Second Edition

Essentials of Operations Management

Nigel Slack
Alistair Brandon-Jones

Pearson

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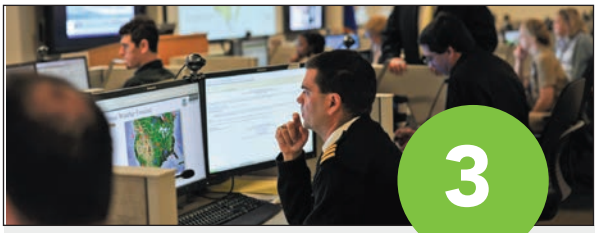

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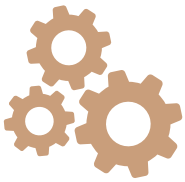

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MyLab Operations Management

For students

- Interactive tutorial exercises with immediate feedback
- A personalized study plan with a range of self-assessment questions
- Excel spreadsheets designed to help support your understanding of key concepts
- An online glossary to explain key terms
- Flashcards to test your understanding of key terms

For instructors

- Operations management simulations allow students to apply key theory to real business scenarios
- A homework and assignment manager, allowing you to assign exercises for your students
- A Gradebook which tracks students' performance on sample tests as well as assessments of your own design

The **Companion Website** provides suggested model answers to the first question in the 'problems and applications' section of each chapter.

For more information please contact your local Pearson Education sales representative or visit www.pearsoned.co.uk/slack

Preface

INTRODUCTION – OPERATIONS MAY NOT RUN THE WORLD, BUT IT MAKES THE WORLD RUN.

Operations management is *important.* It is concerned with creating the services and products upon which we all depend. All organizations produce some mixture of services and products, whether that organization is large or small, manufacturing or service, for profit or not for profit, public or private. Thankfully, most companies have now come to understand the importance of operations. This is because they have realized that effective operations management gives the potential to improve both customer service and efficiency simultaneously. But more than this, operations management is *everywhere*; it is not confined to the operations function. All managers, whether they are called Operations or Marketing or Human Resources or Finance, or whatever, manage processes and serve customers (internal or external). This makes at least part of their activities 'operations'.

Operations management is also *exciting*. It is at the centre of so many of the changes affecting the business world – changes in customer preference, changes in supply networks brought about by internet-based technologies, changes in what we want to do at work, how we want to work, where we want to work and so on. There has rarely been a time when operations management was more topical or more at the heart of business and cultural shifts.

Operations management is also *challenging.* Promoting the creativity that will allow organizations to respond to so many changes is becoming the prime task of operations managers. It is they who must find the solutions to technological and environmental challenges, the pressures to be socially responsible, the increasing globalization of markets and the difficult-to-define areas of knowledge management.

THE AIM OF THIS BOOK

This book provides a clear, authoritative, well-structured and interesting treatment of operations management as it applies to a variety of businesses and organizations. The text provides both a logical path through the activities of operations management and an understanding of their strategic context.

More specifically, this text is:

- **strategic** in its perspective – it is unambiguous in treating the operations function as being central to competitiveness
- **conceptual** in the way it explains the reasons why operations managers need to take decisions
- **comprehensive** in its coverage of the significant ideas and issues that are relevant to most types of operation
- **practical** in that the issues and challenges of making operations management decisions in practice are discussed (the 'Operations in practice' examples that feature in every chapter explore the approaches taken by operations managers in practice)
- **global** in the examples that are used, with descriptions of operations practice from all over the world, and in the treatment of core OM ideas
- **balanced** in its treatment, in that it accurately reflects the balance of economic activity between service and manufacturing operations.

WHO SHOULD USE THIS BOOK?

This book is for anyone who is interested in how services and products are created:

- **Undergraduates** on business studies, technical or joint degrees should find it sufficiently structured to provide an understandable route through the subject (no prior knowledge of the area is assumed).
- **MBA students** should find that its practical discussions of operations management activities enhance their own experiences.
- **Postgraduate students** on other specialist Master's degrees should find that it provides them with a well-grounded and, at times, critical approach to the subject.

DISTINCTIVE FEATURES

Clear structure

The structure of the book uses the '4 Ds' model of operations management that distinguishes between the strategic decisions that govern the *direction* of the operation, the *design* of the processes and operations that create products and services, planning and control of the *delivery* of products and services, and the *development*, or improvement, of operations.

Illustrations-based
Operations management is a practical subject and cannot be taught satisfactorily in a purely theoretical manner. Because of this we have used examples and short 'operations in practice' examples that explain some of the issues faced by real operations.

Summary answers to key questions
Each chapter is summarized in the form of a list of bullet points. These extract the essential points that answer the key questions posed at the beginning of each chapter.

Problems and applications
Every chapter includes a set of problem-type exercises. These can be used to check your understanding of the concepts illustrated in the worked examples. There are also activities that support the learning objectives of the chapter, which can be undertaken individually or in groups.

Want to know more?
Every chapter ends with a short list of further reading that takes the topics covered in the chapter further, or treats some important, related issues. The nature of each further reading is also explained.

To the instructor

THE *ESSENTIALS* SECOND EDITION

When we created the first edition of *Essentials* we hoped that we were keeping up with the requirements and preferences of our book users. We were responding to what we thought was a demand from both lecturers and students for a text aimed at shorter, more introductory courses in operations management. We believed that there was a demand for an authoritative but not necessarily fully comprehensive text. It appears we were right. The first edition of *Essentials,* based on the approach that has made both *Operations Management* and *Operations and Process Management* market-leading texts, was particularly well received – hence this second edition.

- We have retained the concept of a text that is shorter than its companion texts, with coverage focused on what extensive research indicates are key topics. In some cases, this has involved incorporating content from more than one chapter of our longer texts. For example, in this edition we have combined operations management and operations performance content to free up space for an additional chapter on project management that wasn't in the first edition.
- We have also retained many learning features, including 'Operations in practice' examples, 'Key questions', 'Worked examples', 'Test your knowledge', 'Problems and applications', and the 'Want to know more?' features.
- What is new to this edition, in addition to many new examples and increased coverage of some topics, is that for the first time we offer model answers to the 'Problems and applications' exercises at the end of each chapter. Answers to the first question are included in the companion student website to this text. Answers to the other questions are available to bona fide lecturers and tutors in order to support their teaching.

To the student

MAKING THE MOST OF THIS TEXT

All academic texts in business management are, to some extent, simplifications of the messy reality that is actual organizational life. Any book has to separate topics in order to study them, which in reality are closely related. For example, operations strategy impacts on process design, which in turn impacts on approach to quality management; yet, for simplicity, we are obliged to treat these topics individually. The first hint, therefore, in using this text effectively is to look out for all the links between the individual topics. Similarly, with the sequence of topics, although the chapters follow a logical structure, they need not be studied in this order. Every chapter is, more or less, self-contained. Therefore, study the chapters in whatever sequence is appropriate to your course or your individual interests. The same applies to revision – study the introductory passages and 'Test your knowledge' sections.

The text makes full use of the many practical examples and illustrations that can be found in all operations. Many of these were provided by our contacts in companies, but many also come from journals, magazines and newspapers. So, if you want to understand the importance of operations management in everyday business life, look for examples and illustrations of operations management decisions and activities in newspapers and magazines. There are also examples that you can observe every day. Whenever you use a shop, eat a meal in a restaurant, access music via your phone or ride on public transport, consider the operations management issues of all the operations for which you are a customer.

The 'Problems and applications' exercises are there to provide an opportunity for you to think further about the ideas discussed in the chapters. They can be used to test out your understanding of the specific points and issues discussed in the chapter and to discuss them as a group, if you choose. If you cannot answer these you should revisit the relevant parts of the chapter. When you have done this individually, try to discuss your analysis with other course members. Most important of all, every time you analyze one of the case exercises (or any other case or example in operations management), start off your analysis with these two fundamental questions:

- How is this organization trying to compete (or satisfy its strategic objectives if a not-for-profit organization)?
- What can the operation do to help the organization compete more effectively?

Ten steps to getting a better grade in operations management

We could say that the best rule for getting a better grade is to be good. We mean really, really good! But, there are plenty of us who, while fairly good, don't get as good a grade as we really deserve. So, if you are studying operations management, and you want a really good grade, try following these simple steps:

1. **Practice, practice, practice.** Use the 'Test your knowledge' and the 'Problems and applications' features to check your understanding. Use the 'Study plan' feature in MyLabOM and practice to master the topics that you find difficult.

2. Remember a few **key models,** and apply them wherever you can. Use the diagrams and models to describe some of the examples that are contained within each chapter. You can also use the revision podcasts on MyLabOM.

3. Remember to use both **quantitative and qualitative** analysis. You'll get more credit for mixing your methods appropriately: use a quantitative model to answer a quantitative question and vice versa, but qualify this with a few well-chosen sentences. Both the chapters of the text and the exercises on MyLabOM incorporate qualitative and quantitative material.

4. There's always a strategic **objective** behind any operational issue. Ask yourself, 'Would a similar operation with a different strategy do things differently?'. Look at the 'Operations in practice' pieces in the text.

5. **Research** widely around the topic. Use websites that you trust – we've listed some good websites in the 'Notes' section at the end of the text and on MyOMLab. You'll get more credit for using references that come from genuine academic sources.

6. **Use your own experience.** Every day, you're experiencing an opportunity to apply the principles of operations management. Why is the queue at the airport

check-in desk so long? What goes on 'behind the scenes' to deliver you the latest tech gadget? Use the clips on MyLabOM to look further at operations in practice.

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➔ **Always answer the question.** Think 'what is really being asked here?'. 'What topic or topics does this question cover?' Find the relevant chapter or chapters, and search the 'Key questions' at the beginning of each chapter and the 'Test your knowledge' at the end of each chapter to get you started.

8

➔ Take account of the **three tiers of accumulating marks** for your answers:

a) First, demonstrate your knowledge and understanding. Make full use of the text and MyLabOM to find out where you need to improve.
b) Second, show that you know how to illustrate and apply the topic. The 'Operations in practice' sections, combined with those on MyLabOM, give you hundreds of different examples.
c) Third, show that you can discuss and analyze the issues critically. Where appropriate, consider alternative viewpoints.

Generally, if you can do (a) you will pass; if you can do (a) and (b) you will pass well; and if you can do all three, you will pass with flying colours!

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➔ Remember not only **what** the issue is about, but also understand **why**! Read the text and apply your knowledge until you really understand why the concepts and techniques of operations management are important, and what they contribute to an organization's success. Your new-found knowledge will stick in your memory, allow you to develop ideas and enable you to get better grades.

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➔ **Start now!** Don't wait until two weeks before an assignment is due or an exam is about to take place. Read on, log on (www.myomlab.com) and GOOD LUCK!

Nigel Slack and Alistair Brandon-Jones

About the authors

Nigel Slack

Nigel Slack is an Emeritus Professor of Operations Management and Strategy at Warwick University, an Honorary Professor at Bath University and an Associate Fellow of Said Business School, Oxford University. Previously he has been Professor of Service Engineering at Cambridge University, Professor of Manufacturing Strategy at Brunel University, a University Lecturer in Management Studies at Oxford University and Fellow in Operations Management at Templeton College, Oxford. He worked initially as an industrial apprentice in the hand-tool industry and then as a production engineer and production manager in light engineering. He holds a Bachelor's degree in Engineering and Master's and Doctor's degrees in Management, and is a Chartered Engineer. He is the author of many books in Operations Management, including *Operations Management* (with Alistair Brandon-Jones and Robert Johnston), the eighth edition published in 2016, *Operations and Process Management* (with Alistair Brandon-Jones), the fifth edition published in 2018, *Operations Strategy* (with Michael Lewis), the fourth edition published in 2014, *The Manufacturing Advantage,* published in 1991, *Making Management Decisions* (with Steve Cooke) published in 1991, *Service Superiority* (with Robert Johnston), published in 1993, *The Blackwell Encyclopedic Dictionary of Operations* Management, published in 1997, and *Perspectives in Operations Management* (with Michael Lewis), published in 2003. Nigel has authored numerous academic papers and chapters in books. He also acts as a consultant to many international companies around the world in many sectors, especially financial services, transport, leisure and manufacturing. His research is in the operations and manufacturing flexibility and operations strategy areas.

Alistair Brandon-Jones

Alistair Brandon-Jones is a Full Chaired Professor in Operations and Supply Management at the University of Bath, and an Adjunct Professor at Hult International Business School. He was formerly a Reader at Manchester Business School, an Assistant and Associate Professor at Bath University and a Teaching Fellow at Warwick Business School, where he also completed his PhD. In addition to *Essentials of Operations Management,* his other books include *Operations and Process Management* (with Nigel Slack), the fifth edition published in 2018, *Operations Management* (with Nigel Slack and Robert Johnston), the eighth edition published in 2016 and *Quantitative Analysis in Operations Management* (with Nigel Slack), published in 2008. Alistair is an active empirical researcher, focusing on e-enabled operations

and supply management, professional services and healthcare operations. He has published this research extensively in world-leading journals including *Journal of Operations Management, International Journal of Operations and Production Management, International Journal of Production Economics* and *International Journal of Production Research*. He has also disseminated his research through various practitioner publications, conferences, workshops and white papers. Alistair has consulting and executive development experience with organizations around the world, in various sectors including petrochemicals, health, financial services, manufacturing, defence and government. In addition, he has won numerous prizes for teaching excellence and contributions to pedagogy, including from Times Higher Education, Association of MBAs (AMBA), Production Operations Management Society (POMS), University of Bath, University of Manchester and University of Warwick.

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Nigel Slack and Alistair Brandon-Jones

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Figures

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Text

p. 41 From Cookson C (2015) Guildford's SSTL leads world in small satellite supply, Financial Times, June 12; **p. 48** From Ron Johnson (2011) What I Learned Building the Apple Store, HBR Blog network, November 21 https://hbr.org/2011/11/what-i-learned-building-the-ap; **p. 54** From http://searchcio.techtarget.com/definition/outsourcing; **p. 57** from Marty Lariviere (2011) How Apple spends on operations, The Operations Room, November 16; **p. 66** from Definition from techtarget.com, searchdatacenter.techtarget.com/; **p. 73** from https://www.merriam-webster.com/dictionary/innovation; **p. 75** from (2012) iPhone was almost scrapped, says Apple design guru, The Times, July 30; **p. 388** from The EFQM Website, www.efqm.org; **p. 401** from The EFQM Website, www.efqm.org.

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Operations management and performance

Introduction

Operations management is about how organizations create and deliver services and products. Everything you wear, eat, sit on, use, read or knock about on the sports field, and every treatment you receive at the hospital, every service you expect in the shops and every lecture you attend at university has been created by 'operations'. While the people who supervised their creation and delivery may not always be called operations managers, that is what they really are. And that is what this book is concerned with – the activities and decisions of those operations managers who have made the services and products on which we all depend. It is a hugely important activity for any type of organization. As well as impacting the quality, cost and delivery of the services and products that we consume, operations management can help or hinder how an organization achieves its strategic ambitions, and how it fulfills its environmental responsibilities. In this introductory chapter, we will examine what we mean by 'operations management', why it is important, how operations processes are all similar yet different and what it is that operations managers do. Figure 1.1 shows the model of operations management that is developed in the chapter.

Key questions

What is operations management?

What is the input–transformation–output process?

Why is operations management important to an organization's performance?

What is the processes hierarchy?

How do operations and processes differ?

What do operations managers do?

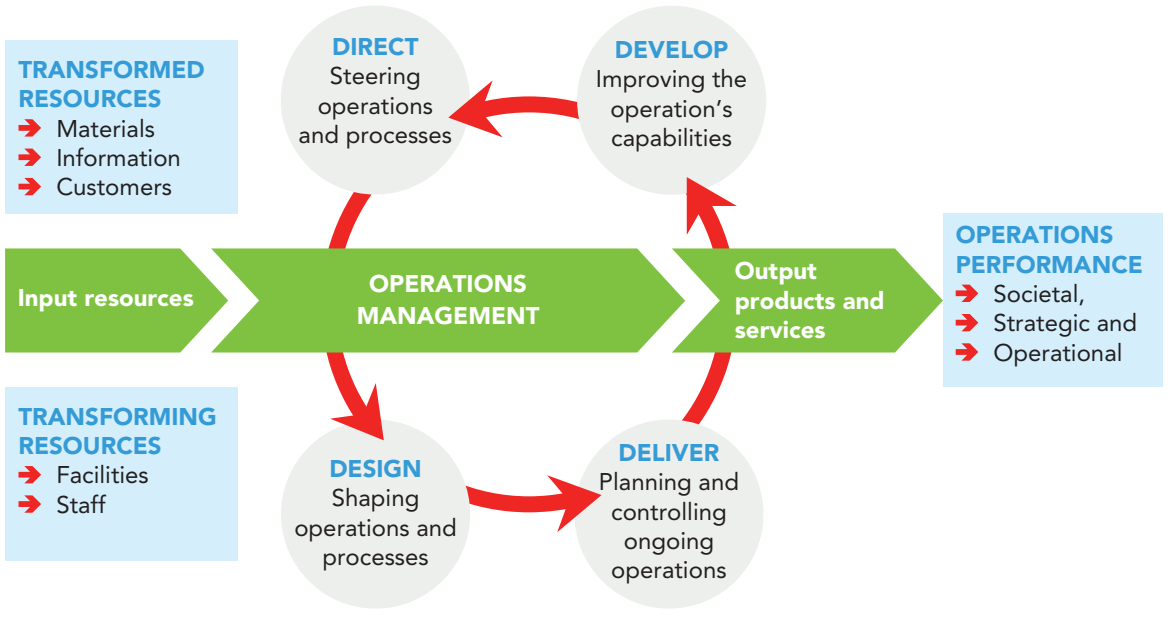
What is operations management?

Operations management is the activity of managing the resources that create and deliver services and products. The operations function is the part of the organization that is responsible for this activity. Every organization has an operations function because every organization creates services and/or products. Operations managers are the people who have particular responsibility for managing some, or all, of the resources and processes within the operations function. However, not all types of organization will necessarily call the operations function by this name. (Note that we also use the shorter terms 'the operation' or 'operations' interchangeably with the 'operations function'.) Similarly, the operations manager could be called by some other name. For example, he or she might be called the 'fleet manager' in a distribution company, the 'administrative manager' in a hospital, or the 'store manager' in a supermarket.

operations principle
All organizations have 'operations' that produce some mix of services and products.

The Prêt A Manger example illustrates how important the operations function is for any company whose reputation depends on producing safe, high-quality, sustainable and profitable services or products. Its customers could choose to go to its competitors if Prêt's operations failed to deliver excellent levels of service or to produce attractive products, which is why it is

FIGURE 1.1 This chapter is an introduction to operations management and performance



Operations in practice

Customer service at Prêt A Manger[1]

Prêt A Manger is proud of its customer service. 'We'd like to think we react to our customers' feelings (the good, the bad, the ugly) with haste and absolute sincerity', its directors say. 'Prêt customers have the right to be heard. Do call or email. Our UK managing director is available if you would like to discuss Prêt with him. Alternatively, our CEO hasn't got much to do; hassle him!'

Prêt A Manger opened its first shop in London and now has over 350 shops spread across the UK, Paris, the USA, Hong Kong and Shanghai. It says that its secret is to focus continually on the quality of both its food and its service. It avoids the chemicals and preservatives common in most 'fast' food. 'Many food retailers focus on extending the shelf-life of their food, but that's of no interest to us. At the end of the day, we give whatever we haven't sold to charity.' Prêt A Manger shops have their own kitchen where fresh ingredients are delivered every morning, with food prepared throughout the day. The team members serving on the tills at lunchtime will have been making sandwiches in the kitchen that morning. 'We are determined never to forget that our hardworking people make all the difference. When they care, our business is sound. If they cease to care, our business goes down the drain. In a retail sector where high staff turnover is normal, we're pleased to say our people are much more likely to stay around! We work hard at building great teams. We take our reward schemes and career opportunities very seriously.'

Examining customers' comments for improvement ideas is a key part of weekly management meetings, and of the daily team briefs in each shop. Moreover, staff at Prêt collect bonuses for delivering outstanding customer service. Every week, each Prêt outlet is visited by a secret shopper who scores the shop on such performance measures as speed of service, product availability and cleanliness. In addition, the mystery shopper rates the 'engagement level' of the staff; questions include, 'did servers connect with eye contact, a smile and some polite remarks'? Above a certain score, every team member receives an extra payment for every hour worked; and if an individual is mentioned by the mystery shopper for providing outstanding service, they get an extra payment.

meticulous about monitoring its quality and ensuring that its processes operate to precise standards. Of course, exactly what is involved in producing products and services will depend to some extent on the type of organization of which the operations function is a part. Table 1.1 shows some of the activities of the operations function for various types of organization.

TABLE 1.1 Some activities of the operations function in various organizations

 Internet service provider	 Fast food chain	 International aid charity	 Furniture manufacturer
Maintain and update hardware	Locate potential sites for restaurants	Provide aid and development projects for recipients	Procure appropriate raw materials and components
Update software and content	Provide processes and equipment to produce burgers, etc.	Provide fast emergency response when needed	Make sub-assemblies
Respond to customer queries	Maintain service quality	Procure and store emergency supplies	Assemble finished products
Implement new services	Develop, install and maintain equipment	Be sensitive to local cultural norms	Deliver products to customers
Ensure security of customer data	Reduce impact on local area, and reduce packaging waste		Reduce environmental impact of products and processes

Operations can produce both services and products

There is a common misperception that operations management is concerned largely with producing physical products. Not so. In all developed economies, services generate a far higher proportion of wealth than manufacturing. Of the four organizations in Table 1.1, the furniture manufacturer produces tangible products. The fast food chain produces food but also serves it to its customers. The international aid charity does not directly produce products but does distribute them and coordinate aid. The internet service provider has no tangible product as such – it provides intangible services. Yet they are all operations with (as we shall see later) similar activities and objectives. Of course, there are some differences between products and services. Products are usually tangible, whereas services are activities or processes. Also, while most products can be stored, at least for a short time, service only happens when it is consumed or used. So, accommodation in a hotel room, for example, will perish if it is not sold that night; a restaurant table will remain empty unless someone uses it that evening.

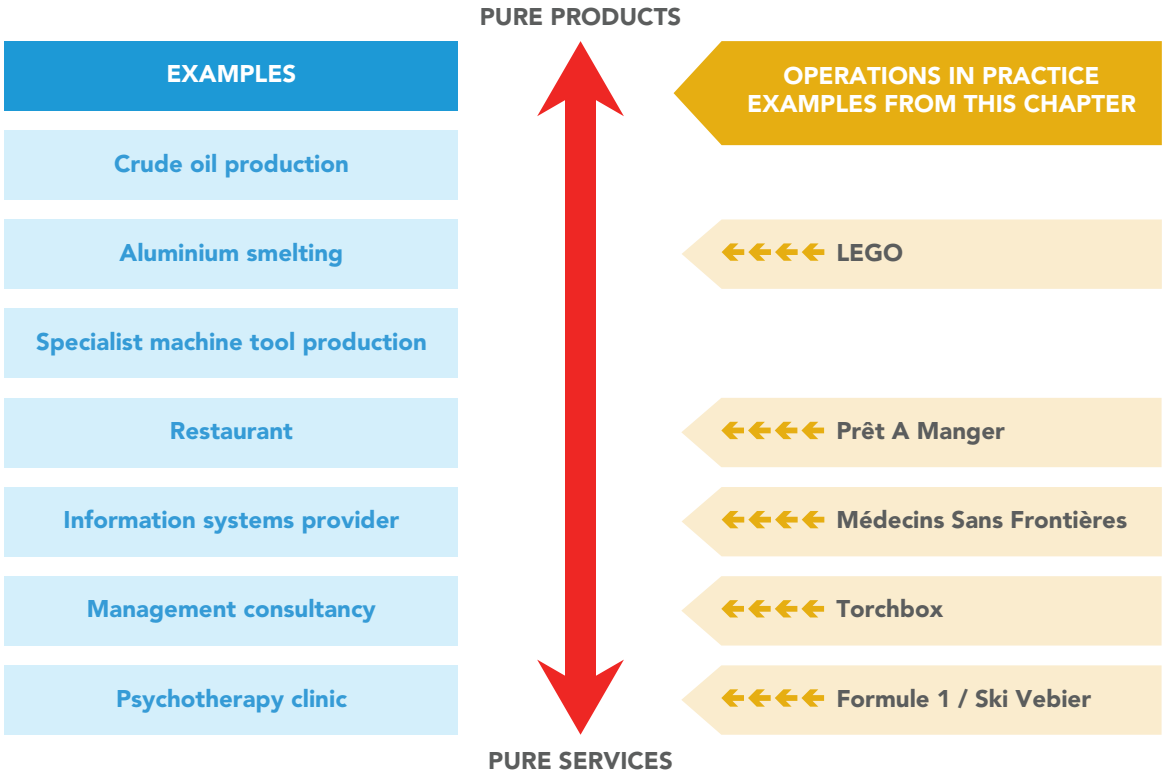
operations principle
Most operations produce a mixture of tangible products and intangible services.

In fact, most operations produce both services and products. Figure 1.2 shows a number of operations positioned in a spectrum, from 'pure' products to 'pure' service. Crude oil producers are concerned almost exclusively with the product from their oil wells. Aluminium smelters are similar, but might also deliver some 'facilitating' services, such as technical advice. To an even greater extent, machine tool manufacturers deliver facilitating services such as technical advice and applications engineering. The restaurant is both a manufacturer of meals and a provider of service. An information systems provider may create software 'products', but primarily provides a service to its customers. Certainly, a management consultancy, although it produces reports and documents, is primarily a service provider. Finally, some pure services solely create and deliver services – a psychotherapy clinic, for example.

Increasingly, the distinction between services and products is difficult to define and not particularly useful. Software has moved from being primarily a product (sold on a disk) to an intangible download when sold over the internet, to an even less tangible rental or subscription service based 'in the cloud'. Indeed, one could argue that all operations are service providers that may create and deliver products as part of the offering to their customers.

operations principle
Whether an operation produces tangible products or intangible services is becoming increasingly irrelevant. In a sense, all operations produce service for their customers.

FIGURE 1.2 **Most operations produce a mixture of products and services. Some general examples are shown here, together with some of the operations featured as 'Operations in practice' examples in this chapter**



Operations in practice

Torchbox: award-winning web designers[2]

We may take it for granted, yet browsing websites as part of your studies, your job or your leisure is an activity that we all do, probably every day, probably many times each day. All organizations need a web presence if they want to sell products and services, interact with their customers or promote their cause. And, not surprisingly, there is a whole industry devoted to designing websites so that they have the right type of impact. It has been one of the fastest-growing industries in the world. But it's also a tough business. Not every web design company thrives, or even survives beyond a couple of years. To succeed, web designers need technology skills, design capabilities, business awareness and operational professionalism. One that has succeeded is Torchbox, an independently-owned digital agency for the charity, non-profit and higher education sectors, with offices in Oxfordshire and Bristol in the UK and Philadelphia in the USA. Founded back in 2000, it now employs over 50 people, providing 'high-quality, cost-effective and ethical solutions for its clients'.

Co-founder and technical director Tom Dyson has been responsible for its technical development. 'There are a number of advantages about being a relatively small operation', he says. 'We can be hugely flexible and agile, in what is still a dynamic market. But at the same time, we have the resources and skills to provide a creative and professional service. Any senior manager in a firm of our size cannot afford to be too specialised. All of us here have their own specific responsibilities; however, every one of us shares the overall responsibility for the firm's general development. We can also be clear and focused on what type of work we want to do. Our ethos is important to us. We set out to work with clients who share our commitment to environmental sustainability and responsible, ethical business practice; we take our work, and that of our clients, seriously. If you're an arms dealer, you can safely assume that we're not going to be interested.'

Nevertheless, straightforward operational effectiveness is also essential to Torchbox's business. 'We know how to make sure that our projects run not only on time and to budget', says Olly Willans, also a co-founder and the firm's creative director, 'but we also like to think that we provide an enjoyable and stimulating experience – both for our customers' development teams and for our staff too. High standards of product and service are important to us: our clients want accessibility, usability, performance and security embedded in their web designs, and of course they want things delivered on time and on budget. We are in a creative industry that depends on fast-moving technologies, but that doesn't mean that we can't also be efficient. We back everything we do with a robust feature-driven development process using a kanban project management methodology that helps us manage our obligations to our clients.'

The 'kanban' approach used by the Torchbox web development teams originated from car manufacturers such as Toyota (and is fully explained in Chapter 10). 'Using sound operations management techniques helps us constantly to deliver value to our clients', says Tom Dyson. 'We like to think that our measured and controlled approach to handling and controlling work helps ensure that every hour we work produces an hour's worth of value for our clients and for us.'

Operations in practice

MSF operations provide medical aid to people in danger[3]

Médecins Sans Frontières (MSF) is an independent humanitarian organization providing medical aid where it is most needed and raising awareness of the plight of the people it helps around the world. Its core work takes place in crisis situations – armed conflicts, epidemics, famines and natural disasters. It delivers both medical aid and material aid (including food, shelter, blankets, etc.). Each year, MSF sends doctors, nurses, logisticians, water-and-sanitation experts, administrators and other professionals to work alongside around thousands of locally hired staff. It is one of the most admired and effective relief organisations in the world. But no amount of fine intentions can translate into effective action without superior operations management. As MSF says, it must be able to react to any crisis with 'fast response, efficient logistics systems and efficient project management'.

MSF response procedures are continuously being developed to ensure that they reach those most in need as quickly as possible. The process has five phases: proposal, assessment, initiation, running the project and closing. The information that prompts a possible mission can come from governments, the international community, humanitarian organizations or MSF teams already present in the region. Once the information has been checked, MSF experts carry out a quick evaluation and send a proposal back to the MSF office. After approval, MSF select personnel, organize resources and secure funds. Initiation involves sending equipment and resources to the area. Thanks to their pre-planned processes, specialized kits and the emergency stores, MSF can distribute material and equipment within 48 hours, ready for the response team to start work as soon as it arrives. Once the critical medical needs have been met, MSF begins to close the project with a gradual withdrawal of staff and equipment. All of which depends on an efficient logistics system working from MSF's four logistical centres based in Europe and East Africa, plus stores of emergency materials in Central America and East Asia where they purchase, test and store equipment. ● ● ●

Operations management in not-for-profit organizations

Terms such as 'business', 'competitiveness' and 'markets', which are used in this text, are usually associated with companies in the for-profit sector. Yet operations management is also relevant to organizations whose purpose is not primarily to earn profits. Managing the operations in an animal welfare charity, hospital, research organization or government department is essentially the same as in commercial organizations. These operations have to create and deliver service and products, invest in technology, contract out