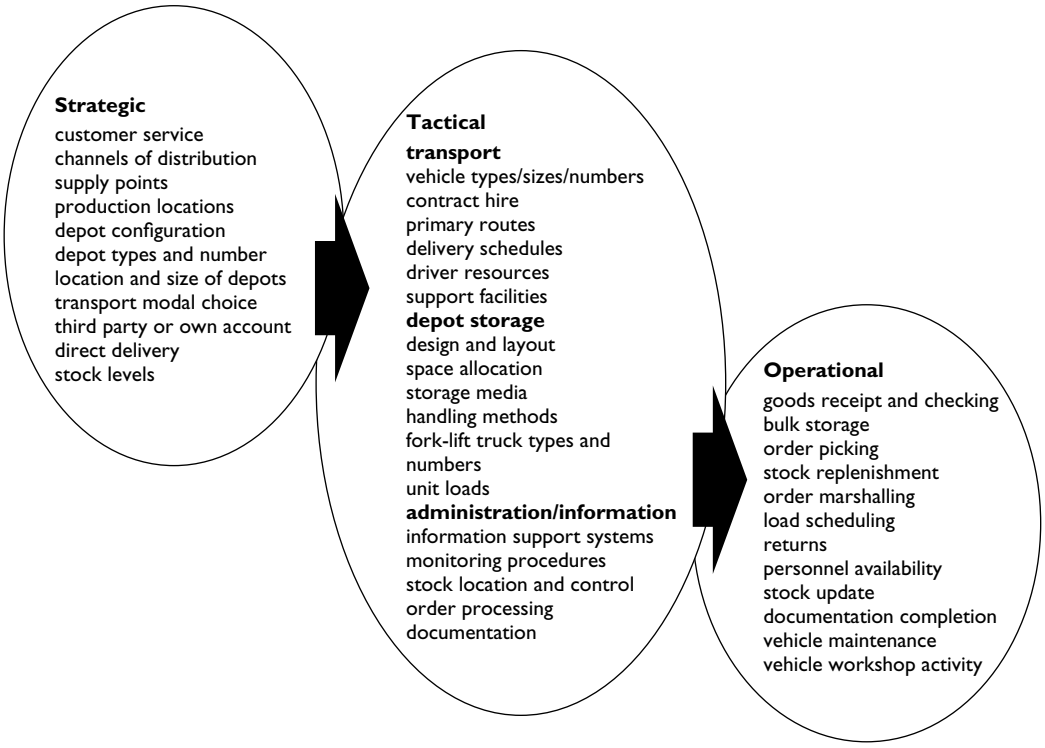


Figure 2.4 Some of the main logistics elements for the different planning time horizons

These examples serve to emphasize the complexity of distribution and logistics. In addition, they underline the need for appropriate planning and control. Distribution and logistics are not merely the transportation of goods from one storage point to another. There are many and varied elements that go together to produce an effective distribution and logistics operation. These elements interrelate, and they need to be planned over suitable time horizons.

The planning and control of an operation can also be described within the context of a broader planning cycle. This emphasizes the need for a systematic approach, where continual review takes place. This is a particularly important concept in logistics, because most operations need to be highly dynamic – they are subject to continual change, as both demand and supply of goods and products regularly vary according to changes in customer requirements for new products and better product availability. One example of a fairly common framework is shown as the planning and control cycle in Figure 2.5. The key stages in the cycle are as follows:

1. The cycle begins with the question 'Where are we now?' Here the aim is to provide a picture of the current position. This might be through a regular information feedback procedure or through the use of a specific logistics or distribution audit.

2. The second stage is to determine the objectives of the logistics process, to identify what the operation should be trying to achieve. These objectives need to be related to such elements as customer service requirements, marketing decisions, etc.
3. The third stage in the cycle is the planning process that spans the strategic and operational levels previously discussed.
4. Finally, there is a need for monitoring and control procedures to measure the effectiveness of the distribution operation compared to the plan. This should be undertaken on a regular weekly, monthly and annual basis.

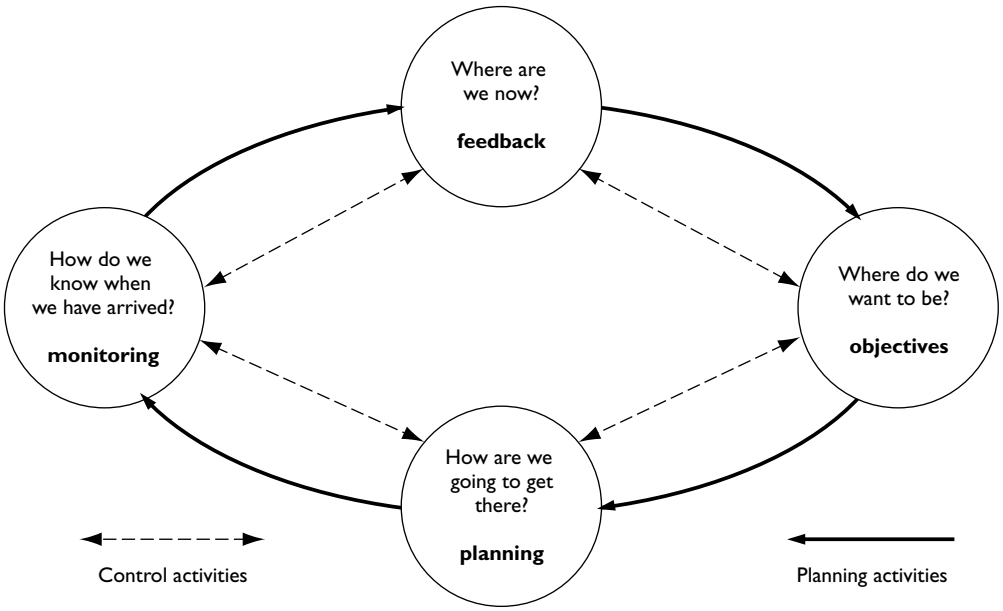


Figure 2.5 The planning and control cycle

The cycle has then turned full circle, and the process is ready to begin again. This allows for the dynamic nature of logistics, the need for continual review and revision of plans, policies and operations. This must be undertaken within a positive planning framework in order to ensure that continuity and progress are maintained.

The financial impact of logistics

Logistics can have a variety of different impacts on an organization's financial performance. Logistics has traditionally been seen as an operational necessity that cannot be avoided; however, a good logistics operation can also offer opportunities for improving financial performance.

For many companies, a key measure of success is the return on investment (ROI): the ratio between the net profit and the capital employed in the business. For improved business performance, this ratio needs to be shifted to increase profits and reduce capital employed. There are many different ways in which logistics can have both a positive and a negative impact on the ROI. These are outlined in Figure 2.6. This shows ROI as the key ratio of profit and capital employed, with the main elements broken down further as sales revenue *less* cost (representing profit) and inventory *plus* cash and receivables *plus* fixed assets (representing capital employed).

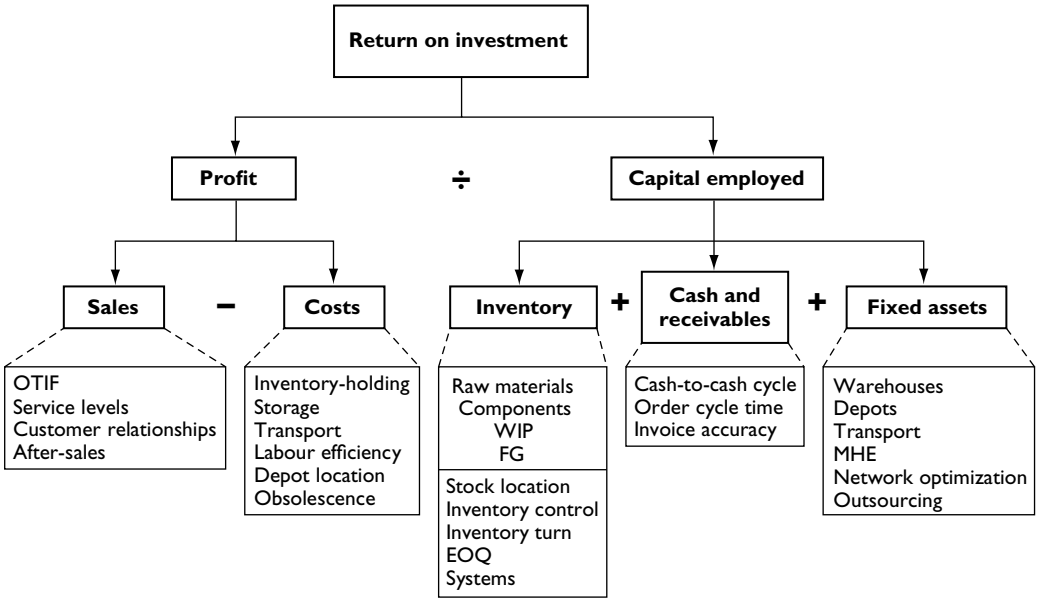


Figure 2.6 The many ways in which logistics can provide an impact on an organization's return on investment

Profit can be enhanced through increased sales, and sales benefit from the provision of high and consistent service levels. One of the aims of many service level agreements is to try to achieve OTIF (on time in full) deliveries – a key objective of many logistics systems. On the other hand, costs can be minimized through efficient logistics operations. There are a number of ways that this might happen, including:

- more efficient transport, thus reducing transport costs;
- better storage leading to reduced storage costs;
- reduced inventory holding leading to less cash being tied up in inventory;
- improved labour efficiency, thus reducing costs.

The amount of *capital employed* can also be affected by the different logistics components. For example, there are many different types of inventory held by companies, including raw materials, components, work-in-progress and finished goods. The key logistics functions impact very significantly on the stock levels of all of these. This impact can occur with respect to stock location, inventory control, stockholding policies, order and reorder quantities and integrated systems, amongst others. Cash and receivables are influenced by cash-to-cash and order cycle times – both of these being key logistics processes. Finally, there are many fixed assets to be found in logistics operations: warehouses, depots, transport, and material handling equipment. The number, size and extent of their usage are fundamental to effective logistics planning. Also, there may be good opportunities to outsource some or all of these operations, which has a significant effect on reducing fixed assets.

Much of this book is taken up with the practical logistics issues that enable the maximization of profit, the minimization of costs and thus the improvement of ROI.

Globalization and integration

One area of significant change in recent years has been the increase in the number of companies operating in the global marketplace. This necessitates a broader perspective than when a national company operates internationally. In the latter, although companies may have a presence across a wide geographic area, this is supported on a local or regional basis through local or regional sourcing, manufacturing, storage and distribution. In the former, the company is truly global, with a structure and policy that represent a global business. Typical global attributes will include: global branding, global sourcing, global production, centralization of inventories and the centralization of information, but with the ability to provide for local requirements, be these electronic standards for electrical goods, language on packaging or left-/right-hand-drive alternatives in the automotive industry. All of these aspects serve to emphasize the added difficulty of operating effectively in a global environment. Logistics and supply chain networks have become far more complicated and the need to plan and manage logistics as a complete and integrated system has become far more difficult.

To service global markets, logistics networks become, necessarily, far more expansive and far more complex. Once again, the need is to plan and manage logistics as a complete and integrated system. As well as the attributes already mentioned, companies operating in a global market are often involved with the outsourcing of some manufacturing and the use of 'focused' factories that specialize in a limited number of products.

Linked closely to the globalization of business is the increase in the complexity of supply chain management. As already indicated, globalization almost certainly leads to greater complexity. Complexity provides some significant implications for logistics operations. These include:

- extended supply lead times;
- production postponement with local added value;
- complicated node management;
- multiple freight transport options;
- extended and unreliable transit times;
- the need for greater visibility in the supply chain.

It is probably clear from this that there is a direct conflict between globalization and the move to the quick response, just-in-time operations that are being sought by many companies. In global companies there is a tendency to see order lead times increase and inventory levels rise because of the distances involved and the complexity of logistics. In companies moving to the just-in-time philosophy there is a desire to reduce lead times and to eliminate unnecessary stock and waste within their operations. For those companies trying to achieve both goals, there is a clear challenge for logistics.

Integrated systems

To support the need to develop more integrated operations there have been a number of developments in logistics and distribution systems that have the concept of total logistics as their basis. Thus, quite revolutionary 'trade-offs' are now being practised. The major reason for this explosion of new ideas is twofold. The first is the realization of the importance, cost and complexity of logistics. The second is the progress made in the field of information technology, which has enabled the development of sophisticated information systems to support and enhance the planning and management of logistics operations, whereby very detailed data collection and analysis can be undertaken that was previously impossible. Some of these alternative approaches to integrated physical and information systems are described in Chapter 32, where information systems in the supply chain are discussed. In addition, some of the key aspects of integration are reviewed in Chapter 12, which considers recent developments in manufacturing techniques. Many of the origins of integrated systems have a background in manufacturing.

Direct product profitability (DPP)

DPP is a technique of allocating all of the appropriate costs and allowances to a given product. All distribution costs (storage, transport, etc) are therefore assigned to a specific product rather than taking an average over a whole product range. Thus, in the same way that a budgetary system operates, the actual costs of distributing a product are monitored and compared to a standard cost determined using DPP. In this way, areas of inefficiency throughout the whole logistics operation can be identified. DPP techniques can identify the costs of specific

products to individual customers and so provide invaluable information for effective marketing strategies.

Materials requirements planning (MRP) and distribution requirements planning (DRP)

MRP/DRP systems have been developed as sophisticated, computerized planning tools that aim to make the necessary materials or inventory available when needed. The concept originated with materials requirements planning, an inventory control technique for determining dependent demand for manufacturing supply. Subsequently, manufacturing resource planning (MRPII) was developed with the objective of improving productivity through the detailed planning and control of production resources. MRPII systems are based on an integrated approach to the whole manufacturing process from orders through production planning and control techniques to the purchasing and supply of materials (see Chapter 12 for further discussion). Distribution requirements planning is the application of MRPII techniques to the management of inventory and material flow – effective warehousing and transportation support.

DRP systems operate by breaking down the flow of material from the source of supply through the distribution network of depots and transportation modes. This is undertaken on a time-phased basis to ensure that the required goods 'flow' through the system and are available as and when required – at the right place, at the right time (one of the classic distribution definitions). Integrated systems of this nature require sophisticated, computerized information systems as their basis. The benefits of an effective system can be readily seen in terms of reduced freight, storage and inventory holding costs and improved customer service.

Just-in-time (JIT)

JIT originated as a new approach to manufacturing and has been successfully applied in many industries such as the automotive industry. It has significant implications for distribution and logistics. The overall concept of JIT is to provide a production system that eliminates all activities that neither add value to the final product nor allow for the continuous flow of material – in simple terms, that eliminates the costly and wasteful elements within a production process. The objectives of JIT are vitally linked to distribution and logistics, including as they do:

- the production of goods the customer wants;
- the production of goods when the customer wants them;
- the production of perfect-quality goods;
- the elimination of waste (labour, inventory, movement, space, etc).

There are a number of JIT techniques used to a greater or lesser extent by the generally large companies that have adopted the JIT philosophy, and these are explained in Chapter 12.

As with all such approaches, JIT has some negative points as well as the more positive ones listed above. It can, for example, lead to increased transport flows due to the need for smaller but more frequent deliveries of goods to the customer.

Competitive advantage through logistics

Attitudes towards distribution and logistics have changed quite dramatically in recent years. It was commonly thought that the various elements within logistics merely created additional cost for those companies trying to sell products in the marketplace. Although there is, of course, a cost associated with the movement and storage of goods, it is now recognized that distribution and logistics also provide a very positive contribution to the value of a product. This is because logistics operations provide the means by which the product can reach the customer or end user, in the appropriate condition and required location.

It is therefore possible for companies to compete on the basis of providing a product either at the lowest possible cost (so that the customer will buy it because it is the least expensive) or at the highest possible value to the customer (eg if it is provided exactly where, when and how the customer wants it). Some companies may, perhaps unwisely, try to achieve both of these cost and value objectives and probably succeed in neither! It is particularly important to understand which competitive stance a company is trying to achieve when planning a logistics operation.

These ideas are illustrated in Figure 2.7. This shows that a company may compete as a *service leader*, where it is trying to gain a value advantage over its competitors by providing a number of key service elements to differentiate its product. Or it may compete as a *cost leader* where it is trying to utilize its resources so that it offers the product at the lowest possible cost, thus gaining a productivity advantage. Examples of how this might be achieved are given in Figure 2.7. For a *service or value advantage*, this might include the provision of a specially tailored service or the use of several different channels of distribution so that the product is available in the marketplace in a number of different ways. It might include a guaranteed service level or a regular update on the status of orders. For a *cost or productivity advantage*, this may include a number of different means of cost minimization, such as maintaining very low levels of inventory and ensuring that all manufacturing and distribution assets are kept at a high utilization.

It should also be emphasized that for many companies it is necessary to develop differently configured logistics structures to cater for the variety of service offerings that they need to provide. It is now appreciated that a 'one-size-fits-all' approach to logistics is usually too limited, because suppliers need to take account of a range of different customer requirements and make sure that their competitive advantage is understood and applied in all market

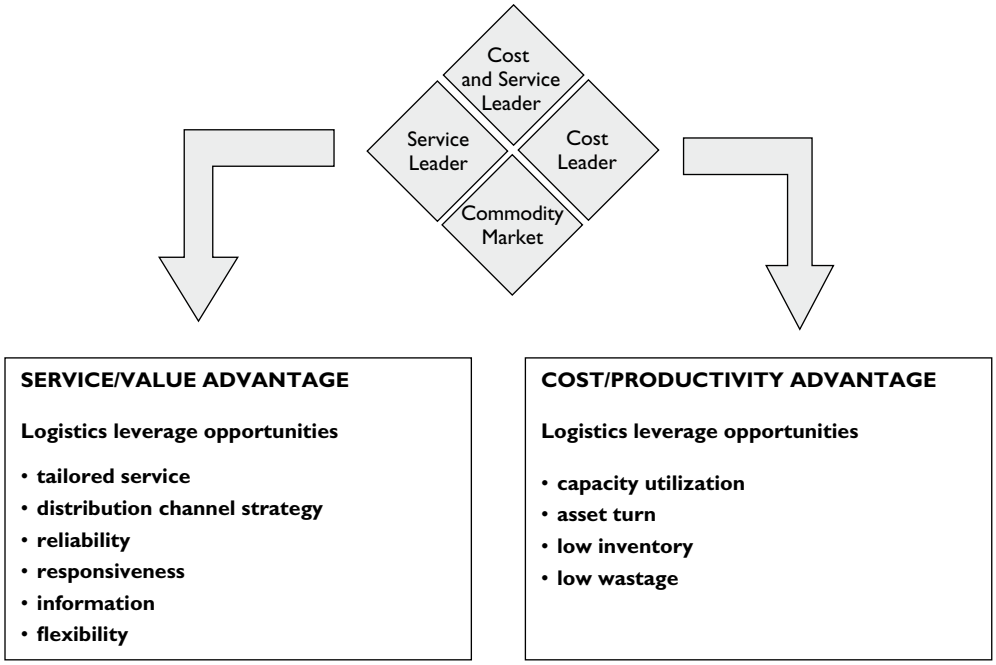


Figure 2.7 The logistics implications of different competitive positions

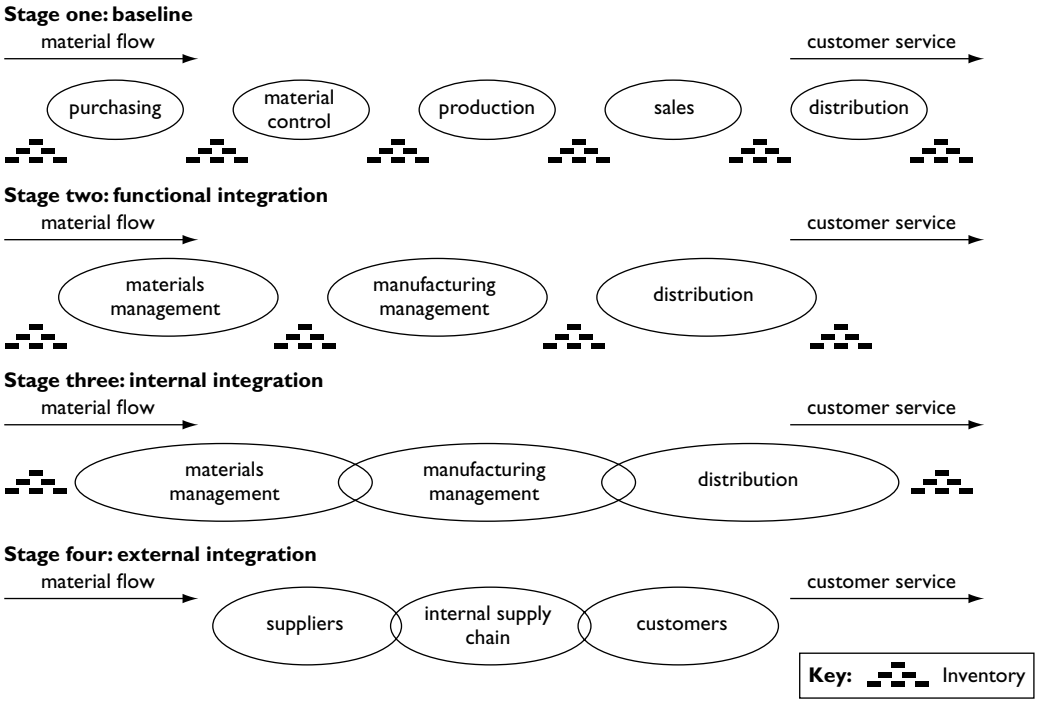
segments. As noted in a European Logistics Association (ELA) survey (2004): 'One size fits all policies will rarely work when applied to modern, diverse service offerings... Leading companies are segmenting their supply chains according to the service and cost needs of the customer.' This important point is discussed in more detail in Chapter 8.

Logistics and supply chain management

The term 'supply chain management' is now commonly used to cover many if not all of the various logistics functions. The concept of the supply chain is really an extension of the ideas that have been developed in this and the previous chapter concerning the integrated nature of logistics. The total logistics concept advocates the benefits of viewing the various elements of logistics as an integrated whole. Supply chain management is similar, but also includes the supplier and the end user in the process or, as indicated in Figure 1.1, the upstream (supply side) and downstream (demand side) partners in the supply chain. This is the major difference between supply chain management and traditional logistics.

There are four distinct differences claimed for supply chain management over the more classic view of logistics, although some of these elements have also been recognized as key to the successful planning of logistics operations. These four are:

1. The supply chain is viewed as a single entity rather than a series of fragmented elements such as procurement, manufacturing, distribution, etc. This is also how logistics is viewed in most forward-looking companies. In an integrated supply chain, however, both the suppliers and the end users are included in the planning process, thus going outside the boundaries of a single organization in an attempt to plan for the supply chain as a whole.
2. Supply chain management is very much a strategic planning process, with a particular emphasis on strategic decision making rather than on the operational systems.
3. Supply chain management provides for a very different approach to dealing with inventory. Traditionally, inventory has been used as a safety valve between the separate components within the pipeline – thus, often leading to large and expensive stocks of products. Supply chain management aims to alter this perspective so that inventory is used as a last resort to balance the integrated flow of product through the pipeline.
4. Central to the success of effective supply chain management is the use of integrated information systems that are a part of the whole supply chain rather than merely acting in isolation for each of the separate components. These enable visibility of product demand and stock levels through the full length of the pipeline. This has only become a possibility with the recent advances in information systems technology.



Source: Stevens (1989)

Figure 2.8 Supply chain integration

The move towards integration within different supply chains has been relatively slow; indeed, many companies still have fairly limited integration within their own organizations. Full external integration thus remains a 'Holy Grail' that most organizations are striving to achieve. Many companies have moved to functional integration, with some achieving an element of full internal integration. Figure 2.8 illustrates the different levels of integration a company might reach. The extent of integration has a big impact on the logistics structure of a company. A company with limited integration will hold stocks in many parts of its operation. A highly integrated company will hold very limited stocks, with the emphasis on the steady flow of product throughout the physical system. The figure emphasizes this need for poorly integrated organizations to hold large inventories at frequent intervals throughout the supply chain.

Summary

The realization of the need for the effective planning and control of logistics, coupled with the obvious interrelationships within logistics systems, has led to the development of several new approaches towards integrated systems. The recent advances in information technology have made the practical application of these new approaches feasible. All in all, there has been a very positive move towards an integrated approach to logistics, although for many companies, both large and small, there is still considerable scope for improvement.

The more complex and sophisticated systems and concepts such as DPP and DRP have been adopted by a number of large, generally multinational companies. Smaller companies have been slower to adopt these concepts, despite the clear benefits to be gained. The main reasons for this are:

- a lack of organizational integration that reflects the role and importance of logistics;
- a failure to develop adequate long-term plans for logistics strategy;
- insufficiently developed information structures and support systems to provide the appropriate databases for good logistics planning and management.

For many small and medium-sized companies, there is also the very pertinent factor that they need to learn to walk the logistics path before they attempt to run on it. However, even for companies such as these, there is a great deal to be gained from taking those first few steps towards recognizing that logistics should be viewed as an integrated system and that there is a strong interrelationship between the different elements of transportation, storage, information, etc. In addition, there is the need to adopt a positive approach to the planning and control of those systems.

Fortunately, in the past few years, companies have, to a greater or lesser extent, realized the importance and relevance of logistics to their business as a whole. Thus, organizational structures and planning policies are now beginning to reflect this integrated approach.

In this chapter, the 'total logistics concept' has been introduced, and the need to recognize the opportunities for logistics trade-offs has been emphasized. The financial impact that logistics has in a business has been described. The importance of the need to integrate the various logistics components into a complete working structure that enables the overall system to run at the optimum has been identified. Some key aspects of planning for logistics have been reviewed. Finally, a number of recent developments in logistics thinking have been described, including the globalization of companies, integrated planning systems, the use of logistics to help create competitive advantage and the concept of supply chain management.

03 Customer service and logistics

Introduction

The vast majority of companies consider customer service to be an important aspect of their business. When pressed, however, there are many companies that find it difficult to describe *exactly what they mean by customer service* or provide *a precise definition of customer service measures*. Traditionally, service provisions have been based on very broad assumptions of what customers want, rather than taking into account the real requirements of customers or at least customers' perceptions of what they require.

For any company or organization it is vital, therefore, to have a clear definition of customer service and to have specific and recognized customer service measures. It is also important to understand that customer service and customer service requirements can and will differ not just between industries and companies but additionally between the market segments that a business might serve.

Another relevant factor is the recognition of the complexity of customer service provision. Customer service is inextricably linked to the process of distribution and logistics. Within this process, there are many influences that may be relevant to customer service. These range from the ease of ordering to stock availability to delivery reliability. Finally, there is the need to balance the level of service provided with the cost of that provision. The downfall of many a service offering is often the unrealistic and unrecognized high cost of providing a service that may, in the event, be greater than is required by the customer.

The key to achieving a successful customer service policy is to develop appropriate objectives through a proper framework that includes liaison with the customer, and then to measure, monitor and control the procedures that have been set up.

The importance of customer service

As already suggested, there are few companies that do not recognize the importance of the provision of good customer service. But, why is it so important? There are many different

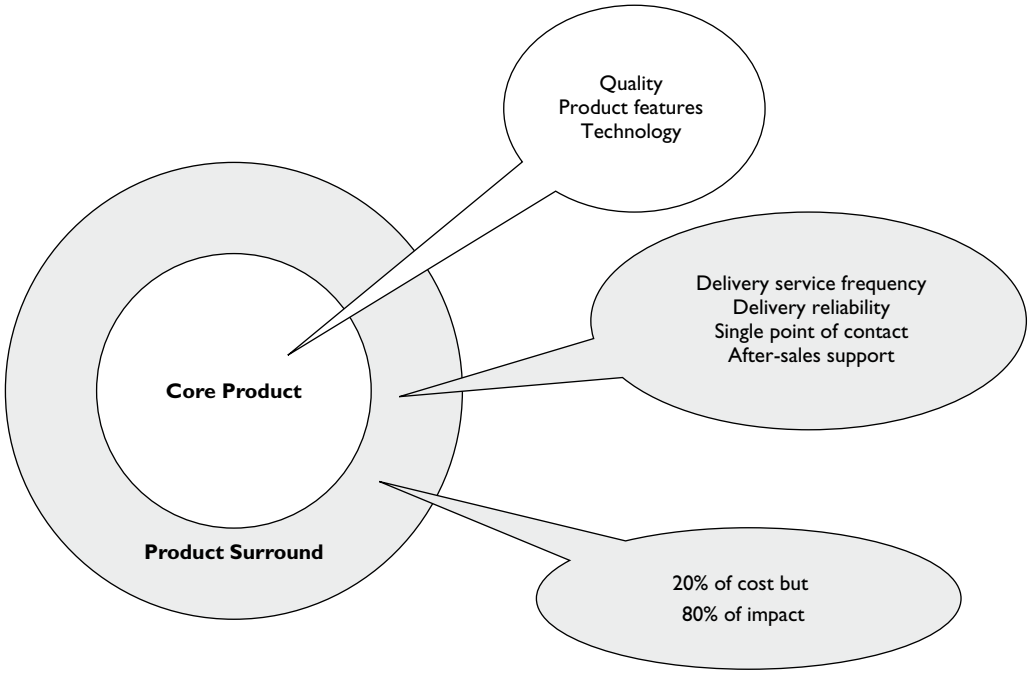


Figure 3.1 Core product versus product 'surround', illustrating the importance of the logistics-related elements

answers to this question, ranging from the growth in competition to the raising of customers' expectations to the similarity of the basic products that are offered. One way of considering customer service is to differentiate between the core product itself and the service elements related to the product. This is depicted in Figure 3.1. The core product concerns the item itself: the technical content, the product features, the ease of use, the style and the quality. The service elements, which can be called the 'product surround', represent the availability of the product, the ease of ordering, the speed of delivery, and after-sales support. There is a long list (as we shall see later in this chapter), and clearly not all of the service items on our list are relevant to all products.

The marketing departments of many companies recognize that the product surround elements are very important in determining the final demand for a product. In addition, these aspects often represent only a small percentage of the cost of a product. Thus, true to the Pareto 80/20 rule, it is estimated that product surround or logistics elements represent about 80 per cent of the impact of the product but only represent 20 per cent of the cost. Thus, no matter how attractive the product may be, it is essential that the customer service elements are satisfactory and, as we shall see, logistics plays a crucial role in providing good customer service.

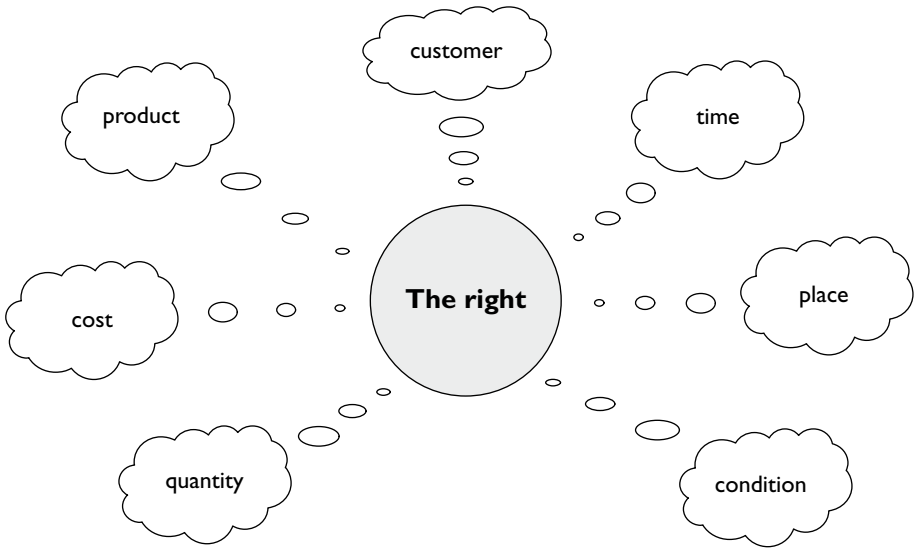


Figure 3.2 The seven 'rights' of customer service, showing the main service classifications

One of the definitions of logistics that was provided in Chapter 1 referred to 'the positioning of resource at the right time, in the right place, at the right cost, at the right quality'. This definition can be expanded into what might be considered as the seven 'rights' of customer service. These are the right quantity, cost, product, customer, time, place and condition; and the concept of applying these to customer service can be seen in Figure 3.2. All of these different aspects can be key requisites of a good customer service offering – indeed, each of them may be essential to ensure that a product achieves its expected sales in the various markets where it is made available. It is notable that all of these elements are affected by the standard and quality of the logistics operations that are essential to getting a product to market. Thus, these elements can provide the basis for identifying the different aspects of logistics that should form a part of any customer service offering, and also, and this is of equal importance, these elements should become the basis of the key measurements that are used to monitor operational success or failure. This will be considered in the final sections of this chapter.

The components of customer service

The logistics components of customer service can be classified in different ways. They may be seen as direct transaction-related elements, where the emphasis is on the specific physical service provided, such as on-time delivery, or they may be seen as indirect support (eg non-transactional, or pre- and post-transactional) attributes that are related to overall aspects of order fulfilment, such as the ease of order taking.

Logistics customer service elements can thus be divided into three categories that reflect the nature and timing of the particular service requirements (before, during and after delivery of the product):

1. *Pre-transaction elements:* these are customer service factors that arise prior to the actual transaction taking place. They include:
   - written customer service policy;
   - accessibility of order personnel;
   - single order contact point;
   - organizational structure;
   - method of ordering;
   - order size constraints;
   - system flexibility;
   - transaction elements.
2. *Transaction elements:* these are the elements directly related to the physical transaction and are those that are most commonly concerned with distribution and logistics. Under this heading would be included:
   - order cycle time;
   - order preparation;
   - inventory availability;
   - delivery alternatives;
   - delivery time;
   - delivery reliability;
   - delivery of complete order;
   - condition of goods;
   - order status information.
3. *Post-transaction elements:* these involve those elements that occur after the delivery has taken place, such as:
   - availability of spares;
   - call-out time;
   - invoicing procedures;
   - invoicing accuracy;
   - product tracing/warranty;
   - returns policy;
   - customer complaints and procedures;
   - claims procedures.

Logistics customer service elements can also be classified by *multifunctional dimensions*. The intention is to assess the different components of customer service across the whole range of company functions, to try to enable a seamless service provision. Time, for example, constitutes a single requirement that covers the entire span from order placement to the actual

delivery of the order – the order cycle time. One of the main consequences of this approach is that it enables some very relevant overall logistics measures to be derived. These will be considered later in this chapter. The four main multifunctional dimensions are:

1. *time* – usually order fulfilment cycle time;
2. *dependability* – such as guaranteed fixed delivery times of accurate, undamaged orders;
3. *communications* – such as the ease of order taking or effective queries response;
4. *flexibility* – the ability to recognize and respond to a customer's changing needs.

Each of these can be broken down into further detailed elements. One example of this is shown in Figure 3.3, which describes the different time-related components.

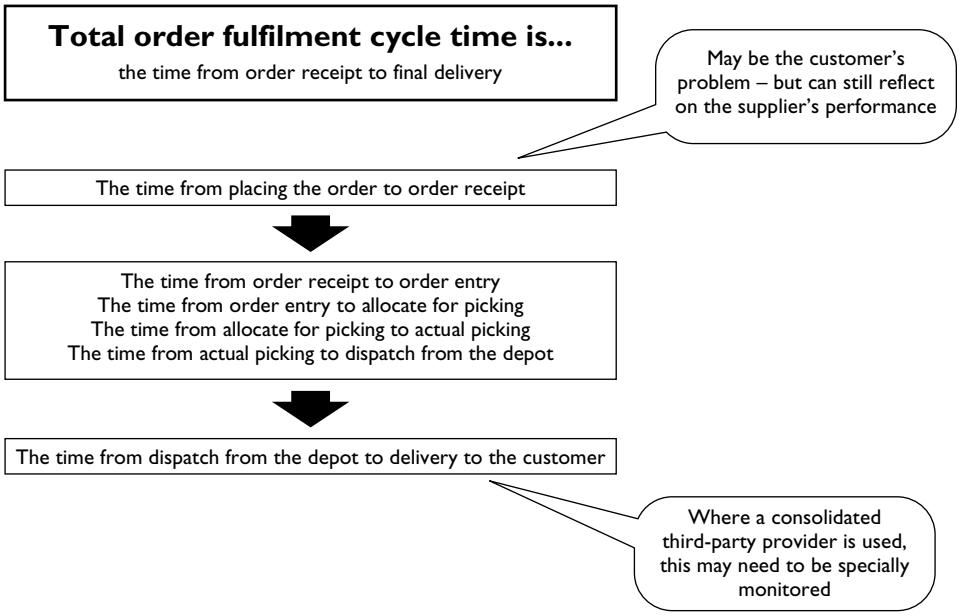


Figure 3.3 The constituent parts of total order fulfilment cycle time

The total order fulfilment cycle time has been split into the five main time-related components from order receipt to final delivery. In addition, there is a preliminary step from order placement to order receipt, although this is not considered by some companies because it is deemed to be part of their customers' ordering process. When identifying and measuring order fulfilment cycle time it is important to be able to break it down to all of the key components. Thus, if there is a customer service problem it can be measured and traced quickly and easily and the actual detailed problem can be identified and remedied.

As indicated already in this chapter, there are many different elements of customer service, and their relevance and relative importance will vary according to the product, company and market concerned.

Two conceptual models of service quality

Service quality is a measure of the extent to which the customer is experiencing the level of service that they are expecting. Two different models of service quality are considered: a very basic model and a more complicated, extended model.

Basic service model

A very simple, yet effective, view of service quality is that it is *the match between what the customer expects and what the customer experiences*. Any mismatch from this can be called the 'service quality gap'. Note that the customer viewpoint is what the customer *perceives* or believes to be happening, not necessarily what is *actually* happening in terms of what the supplier is providing (or thinks they are providing). Perceived quality is always a judgement that the customer makes – whatever the customer thinks is reality, no matter what the supplier may believe to the contrary! This is another reason why careful measurement of customer service is necessary: to be able to demonstrate that certain agreed standards are being achieved.

Thus, service quality is what the customer thinks that it is:

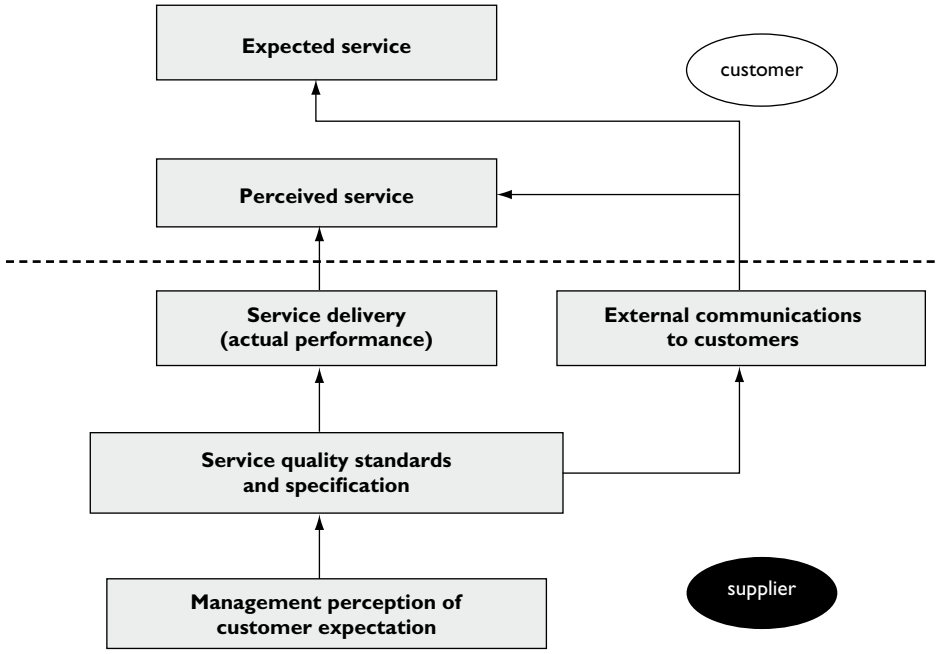
$$\text{Service quality} = \frac{\text{perceived performance}}{\text{desired expectations}} \times 100$$

Extended service model

A rather more complicated approach can also be used as a conceptual model of service quality. This is particularly useful in helping to identify and measure the critical elements of service for key customers. The main factors are outlined in Figures 3.4 and 3.5. The aim of this approach is to identify the various different service gaps that can or might appear throughout the customer service process. Measures are then set up to assess the relative importance of each of these gaps and to monitor them on a regular basis.

The boxes in Figure 3.4 represent the key factors in the process of providing a service to customers. The starting point is the supplier's perception of what they think is the customer's service expectation. From this, the supplier should develop appropriate service quality standards and specifications. These should then be communicated to and agreed with the customer. Subsequently, the service is provided by the supplier via the logistics operation. The customer will then have a certain expectation of the service level to be provided and can compare this to the service that he or she perceives is being received.

In Figure 3.5, this concept is developed to illustrate the potential areas for service failure. Working backwards, the main issue is likely to be the one between the service that the customer expects and the service that the customer perceives to be provided (Gap 6). This is the perceived service–expected service gap, and for both the customer and the supplier it is the

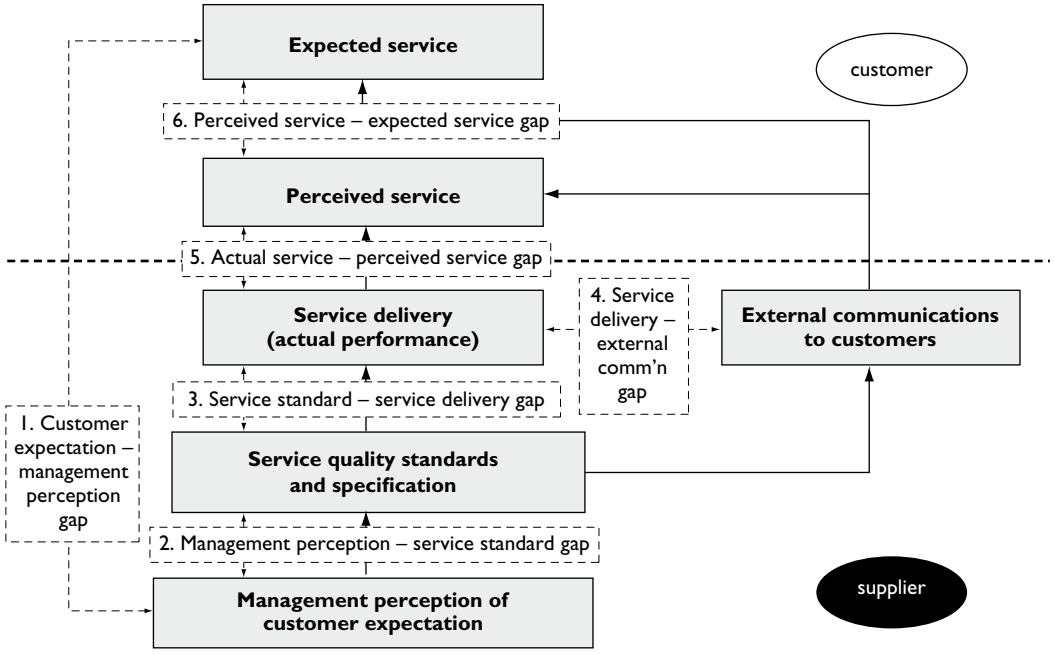


(Based on work by Parasuraman and Zeithaml)

Figure 3.4 A conceptual model of service quality: the basic elements

major aspect of service quality that needs to be measured. How is this undertaken? As described later in this chapter, there are a number of different types of customer service studies that can be carried out to achieve this. However, it is also important to be able to identify *why* any such service failure has occurred, and the different reasons can be identified by measuring the other service gaps that appear in Figure 3.5. These are as follows:

- *Gap 5: actual service–perceived service gap:* this is the difference between the service that the supplier is providing and the service that the customer thinks is being received. This gap may, typically, be caused because the supplier and the customer are measuring service in a different way.
- *Gap 4: service delivery–external communication gap:* this is the difference between the actual service that is provided and the promised level of service that was communicated to the customer. This gap may be caused by a misunderstanding in communication.
- *Gap 3: service standard–service delivery gap:* this is the difference between the actual service that is provided and the planned level of service based on the service specification that has been set. The cause for this gap may be inefficiency within the delivery service.



(Based on work by Parasuraman and Zeithaml)

Figure 3.5 A conceptual model of service quality: the service gaps

- *Gap 2: management perception–service standard gap:* this is the difference between the service specification that is set and the supplier management assessment of customer service requirements. This gap is likely to be caused by an inadequate initial operational set-up.
- *Gap 1: customer expectation–management perception gap:* this is the difference between the service that the customer expects and the service level that the supplier thinks that the company wants. This gap is usually caused because the supplier does not understand the real customer requirements.

Conceptual models of this nature are valuable to help the understanding of the underlying issues that are involved. They need to be interpreted into a practical format to enable actual service policies to be derived. The remaining sections of this chapter address this requirement.

Developing a customer service policy

Every company that provides products and services to its customers should have an appropriate customer service policy. Such a customer service policy needs to be developed based on identifiable customer service requirements, and a suitable logistics operation must be

established to provide this service. The next few sections of this chapter describe how this can be done. Because there are so many different elements of customer service, this policy must be very clearly and carefully defined. Also, there are many different types of customer even for the same product. A can of fizzy drink, for example, may be bought in a supermarket, a corner shop, a petrol station or from a self-service dispensing unit. It is unlikely that a manufacturer of fizzy drink would wish to provide exactly the same level and style of service to all these very different customer types. This is why many companies segment their customers into different customer categories. It is also an additional reason for having a distinct customer service policy.

Many studies have been undertaken to measure the effects of poor customer service. These studies conclude, quite categorically, that where stock is not available or where delivery is unreliable many buyers will readily turn to an alternative supplier's products to fulfil their requirements.

It is also important to understand what minimum requirements are necessary when identifying any particular service policy. A supplier is really working towards meeting customers' minimum requirements to cross the threshold of customer satisfaction. If these minimum requirements are not met, the supplier cannot even expect to be considered as a feasible supplier. Once these requirements are met and the supplier begins to exceed them, it then becomes possible to achieve customer satisfaction and begin to add value to the supply relationship.

Once the positive need for a customer service policy has been accepted, it is useful to adopt a recognized approach to determine the basic requirements and format of this policy. One such approach is outlined in Figure 3.6 and described in the remainder of this section. As well as showing the major steps that should be taken, the figure also indicates how these steps can be carried out. This is a six-step plan to identify key customer service components and then to design and maintain a suitable customer service package.

The main steps are:

1. *Identify the main elements of service and identify suitable market segments.* The first step is to identify those elements of service that are most highly rated by customers. Only then can the company's resources be concentrated on these key factors. The main means of determining these key elements are by market research techniques. A typical approach might be:
   - the identification of the main decision maker or buyer of the product;
   - the use of personal interviews to determine the importance of customer service and the different elements within customer service;
   - the use of group interviews to determine the same.

   The importance of this stage is to identify relevant measures of service that are generated by customers themselves and not imposed arbitrarily by 'best guesses' from outside. A major output from this stage of the study is to enable an appropriate survey questionnaire to be designed.

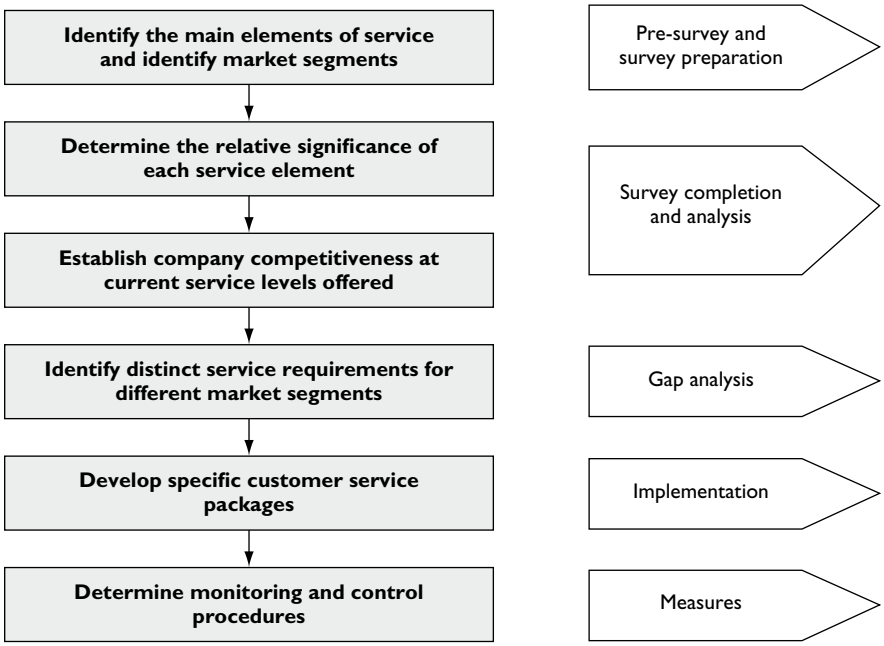


Figure 3.6 An overall approach for establishing a customer service strategy

In addition, it is important at this stage to identify the different market segments or customer types that exist. It is highly unlikely that a universal level of customer service will be appropriate for all customers. Most customer populations consist of a range of customers of different size and importance. Part of this preliminary stage is, therefore, to try to identify broad customer categories and to ensure that any questionnaire is designed to enable the different requirements of these different categories to be identified.

It should be noted that there is a variety of types of customer service study that can be used. These are summarized in Figure 3.7. For some companies it is relevant to use several of these for different purposes.

Approach	Comment
Complaint analysis	Qualitative. Statistically limited. Limited to those who do complain.
Critical incident studies	Qualitative. Relevant to individual customers only. Limited scope.
Customer panels	Limited coverage. Qualitative information. Would not show priorities.
Key client survey	Useful Pareto approach. Not valid across whole client base. Qualitative and quantitative.
Customer survey/questionnaire	Good overall coverage (statistical sampling). Qualitative and quantitative.

Figure 3.7 Different types of customer service study

Type	Advantages	Disadvantages
Telephone	Can probe interviewee. Control over response rates. Can control questions answered. Can ensure appropriate respondent. Can be quick.	Expense. Possible interviewer bias. Time-restrictive. Not anonymous.
E-mail	Inexpensive. Fast response.	Limited interaction. Limited response. Not anonymous.
Fax	Inexpensive. Quite fast response. Flexible time for respondent to complete.	Can't probe/clarify answers. Low response rates. Non-response to some questions.
Web	Inexpensive. Quick response. Flexible time for respondent to complete.	No control over respondents. Limited to internet/computer users.
Mail	Inexpensive. Flexible time for respondent to complete. Anonymous. No interviewer bias.	Time-consuming. Limited response. Non-response to some questions. Can't probe/clarify answers.
Face to face	Can probe. Can ensure appropriate respondent. Can control questions. Allows greater complexity. All questions answered.	Expensive. Limited sample. Very time-consuming. Possible interviewer bias. Not anonymous.

Figure 3.8 The advantages and disadvantages of different survey approaches

The most common approach for the major element of a study is likely to be a detailed questionnaire-based customer survey. This can be undertaken in a number of different ways including telephone, mail/post, face to face or web-based. The key advantages and disadvantages of these different approaches are described in Figure 3.8.

Survey or questionnaire design is a vital part of the overall process, and when putting together a questionnaire it is sensible to refer to one of the many books available that address the topic specifically. The major steps can be summarized as follows:

- Clarify the purpose and objectives.
- Identify any specific information required.
- Select the most appropriate survey type.
- Determine the resources required to undertake the survey.
- Determine who should undertake the survey.
- Determine who should complete the survey.
- Identify key customer/market segments.
- Identify key service elements to include.
- Prepare the question and answer format.
- Design the analysis and reporting format.
- Determine the sample size and selection.
- Pilot the survey.
- Adjust and finalize.

2. *Determine the relative significance of each service element.* Recognized research techniques can be used within the questionnaire to enable the measurement of the relative