

Nigel Slack
Alistair Brandon-Jones
Robert Johnston

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Seventh Edition

OPERATIONS MANAGEMENT

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OPERATIONS MANAGEMENT

Nigel Slack

Alistair Brandon-Jones

Robert Johnston

Operations management is important, exciting, challenging ... and everywhere you look!

- Important, because it enables organizations to provide services and products that we all need
- Exciting, because it is central to constant changes in customer preference, networks of supply and demand, and developments in technology
- Challenging, because solutions must be financially sound, resource-efficient, as well as environmentally and socially responsible
- And everywhere, because in our daily lives, whether at work or at home, we all experience and manage processes and operations.

Operations Management focuses on the sustainable and socially responsible imperatives of operations management, using over 120 cases and illustrations of real-life operations around the world, including Apple, Médecins Sans Frontières, Amazon, Ecover, Dyson, Disneyland Paris, Google, The North Face, and many more.

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Welcome to OPERATIONS MANAGEMENT

Operations Management – it's important, it's exciting, it's challenging, and everywhere you look!

Important, because it's concerned with creating all of the products and services upon which we depend. Exciting, because it's at the centre of so many of the changes affecting the world of business. Challenging, because the solutions that we find need to work globally and responsibly within society and the environment. And everywhere, because every service and product that you use – the cereal you eat at breakfast, the chair you sit on, and the radio station you listen to while you eat – is the result of an operation or process.

Our aim in writing *Operations Management* is to give you a **comprehensive understanding** of the issues and techniques of operations management, and to **help you get a great final result** in your course. Here's how you might make the most of the text:

- Get ahead with the latest developments – from the up-to-the-minute *Operations in practice* features in every chapter to the focus on corporate social responsibility in the final chapter – these **put you at the cutting edge**.
- Use the *Worked examples* and *Problems and applications* to improve your use of key quantitative and qualitative techniques, and work your way to **better grades in your assignments and exams**.
- Follow up on the recommended readings at the end of each chapter. They're specially selected to enhance your learning and **give you an edge** in your course work.

And in particular, look out for the references to **MyOMLab** in the text, and log on to www.myomlab.com* where you can

The logo for MyOMLab, featuring the text 'MyOMLab' in a green, sans-serif font. The 'O' and 'M' are larger and more prominent than the other letters.

- check and reinforce your understanding of key concepts using self-assessment questions, video clips and more;
- practise your problem-solving with feedback, guided solutions and an almost limitless supply of questions!

We want *Operations Management* to give you what you need: a comprehensive view of the subject, an ambition to put that into practice, and – of course – success in your studies. So, read on and good luck!

Nigel Slack
Alistair Brandon-Jones
Robert Johnston

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Making the most of this book and MyOMLab

Check your understanding

Each chapter opens with a set of **Key questions** to identify major topics. **Summary answers** conclude the chapter. You can check your understanding of each chapter by taking the **Sample tests of self-assessment questions** on MyOMLab at www.myomlab.com.

3 Operations strategy

Key questions

- What is strategy and what is operations strategy?
- What is the difference between a 'top-down' and a 'bottom-up' view of operations strategy?
- What is the difference between a 'market requirements' and an 'operations resources' view of operations strategy?
- How can an operations strategy be put together?

INTRODUCTION

No organization can plan in detail every aspect of its current or future actions, but all organizations need some strategic direction and so can benefit from some idea of where they are heading and how they could get there. Once the operations function has understood its role in the business and after it has articulated its performance objectives, it needs to formulate a set of general principles which will guide its decision making. This is the operations strategy of the company. Yet the concept of 'strategy' itself is not straightforward; neither is operations strategy. Here we consider four perspectives, each of which goes partway to illustrating the forces that shape operations strategy. Figure 3.1 shows the position of the ideas described in this chapter in the general model of operations management.

```
graph TD
    OM[Operations management] --- OS[Operations strategy]
    OM --- OP[Operations performance]
    Design --> OM
    OM --> Deliver
    Deliver --> Develop
    Develop --> Design
    subgraph "Topic covered in this chapter"
        OS
    end
```

Figure 3.1 This chapter examines operations strategy

MyOMLab Check and improve your understanding of this chapter using self-assessment questions and a personalized study plan, a video case study, and an eText – all at www.myomlab.com.

SUMMARY ANSWERS TO KEY QUESTIONS

MyOMLab Check and improve your understanding of this chapter using self-assessment questions and a personalized study plan, a video case study, and an eText – all at www.myomlab.com.

What is process design?

- Design is the activity which shapes the physical form and purpose of both products and services and the processes that produce them.
- This design activity is more likely to be successful if the complementary activities of product or service design and process design are coordinated.

What objectives should process design have?

- The overall purpose of process design is to meet the needs of customers through achieving appropriate levels of quality, speed, dependability, flexibility and cost.
- The design activity must also take account of environmental issues. These include examination of the source and suitability of materials, the sources and quantities of energy consumed, the amount and type of waste material, the life of the product itself, and the end-of-life state of the product.

How do volume and variety affect process design?

- The overall nature of any process is strongly influenced by the volume and variety of what it has to process.
- The concept of process types summarizes how volume and variety affect overall process design.
- In manufacturing, these process types are (in order of increasing volume and decreasing variety) project, jobbing, batch, mass and continuous processes. In service operations, although there is less consensus on the terminology, the terms often used (again in order of increasing volume and decreasing variety) are professional services, service shops and mass services.

How are processes designed in detail?

- Processes are designed initially by breaking them down into their individual activities. Often common symbols are used to represent types of activity. The sequence of activities in a process is then indicated by the sequence of symbols representing activities. This is called process mapping. Alternative process designs can be compared using process maps and improved processes considered in terms of their operations performance objectives.
- Process performance in terms of throughput time, work-in-progress, and cycle time are related by a formula known as Little's law: throughput time equals work-in-progress multiplied by cycle time.
- Variability has a significant effect on the performance of processes, particularly the relationship between waiting time and utilization.

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This Question: 1 pt This Test: 7 pts 0 of 7 complete

1) The Cocoa and Coffee Company always has 4 members of staff serving drinks and snacks. It is open for 9 hours every day and the average time it takes for any customer to be served is 6 minutes. How many customers can be served in a day?

2) How many more customers could now be served in a day if there were 7 servers (average time to serve a customer is the same as in Part 1)?

3) If the Cocoa and Coffee Company keeps the number of staff at 4, improves efficiency and reduces the average time taken to serve a customer from 6 minutes to 4.5 minutes, how many customers can be served in a day?

1) Customer served per day =
(Round to nearest whole number as needed)

2) Customer served per day =
(Round to nearest whole number as needed)

3) Customer served per day =
(Round to nearest whole number as needed)

Enter any number or expression in each of the edit fields.

Previous Question Next Question Submit Test

Practice makes perfect

Worked examples show how quantitative and qualitative techniques can be used in operations management. Problems and applications at the end of the chapter allow you to apply these techniques, and you can get more practice as well as guided solutions from the Study plan on MyOMLab at www.myomlab.com.

Worked example

EXL Laboratories is a subsidiary of an electronics company. It carries out research and development as well as technical problem-solving work for a wide range of companies, including companies in its own group. It is particularly keen to improve the level of service which it gives to its customers. However, it needs to decide which aspect of its performance to improve first. It has devised a list of the most important aspects of its service:

- **The quality of its technical solutions** – the perceived appropriateness by customers of information.
- **The quality of its communications with customers** – the frequency and usefulness of information.
- **The quality of post-project documentation** – the usefulness of the documentation which goes with the final report.
- **Delivery speed** – the time between customer request and the delivery of the final report.
- **Delivery dependability** – the ability to deliver on the promised date.
- **Delivery flexibility** – the ability to deliver the report on a revised date.
- **Specification flexibility** – the ability to change the nature of the investigation.
- **Price** – the total charge to the customer.

EXL assigned a score to each of these factors using the 1–9 scale described in Figure 20.8 and then turned their attention to judging the laboratory's performance against competitor organizations. Although they have benchmarked information for some aspects of performance, they have to make estimates for the others. Both these scores are shown in Figure 20.10.

EXL Laboratories plotted the importance and performance ratings it had given to each of its competitive factors on an importance-performance matrix. This is shown in Figure 20.11. It shows that the most important aspect of competitiveness – the ability to deliver sound technical solutions to its customers – falls comfortably within the appropriate zone. Specification flexibility and delivery flexibility are also in the appropriate zone, although only just. Both delivery speed and delivery dependability seem to be in need of improvement as each is below the minimum level of acceptability for their respective importance positions. However, two competitive factors, communications and cost/price, are clearly in need of immediate improvement. These two factors should therefore be assigned the most urgent priority for improvement. The matrix also indicates that the company's documentation could almost be regarded as 'too good'.

Figure 20.10 Rating 'importance to customers' and 'performance against competitors' on the nine-point scales for EXL Laboratories

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PROBLEMS AND APPLICATIONS

MyOMLab

These problems and applications will help to improve your analysis of operations. You can find more practice problems as well as worked examples and guided solutions on MyOMLab at www.myomlab.com.

1 Sophie was sick of her daily commute. 'Why, she thought, should I have to spend so much time in a morning stuck in traffic listening to some babbling halli on the radio? We can work flexi-time after all. Perhaps I should leave the apartment at some other time?' So resolved, Sophie deliberately varied her time of departure from her usual 8.30. Also, being an organized soul, she recorded her time of departure each day and her journey time. Her records are shown in Table 18.1.

(a) Draw a scatter diagram that will help Sophie decide on the best time to leave her apartment.
 (b) How much time per (5 day) week should she expect to be saved from having to listen to a babbling halli?

Table 18.1 Sophie's journey times (in minutes)

Day	Leaving time	Journey time	Day	Leaving time	Journey time	Day	Leaving time	Journey time
1	7.15	19	6	8.45	40	11	8.35	46
2	8.15	40	7	8.55	32	12	8.40	45
3	7.25	25	8	7.55	31	13	8.20	47
4	7.20	19	9	7.40	22	14	8.00	34
5	8.40	46	10	8.30	49	15	7.45	27

2 The Protospread Laser printer company was proud of its reputation for high-quality products and services. Because of this it was especially concerned with the problems that it was having with its customers returning defective toner cartridges. About 2,000 of these were being returned every month. Its European service team suspected that not all the returns were actually the result of a faulty product, which is why the team decided to investigate the problem. Three major problems were identified. First, some users were not as familiar as they should have been with the correct method of loading the cartridge into the printer, or in being able to solve their own minor printing problems. Second, some of the dealers were also unaware of how to sort out minor problems. Third, there was clearly some abuse of Protospread's 'no-questions-asked' return policy. Empty toner cartridges were being sent to unauthorized refilling companies who would sell the refilled cartridges at reduced prices. Some cartridges were being refilled up to five times and were understandably wearing out. Furthermore, the toner in the refilled cartridges was often not up to Protospread's high quality standards.

(a) Draw a cause-effect diagram that includes both the possible causes mentioned, and any other possible causes that you think worth investigating.
 (b) What is your opinion of the alleged abuse of the 'no-questions-asked' return policy adopted by Protospread?
 (c) Think back to the last product or service failure that caused you some degree of inconvenience. Draw a cause-effect diagram that identifies all the main causes of why the failure did occur. Try to identify the frequency with which such causes happen. This could be done by talking with the staff of the operation that provided the service. Draw a Pareto diagram that indicates the relative frequency of each cause of failure. Suggest ways in which the operation could reduce the chances of failure.

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An insurance process checks details of insurance claims and arranges for customers to be paid. It samples 367 claims at random at the end of the process. It is found that 39 claims had one or more defects and there were 73 defects in total. Four types of errors were observed: coding errors, policy conditions errors, liability errors and notification errors.

(a) Calculate the proportion of defects in the process.
 (b) Calculate the number of defects per unit.
 (c) Calculate the number of defects per million opportunities (DPMO).

(a) Proportion defective = % (Round to one decimal place as needed)

Help Me Solve This

An insurance process checks details of insurance claims and arranges for customers to be paid. It samples 316 claims at random at the end of the process. It is found that 58 claims had one or more defects and there were 89 defects in total. Four types of errors were observed: coding errors, policy conditions errors, liability errors and notification errors.

(a) Calculate the proportion of defects in the process.
 (b) Calculate the number of defects per unit.
 (c) Calculate the number of defects per million opportunities (DPMO).

(a) Proportion defective = $\frac{\text{number of defective claims}}{\text{number of claims processed}}$

Enter any number or expression in each of the edit fields, then click Check Answer.
 3 parts remaining Skip Ahead Clear All Check Answer Close

Enter any number or expression in the edit field, then click Check Answer.
 3 parts remaining Clear All Check Answer Close

Making the most of this book and MyOMLab (continued)

Analyse operations in action

The **Operations in practice** and **Case study** features in each chapter illustrate and encourage you to analyse operations management in action. You can see and hear more about how theory is applied in practice in the video clips in the **Multimedia library** in MyOMLab at www.myomlab.com.

OPERATIONS IN PRACTICE

Innovative design from Dyson

In 1907 a janitor called Murry Spangler put together a golfcourse, a fan, an oil blowlift, and a broom handle. It was a great innovation - the world's first vacuum cleaner - but not one that he ever capitalised on. One year later he had sold his patented idea to William Hoover whose company went on to dominate the vacuum cleaner market for decades, especially in its United States homeland. Yet between 2002 and 2005 Hoover's market share dropped from 35 per cent to 13 per cent. Why? Because a futuristic-looking and comparatively expensive rival product, the Dyson vacuum cleaner, had jumped from nothing to over 20 per cent of the market. In fact, the Dyson product date back to 1978 when James (now Sir James) Dyson noticed how the air filter in the spray-finishing room of a company where he had been working was constantly clogging with power particles (just like a vacuum cleaner bag clogs with dust). So he designed and built an industrial cyclone tower which removed the powder particles by exerting centrifugal forces. The question intriguing him was, 'Could the same principle work in a domestic vacuum cleaner?'

Five years and five thousand prototypes later he had a working design, since praised for its uniqueness and functionality. However, existing vacuum cleaner manufacturers were not so impressed - two rejected the design outright. So Dyson started making his new design himself. Within a few years Dyson cleaners were in the UK, outselling the rivals who had once rejected them. The aesthetics and functionality of the design help to keep sales growing in spite of a higher retail price. To Dyson, good design 'is about looking at everyday things with new eyes and working out how they can be made better. It's about challenging existing technology.'

The Dyson engineers then took the technology one stage further and developed core separator technology to capture even more microscopic dirt. Dirt now goes through three stages of separation. Firstly, dirt is drawn into a powerful outer cyclone. Centrifugal forces fling larger debris such as pet hair and dust particles into the clear bin at 500G's (the maximum G-force the human body can take is 5G). Second, a further cyclonic stage, this core separator removes dust particles as small as 0.5 microns from the airflow, particles so small you could fit 200 of them on the full stop. Finally, a cluster of smaller, even faster cyclones generate centrifugal forces of up to 150,000G's - extracting particles as small as mould and bacteria.

Other innovations followed. In 2006 came the Dyson Anhydrous™ an electric hand dryer. Rather than using a broad, relatively unheated hot air jet, the Dyson engineers decided to use a blaster of cold air that emerges from the dryer at around four hundred miles per hour (643 km/hr). The advantage of this innovation is that it dries hands quicker (around 10 seconds) and uses less electricity than conventional hand dryers. Then came the Dyson Air Multiplier™. These are fans and fan heaters that work very differently to conventional fans and electric heaters. They don't have fast-spinning blades that chop the air and cause uncomfortable buffeting. Instead, they use Air Multiplier™ technology to draw in air and amplify it up to 18 times, producing an uninterrupted stream of smooth air. Sir James, who remains chief engineer and sole shareholder in Dyson, is enthusiastic about the Air Multiplier™. 'This electric heater/blower is at least as large as the vacuum cleaner sector and I hope we will do as well in this as we have done in floor cleaners', he said. 'One of the benefits of the new device is that it will heat all the air in the room to reduce the effect of hot and cold spots. Sensors measure the temperature of the surrounding air so that once the desired temperature is reached, the system cuts out, making the product much more efficient and safer than comparable heaters'. He said the new heater was part of the company's effort to turn itself into a 'broad-line technology company rather than being seen as only an appliance maker.' 'I would not limit the company to particular areas of technology or markets. We are developing a range of technologies to improve both industrial and consumer products so that the people using them get a better experience than with the comparable items that currently exist.'



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CASE STUDY

Rochem Ltd

Dr Rhodes was losing his temper. 'It should be a simple enough decision. There are only two alternatives. You are only being asked to choose a machine!'

The Management Committee looked abashed. Rochem Ltd was one of the largest independent companies supplying the food-processing industry. Its initial success had come with a food preservative used mainly for meat-based products and marketed under the name of Lunemyl. Other products were subsequently developed in the food colouring and food container coating fields, so that 'now Lunemyl' accounted for only 25 per cent of total company sales, which were now slightly over £10 million.

The decision

The problem over which there was such controversy related to the replacement of one of the process units used to manufacture Lunemyl. Only two such units were used, both were Chemling machines. It was the older of the two Chemling units which was giving trouble. High breakdown figures, with erratic quality levels, meant that output level requirements were only just being reached. The problem was, should the company replace the ageing Chemling with a new Chemling, or should it buy the only other plant on the market capable of the required process, the AFU unit? The Chief Chemist's staff had drawn up a comparison of the two units, shown in Table 8.5.

The body considering the problem was the newly formed Management Committee. The committee consisted



The Marketing Manager

The current market for this type of preservative had reached a size of some £5 million, of which Rochem Ltd supplied approximately 48 per cent. There had, of late, been significant changes in the market - in particular, many of the

Table 8.5 A comparison of the two alternative machines

	CHEMLING	AFU
Capital cost	£390,000	£880,000
Processing costs	Fixed: £10,000/month Variable: £750/kg	Fixed: £40,000/month Variable: £600/kg
Design capacity	315 kg/month	140 kg/month
Quality	98 ± 0.7% purity	99 ± 0.2% purity
Maintenance	Manual testing	Automatic testing
After-sales services	Adequate but needs servicing	Not known - probably good
Delivery	Very good	Not known - unlikely to be good
	Three months	Immediate

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Slack et al: Operations Management 7e

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Diagnostic question - Is process technology appropriate?

Different process technologies are appropriate for different Volume-Variety combinations.

Chapter 8. Process technology

Other Extras

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Take a different view

Critical commentaries, together with Selected further reading and Useful websites at the end of each chapter, show a diversity of viewpoint and encourage you to think critically about operations management. You can link to the Useful websites in the Multimedia library of MyOMLab at www.myomlab.com.

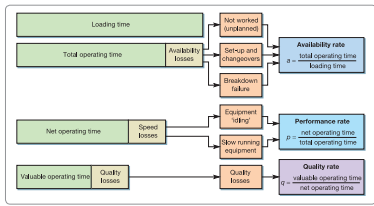


Figure 11.4 Operating equipment effectiveness

Critical commentary

For such an important topic, there is surprisingly little standardisation in how capacity is measured. Not only is a reasonably accurate measure of capacity needed for operations planning and control, it is also needed to decide whether it is worth investing in extra physical capacity such as machines. Yet not all practitioners would agree with the way in which design and effective capacity have been defined or measured in the previous worked example. For example, some would argue that the first five categories do not occur as a consequence of reasonably unavoidable, planned occurrences. Product changeover set-up can be reduced, allocating work in a different manner between processes could reduce the amount of time when no work is scheduled, even re-examining preventative maintenance schedules could lead to a reduction in lost time. One school of thought is that whatever capacity efficiency measure is used, they should be useful as diagnostic measures which can highlight the root causes of inefficient use of capacity. The idea of overall equipment effectiveness (OEE) described next is often put forward as a useful way of measuring capacity efficiencies.

Lost time as were used in Figure 10.4 in the previous chapter. Some of the reduction in available capacity of a piece of equipment (for any process) is caused by time losses such as set-up and changeover losses (when the equipment or process is being prepared for its next activity), and breakdown failures when the machine is being repaired. Some capacity is lost through speed losses such as when equipment is idling (for example, when it is temporarily waiting for work from another process) and when equipment is being run below its optimum work rate. Finally, not everything processed by a piece of equipment will be error free. So some capacity is lost through quality losses.

Taking the notation in Figure 11.4:

$$OEE = a \times p \times q$$

SELECTED FURTHER READING

- Brandimarte, P and Villa, A. (1999) *Modelling Manufacturing Systems: From Aggregate Planning to Real Time Control*. Springer, New York. Very academic, although it does contain some interesting pieces if you need to get under the skin of the subject.
- Hopp, WJ and Spearman, M.L. (2000) *Factory Physics*, 2nd edn. McGraw-Hill, New York. Very mathematical indeed, but includes some interesting maths on queuing theory.
- Ohager, J, Rudberg, M and Wikner, J. (2001) Long-term capacity management: linking the perspectives from manufacturing strategy and sales and operations planning. *International Journal of Production Economics*, vol. 69, issue 2, 215-225. Academic article, but interesting.
- Vollmann, T, Berry, W, Whybark, D.C. and Jacobs, F.R. (2004) *Manufacturing Planning and Control Systems for Supply Chain Management: The Definitive Guide for Professionals*. McGraw-Hill Higher Education, New York. The latest version of the bible of manufacturing planning and control. It's exhaustive in its coverage of all aspects of planning and control, including aggregate planning.

USEFUL WEBSITES

- www.bls.gov.uk/policies/employment-matters/strategies Website of the Employment Relations Directorate who have developed a framework for employers and employees which promotes a skilled and flexible labour market founded on principles of partnership.
- www.workmart.org.uk/index.php This site is from the Trades Union Congress. Its aim is to help today's working people get the best out of the world of work.
- www.dol.gov/index.htm US Department of Labor's site with information regarding using part-time employees.
- www.downtimecentral.com Lots of information on operational equipment efficiency (OEE).
- www.myomlab.com See which sections you have mastered and which you need to review, with questions, a personalised study plan, video clips, guided solutions, and cases.
- www.opman.org Useful materials.
- <http://operationsroom.wordpress.com> Stanford University's take on topical operations stories.
- www.iomnet.org The Institute of Operations Management site. One of the main professional bodies for the subject.
- www.opm.org A US academic society for production and operations management. Academic, but some useful material, including a link to an encyclopedia of operations management terms.

The screenshot shows the 'Multimedia Library' interface. On the left, there are navigation menus for 'My Courses', 'Student' (Course Home, Calendar, Study Plan, Homework, Quizzes & Tests, Results), 'Chapter Resources' (Download Center), and 'Instructor' (Course Manager, Home Page Manager, HW & Test Manager, Study Plan Manager, Gradebook, Instructor Resources). The main content area is titled 'Slack et al.: Operations Management 7e'. It prompts the user to view multimedia resources for their textbook. The 'Chapter' is set to '11. Capacity management' and 'Section' is 'All Sections'. There are checkboxes for 'Media Type' (Select All, Case Study, excel spreadsheet, Flashcards, Other Extras, Video) and 'Web Links'. A 'Find Now' button is present. Below, it lists 'Chapter 11: Capacity planning and control' and 'Web Links'. A list of links is provided, including the OEE formula and various academic and industry websites mentioned in the text above.

Preface

Introduction

Operations management is *important*. It is concerned with creating the services and products upon which we all depend. And 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 efficiency and customer service 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 which 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 which 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' feature, which starts every chapter, the short cases that appear through the chapters and the case studies at the end of each chapter all explore the approaches taken by operations managers in practice.
- *International* in the examples which are used. There are over 120 descriptions of operations practice from all over the world.
- *Balanced* in its treatment. This means we reflect the balance of economic activity between service and manufacturing operations. Around seventy-five per cent of examples are from service organizations and twenty-five per cent from manufacturing.

Who should use this book?

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 experience.
- *Postgraduate students* on other specialist masters 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 a model of operations management which distinguishes between direct, design, deliver and develop.

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 'boxed' short cases which explain issues faced by real operations.

Worked examples

Operations management is a subject that blends qualitative and quantitative perspectives; 'worked examples' are used to demonstrate how both types of technique can be used.

Critical commentaries

Not everyone agrees about what is the best approach to the various topics and issues with operations management. This is why we have included 'critical commentaries' that pose alternative views to the one being expressed in the main flow of the text.

Summary answers to key questions

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

Case studies

Every chapter includes a case study suitable for class discussion. The cases are usually short enough to serve as illustrations, but have sufficient content also to serve as the basis of case sessions.

Problems and applications

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

Selected further reading

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

Useful websites

A short list of web addresses is included in each chapter for those who wish to take their studies further.

To the Instructor . . .

Teaching and learning resources for the 7th edition

New for the seventh edition

Our users have been, as usual, very generous in answering our questions as to how we can improve the book. Our research for the 7th edition resulted in maintaining the successful structure of previous editions and incorporating the following key changes:

- The topic of Corporate Social Responsibility (CSR) has been emphasized further, both in the final chapter and throughout the book.
- We have further strengthened the emphasis on the idea that ‘operations management’ is relevant to every functional area of the organization.
- The ‘Operations in Practice’ that are used to introduce the topic at the beginning of each chapter and the ‘Short case’ sections have been substantially refreshed.
- New ideas in operations management have been included in order to keep the text up to date with

the latest trends while retaining its emphasis on the foundations of the subject.

- Several of the cases at the end of the chapter are new (but the old ones are still available on the website), and provide an up-to-date selection of operations issues.
- The book has been visually redesigned to aid learning.

Instructor’s resources

A completely new instructor’s manual is available to lecturers adopting this textbook, together with PowerPoint presentations for each chapter and a Testbank of assessment questions. Visit www.pearsoned.co.uk/slack to access these.

Most importantly, a new set of online resources to enable students to check their understanding, practise key techniques and improve their problem-solving skills now accompanies the book. Please see below for details of MyOMLab.

MyOMLab

The key to greater understanding and better grades in Operations Management!

MyOMLab for instructors

MyOMLab is designed to save you time in preparing and delivering assignments and assessments for your course, and to enable your students to study independently and at their own pace. Using MyOMLab, you can take advantage of:

- A wide range of engaging resources, including PowerPoint slides and video.
- Hundreds of self-assessment questions, including algorithmically-generated quantitative values which generate a different problem every time.
- A Homework feature, allowing you to assign work for your students to prepare for your next class or seminar.
- A Gradebook which tracks students’ performance on sample tests as well as assessments of your own design.

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To the Student . . .

Making the most of this book

All academic textbooks in business management are, to some extent, simplifications of the messy reality which is actual organizational life. Any book has to separate topics, in order to study them, which in reality are closely related. For example, technology choice impacts on job design which in turn impacts on quality control; yet we have treated these topics individually. The first hint therefore in using this book 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. But because each part has an introductory chapter, those students who wish to start with a brief 'overview' of the subject may wish first to study Chapters 1, 4, 10 and 18 and the chapter summaries of selected chapters. The same applies to revision – study the introductory chapters and summary answers to key questions.

The book makes full use of the many practical examples and illustrations which 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 which you can observe every day. Whenever you use a shop, eat a meal in a restaurant, borrow a book from the library or ride on public transport, consider the operations management issues of all the operations for which you are a customer.

The case exercises and study activities are there to provide an opportunity for you to think further about the ideas discussed in the chapters. Study activities can be used to test out your understanding of the specific points and issues discussed in the chapter and discuss them as a group, if you choose. If you cannot answer these you should revisit the relevant parts of the chapter. The case exercises at the end of each chapter will require some more thought. Use the questions at the end of each case exercise to guide you through the logic of analysing the issue treated in the case. When you have done this individually, try to discuss your analysis with other course members. Most important of all, every time you analyse one of the case exercises (or any other case or example in operations management), start off your analysis with the 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?

MyOMLab

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MyOMLab has been developed to help students make the most of their studies in operations management. Visit MyOMLab at www.myomlab.com to find valuable teaching and learning material including:

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- Video clips and short cases to illustrate operations management in action.
- Questions that are mapped to learning objectives (rather than just to chapters).

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:

Step 1 Practise, practise, practise. Use the Key questions and the Problems and applications to check your understanding. Use the Study plan feature in MyOMLab and practise to master the topics which you find difficult.

Step 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 the chapter. You can also use the revision pod casts on MyOMLab.

Step 3 Remember to use both **quantitative and qualitative analysis**. You'll get more credit for appropriately mixing your methods: 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 book, and the exercises on MyOMLab, incorporate qualitative and quantitative material.

Step 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 Short cases, Case studies, and Operations in practice pieces in the book.

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

Step 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 'hole in the wall' of your bank's ATM machines? Use the videos on MyOMLab to look further at operations in practice.

Step 7 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 Summary at the end of each chapter to get you started.

Step 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 MyOMLab to find out where you need to improve.
- (b) Second, show that you know how to illustrate and apply the topic. The Short cases, Case studies and 'Operations in practice' sections, combined with those on MyOMLab, give you hundreds of different examples.
- (c) Third, show that you can discuss and analyse the issues critically. Use the Critical commentaries within the text to understand some of the 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!

Step 9 Remember not only **what** the issue is about, but also **understand why!** Read the text and apply your knowledge on MyOMLab 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.

Step 10 Start now! Don't wait until two weeks before an assignment is due. Log on (www.myomlab.com), read on, and GOOD LUCK!

*Nigel Slack
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Robert Johnston*

About the authors

Nigel Slack is the Professor of Operations Management and Strategy at Warwick 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 and papers in the operations management area, including *The Manufacturing Advantage*, published by Mercury Business Books, 1991, and *Making Management Decisions* (with Steve Cooke), 1991, published by Prentice Hall, *Service Superiority* (with Robert Johnston), published in 1993 by EUROMA and *Cases in Operations Management* (with Robert Johnston, Alan Harrison, Stuart Chambers and Christine Harland) third edition published by Financial Times Prentice Hall in 2003, *The Blackwell Encyclopedic Dictionary of Operations Management* (with Michael Lewis) published by Blackwell in 2005, *Operations Strategy* together with Michael Lewis, the third edition published by Financial Times Prentice Hall in 2011 and *Perspectives in Operations Management (Volumes I to IV)* also with Michael Lewis, published by Routledge in 2003, *Operations and Process Management*, with Alistair Brandon-Jones, Robert Johnston and Alan Betts, now in its 3rd edition, 2012. He 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 is a Reader in Operations and Supply Management at Manchester Business School, Visiting Research Fellow at the University of Bath, and Visiting Lecturer at Warwick Medical School. Prior to his move, he was a Senior Lecturer (Associate Professor) and Lecturer (Assistant

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Robert Johnston was Professor of Operations Management at Warwick Business School and its Deputy Dean. He was the founding editor of the *International Journal of Service Industry Management* and he also served on the editorial board of the *Journal of Operations Management* and the *International Journal of Tourism and Hospitality Research*. He was the author of the market leading text, *Service Operations Management* (with Graham Clark), now in its 4th edition (2012), published by Financial Times Prentice Hall. Before moving to academia Dr Johnston held several line management and senior management posts in a number of service organizations in both the public and private sectors. As a specialist in service operations, his research interests included service design, service recovery, performance measurement and service quality. He was the author or co-author of many books, as well as chapters in other texts, numerous papers and case studies.

We very much regret that our friend and colleague Bob Johnston passed away shortly after the manuscript for this edition was completed. He will be greatly missed by all his many friends, colleagues and students.

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*Nigel Slack
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Tables

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