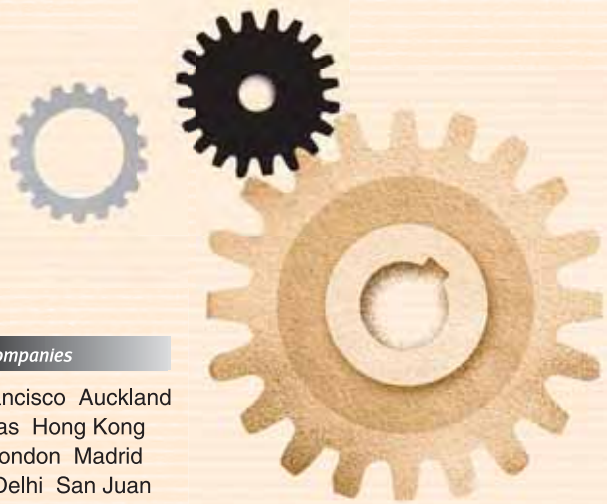
ROGER OAKDEN
KATIA LEONAITE

A FRAMEWORK FOR SUPPLY CHAINS

LOGISTICS OPERATIONS IN THE ASIA–PACIFIC REGION



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PART 3 INTEGRATING DEMAND AND SUPPLY

Preface

This book is designed to address the need for a text that considers the specifics of supply chains and logistics in the Asia–Pacific region, covering issues that are not included in books written for North American or European regions.

Our approach has been to provide a framework in which to understand the scope of supply chains and logistics, and a foundation that informs the reader of the principles behind a topic. It is designed so that the reader can understand where individual elements fit into the larger picture and grasp the scope of supply chains and logistics as they apply to specific business models and economies.

The book's main theme, reinforced and revisited throughout, is that supply chains and logistics ensure the *availability* of products and services for the customers of an enterprise. A second theme is that organisations have multiple supply chains, both internal and external. In reality these are a complex network of independent, and possibly interdependent, product and service suppliers and customers. The result of this need for availability—and for working within the supply network processes—is a heightened requirement for planning and scheduling, while recognising the importance of managing risk.

The book's four parts consider different themes and the four chapters within each part are linked. Each chapter serves as an introduction to the topic and can be selected as required. The key terms in each chapter help readers build their own electronic information pack on the topic, based on the framework provided.

A Framework for Supply Chains is designed for readers from a variety of backgrounds: students new to the logistics discipline; those with experience working in just one aspect of supply chains who need to understand the broader concepts; and those who have worked and studied in other disciplines and have been promoted or transferred into a logistics role. It is also of value to those working in disciplines that interact with logistics and who need to understand why supply chains are important to the business.

We view supply chains and logistics as a critical part of a business but our experience has shown that many companies have yet to understand and embrace this criticality—it is far more than trucks and boxes! The exciting aspect of studying and working within supply chains is that the theory and real-world experience inform each other—this is not a discipline that stands still, in any sense.

We invite feedback on your experiences from reading and using this book; please send your views and suggestions to us at authors@learnaboutlogistics.com. We continue the learning experience at www.learnaboutlogistics.com.

Roger Oakden
Katia Leonaite

Acknowledgments

Our thanks go to Kerrie-Anne McPhee for encouraging us to write a book that addresses the issues and challenges specific to the region. We would also like to thank Jenny Dick for her help in determining the best approach to meet the learning needs of our diverse reader groups.

We thank our many colleagues in various supply chains for their tireless contribution by way of reviews and feedback, and for being excellent sounding boards for ideas and case study material; also our students, past and present, on whom much of the material has been tested over time.

Special thanks go to the chapter reviewers who provided the knowledgeable feedback required for us to improve each chapter— although, of course, responsibility for the contents of the finished chapter remains with us. Our esteemed reviewers are: Melissa Bayley, Guy Callender, David Grieve, Kerry Hammond, Shaun Hodgson, Peta Irving, Tiong Lee, Pieter Nagel, Stephen Paull, Tom Rafferty, Chris Rowlands and Sue Schmid.

To those who took the time from their busy schedules to write the case studies and exercises that provide such a wide range of scenarios concerning supply chains and logistics as practised in the Asia–Pacific region, we are enormously grateful. They are: Jwalant Batavia, Antoinette Brandi, Tony Clarke, Laurie Le Fevre, Gen Ford (www.ithacabusiness.biz), Kerry Hammond, Mark Kluver, Carter McNabb (www.gra.net.au), Stephen Pereira (www.gs1.org.au), Derrick and Grace Phua, Chris Rowlands, Ranjeet Singh (www.transecopl.com) and George Zhou.

Thank you all.

Roger Oakden
Katia Leonaite

Author profiles

Roger Oakden

Roger is the Principal of REN Services, a consulting firm that works with clients to improve their supply chains, business systems and processes. Formerly at RMIT University in Melbourne, Roger was the Program Manager responsible for development of the largest postgraduate supply chain logistics program in the Asia-Pacific region, with centres in Australia, Singapore and Hong Kong. While at RMIT, Roger was appointed Ford Motor Company Procurement Fellow in Australia.

Roger's extensive industry background includes significant high-level roles. As Associate Director at a global consulting firm, he led teams in assisting clients to improve their manufacturing operations, systems, logistics and strategic procurement. Earlier, at a multinational computer company, he provided pre-sales analysis of manufacturing industry customer requirements throughout the region and project management for the implementation of ERP/MRP and other applications.

His industrial management experience covers industrial engineering, management accounting, procurement and operations in the shipping, chemical, metals and food industries.

Roger holds a Masters degree in Logistics Management, a first class honours degree in Finance and Accounting, is certified in Production and Inventory Management (CPIM) and is a Certified Purchasing Manager (CPM). He is also certified in Assessment and Workplace Training.

He is a past president of the Australian Production and Inventory Control Society (APICS), has written articles for the business press and presented papers at logistics industry conferences in Australia, Asia and Europe.

Katia Leonaite

Katia is a supply chain professional with industry experience ranging from agricultural to retail and is passionate about managing change in the complex supply chains context.

She began her career in a 'point-to-point' transport courier environment. Upon completing her MBA at the Macquarie Graduate School of Management, she managed a key logistics services portfolio in a government enterprise as it went through the privatisation process. Since then she has been successfully engaged in various supply chains and logistics management roles, ranging from large events to contract management with some of Australia's leading organisations.

Katia is currently the Course Convenor for the Graduate Certificate in Supply Chains at Swinburne University in Melbourne. Through her firm L5 Consulting, she has provided development of learning materials and lecturing services in the area of supply chain and logistics for Monash University, University of Ballarat, Central Queensland University and Victoria University.

Katia holds an MBA (Operations and Logistics) from Macquarie University and a BA/BEd (Maths/Computer Science) from the University of NSW.

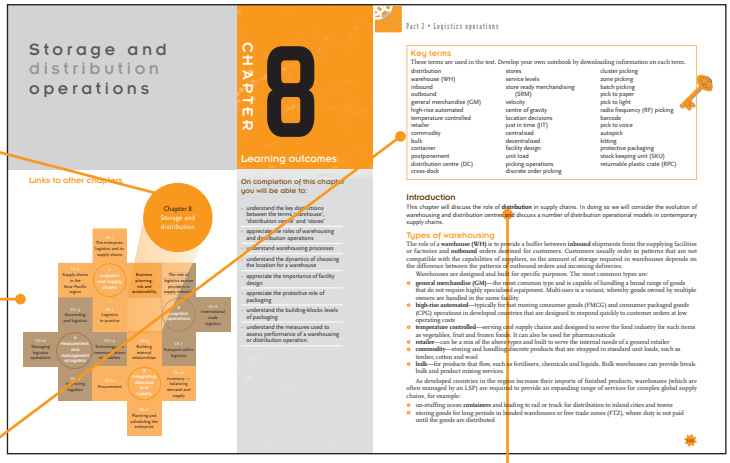
How to use this book

Links to other chapters

Each chapter opens with a visual representation of how it relates to the other chapters. This encourages students to develop a 'mind-map' of where each chapter fits in.

Learning outcomes

A set of learning objectives at the beginning of each chapter outlines the core skills and knowledge students are expected to derive from the chapter. They are also designed to assist with student revision.



Key terms

A list of key terms used and highlighted in the text is located at the beginning of each chapter. Students are encouraged to develop their own notebook by downloading information from the internet about each term.

Introduction

The introduction, combined with the learning outcomes, helps to set a clear path for learning and a foundation for the key principles of the chapter.

Chapter questions and exercises

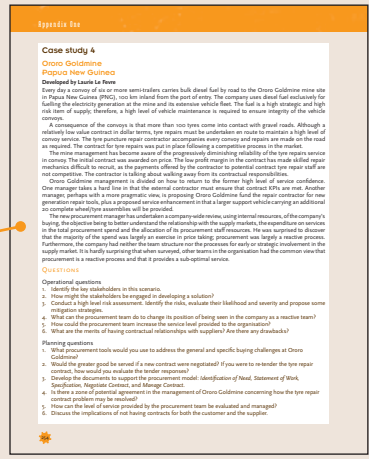
A series of practice questions can be found at the end of each chapter. Divided into three progressive categories—Operational, Planning and Management—to suit diploma-level, undergraduate and postgraduate students respectively. Exercises are also provided where relevant.

References and links

There is list of references and links at the end of each chapter where students can seek further information.

Case studies appendix

Ten case studies in transport and logistics derived from Australia and the wider Asia–Pacific region are provided. The case study questions have the same format as the end-of-chapter questions, listed in the three categories of Operational, Planning and Management.



e-student and e-instructor

E-STUDENT

Online LearningCentre

The online Learning Centre (OLC) that accompanies this text helps you get the most from your course. It provides a powerful learning experience beyond the printed page.

www.mhhe.com/au/oakden

PowerPoint® presentations

A series of PowerPoint® presentations summarises the key points of each chapter. They can be downloaded as valuable revision aids.

E-INSTRUCTOR

In addition to the student resources, instructors also have password-protected access to:

Instructor resource manual

The instructor resource manual provides chapter summaries, solutions to end-of-chapter questions and additional quality teaching resources. It saves time for instructors and helps provide consistency across teaching teams.

Artwork library

Illustrations and tables from the text are available in an online artwork library as digital image files. Instructors thus have the flexibility to use them in the format that best suits their needs.

EZ Test Online

EZ Test Online is a powerful and easy-to-use test generator for creating paper or digital tests. It allows easy 'one click' export to course management systems such as WebCT and Blackboard, and straightforward integration with Moodle.

EZ Test Online gives instructors access to the testbanks of this text and a range of others from one point of entry, and also permits instructors to upload or edit their own questions. More information is available via the Online Learning Centre.

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Testbank

A bank of test questions written specifically for this text lets instructors build examinations and assessments quickly and easily. The testbank is available in a range of flexible formats: in Microsoft Word®, in EZ Test Online or formatted for delivery via Blackboard or WebCT.

Useful websites for logisticians

Websites can provide additional information about supply chains and logistics. Additional links are also provided at the end of chapters under 'References and Links'. There are more sites available but to have confidence in the information consider the following:

- Go to trusted sources such as government, university, library, quality newspaper and magazine sites. Follow their links.
- Cross-check the information against other sources.
- Check the source of a web page if you have concerns about its authenticity and independence.
- Check if the information is current.

Wikipedia at www.wikipedia.com is a good resource for commencing the research using the key terms provided for each chapter

Associations

www.laa.asn.au—Logistics Association of Australia
www.sclaa.com.au—Supply Chain and Logistics Association of Australia
www.apics.org/default.htm—APICS
http://cscmp.org—Council of SCM Professionals
www.supply-chain.org—Supply Chain Council (SCOR)
www.cipsa.com.au—Chartered Institute for Purchasing and Supply in Australasia (CIPSA)
www.supplychains.com—Global Supply Chain Council of China; publishes *ChaINA* online magazine
www.chinawuliu.com.cn—China Federation of Logistics and Purchasing
www.ism.ws – Institute for Supply Management in America

Information

www.wikipedia.com—Wikipedia information resource
www.gartner.com/resources/201200/201212/the_amr_supply_chain_top_25__201212.pdf—Gartner report on the top Logistics services companies
www.logisticsmagazine.com.au—online *Logistics Magazine* in Australia
http://resources.bnet.com/topic/supply+chain.html—online business resources
http://logistics.about.com—reference concerning logistics and supply chains
www.sloanreview.mit.com —MIT Sloan Management Review
www.bcg.com—Boston Consulting Group publications
www.mckinseyquarterly.com—online journal of McKinsey & Co.
www.transportintelligence.com—weekly newsletter
www.nztransport-logistics.co.nz—newsletter
www.unescap.org—United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). Based in Bangkok.
www.aberdeen.com—Aberdeen Group research industry reports
www.lean.org—Lean Enterprise Institute
www.eft.com—Eye for Transport information source
http://knowledge@whartonschool.com—Wharton Business School

USA-based newsletters

www.supplychainbrain.com—*Supply Chain Brain Today*, online newsletter
www.sdce.com—*Supply & Demand Chain Executive*
www.scdigest.com—*Supply Chain Digest*
www.scmr.com—*Supply Chain Management Review*
http://scm.ncsu.edu—*Supply Chain Resource Digest*. Based at NC State University

Award courses and book chapters

Undergraduate and postgraduate-level courses presented by the business or engineering faculties of universities may provide an overview of supply chains and logistics as a core or elective subject. This book provides a framework within which the subject content can be learned.

At the vocational level, information regarding industry trends, workforce development and changes to qualifications and units of competency can be accessed via the Industry Skills Council website at www.isc.org.au. For qualifications and units relevant to business, access the Innovation and Business Industry Skills Council (IBSA) at www.ibsa.org.au.

Qualifications and the units available which address operational logistics for the commercial and military sectors are prescribed by the Transport & Logistics Industry Skills Council (TLISC) in Australia at www.tlisc.com.au.

For industry and logistics service providers (LSP):

- Diploma of Logistics

For the military and service companies engaged in the re-supply of continuing operations:

- Diploma of Deployment Logistics
- Advanced Diploma of Deployment Logistics

For whole-of-life support for military capability platforms, including ships, aircraft and tanks, from acquisition to decommissioning:

- Diploma of Matériel Logistics
- Advanced Diploma of Matériel Logistics

This book provides a framework for the Diploma of Logistics and the Diploma of Deployment Logistics, within which the study of individual units is undertaken with the assistance of unit learner guides. The units that link to the chapters in this book are listed in the table below.

Chapter number	Chapter title	Unit number	Unit title
Part 1 Logistics and supply chains			
Chapter 1	*The enterprise, its logistics and supply chains*	TLIL5507A TLIL5055A BSBPUR504A BSBPUR504B	Manage a supply chain
		BSBMKG405A BSBMKG514A	Implement and monitor marketing activities
		TLIXXX01	Monitor supply chain operations
		TLIX4028A	Apply knowledge of logistics
Chapter 2	*Business planning, risk and sustainability*	BSBMGT601A	Contribute to strategic direction
		BSBMGT616A	Develop and implement strategic plans
		TLIP607P TLIP5006A	Establish international distribution networks
		BSBMGT609A PSPMNGT608B BSBRSK501A	Manage risk
		BSBSUS501A TLIU4010A	Develop workplace policies and procedures for sustainability
		TLIU607B TLIU5006A	Conduct environmental audits
Chapter 3	*Logistics in practice*	BSBMGT601A	Contribute to strategic direction
		BSBMGT602A	Contribute to the development and implementation of strategic plans
		MCMT481A	Undertake proactive maintenance analyses
		TLIB1007C TLIB5010A	Plan and implement maintenance schedules

Chapter number	Chapter title	Unit number	Unit title
		TLILOGXXX15	Plan maintenance for deployed operations
		TLILOGXXX01	Plan logistic support for deployed operations
		TLILOGXXX10	Plan deployed logistics support for significant operations
		TLIX4028A	Apply knowledge of logistics
Chapter 4	*Supply chains in the Asia–Pacific region*	BSBMGT601A	Contribute to strategic direction
		BSBMGT602A	Contribute to the development and implementation of strategic plans
		BSBMGT609A PSPMNGT608B BSBRSK501A	Manage risk
Part 2 Logistics operations			
Chapter 5	*The role of logistics service providers (LSP) in supply networks*	TLIL2007C TLIL5020A	Develop and maintain operational procedures for a transport and logistics enterprise
		TLIP407C	Develop a transport and distribution business plan
		TLIP5004A	Develop a transport and logistics business plan
		TLIP1107C	Develop and evaluate strategies for a transport and distribution enterprise
		TLIP5011A	Develop and evaluate strategies for a transport and logistics enterprise
		TLIL5707A TLIL5057A	Maintain, monitor and improve transport operations systems
		TLIP807C	Manage a transport and distribution business unit
		TLIL5057A	Manage a transport and logistics business unit
		TLIXXX04	Work effectively in the transport and logistics industry
Chapter 6	*International trade logistics*	TLIA3507B TLIA5035A	Manage international freight transfer
		TLIL2607B TLIL5026A	Manage export logistics
		TLIO1807A TLIO5018A	Manage compliance with customs and excise
Chapter 7	*Transport within logistics*	TLIL1907C TLIL5019A	Implement and monitor transport logistics
		TLIL2007C TLIL5020A	Develop and maintain operational procedures for a transport and logistics enterprise
		TLIO607D TLIO5006A	Plan and manage security procedures for transferring and transporting dangerous goods
		TLIXXX02	Monitor transport operations
		TLILOGXXX06	Organise road transport operations
Chapter 8	*Storage and distribution operations*	TLIA5807A TLIA5058A	Manage facility and inventory requirements
		TLIA2907D TLIA5029A	Plan and manage storage of dangerous goods and hazardous substances
		TLIO507C TLIO5005A	Plan and manage security procedures for the enterprise
		TLIO1707A TLIO5017A	Manage security of storage facilities
		TLILOGXXX14	Plan distribution operations on deployment
Part 3 Integrating demand and supply			
Chapter 9	*Building external relationships*	TLII1807B TLII5018A	Manage customer service

Chapter number	Chapter title	Unit number	Unit title
		TLIR1407A TLIR5014A	Manage suppliers
		BSBPUR502A	Manage supplier relationships
Chapter 10	*Inventory–balancing demand and supply*	MEM11015B	Manage warehouse inventory system
Chapter 11	*Planning and scheduling the enterprise*	BSBFLM505B	Manage operational plan
Chapter 12	*Procurement*	TLIR607A TLIR5006A BSBPUR501A	Develop, implement and review purchasing strategies
		TLIR307C TLIR4003A	Negotiate a contract
		TLIR507A TLIR5005A	Manage a contract
		TLIR707A TLIR5007A	Manage international purchasing
		TLIX5040A	Manage contracted support services
Part 4	**Measurement and management of logistics**		
Chapter 13	*Accounting and logistics*	TLIQ207C TLIP5025A	Set and achieve a budget
		BSBSBM406A	Manage finances
		BSBMGT503A	Prepare budgets and financial plans
		TLIQ1407A TLIP5035A	Manage budgets and financial plans
		TLIQ1507A TLIP5036A	Manage assets
Chapter 14	*Technology and communications as enablers*	BSBEBUS605A	Identify and implement eBusiness innovation
		BSBEBUS601A	Develop an eBusiness strategy
		TLIK607C TLIK5006A	Evaluate software requirements and hardware enhancements
		TLIX5036A	Manage and monitor technical data and information systems
Chapter 15	*Improving logistics*	BSBCMN419A BSBPMG510A	Manage projects
		BSBFLM509B BSBMGT516A	Facilitate continuous improvement
		TLIJ707C TLIJ5007A	Conduct internal quality audits
Chapter 16	*Managing logistics operations*	BSBMGT505A BSBOHS509A	Ensure a safe workplace
		BSBMGT502A	Manage people performance
		BSBFLM514A	Manage people
		PSPGOV518A	Benchmark performance
		BSBMGT506A	Recruit, select and induct staff
		BSBHRM402A	Recruit and select personnel
		BSBMGT605A BSBMGT605B	Provide leadership across the organisation
		TLIF2007B TLIF5020A	Manage emergencies
		TLIF6407A TLIF4064A	Manage fatigue management policy and procedures

PART 1

Logistics and supply chains

CHAPTER 1

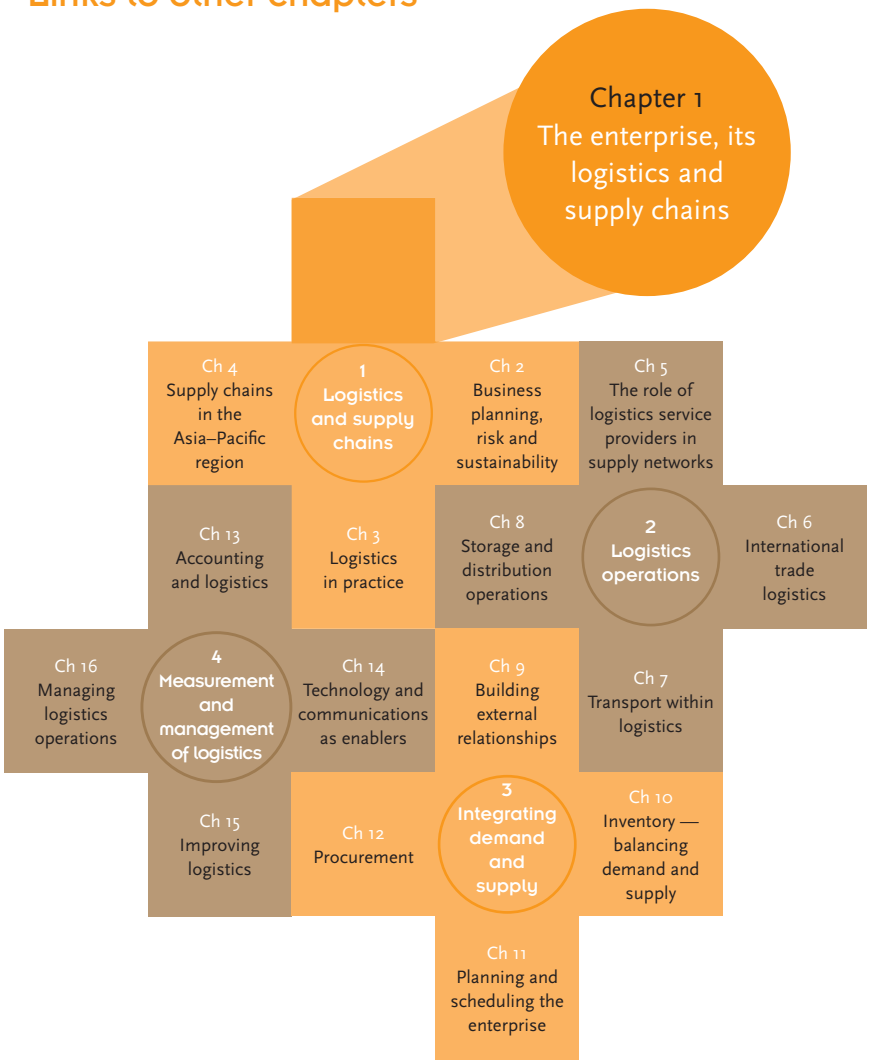
The enterprise, its logistics and supply chains

Learning outcomes

On completion of this chapter you will be able to:

- understand the role of an organisation in adding value for its customers
- appreciate the distinction between a supply chain and a value chain
- distinguish between logistics and supply chains
- understand the structure and connections of supply networks
- discuss the importance of logistics and supply chains to the success of the enterprise
- recognise the importance of logistical trade-offs in the design of supply chains.

Links to other chapters



Key terms

These terms are used in the text. Develop your own notebook by downloading information on each term.

cash flow
business flows
added value
value chain
inbound
outbound
supply chain
logistics
core supply chain
extended supply chain
sales and operations planning, (S&OP)
demand
supply
fast-moving consumer goods (FMCG)
consumer packaged goods (CPG)
full container load (FCL)
supply network
logistics service provider (LSP)
third-party logistics (3PL)
original design manufacturer (ODM)
original equipment manufacturer (OEM)
power
dependency
availability
tier 1 suppliers
cash-to-cash
logistical trade-off

Introduction

This chapter provides an overall framework within which to position an organisation's logistics operations and supply chains. It identifies a flow of materials and services from suppliers, through the enterprise to its customers. The network surrounding the enterprise becomes more complex as the business becomes larger and ventures into multiple markets. You will identify the main features of supply chains and logistics and how they must be tailored to suit the business model of the enterprise.

The enterprise and adding value

A business is an economic system in which goods and services are exchanged on the basis of their perceived worth and typically for money. The *Business Dictionary* states, 'every business requires some form of investment and a sufficient number of customers to whom its output can be sold at a profit on a consistent basis' (www.businessdictionary.com).

The income generated provides a **cash flow** for the business, enabling it to purchase goods or services from other businesses, which are called suppliers. There is now a flow of materials and services from suppliers to their customers and a flow of money in the reverse direction. To ensure the required materials and services are supplied and the agreed money is paid, there is a flow of data and information between the parties to the agreement. These **business flows** are shown in Figure 1.1.

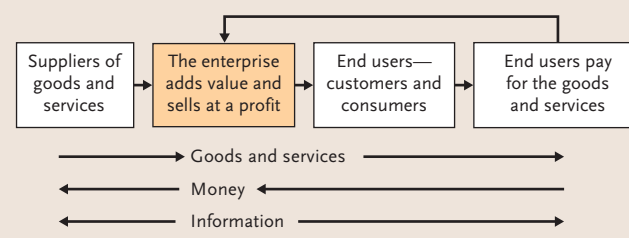
Adding value

In providing a product or service that customers want to buy, a business adds value to the supplies that it has purchased.

A coffee shop is an example of a small business that adds value. It has a range of product suppliers, including distributors of beverages and cakes as well as suppliers of services, such as the landlord from whom the premises are rented, utility companies and a bank, which provides financial services such as EFTPOS, a credit card facility and a business loan. In addition, there are one-off suppliers of goods such as furniture and shop-fitting services.

The coffee shop provides food and drinks and a pleasant ambiance.

Figure 1.1 Business flows



Customers may pay $3 for a coffee and $10 with cakes. In paying these prices, customers will mentally evaluate the **added value** being provided over the input costs of the coffee and cakes in a form that is of use, and at a time and place that is convenient.

These same customers could probably make the coffee in their office for free and bring cakes from home for substantially less cost. However, the ability to get away from their workstation for a few minutes is a factor in the customers' positive cost–benefit analysis that justifies paying the price demanded.

For an example of added value in a larger organisation, consider the cost of the Google Nexus One mobile phone. This was discussed in an article published by *ChaINA* magazine (2010) and is summarised in Table 1.1.

In this example, the total cost of the materials and freight is US$189. HTC has used the intelligence of its staff to design and produce the mobile phone and Google is willing to pay US$281 for the finished item.

To provide this new product, HTC has therefore added value of US$92 to the purchase cost of material items. The US$92 is then available for HTC to pay its staff, keep the business established, pay the banks, pay the government and provide a dividend to its shareholders.

Where is the added value in services? An example is a car insurance company; it provides a risk management service, such that if the insured driver damages a car valued at $40 000, it is repaired at full cost, even though the driver has paid only, say, a $1000 premium. The administration cost may be a 10th of the premium and the difference can be considered the added value provided by the insurance company.

Table 1.1 Mobile phone added value

Component	Comment	Cost US$
Processor		30.50
Memory		20.40
Electrical		16.30
Camera		12.50
Mechanical		2.80
Total material cost		174.15
Manufacturing cost	Estimated cost: HTC (Taiwan) is the original design manufacturer (ODM)	27
Airfreight to USA	Estimated cost: sent to Brightpoint Inc, the logistics service provider (LSP) in North America for HTC	5
Fulfilment	Estimated cost: including final configuration and packaging (5–8 minutes per unit) and inventory holding cost	10
Total delivered cost	Estimated	216
Sale price by HTC to Google	Estimated 30% gross margin	281
Added value by HTC		92
Sale price by Google to consumers	Estimated 87% gross margin	530

Source: Based on *ChaINA* magazine, March–April 2010, www.supplychains.com.

Value chain

The concept of added value was initially promoted by Porter (1985) in which he defined value as the amount that a buyer is willing to pay for an item. He considered the **value chain** as a combination of nine activities that work together within any business to provide value for customers.

The nine activities are divided into a primary and support focus. The primary activities are:

- **inbound** and **outbound** logistics
- production
- sales and marketing.

The support activities are:

- administrative infrastructure
- human resource management
- information technology
- procurement.

The value-adding process and the concept of economic exchange between organisations are at the core of business relationships.

Supply chains and networks

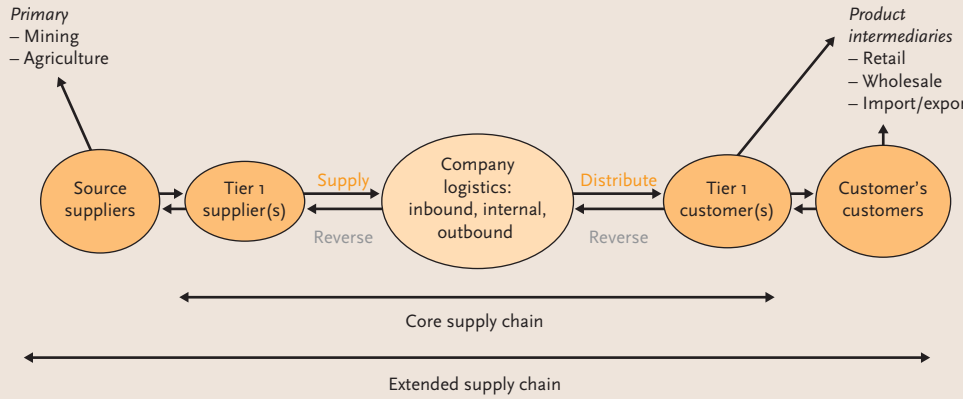
The terms **supply chain** and **logistics** have gained popularity over time and are often used interchangeably. Although linked, the terms do have different meanings; these concepts will be examined in relation to their part in adding value within and between organisations.

Supply chain

The term 'supply chain' entered the business language in the 1990s, although it was first used in an article about ten years earlier. The concept was developed to reflect the complex arrangements that take place in getting goods from their initial raw materials to the ultimate finished product and so provide benefits for the end user.

Commencing with the final end user for an item and stepping back through each link, there are purchases by each party in the chain back to the raw materials purchased from mines and farms. This provides the supply chain for an item, as represented in Figure 1.2.

Figure 1.2 A supply chain



The transactions within a business and between a business and its immediate (tier 1) suppliers and customers are referred to as the **core supply chain**. The **extended supply chain** includes all the suppliers' suppliers back to the farm and mine and all of the customers' customers (product intermediaries) that handle an item through to the end user or consumer.

An example of a supply chain is that of aluminium cans, shown in Figure 1.3 overleaf.

The elapsed time from the bauxite mine to the retail shelf in Europe is about 300 days. However, the time when value is being added to the material is about three hours: that is, to convert the bauxite through all stages to finally become a can containing a beverage.

What is occurring for the balance of the time? The material is either in transit through transport links (arrows in the diagram) or is resting as inventory in the multiple inbound and outbound storage areas. Because bauxite is mined in remote locations, it can be argued that transport from the mine to the alumina refinery is adding value—what do you think?

Other examples of time taken through supply chains are:

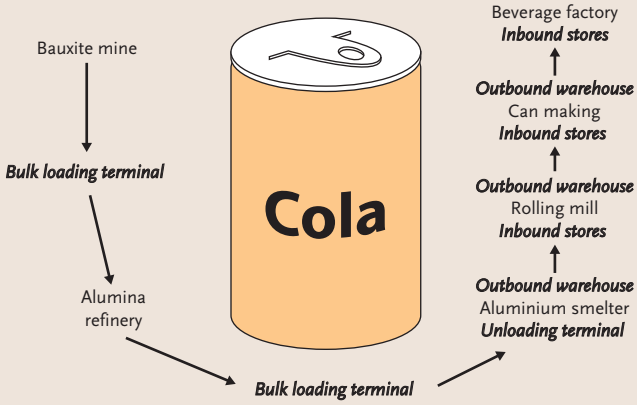
- cars—from iron ore to vehicle for sale at a dealer: 12 months
- medical grade plastic tubing used in hospitals—from completion of manufacturing in America to customer hospitals throughout Asia: 11 months
- clothing—from the wool fleece shorn from a sheep to clothing at a retailer: 18 months.

These are the costs in supply chains—planning the added-value stages, planning to move the item, transport time and holding inventory. The total cost is not only the money paid directly to the business and to other parties in the supply chains, but the cost of time, especially at bottlenecks: 'What you do takes time and costs money—the longer it takes, the more it costs' (Goldratt & Cox 1984).

Supply chain and value chain

The difference between a supply chain and value chain is defined by Feller, Shunk & Callarman (2006), who see a supply chain as being focused on 'integrating supplier and producer processes, improving efficiency and reducing waste, while value chains' focus is downstream, on creating value in the eyes of the customer'. This is illustrated in Figure 1.4 overleaf.

Figure 1.3 Supply chain for an aluminium can



Although the illustration in Figure 1.4 (below) indicates two parallel lines for the value chain and supply chain, they can meet through an integrative planning process, called **sales and operations planning (S&OP)**, as shown in Figure 1.5 opposite.

The S&OP process is vital to the improved performance of a business and is discussed in Chapter 11.

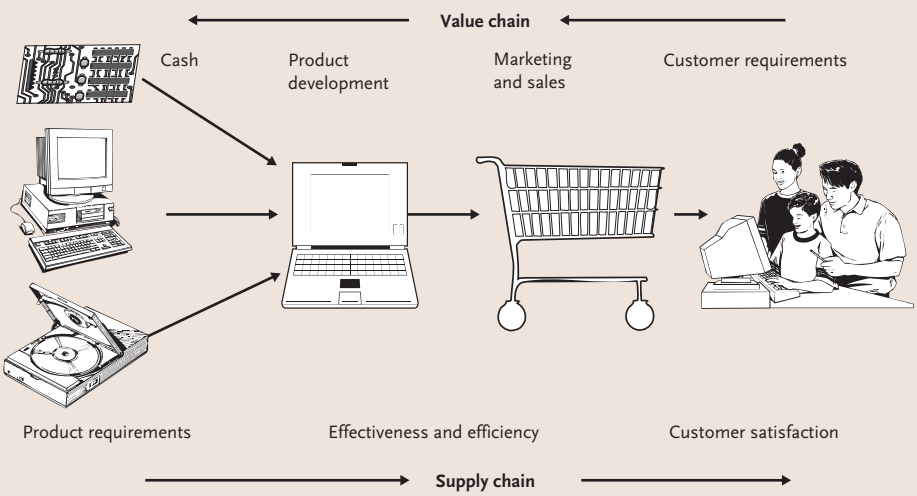
Multiple supply chains

A business has two external components—the **demand** side and **supply** side. For each product type on the demand side and each material type on the supply side, there could be a different supply chain; a business will actually deal with multiple supply chains.

The demand side of the enterprise is driven by the customer and their requirements. For industrial products, the end user is more likely to be the business that buys the item, but for consumer products, the end user can be a commercial customer or a consumer. As an example, for **fast moving consumer goods (FMCG)** such as mobile phones, and **consumer packaged goods (CPG)** such as breakfast cereals, the customer is a retail chain, which buys the product in large quantities from the brand company, whereas the consumer is the person who purchases a single unit of the item, such as a box of cereal to consume at breakfast time.

Wholesalers are customers that act as intermediaries between manufacturers or importers and smaller retailers. Manufacturers or importers may only supply large deliveries, for example a full truckload or **full container load (FCL)**, while smaller retailers require a specific mix from the total product range being offered. The role of the wholesaler is to promote the products within categories that suit different customers and then break the bulk delivery received into the smaller deliveries required.

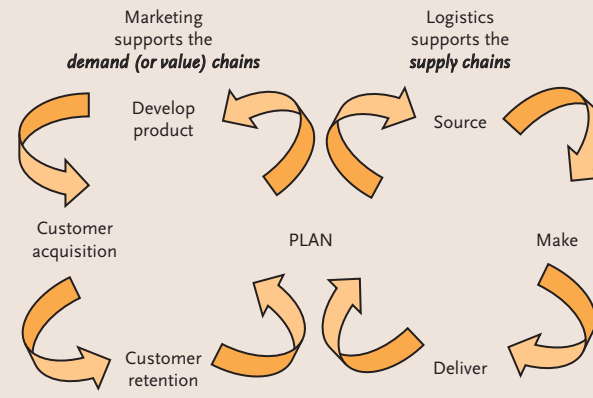
Figure 1.4 Value chain and supply chain



Consider pharmaceuticals in Australia. These are predominantly sold through the approximately 4000 pharmacies (or chemists). There are about 150 manufacturers and importers of pharmaceutical products, so for each chemist to buy from each manufacturer once per month would be a substantial task. Instead, there are three 'full-line' wholesalers (with about 90 per cent of the market) who supply the pharmacies on an 'as required' basis, which can be within a few hours for certain types of drugs.

Another type of customer is the distributor, which brand companies use to distribute their products through specific market channels; for example, the food services channel supplies breakfast cereals in different packaging to hotels, hospitals and catering companies.

Figure 1.5 The integrative planning process



On the supply side are the products, materials, components and services procured from the immediate, or tier 1, suppliers. These suppliers in turn source their own products and services from their suppliers (referred to as tier 2 suppliers) and so on. Sometimes a tier 2 or tier 3 source supplier can have a direct relationship with the principal brand name business to supply a specific item.

Similar to the supply side, the brand company's direct customers are referred to as 'tier 1' and their customers are referred to as 'tier 2'. Again, it is possible for the brand company to have a direct relationship with some non-tier 1 customers.

Supply network

As discussed, a business will have multiple supply chains for its outbound finished goods, inbound materials, components and purchased products. Figure 1.6 (overleaf) represents these as a network of relationships for a business.

In this diagram, the enterprise will have its tier 1 material suppliers and customers (which have their own **supply networks**), and **logistics service providers (LSP)**, which undertake contracted roles in:

- goods movement: often referred to as **third party logistics (3PL)**, while governments may refer to 3PL services as the transport and logistics (T&L) industry
- material services such as buying services
- professional firms such as IT services.

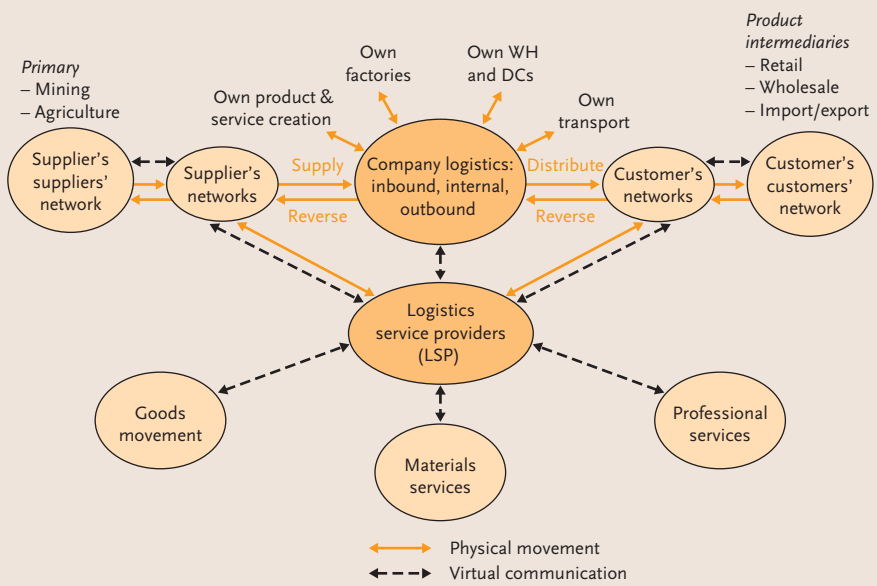
'Logistics service provider' is a collective term that identifies the wide range of logistics services available. This is discussed in Chapter 5.

The supply network can also include contract manufacturers and **original design manufacturers (ODM)** that produce products on behalf of the brand owner, which are known in this instance as **original equipment manufacturers (OEM)**. The OEM will coordinate with the contract manufacturers and component suppliers for delivery of materials and components to the contract manufacturers. They in turn provide finished products to distribution contractors, for delivery to customers on behalf of the brand owner.

The supply network for the business has both physical and communications links. The transmission of standardised data through supply chains is being assisted by the development of communication standards and implementation of technologies, such as mobile and radio frequency. The communications capability will be a vital element of supply networks into the future, and is discussed in Chapter 14.

One of the first references to the term 'supply network' was by Rosenbaum and Kuglin (2000), but a definition of the term is provided by Slack et al. (2007):

Figure 1.6 A supply network



A supply network perspective means setting an operation in the context of all the other operations with which it interacts, some of which are its suppliers and its customers. Materials, parts, other information, ideas and sometimes people all flow through the network of customer–supplier relationships formed by all these operations.

A supply network consists of four components:

- physical locations: the 'nodes' of the network. Locations can be factories, warehouses, distribution centres, ports and intermodal terminals.
- transport: movement between the nodes of the network. Transport can be by trucks, trains, aircraft and marine vessels (deep sea and river).
- systems: software applications and tools that support operations within the network. Examples are order management systems, warehouse management systems, transport management systems, logistics modelling and simulation, and inventory optimisation tools.
- relationships: the business and personal relationships developed within and between organisations, recognising the similarities and differences between peoples and their cultures. This is illustrated in Figure 1.7 opposite.

As an example, Confucianism has *Xiao* as a moral imperative (meaning filial piety—that is, benefiting a son or daughter and respect for parents). Therefore, in a business setting:

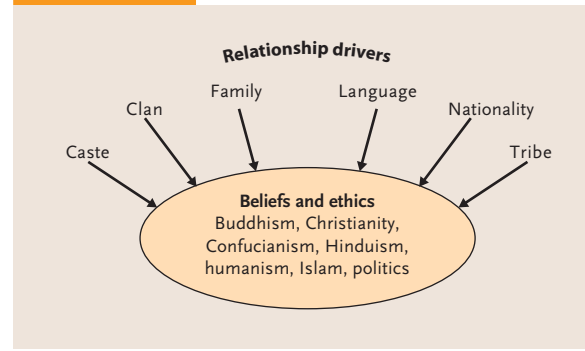
- family members are trusted, within reason
- friends, colleagues and associates are trusted to the extent that a mutual dependence has been established
- all others will have no assumptions made about their goodwill.

However, within a Christian and Western business relationship, more support is given to legal and contractual approaches, which establish the boundaries of the business relationship.

The basis of these business relationships is the use of **power** and **dependency**. As Cox (2000) argues, 'the freedom to develop advantageous terms is limited by the reality of exercising power and dependency in dealings between organisations'.

Logistics and availability

Figure 1.7 Relationships of people within a supply network



Unlike the term 'supply chain', the term 'logistics' is very old, but only entered regular vocabulary following the 1990 Gulf War, which various media portrayed as the 'logistics' war.

However, many years earlier, the French military campaigns led by Napoleon Bonaparte, especially into Russia, and those of the British in both the American War of Independence and the New Zealand Maori wars, could also be considered 'logistic'. These campaigns extended over long distances. In the case of the British, they obtained the majority of their supplies from England. The supply chains were therefore long and their management was too complex. The resultant failure to provide a continuous supply of military materiel contributed to the loss of each campaign.

The term 'logistic' is derived from the Greek words *logizesthai* (to compute) and *logistikos* (skilled in calculating). In Roman times there was a military administrative official called Logisa and by Napoleon's time, with the advent of organised military campaigns, the French word *loger* (to lodge) was in use. Logistics in the military sense therefore required the moving, lodging and supplying of troops and their equipment.

The development of logistics ideas remained in the military until the advent of the Dutch and English trading companies of the 17th and 18th centuries, which organised cargoes and voyages between Asia and Europe and were the forerunners of the multinational companies of today.

At a presentation concerning the positioning of logistics and supply chains, the consultant and educator Kerry Hammond (c. 2001) stated:

> Logistics provides the underpinning theories and techniques which drive supply chains, as mathematics and physics underpin engineering. Hence, in logistics the theories and techniques used within transport, warehousing, procurement and inventory planning underpin supply chains and are similar to learning about and using calculus and algebra as the pillars of engineering.

Further, the US Council of Supply Chain Management Professionals (CSCMP) gives the following definition:

> Logistics is that part of the supply chains 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 ... Logistics Management is an integrating function which co-ordinates and optimises all logistics activities, as well as integrates logistics activities with other functions ...

Logistics is therefore what an organisation does; a supply chain for an item is the environment within which the item and its constituent parts move. While these terms have become buzz words, used liberally and interchangeably, they are different.

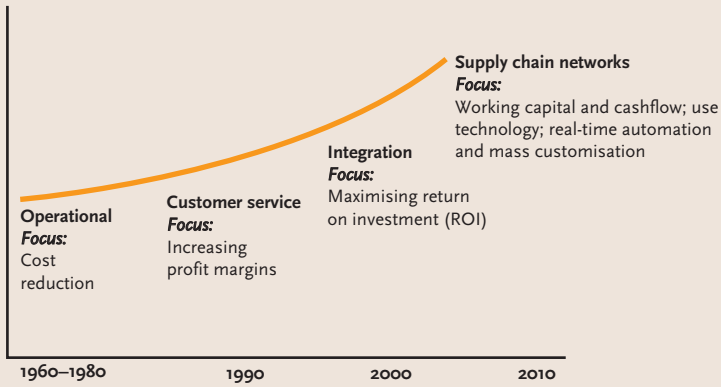
The equivalent Chinese term for logistics is *wu liu* (flow of goods); however, as with those who use the term 'logistics' in the English-speaking community, the term is not well understood by Chinese speakers.

Logistics in business is continuing to evolve, primarily due to:

- the availability and decreasing cost of IT and communications hardware and applications, which allow the development of technologies and applications that enable and hasten the integration of parties in supply chains
- the development of a body of knowledge since the 1960s concerning the discipline.

Figure 1.8 overleaf illustrates the stages to date.

Figure 1.8 Stages in logistics evolution



Availability

In practical terms, meeting customer requirements means the time-related positioning of resources to provide **availability** of goods and services for customers. This also refers to the availability of resources, including **tier 1 suppliers**—the immediate suppliers to an enterprise.

If availability is the objective of logistics, then the measurement of logistics performance at each stage of a supply chain is 'delivery, in full, on time, with accuracy' (DIFOTA). This measure is holistic—while it measures the physical capability of the business, the wider administrative and systems capability must also be considered. It is of little value to deliver in full and on time if the customer's order has the wrong address for delivery, or the invoice is incorrect. DIFOTA is discussed in chapter 15.

Product logistics

Logistics within a product business contains four subsets that together provide availability:

1. *Customer service logistics*
   a. Inventory: how many and what value of products to hold and where, what materials to acquire and when, what to make (or import) and when
   b. Material movement: importing, materials storage, finished goods warehousing and distribution operations (provided through the organisation's own resources or providers of distribution services)
   c. Transport: owned by the organisation or operated by a provider of transport services.
2. *Conversion logistics*—planning of manufacturing or the final assembly, pack and test of inputs. In conversion logistics the planning of inventory is the main component of availability.
3. *Reverse logistics*—the return of goods, which typically involves packaging (primary and secondary), parts (warranty items) or whole products (recalled items).
4. *Support logistics*—the post-sales support of products and services. Also the planning and scheduling for the life-cycle support of an organisation's internal infrastructure and capital equipment. The United States military adopted the term 'integrated logistics management' (ILM) in the 1960s, which addressed the need for managing the total cost of ownership throughout the life cycle of weapons systems. ILM uses the techniques and tools of integrated logistics support (ILS) and logistics systems analysis (LSA). The underlying reason for support logistics is that design decisions and actual operational expenditure can be at widely spaced intervals, requiring management of the process that reflects the approximate situation at each stage of the product life cycle:
   a. Concept and specify stage: only about 50 per cent of supportability decisions are made
   b. Design and development stage: only about 20 per cent of support decisions can be changed without considerable effort

c. Use stage: only about 5 per cent of support decisions can be changed without considerable effort
d. Planned maintenance stage: 70 per cent of total costs are incurred.

Each of these four subsets of logistics contains a planning (thinking and calculating) and physical (doing) function. They can be performed internally by the enterprise or contracted externally to specialist service providers, which is commonly called outsourcing.

Services logistics

Services logistics is the process of providing availability for non-material activities and associated materials required in the delivery of a service. Services logistics can be applied in a wide range of businesses, for example in fast-food outlets, hospitals and health delivery, finance and insurance and in the entertainment sector.

The factors addressed in planning for services that are different from those of a product company are capacity and costs. Service capacity is mainly about planning for the availability of people, which have the same role as inventory in a product environment. Features of planning for service delivery are:

- People must be available for peak period demands.
- Capacity planning is often by defined groups or teams that operate in fixed sizes.
- Groups are often dedicated to a location, so are difficult to re-allocate.

The cost structure in services generally has labour and other resources as fixed, at more than 75 per cent of operating costs:

- There is a low marginal cost to adding an additional customer.
- The loss of revenue from a disaffected customer has a greater effect than in a product environment.

The business model—providing the products and services

Business model

The discussion concerning supply chains and logistics has highlighted that there is not a single or best way to design supply chains and implement logistics; it depends on multiple elements, including the industry, product and locality.

The most suitable business model (that is, most profitable) for a commercial business is, in part, dependent on how it interacts with its core supply chains (see Figure 1.2) and supply network (see Figure 1.6). As the global influence of supply chains is so pervasive, companies need to undertake a regular review (say, annually) and if need be, adapt the business model to take advantage of changes in the supply chains.

The industry and product type

Logistics strategy and operations will differ by broad industry type. These are shown in Figure 1.9 overleaf.

Within each industry type, there are different influences and pressures at the inbound, internal or outbound parts of their core supply chains. Even in primary industries such as mining and agriculture there are input supply chains, such as equipment, fuel, seed and fertiliser. There is also the availability and capacity of transport modes to move the product in bulk, especially at harvest time or when there is high international demand for minerals.

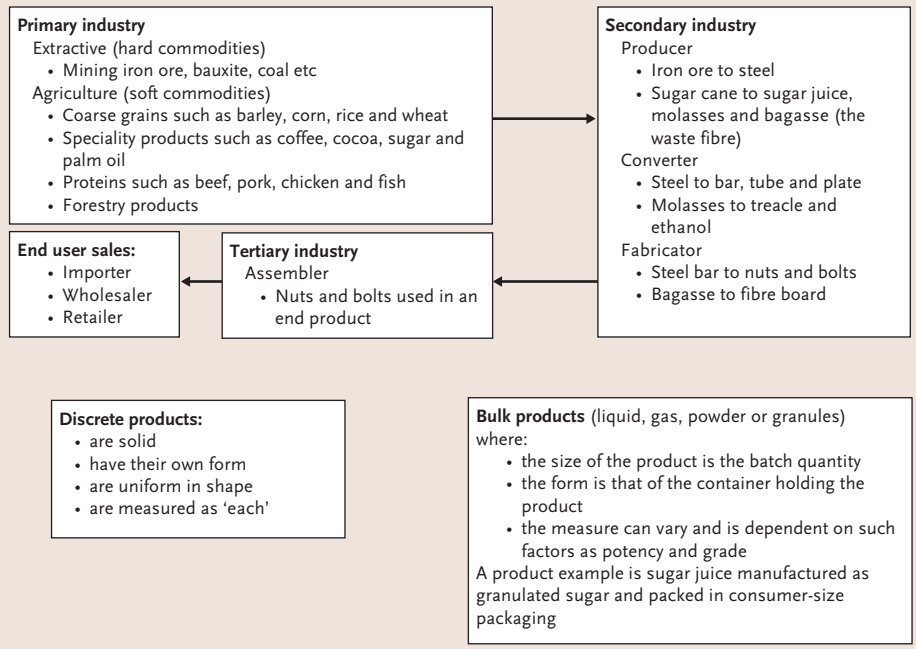
The handling, storage and transport of discrete and bulk products are very different, although companies can have bulk products as inputs and discrete products as outputs.

'Owning' the product

Within a company, ownership of the product has a strong influence on the business model, because it is the product 'owner' who is responsible for making money for the business. How the ownership is structured will influence the logistics operations. Responsibility for sales and profit can be assigned by:

- divisions or subsidiary companies, each with their own sales teams, which could even compete with other divisions of the same business
- geographic areas, in which region or area managers are responsible for all that happens within their allocated geographic zone—within the Asia–Pacific region, businesses may define the sub-regions of East

Figure 1.9 Industry types



Asia (greater China, Japan and Korea); South-East Asia (the ASEAN countries); South Asia (India, Pakistan, Bangladesh and Sri Lanka) and Oceania (Australia, New Zealand and the Pacific island states). Within the South-East Asia sub-region, there could be smaller sub-regions such as the Greater Mekong region, consisting of Thailand, Vietnam, Cambodia and Laos

- product group, where a particular product group is manufactured in its own facilities and 'sold' (at an internal transfer price), to the company's sales group.

How the company views its markets

Companies operate with their own view of how they relate to their markets; therefore, companies in the same industry can operate in quite different ways, including their logistics; for example:

- Domestic—the company only operates within a local or country market.
- Multi-domestic—the domestic business model is copied for all countries where the business operates.
- International—the approach is that all countries operate as subsidiaries of head office; therefore policies and plans are centrally generated, although products and operations may differ in individual countries.
- Global—there is one company image, with standard product lines and standardised processes. There are few manufacturing locations (or outsourced contract manufacturing) that serve all markets.
- Multinational/transnational—the brand image is of high importance, but the approach is to 'think global, act local'. An objective is to effectively balance local and global sourcing, manufacturing and distribution.

Supply chain links

Each approach noted below defines the links in the supply chains and has an impact on the supply network configuration, the **cash-to-cash** cycle and organisation structure.

1 *Core or focused business*—where the objective is to have a focused business (narrow product range or market), concentrate on the highest value adding parts of the supply chains and outsource the balance. This results in a network of logistics service providers (LSP) that require managing and integrating into the business.

2 *Horizontal integration*—where the aim is to sell a type of product or service in numerous markets through subsidiary companies. Each provides variations of the product to a different market segment or geographical area. It is common in the retail apparel sector. This approach will hopefully increase total sales, but lower the exposure to any one market segment and fully utilise the company's own or outsourced production facilities.

   Conglomerate organisations have a horizontal integration focus, but instead of being in one type of product or service, they can be in many. In this model, the company owns a collection of non-related businesses, with the holding company acting as a central bank. This business model went out of fashion in the 1980s, when 'focused' businesses became the accepted model. It is worth noting, however, that one of Australia's major businesses, Wesfarmers, is a conglomerate. Khanna and Palepu (1997) argued that conglomerates can be a useful model for developing countries, because the wider institutions of business (for example distribution and training) may not be widely available in the country. Strong conglomerates with trusted corporate brands could therefore best address the multiple needs of a developing economy.

3 *Vertical integration*—where consideration is given to the amount of a supply chain that an organisation owns, controls or influences. Vertically integrated businesses share a common owner and are united through an administrative hierarchy, but each member of the hierarchy produces different products or services, which are combined through a specific supply chain to satisfy a customer need.

   Manufacturers or importers can forward (or downstream) integrate towards the retail demand side (an example is IKEA furniture); manufacturers or importers can also integrate backward (or upstream) towards the supply side, by acquiring supplier businesses. This can be driven by actual or potential supply shortages, such as the need for rare earths in the manufacture of electric cars and mobile phones.

4 *Virtual integration*—where the company forms a network of business that are drawn together to meet a specific customer need in a project management structure. When the need has been satisfied, the company will form new networks to address different requirements or contracts. An example is when major construction projects are carried out.

5 *Supplier alliance*—where a formal relationship exists between two or more parties for a set period of time. The objective is to pursue a set of agreed-upon goals or to meet a critical business need, while remaining independent organisations. The alliance is a collaboration that aims for a synergy between the parties, where the total gain is greater than the sum of the individual business parts.

   The parties to the agreement may participate by providing the alliance with resources such as products, distribution channels, manufacturing capability, project funding, capital equipment, knowledge, expertise and intellectual property.

   Public–private partnership (sometimes referred to as PPP or P^3) is a special case of strategic alliance, where a government venture is funded and operated through a contract between a government and one or more private sector companies.

   Unfortunately, the terms 'partner' and 'partnership' have become a part of the business vocabulary, even though they should be rarely used. *Encyclopaedia Britannica* defines the term 'partnership' as 'a voluntary association of two or more parties for the purpose of managing a business enterprise and sharing its profits or losses'.

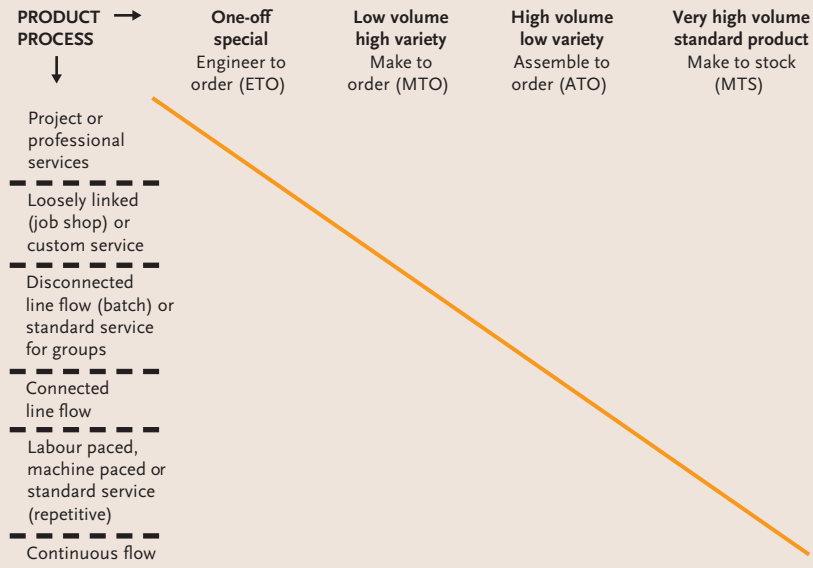
   The sharing of risk and reward is the defining measure of a partnership, but contracts between parties in supply chains rarely meet this criterion. On the basis of the above definition, all supply chain relationships known by the authors and referred to as 'partnerships' are in fact customer–supplier contracts; with some contracts written as alliances to achieve an agreed objective.

Positioning the business

The business model (and therefore logistics) will differ for organisations within the same industry, depending on how the company decides to address its customers' needs. Hayes and Wheelwright (1979) argue that although each business has the same steps in its business flow (Figure 1.1), the means to implement these steps is very different. It depends on the products and the processes used to produce the product or service for sale. Figures 1.10–1.13 enhance the work of Hayes and Wheelwright.

Figure 1.10 overleaf illustrates the matrix of product types and processes that are common to both product and service businesses.

Figure 1.10 Positioning an organisation—products and services



Source: Adapted from Hayes, R. and Wheelwright, S.C., 'Link Manufacturing Process and Product Life Cycles', *Harvard Business Review*, January–February 1979.

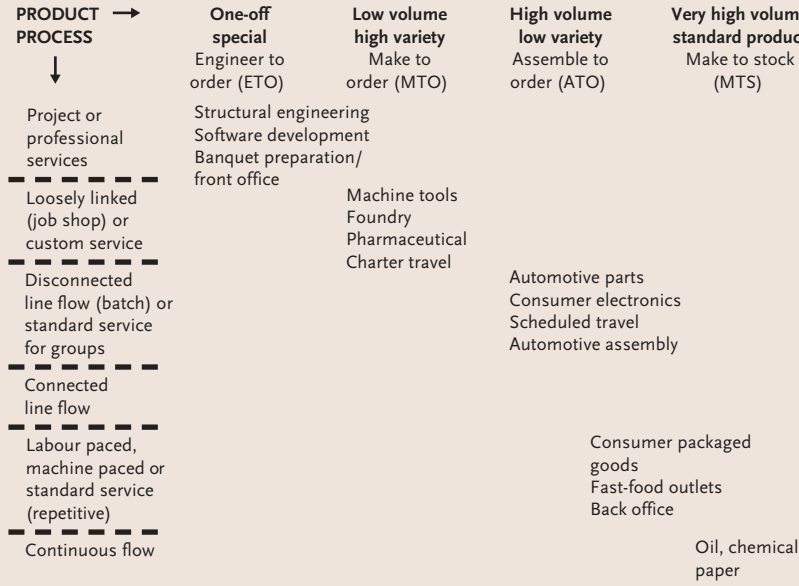
The explanation for the different product sectors is as follows:

1. Design is based on customer's specification and then 'engineered to order' (ETO).
2. Provide a design service (can be for options to a base product) and 'make to order' (MTO).
3. Assemble final products to order = Assemble to order (ATO) is based on orders from either customers or sales. Make or buy materials, components, sub-assemblies and options to:
   a. immediately assemble into finished goods and deliver. Can use just in time/lean/flow models.
   b. stock materials, components, sub-assemblies, etc. as inventory; then assemble items or mix ingredients and deliver, based on a customer order (this is called 'postponement').
4. Sell from finished goods inventory = Make to stock (MTS):
   a. Make finished goods from multiple components and hold in inventory.
   b. Make finished goods from one or a few ingredient materials that are processed into end products, co-products and by-products, then hold in inventory.
   c. Import finished items and hold in inventory.
   d. Make and distribute 'short shelf life' (perishable) products.

In positioning a business, its resources are focused on either the process or the product:

- Towards the top left-hand corner of the diagonal (ETO and MTO), the focus is on the process, so that customers and products compete for the available resources.
- In the bottom right of the diagonal (ATO and MTS), the focus is on the product, with the workforce and equipment (can be duplicated) organised around the product or service.

Figure 1.11 Positioning an organisation—examples



Source: Adapted from Hayes, R. and Wheelwright, S.C., 'Link Manufacturing Process and Product Life Cycles', *Harvard Business Review*, January–February 1979.

Examples of enterprises in each of the sectors are shown in Figure 1.11. The characteristics and complexity of these organisations is shown in Figure 1.12 overleaf. The challenges for each of these types of business are identified in Figure 1.13 on page 17.

The essential point to note is that the challenges in each sector are very different; therefore, approaches to overcoming these challenges will also be different in terms of organisation structure, use of technology, logistics and planning and scheduling methods.

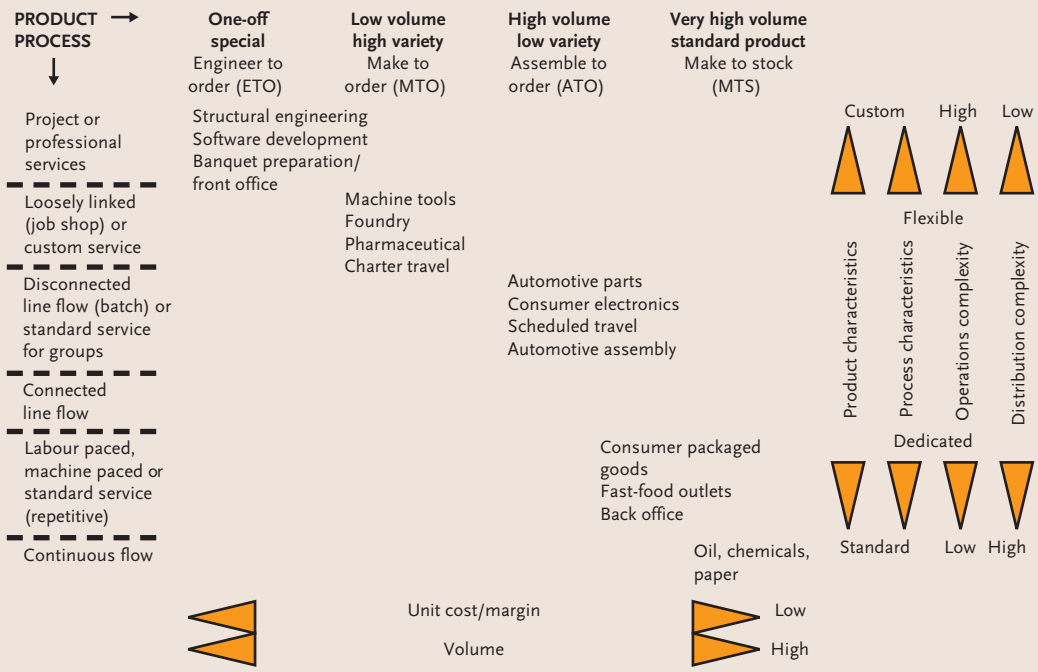
Logistical trade-offs

When considering the business model, the challenge of **logistical trade-offs** is something that supply chain professionals grapple with on a daily basis. In lay terms it can be represented by the phrase 'you can't have everything', because there is a relationship between the variables of a supply chain—performance, service level, cost and so on.

When these are separated into relationship pairs such as performance to cost, or service levels to cost, or staff training to customer satisfaction, there can be a statistical correlation between the variables. For example, as service levels for customers improve, costs will most likely increase. Conversely, as costs are reduced, performance tends to deteriorate.

Another example is the trade-off between transport costs and the number of warehouses, as shown in Figure 1.14 on page 17.

Figure 1.12 Positioning an organisation—characteristics



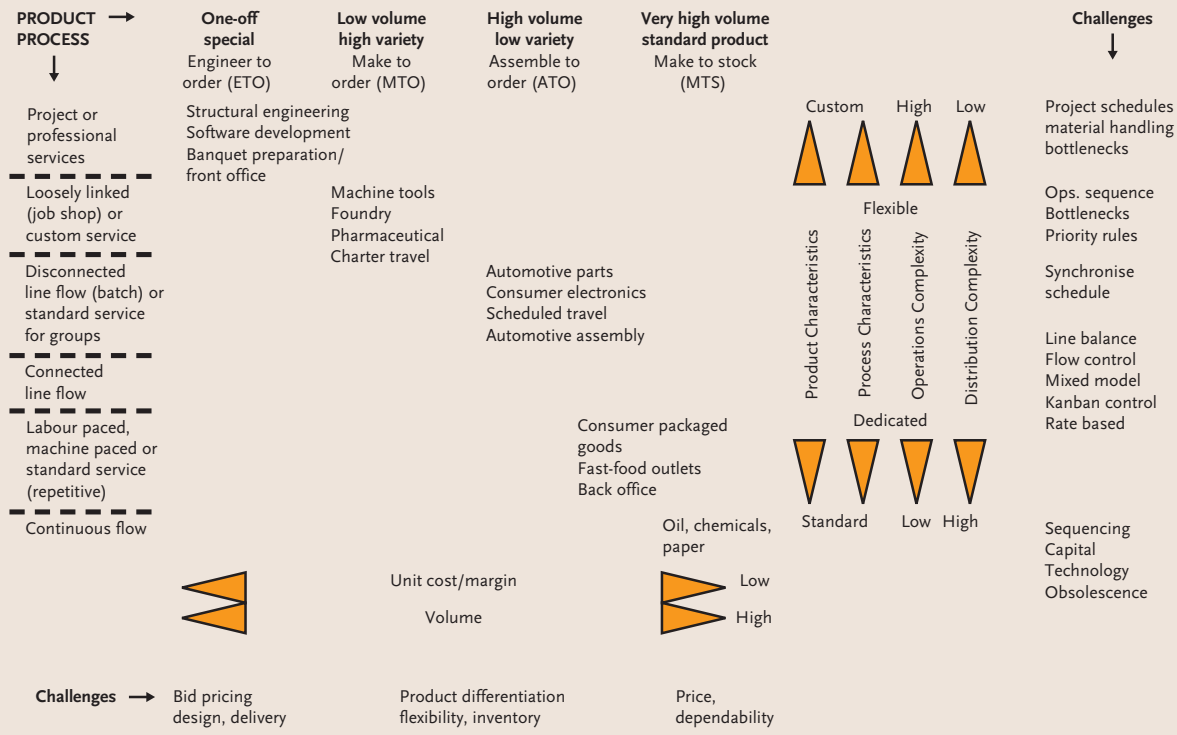
Source: Adapted from Hayes, R. and Wheelwright, S.C., 'Link Manufacturing Process and Product Life Cycles', *Harvard Business Review*, January–February 1979.

Global supply chains make the trade-offs in logistics more acute. For example:

- The reduced cost of globally sourced materials is traded off against the increased cost of holding additional inventory caused by the longer lead times.
- The lower cost of manufacturing in a particular location may be offset by the transport costs incurred and the administrative burden of importing/exporting.

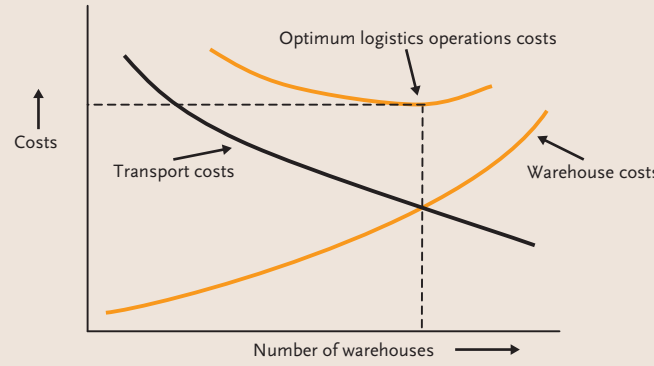
There is a point at which the equation can be optimised and the 'best value for money' combination of the variables is achieved. Creating the balance between these variables is an applied problem of supply chains and can become very complex when considering supply networks.

Figure 1.13 Positioning an organisation—challenges



Source: Adapted from Hayes, R. and Wheelwright, S.C., 'Link Manufacturing Process and Product Life Cycles', *Harvard Business Review*, January–February 1979.

Figure 1.14 Example of a logistical trade-off



Chapter questions

Operational

1. Explain the difference between logistics strategy and logistics operations.
2. What are some of the common causes of the misalignment of logical and physical supply chains? What are the consequences of such misalignments?
3. Select a routine process in a supply network from which you can obtain the necessary information. Map the physical process. Then map the corresponding logical process.

Planning

4. Are there any undesirable consequences of the terms 'supply chain' and 'logistics' being used interchangeably?
5. Draw a map of a supply chain network from which you can obtain the necessary information. Are there any peculiarities of this network?
6. Develop a map of a value chain from which you can obtain the necessary information. Where do you see opportunities to add further value to the process?

Management

7. Is a supply chain strategy different from a logistics strategy? If so, how?
8. In the real world, few organisations are purely horizontally or vertically integrated. Companies can mix the two types of integration in their supply chain network. Identify some examples of such combinations and why these companies chose their specific combination of horizontal and vertical integration.
9. What model of integration (or combination of them) is found in a business from which you can obtain the necessary information? Discuss how this business model affects the supply chain design and logistics operations. In particular, consider the impact on customer service levels, response to the market and quality of data collection and reporting.

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