The operations management function

WHY IS IT IMPORTANT
An operations system is used to transform inputs into outputs. In a chocolate factory, this means using labour and raw resources, such as cocoa beans, to make chocolate. The Mars chocolate factory in Ballarat manufactures well-known brands including Mars and Snickers bars, Maltesers and M&Ms, and the plant has the capacity to produce 1 million Mars bars in just 8 hours. Mars Australia sources its cocoa beans from Rainforest Alliance certified farms. Most of the process of chocolate making is automated (done by machines) — just picture huge vats of melting chocolate and caramel with lots of workers in white coats. When you learn about operations management in this chapter, you will be studying how large-scale organisations actually make their product or service and the processes they use to optimise production.

WHAT YOU WILL LEARN

KEY KNOWLEDGE
Use each of the points below from the Business Management study design as a heading in your summary notes.

THE OPERATIONS MANAGEMENT FUNCTION

- Ethical and socially responsible management of an operations system
- The operations function and its relationship to business objectives and business strategy
- Strategies adopted to optimise operations, including:
  - facilities design and layout
  - materials management
  - management of quality
  - extent of the use of technology
- Characteristics of operations management within large-scale manufacturing and service organisations
- Productivity and business competitiveness, their importance for and impact on the operations system
- Key elements of an operations system (inputs, processes and outputs) in different types of large-scale organisations

KEY SKILLS
These are the skills you need to demonstrate. Can you demonstrate these skills?

- accurately use relevant management terms
- research aspects of operations management using print and online sources
- analyse business information and data
- apply operations management knowledge and concepts to practical and/or simulated situations
- discuss key aspects of operations management
- analyse strategies that arise through practices within operations management.
The operations management function • CHAPTER 3  99

Toyota’s operations system

Operations is the part of the business that ‘gets the job done’. At Toyota, that means producing more than 100,000 cars each year, two-thirds of which are exported. The process of producing the Camry at Toyota’s manufacturing plant in Altona is similar to producing a cake (or any other product for that matter). You need inputs (resources used in the production process, such as labour and raw materials). The next step is to transform those raw materials into output (finished products). Many of the components used to build an engine, such as pistons and cylinder head covers, are produced in-house by Toyota. Some parts are sourced from local suppliers. What else is needed to make a car? Lots of steel panels that are welded, painted and undergo a multitude of processes to finally reach the 250-metre long assembly line.

Operations is not just about making products or producing services though. Many organisations strive to produce the best product or service on the market. Toyota uses the concept of continuous improvement to do this (referred to in Japanese as kaizen). This means that all company activities — from the assembly line to customer service — are continually scrutinised, so that new and better ways of doing things are introduced if needed.

Just in time (JIT) production is also used at Toyota. This means that the right parts and materials are manufactured and provided in the exact amount needed, and when needed. The number of cars produced is directly related to customer demand.

Toyota uses technology to its advantage. For example, the welding involved to make the shell of a car involves 250 welding processes and 526 parts. Robots do 105 of the welding jobs and the remainder are carried out by workers on both night and day shifts. Toyota says they are automated, but ‘with a human touch’.

Welding on the assembly line at Toyota. Toyota is credited widely for its high quality, low cost, short lead time and flexible production system.

• Operations is not just about making products or producing services.
3.1 The operations function and its relationship to business objectives and business strategy

**KEY CONCEPTS**

Operations management is about producing goods and/or services based on business objectives.

Large-scale manufacturing and service organisations differ in their operations systems.

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Operations management consists of all the activities in which managers engage to produce goods or services.

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Operations management is the responsibility of managers engaged to produce goods or services. It is concerned with creating, operating and controlling a transformational process that takes inputs from a variety of resources and produces outputs of goods and services, to satisfy customer demand. When you buy a loaf of bread, for example, the bakery will have undertaken a number of processes — from buying the ingredients, to mixing and blending them, baking and wrapping the finished loaves and, finally, delivering the loaves to the retail outlets.

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Australia’s leading bathroom manufacturer, Caroma, uses automated robots in its production process to spray finish glaze onto various bathroom products. In its 60 years of manufacturing, Caroma has accomplished many world firsts. It is best known for creating the world’s first dual flush toilet suite.

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**DID YOU KNOW?**

Businesses can become more competitive by looking at their production processes. For example, the ‘better mango project’ identified why so many mangoes were arriving at retail outlets bruised or overripe. Better handling techniques and temperature control have resulted in more consistent fruit quality and better profits.

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The core objective of all organisations is to efficiently produce goods or services. Operations management is the strategy used to achieve this objective. Operations management, therefore, is at the heart of the success of all organisations. Production involves the skilful bringing together of a number of resources, such as finance, equipment, management, technology and people, to create finished goods and services through a series of operations. The nature and type of operations vary considerably from one type of goods or services to another. However, how the operations management function is carried out will directly affect an organisation’s competitive position, because it will:

- establish the level of quality of the goods or services
- influence the overall cost of production, given that the operations function is responsible for the largest part of an organisation’s capital and human expenses
- determine whether sufficient products are available to satisfy consumer demand.

The operations management function has a considerable influence on the quality, cost and availability of an organisation’s goods or services. These, in turn, have a direct bearing on whether the organisation achieves its other main objectives — specifically, to increase profitability, to increase market share, to provide a reasonable return for investors or to contribute to the wellbeing of the community.
Characteristics of operations management within large-scale manufacturing and service organisations

Operations management differs from other forms of organisational management, because it applies specifically to the management of the productive or transformational process.

Coordinating this process is a management activity. It is important to note, however, that operations managers should no longer be considered as simply engineers of a manufacturing process (production managers), as was the case before the 1970s. Today, operations managers carry out a wide range of tasks.

Interview with an operations manager

Matthew Arblaster: Production supervisor  
Company: Bayer MaterialScience  
Qualifications: Bachelor of Engineering Certificate 4 in Accounting, Diploma in Management

I am responsible for the production department of the Australian site of Bayer MaterialScience. In this role my biggest and most challenging task is to mentor the production and maintenance teams to ensure we have a culture of safety, quality and efficiency. This involves me working with and developing team leaders and operators so that they can make the correct decisions and build on their knowledge to ensure the plant runs smoothly. I run and coordinate training days for the teams to align and develop skills and aim to create a development culture.

As well as this I help production operators and maintainers solve problems and address any critical issues that may arise. Another key responsibility is to work with scheduling to coordinate future production and develop new products. I also need to ensure that I am ‘on top’ of what happens at the 24hr plant to ensure production runs according to plan... put things back on track when things go array.

Other parts of my role involve being the global leader for efficiency, which involves coordinating the shared knowledge with my global counterparts to ensure we learn from each other and deliver best practices.

In the whole manufacturing industry we are all doing more and more with less, but it’s about finding simple ways to complete the new tasks which is easier said than... in the end it’s about questioning at the core of a task what function does this do and how do we do this simply.

Higher cost pressures are a problem for everyone in manufacturing around the world and we are expected to do more with less. Through building a strong base of skill and flexibility in our teams and thinking long term with our equipment we can be competitive.

Source: Adapted from 2013, Manufacturers’ Monthly Q&A series, 2 May

DID YOU KNOW?

In 1913, Henry Ford developed an approach to car assembly that involved a chassis moving down an assembly line on a conveyor belt. A small team of workers would move with the car, fitting the various components that had been carefully set out along the production line. The end result was a reduction of the hours spent on the assembly of a car, from 728 to just 1.5.
3.1 The operations function and its relationship to business objectives and business strategy

Tangible and intangible products

A manufacturer will transform inputs into tangible products. **Tangibles** are physical products that can be handled and stored before they are sold to the consumer, such as bread, clothing or a car. The production process and consumption are not linked. That is, there is little customer involvement in production.

A service organisation will transform inputs into services. Services are **intangible**, which means that they cannot be touched. For example, if you attend a training course, you cannot physically touch it, but you benefit from gaining knowledge and learning new skills. Services cannot be stored and the customer may actually need to be present when the service is being delivered. For example, the customer must be present when receiving a haircut.

In reality, many LSOs today produce a combination of both manufactured goods and services. Products such as cars or electronic equipment often come with a warranty and other services. When a customer enters a contract with an Internet provider, they will receive a service (their broadband connection), a modem and other goods necessary to enable the connection.

Role of the operations manager in senior management

**DID YOU KNOW?**

An operations manager can select strategies from four areas to achieve optimal operations: facilities design and layout, materials management, management of quality and use of technology.

The operations manager is part of the senior management team. A large-scale organisation will most likely have many managers under the operations manager, such as the production manager, warehouse manager and quality manager.
Regardless of whether an organisation manufactures a product or produces a service, most large-scale organisations will have an operations function or department. Sometimes, it may be referred to by other names, such as production or supply. The strategies that the operations function uses will differ according to whether the organisation manufactures a product or provides a service. A bank, for example, would not be as concerned with the management of materials as a car manufacturer would be.

The operations manager, like any other manager, uses the four management roles discussed in chapter 2. The operations manager may, for example, lead the way by investigating the purchase of new state-of-the-art machinery that will complement the operation rather than compete with the need for labour, therefore cutting production costs. Before purchasing new machinery the manager must plan, determining objectives for the operations and how they will be achieved (in this case, by purchasing new equipment) and organise staff to facilitate the process of installing new equipment. Once the new machinery is installed the operations manager may control the quality of the product by monitoring the production run and inspecting the product to ensure it meets standards.

**TEST your understanding**

1. What is the difference between an input and an output?
2. ‘Operations management is the part of the business that actually gets the job done.’ Demonstrate this concept on a smaller scale by describing the materials you would need and the process you would undertake to bake a cake (your finished product).
3. Outline some of the tasks that Matthew Arblaster carries out as production supervisor.
4. Explain the main differences between goods and services.
5. Contrast the main characteristics of a manufacturer with those of a service organisation.
6. Why do modern large-scale organisations combine goods and services?
7. What is the role of an operations manager?

**APPLY your understanding**

8. One strategy to produce goods more quickly is to use better technology. For example, using a hand beater to mix a cake batter might not be as efficient as using an electric beater. Fill in the following table and list some strategies that an operations manager might use to achieve the listed business objectives. The first entry has been completed for you.

<table>
<thead>
<tr>
<th>Business objective</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase the quality of service provided</td>
<td>Introduce quality management</td>
</tr>
<tr>
<td>Increase the quality of the product</td>
<td></td>
</tr>
<tr>
<td>Reduce production costs</td>
<td></td>
</tr>
<tr>
<td>Contribute to the wellbeing of the community</td>
<td></td>
</tr>
<tr>
<td>Increase profitability</td>
<td></td>
</tr>
</tbody>
</table>

9. Pick one large-scale organisation like BHP Billiton or Coles Group Limited (part of Wesfarmers), and list at least three of their business objectives. This information can be found on their website, in their annual report or in speeches made by the company CEO. For each objective, state what strategies the operations manager might employ to help achieve the objective at the operational level.

10. Give two examples of how an operations manager of a manufacturing plant that produces confectionery might use the roles of organising and controlling in his or her daily job.

11. Use the Internet, or look at the employment section of the newspaper, to find a job advertisement for an operations manager (sometimes called a factory manager). The advertisement will most probably list responsibilities involved in the position. Categorise these responsibilities into the four POLC management roles (planning, organising, leading and controlling).
**KEY CONCEPT**

There is a relationship between business objectives and operations.

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**Woolworths improves operations**

Woolworths Limited is a retail company that owns brands such as Big W and Masters as well as Woolworths supermarkets. It is probably a business that you come into contact with in some way, almost every day. Woolworths serves millions of customers, selling food and groceries, liquor, petrol, general merchandise home improvement products and hotel services.

Like many large-scale organisations (LSOs), Woolworths' focus is on improving the efficiency of its business. Efficiency refers to how well an LSO uses resources to achieve its objectives; for example, reducing costs or time used during production.

**Project Refresh**

Former CEO of Woolworths, Roger Corbett, led an efficiency drive in 1999. He questioned how a business that sells products to customers every day, and replenishes its stores regularly, could run out of supplies in its stores yet still have almost two months' worth of stock in its distribution networks.

It was found that processes in the stores and systems that did not communicate the required information were to blame. These were not the only problems that were singled out for improvement in what was known as ‘Project Refresh’ at Woolworths. The business also focused on:

- allowing consumers to dictate what they wanted
- developing the skills of staff
- redesigning the organisational structure of the business
- making improvements to the cost of doing business
- ensuring IT systems were consumer focused.

The success of Project Refresh is renowned and the cost savings were put to good use. Woolworths continues to take advantage of the concept known as ‘double looping’, where cost savings are used to lower prices. This in turn leads to higher sales, increased market share and higher returns for shareholders.

**Project Quantum**

Woolworths commenced a new project called Quantum in 2010. The objective of the program was to reduce costs and improve efficiencies across Woolworths, including its supply chain, procurement (the acquisition of goods at the best possible cost from suppliers), work practices, direct sourcing from global suppliers and support structures. These initiatives followed on from the successes of Project Refresh. Woolworths continues to build on the Quantum project.

**Improved supply chain management**

Woolworths’ supply chain has been under the microscope for several years now, as the company searches for new and more efficient ways to do business. A supply chain (sometimes called a logistics network) includes suppliers, wholesalers, production and distribution, through to the customer — all those links in the chain that help turn inputs into finished products. If you think about the supply chain at Woolworths, processes and systems will be required to:

- replenish stock on the shelves of their retail outlets
- replenish stock available at their warehouses (called distribution centres)
- deliver stock to their retail outlets.

A faster supply chain delivering fresher food with a longer shelf life to Woolworths stores contributed to lower costs in the 2012/13 financial year. This resulted in a reduction in prices and supported the ‘More Savings Every Day’ marketing campaign. Higher food and liquor sales of $40 billion in Australia led to profit growth.

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**DID YOU KNOW?**

Reducing costs and caring for the environment is a win–win situation. Woolworths launched a tracking system for finding the thousands of trolleys that go ‘feral’ each year. The Trolley Tracker system targets the 15,000 shopping trolleys that go missing from Woolworths and Big W stores nationally each year. Abandoned trolleys cost the company $50 million each year; it costs more than $150 to replace a broken or lost trolley. Dumped shopping trolleys damage the environment; they end up in creeks and backyards. Residents who see abandoned trolleys can call a national toll-free number, and enter a draw to win a $1000 monthly reward.

‘A faster supply chain delivering fresher food . . . contributed to lower costs . . . ’

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**EXTEND YOUR KNOWLEDGE:** The operations function and business objectives
Utilising technology to increase efficiency

Woolworths makes use of technology in its huge distribution centres. Distribution centres store products before they are transported to retail outlets. To increase efficiency, an IT system called StockSmart forecasts when stock needs to be replenished. Staff also use handheld devices or forklift-mounted terminals to receive instructions on what goods in the warehouse need to be located and then transported to a particular Woolworths supermarket. The technology will actually direct the worker to the desired pallet of goods. Woolworths’ efficient transport management system (TMS) supports the movement of products into distribution centres and out to retail stores, providing reporting on transport performance.

Furthermore, Woolworths stores use IT to improve efficiency. A system called AutoStockR is used to forecast when supermarket shelves need to be replenished with stock.

Further improvement

In its 2013 annual report, Woolworths noted that it still needs to focus on improving its world-class supply chain and replenishment across the business. Woolworths believes that continued productivity improvement programs will continue to reduce costs in to the future.

TEST your understanding

1. What is a supply chain?
2. How did Woolworths use technology to improve its supply chain?
3. When a company reduces its costs, it increases its profit. Sometimes, profit is offered to shareholders in the form of a dividend; sometimes, it is used to further expand the business. Explain what Woolworths does with its cost savings (emphasising the concept of the ‘double loop’).

EXTEND your understanding

4. Efficiency was Woolworths’ business objective. Explain three strategies used in operations at Woolworths to achieve this objective.
5. Think of a time when you purchased a product that was of poor quality (for example, the item did not last as long as expected or it did not work as expected) or came with poor service (for example, it took too long for coffee to arrive or you were stranded at the checkout for 10 minutes waiting to be served). Explain what could have been the reasons behind the poor quality product or service. Discuss strategies that could be used at the operational level to improve the product or the delivery of the service.
6. An efficient operations system should contribute to an organisation achieving its objectives. For a company, that means profit. Shareholders benefit from this by being paid dividends (part of the company’s profits). If the company’s share price rises, they can make a capital gain (if they sell their shares). Good company performance is just one factor in a company’s share price performance, but it is an important one. The following table lists the closing share price (closing means the last price the shares sold for at the end of the day’s trading) for Woolworths’ shares on 30 June of 2004, 2007, 2010 and 2014.

(a) Find the most recent closing share price for Woolworths’ shares and draw a line graph of Woolworths’ performance.
(b) If you had purchased shares in 2004, would you think your investment has performed well? Use the Woolworths shares weblink in your eBookPLUS to find out about Woolworths’ operations.

<table>
<thead>
<tr>
<th>Date</th>
<th>Closing share price for Woolworths (code WOW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 June 2004</td>
<td>$11.40</td>
</tr>
<tr>
<td>30 June 2007</td>
<td>$33.99</td>
</tr>
<tr>
<td>30 June 2010</td>
<td>$27.02</td>
</tr>
<tr>
<td>30 June 2014</td>
<td>$35.22</td>
</tr>
</tbody>
</table>

7. In the Australian supermarket sector, Coles is Woolworths’ biggest competitor. Wesfarmers acquired Coles in 2007. Use the Coles weblink in your eBookPLUS to locate its latest annual report. List at least two of Coles’ objectives and the operations strategies used to achieve those objectives.
3.2 Key elements of an operations system in large-scale organisations

**KEY CONCEPTS**
The elements of an operations system are inputs, transformation processes and outputs.
The operations system used in a manufacturing organisation will be different to the operations system used in a service organisation.

## Inputs

Inputs are the resources used in the process of production. Some resources are owned by the organisation, while others are from suppliers. There are six categories of inputs:

1. **Materials** includes raw materials, components and parts consumed or converted by the transformation process.
2. **Capital equipment** includes the plant, machinery, equipment and property necessary to conduct operations.
3. **Labour** refers to people involved in the operations function.
4. **Information from a variety of sources** contributes to the transformation process. Organisations do not always account for the value of this resource, because it cannot be easily quantified as a business asset.
5. **Time** and its efficient use are critical to all organisations. Coordinating resources within appropriate time frames limits costs and wastage. Operational planning may involve achieving production tasks ranging in duration from one year to merely hours.
6. **Money** is generally considered to be the most flexible of all resources, because it can easily be converted into any quantity or combination of materials, capital or labour.

Inputs differ between manufacturing organisations and service organisations. Manufacturers tend to make more use of capital equipment and materials and use less labour and information. A hospital is an example of an organisation that provides medical services. The inputs to provide these services involve medical equipment and products such as tape, injections, sheets, towels and hand-wash solutions. Labour, in the form of medical supervision by nurses and doctors, is also required. For a service provider such as a hospital, information is a very important input. For example, information about medical practices and patients are combined with the other inputs in the transformation process to improve patient health.

In a hospital the inputs include labour, such as the doctors and nurses who work there, the equipment and materials they use to care for patients, as well as the hospital facilities themselves.
Processes/Transformation

The main concept of operations management is transformation — conversion of inputs (resources) into outputs (goods or services). Sony, for example, takes plastic, metal, glass and electronic parts, and transforms them through design, manufacturing and assembly into numerous electronic products.

The term 'transformation' implies physical changes, but, today, it also includes the conversion of resources into services. Your school takes its main inputs — students, the syllabus, staff and buildings — and produces educated, employable graduates.

It is important to understand that the transformation process differs between manufacturing organisations and service organisations. A manufacturer transforms inputs into tangible products (goods which can be touched). A service organisation transforms inputs into intangible products (services which cannot be touched). The operations system of a manufacturer tends to be highly automated or mechanised. Manufacturers use machinery, robots and computers to transform inputs into outputs. Service providers rely heavily on interaction with the customer and their processes tend to be more labour-intensive; that is, staff are crucial to the operations.

The transformation process involves using resources to produce the final goods or services. Many LSOs continually work to improve the way they transform resources into finished products or services.
3.2 Key elements of an operations system in large-scale organisations

**Outputs**

Essentially, outputs are the result of an organisation's efforts — the final good or service that is delivered or provided to the consumer. Goods tend to be homogenous, which means that they are basically all the same or similar. Services tend to be differentiated, that is, they are provided to individual customers and are modified to suit each customer.

So far, we have drawn a distinction between service and manufacturing operations, but, in many cases, organisations carry out both types of operation. Toyota Australia, for example, separates its vehicle manufacturing operation from its customer service operation, although both elements are critical to the organisation's overall success. All organisations carry out many activities that can be isolated from direct involvement with the customer. Insurance companies employ mathematicians called actuaries who use formulas to determine risk and probability in setting the level of insurance premiums. Actuaries never deal directly with the public, but are instrumental in forming parameters or boundaries in which operations will occur.

A car is an output that requires many individual processes. There may be several thousand inputs, such as nuts and bolts, supplied by hundreds of businesses.

An operations system for a manufacturing company producing building products

**Inputs**

- **Raw materials** — water, steel and electricity
- **Capital equipment** — factories, trucks, forklifts and tools
- **Labour** — process workers, storepersons, drivers, machinery operators, labourers
- **Information** — the use of advances in technology and research
- **Time**
- **Money**

**Transformation process**

- **Design**
- **Manufacturing**
- **Quality control**

**Output**

Building product

An operations system for a bank

**Inputs**

- **Raw materials** — computer software and paper
- **Capital equipment** — security screens, computers, safes and office furniture
- **Labour** — tellers, mobile lenders, managers and lawyers
- **Information** — provided by market research companies to assist in product design and delivery
- **Time**
- **Money**

**Transformation process**

- **Investment advice**
- **Ensuring good customer service**
- **Ensuring the computer systems work**
- **Establishing banking systems and procedures**

**Output**

Delivery of financial services to customer
The operations manager must be able to link transformation processes to the activities performed by other areas of the organisation. Output must always be responsive to customer demands. Issues of quality, efficiency and flexibility must be balanced against the resources and strategic plan of the organisation. See page 119 for how Hallmark cards improved its operations and therefore its sales.

A delicate balancing act

**TEST your understanding**

1. Identify three key elements of an operations system.
2. Distinguish between ‘input’, ‘process’ and ‘output’.
3. Using the process of completing homework as an example, draw a diagram that describes the operations component (that is, the transformation from no homework done to all homework completed).
4. Identify the inputs, processes and outputs of the following organisations:
   (a) Coles supermarkets
   (b) Four ‘n’ Twenty pies
   (c) RACV.
5. Miriam’s Interior Decorating Service is a business specialising in home redecorating. Outline the range of operations activities offered in such a business.
6. Are the following definitions true or false? If the definition is false, write out the correct definition.
   A. Operations management involves planning, organising and controlling activities required to produce goods or services.
   B. An operations system refers to the machinery involved in producing the product.
7. Construct a mind map to illustrate the six categories of inputs. The mind map at right has been started for you.

**APPLY your understanding**

8. The Rio Tinto Group is an international mining company. Rio Tinto finds, mines and processes mineral resources, which are then converted to products such as coal, copper, gold and silver. Use the Rio Tinto weblink in your eBookPLUS to identify the inputs, transformation processes and outputs that Rio Tinto would use to produce its products.
9. Monash Health provides health services through major hospitals and community health facilities across south-eastern Melbourne. Use the Monash Health weblink in your eBookPLUS to identify the inputs, transformation processes and outputs that Monash Health would use to provide its services.
3.3 Operations, productivity and business competitiveness

**KEY CONCEPT** Productivity and competitiveness can be improved when operations reduces costs, improves quality and delivers goods and services on time.

Patties Foods manufactures products of well-known brands, including Four’n Twenty pies, Nanna’s frozen desserts and Herbert Adams pastry. Its plant in Bairnsdale produces 21,000 pies an hour. While that number sounds impressive, we all know that the measure of a winning product is not just about the quantity. Patties Foods remains competitive in the market, because it is committed to producing quality products at low cost, with high productivity levels.

Let’s take a look at what the terms *productivity* and ‘*business competitiveness*’ mean. Productivity measures the amount of output compared to the amount of inputs that go into production — it is a measure of efficiency. Productivity can be improved by reducing the amount of input required to obtain the same level of output or increased output. Alternatively, productivity may rise if input remains the same but output increases, therefore getting more out of the input.

Productivity may be improved by producing more outputs from the same input or by reducing the level of inputs for the same output.

Organisations can improve productivity in several ways. Improved communication between management and employees can boost production. Management styles (see chapter 2, p. 70) that involve the employee in the decision-making process can increase worker productivity, as can human resources strategies such as recognition and reward programs aimed at improving worker motivation (see chapter 6). Automating work processes to reduce the labour required to perform a task and increase production levels is also a strategy used in many large-scale organisations. The use of robots in car manufacturing plants is now commonplace. Improving the design and layout of facilities in a workplace can also enhance productivity levels (see p. 114).
In this way, improving productivity will impact on operations. Organisations that can improve productivity will become more competitive, because they are able to produce more outputs at lower cost. ‘Business competitiveness’ refers to the ability of an organisation to sell products in a market. Competitive advantage occurs when an organisation is able to produce goods or services better than its competitors. Organisations essentially compete in two ways:

1. cost — providing customers with lower priced goods or services
2. differentiation — providing customers with superior value in terms of service (flexibility, speed, quality) or added features compared to lower priced competitors.

**Areas of operational competitiveness**

The operations strategy adopted by an organisation will be impacted by decisions relating to the organisation’s productivity, competitive advantage and competitive scope. This strategy should provide a vision to unite all areas of the organisation and ensure consistency in decision making.

**Competing on cost**

Most of us have heard about companies that have tried to reduce costs by outsourcing or cutting staff. In 2007, Tasmanian footwear manufacturer Blundstone outsourced its manufacturing operations to Asia. The company was forced to move their manufacturing operations, because costs were too high in Australia. You’ve also probably seen workers leaving a factory after being told the company is reducing staff or closing down part of its operations. Blundstone’s decision resulted in more than 300 job losses in Australia.

Instead of outsourcing part of its operations, Patties Foods remain viable and competitive by increasing the production capacity of their facility. This is often referred to as achieving economies of scale, which also means finding the right sized operation with the cheapest cost. For many organisations, reducing costs is a matter of working ‘smarter’ by finding new and improved ways to produce products efficiently. Patties has also invested millions of dollars in automated equipment. There are many ways an organisation can reduce costs, as you can see from the diagram on the next page.

**DID YOU KNOW?**

In his bestseller Competitive Advantage, Michael E Porter suggested that a business must choose between competing on cost or differentiation, and then choose between one of two types of competitive scope. Competitive scope refers to the range over which the business intends to compete. This range may include the number of countries, markets, industries or customers that the business services. Competitive scope, therefore, may be narrow (a small number of countries, markets or customers) or broad (a large number of countries, markets or customers).

**DID YOU KNOW?**

The iconic Four’n Twenty brand was purchased by the US company Simplot in 1995. Eight years later, Simplot sold Four’n Twenty pies back to an Australian company when Patties Foods purchased the brand. Simplot wanted to leave the pie market because it believed that it was unhealthy and unprofitable.

Cost per unit can sometimes fall as output increases.
Operational managers in organisations that compete on cost prioritise their decision making based on reducing costs and improving productivity by:
- ensuring stable production processes with limited interruption
- ensuring all resources are used to their optimum advantage
- constantly looking for opportunities to streamline production processes
- updating facilities and equipment with new, more efficient technology
- providing training and development to improve the skills and capabilities of employees.

Competing on quality

Many organisations compete on quality — that means that they aim to produce the best product or service available in the marketplace. Patties Foods is a company that is known for its emphasis on quality. According to Patties Foods’ guiding principle, they ‘only use the best quality ingredients available that represent good value for the consumer. From our state-of-the-art production facility at Bairnsdale, in regional Victoria, we make quality food in keeping with our company commitments.’ One of the ways that it does this is by listening to the needs of customers and responding to those needs and by dealing with reputable suppliers who meet strict quality standards.

There are several ways an organisation can compete on quality, as you can see from the diagram.

In organisations that compete on quality, operational managers make decisions based on ensuring strict application of total quality management (TQM) (see page 125) approaches by:
- evaluating processes to ensure minimal defect rates
- reducing human variables
- relying on extensive use of integrated technology and computerisation
- building strong links with the customer.
Competing on speed of delivery

Organisations can also compete on speed of delivery.

WAYS ORGANISATIONS CAN COMPETE ON SPEED OF DELIVERY

- Maintain a corporate culture expecting ongoing and radical change
- Promote a sense of urgency within the organisation
- Have flatter management structures
- Reduce the problems associated with bureaucracy
- Respond quickly to changes in demand
- Identify and act on trends quickly

In organisations that compete on speed of delivery, operational managers make decisions based on ensuring faster transformation processes by:
- creating autonomous work teams
- establishing supply chains which work efficiently between the supplier and the organisation
- developing faster feedback mechanisms
- adapting the transformation process to reflect the necessity for constant change.

<table>
<thead>
<tr>
<th>Bakery</th>
<th>Input (employees)</th>
<th>Daily output (loaves of bread)</th>
<th>Labour productivity (loaves per day/employee)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>80</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>10</td>
<td>700</td>
<td></td>
</tr>
</tbody>
</table>

**TEST your understanding**

1. What is the link between productivity and an organisation’s operations?
2. Explain the relationship between productivity and business competitiveness.
3. Identify three ways in which a manufacturing organisation could improve productivity.
4. Identify three ways in which a service organisation could improve productivity.
5. What strategies can a sporting team implement to give it a competitive advantage over other teams?
6. Explain what it means to compete on:
   (a) cost
   (b) quality
   (c) speed of delivery.

**APPLY your understanding**

7. (a) Productivity can be calculated by using the formula
   \[ \text{Productivity} = \frac{\text{Output}}{\text{Input}} \]
   Calculate the labour productivity (output per employee) of bakeries A–D in the table opposite.
   (b) Working in groups of three or four, suggest why:
      (i) bakery D’s labour productivity is so high
      (ii) bakery C’s labour productivity is so low.

8. Working in groups of three or four, identify organisations that compete on:
   (a) cost
   (b) quality
   (c) speed of delivery.

9. Research why it can be easier to increase productivity in a manufacturing organisation than in a service organisation.

10. Explain why competitiveness plays such a significant role in the management of operations. In your answer, refer to:
    (a) productivity
    (b) competitive advantage
    (c) cost minimisation.
Key Concepts

Facilities design and layout is used by operations managers to optimise operations. Management of the facility design and layout involves planning the layout of workspace, so that production will flow smoothly and efficiently.

Imagine that you are a manager at a McDonald’s store where the equipment is all over the place. There is mess and clutter everywhere, and productivity is low. It would be difficult to optimise operations in this situation. The fact is, management at McDonald’s has spent a great deal of time planning the layout of workspace to make sure that production of chips and hamburgers is streamlined; that it flows smoothly, efficiently and quickly. The seating, the drive-through window, the play area and the arrangement of equipment and technology in the kitchen are all part of McDonald’s facilities design and layout strategy.

Facilities or plants that are arranged in order will achieve the highest levels of efficiency in production. The best layout will optimise operations; that is, it will result in improved productivity, satisfied customers and deadlines being met.

When choosing the best layout, an operations manager needs to consider whether or not there is:
- enough physical space for the anticipated volume of production
- effective use of production equipment and technology
- an adequate location of stock and warehousing requirements
- an efficient flow of the goods or services through the system
- conformity with legal regulations (such as site and building constraints and occupational health and safety standards).

There are many ways in which the physical layout of the facilities can be organised. The method adopted by the operations manager will depend on the type of operations conducted by the organisation.

Manufacturing layouts

The first two layouts discussed apply specifically to manufacturing.

Fixed position layout

Fixed position layout is used for big project production. This deals with large-scale, bulky activities such as the construction of bridges, ships, aircraft or buildings. With fixed position layout, it is more efficient to bring materials to the site; workers and equipment come to the one work area. This layout is used when it would be too difficult to move the product. One disadvantage of the layout is storage — materials needs change constantly, and it can be hard to find space to store them safely.
Product layout
In a product layout, machinery and equipment are arranged in line and components are added to the product in a sequence of steps. A motor vehicle being produced on an assembly line is an example of this type of layout. It is best suited to the manufacture of high-volume, standardised goods. Usually, the product would move along a highly automated production line on a conveyor belt. Cost is reduced because of the use of technology, and staff only complete specialised tasks. It can, however, be very expensive to set up a capital-intensive, automated assembly line. Another disadvantage is that staff can become bored with repetitive, low-skilled activities. A problem on the production line can sometimes mean that the whole factory needs to be shut down.

An assembly line production method

Other layouts
These layouts apply to all types of organisations.

Process layout
A process layout is often referred to as a functional layout, because equipment and machinery that perform a similar function are arranged together. A process layout is best suited to organisations that deal with a variety of products. A manufacturer of sports shoes or brake pads, for example, would commonly use this type of layout. A process layout lends itself to batch production, as in the case of a bakery, where different types of breads, rolls or buns are manufactured in limited numbers. Each batch would be completed at a production stage and then would move on to another stage. In service organisations such as banks or hospitals, a process layout is used to deal with the different needs of customers. A disadvantage of this layout is that the work can be monotonous for staff, if they are involved only in one stage of the process.

A product layout deals with the manufacturing of goods in mass volume using an assembly line.

A process layout deals with high varieties of products by grouping activities, equipment and machinery of similar function together.
3.4 Facilities design and layout

A process layout often uses work cells. Rather than having the straight production line, operations and people can be arranged into cells, such as the U-shape shown in the figure. The team working on a product, or components, in this cell would be able to solve problems together as communication is improved. Productivity improves, because the whole factory does not need to be shut down if there are defects or problems in one cell — other teams can continue working on their product. Another advantage is that the product, or components, that a cell is responsible for can easily be altered or completely changed.

Retail layout

Exposure is a critical consideration to the layout of retail stores. Stores such as Kmart and Big W guide customers through departments or sections. Customers are exposed to other aisles or sections as they move from one point to another. It can be difficult to move efficiently from one part of the store to another, because barriers are established to ‘showcase’ or ‘display’ items for sale. Retailers such as Coles and Woolworths use approaches such as:

- locating high-impulse or high-margin products in prominent locations — often at the end of aisles or near checkouts
- locating ‘high-draw’ items such as bread and dairy products on opposite sides of the store
- locating ‘power items’ (high-priority items for most shopping trips) at intervals throughout a series of aisles.

DID YOU KNOW?

Imagine being able to design your own customised motor home. Talvor Motorhomes Pty Ltd, an Australian manufacturer of motor homes and campervans, improved its production process by introducing work cells in a U-shaped layout. The changes made to its manufacturing processes and workspace layout increased production by 375 per cent, and reduced assembly time by 35 per cent. Individual work cells also mean that it is possible to combine components to suit customer preferences.

Supermarkets target children with their retail layout, putting food and drinks at their eye level and within easy reach. Children are attracted by bright colours and food items they can play with — even fruit and vegetables.
Office layout

Efficient movement of information and proximity to resources (such as the photocopier, computers, printers and storage areas) are priorities for the layout of an office. Locating workstations together in departments that are required to communicate constantly may also be important. In a manufacturing organisation, the office layout is often informal and may overlook the factory floor, so managers can easily supervise. For a service provider, such as an accountant or a doctor, clients need to feel welcome, but privacy is a concern, so the layout of the office should reflect this.

An office might also need to provide a space (such as a lunch room) that enables employees to take a break from the work environment if required. Personal storage space and meeting rooms may also be required. Office layout is often open plan or in pods. With staff working closely together, a code of conduct is often adopted called ‘cubicle etiquette’. Staff that work in close proximity to each other are expected to be considerate. This means keeping noise to a minimum, keeping the work area tidy, and in some workplaces it may mean eating lunch foods in a designated area, such as a canteen.

TEST your understanding
1. Explain in your own words what is meant by the term ‘facilities design and layout’.
2. Identify the key factors that an operations manager needs to consider when determining optimal layout.
3. Outline the operations needs that influence:
   (a) fixed position layout
   (b) product layout
   (c) process layout
   (d) retail layout
   (e) office layout.
4. Analyse your school’s canteen or classroom in terms of efficiency and effectiveness of layout. What changes could you make to improve productivity and student satisfaction? Draw the new layout.
5. How would a large organisation evaluate the performance of its layout?
6. Match the following terms with their definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>fixed position layout</td>
<td>(a) a production layout that deals with high varieties of products by grouping activities, equipment and machinery of similar function together</td>
</tr>
<tr>
<td>process layout</td>
<td>(b) a production layout that deals with the manufacturing of goods in mass volume, using an assembly line</td>
</tr>
<tr>
<td>product layout</td>
<td>(c) a production layout that deals with large-scale, bulky activities</td>
</tr>
</tbody>
</table>

DID YOU KNOW?
Increasingly, office layouts are changing, so that managers are located with staff; walls and screens are disappearing. Open plan layouts contribute to more effective communication, as well as providing a positive and effective working environment for the staff.

In an open-plan office, it is good etiquette to speak softly on the phone, not make personal calls and to keep decoration to a minimum.

APPLY your understanding
7. Use the Bized weblink in your eBookPLUS to find the Virtual Factory link. Go to ‘Factory floor’ and then to ‘Production’. Complete the following tasks:
   (a) List the stages of production involved in the manufacturing of hot-air balloons.
   (b) Identify the inputs, process and outputs of the balloon factory.
   (c) What type of layout does the Cameron Balloons plant use? Give reasons for your answer.
   (d) Why would this type of layout have been chosen?
   (e) Do you think that the production of balloons is capital-intensive or labour-intensive? Explain your answer.
8. Gemma bought a fitness centre. She plans to renovate the premises and change the layout of the equipment. Advise her on the most suitable layout. Provide Gemma with a sketch of the recommended layout. You may wish to use a multimedia application.
Office layout problems

Sally was wondering whether she needed a career change. She was an editor for a large publishing company. It had not been a good start to the day, because she had tripped over a power cord that had been stuck to the carpet with masking tape. That was a shock but no real harm was done, she thought as she meandered through the maze of desks. Piles of books were lying everywhere and it was more like an obstacle course than an efficient workplace.

She turned on her computer, shielding herself from the glare. The office was supposed to be light and airy; it had lots of glass but blinds were not permitted, because they didn’t fit ‘the atmosphere’. If only her monitor was adjustable! It did look silly, but she had brought in her own sun visor to attach to the top of her monitor so that she wouldn’t have to squint all day. It would also have helped, if she had been able to adjust her chair.

Having survived her arrival in the office, Sally wrote a letter and sent it off to print. She had to walk at least 30 metres to retrieve her printout, and then it was off to the mailroom downstairs to deliver the letter. It was good to get away from the noise. In her organisation, they believed in open planning, so the office space was a sea of desks with no partitions — and that made it difficult to concentrate at the best of times. Sally didn’t know if it was a good or a bad thing, but her manager wasn’t even on the same floor as her. So, if she wanted to discuss work matters, she had to take the lift down to the next floor.

Perhaps a change of job is what I need, thought Sally, as she carefully stepped over that cord again.

Sally’s office layout can be greatly improved — where would be the best place for reception?

TEST your understanding
1. What type of layout does Sally work in?
2. Outline the priorities for this type of layout.
3. Find 10 facilities design and layout faults at Sally’s office. You may like to use a table to set out your answers.

APPLY your understanding
4. List what might be done to make the facilities design and layout more efficient.
5. Redesign the layout using your list of solutions. Consider and emphasise smooth workflow, the needs of clients, the need for privacy, the need for a space to take a break and any other faults associated with the old layout.
6. Explain the reasons for the changes you have made.
Lean manufacturing and work cells

Lean manufacturing is an operations management approach designed to eliminate waste — ‘lean’ in this case means no excess, just as lean meat has little fat. Productivity is maximised by carefully analysing each stage of the production process, detecting inefficiencies and correcting them. The advantages are reduced energy and resource consumption and increased worker productivity. The focus is on:

- reducing unnecessary movement of workers, machines and products
- minimising storage required
- reducing defects in products and equipment breakdown
- reducing waste
- reducing the time workers wait for work to come through
- shortening the time taken to switch equipment and people to produce new products
- shortening the time to develop new products.

The concept of lean manufacturing derived from the Toyota production system. Part of Toyota’s philosophy of waste minimisation was the use of cellular manufacturing — efficiencies are gained through grouping machines and people into separate ‘cells’ that produce similar items or require a similar production process.

Hallmark Cards adopted this new work practice with great results. In the 1980s, the company took two years to produce a greeting card. Card designs were shifted from building to building in its Kansas complex in the United States. Hallmark’s president was asked to dismiss 20 per cent of the staff to reduce costs. Instead, he reorganised production and maintained faith with his employees.

Managers came together from all sections of the business to solve the problem. The company’s ‘shoe box’ card line was chosen for a new cellular manufacturing approach and artists and writers were grouped on one floor into work cells, with production directly below them. Production time of a new card was reduced from two years to about three months!

Lean manufacturing aims to eliminate waste at every stage of production. It involves analysing each stage of the production process, detecting where inefficiencies are and correcting them.

Test your understanding

1. What is lean manufacturing and what are its benefits?
2. Where did the idea of lean manufacturing originate?
3. Explain how Hallmark was able to reduce the time it took to make a greeting card just by changing its facilities design and layout.
4. How did Hallmark develop this solution?

Apply your understanding

5. The work cell approach relies on workers being able to do a variety of tasks, not just one task. Give one advantage and one disadvantage associated with workers becoming multiskilled.
6. Why do you think work cells would rely more heavily on teamwork than individual achievement?
7. Imagine that you are the president of Hallmark in the early 1980s, and you have just been asked to fire almost one-quarter of your staff. Evaluate the issues involved in making this decision. What would be your final solution?
8. Use the Lean manufacturing weblink in your eBookPLUS to describe how creating brilliant processes for producing goods or delivering services is just as important as finding brilliant workers.
3.5 Materials management

**KEY CONCEPTS**

Materials management is used by operations managers to optimise operations.

Materials management involves managing the use, storage and delivery of materials to ensure the right amount of inputs are available when required.

Vehicle manufacturer Ford uses just in time production — a strategy where assembly plants keep small supplies of parts on hand, and materials are delivered from nearby facilities when needed. A delay in delivery can shut down the entire manufacturing process. In 2012, Ford was forced to stop production for several days after one of its key suppliers, CMI International, was placed into voluntary receivership. Managing materials so that they arrive in the right places, in the right quantities and at the right time is an important area of operations management.

**WHAT MATERIALS MANAGEMENT INVOLVES**

- Controlling the release of materials into the production process
- Receiving materials
- Storing materials safely
- Reducing holdings of surplus stock
- Identifying ongoing materials requirements
  - by ensuring timely purchase of materials
  - by forecasting

Materials management is an intricate strategy. It involves several critical activities.

**DID YOU KNOW?**

When Navitaire, the supplier of Virgin Blue’s reservations and check-in systems, experienced a computer hardware failure in 2010, Virgin Blue was forced to switch to slower manual check-in arrangements, causing delays and cancellations of flights. Hundreds of passengers were left stranded.

**Materials management** is the strategy that manages the use, storage and delivery of materials to ensure the right amount of inputs is available when required in the operations system.

**Inventory** is the goods and materials held as stock by an organisation.

Huge warehouses holding a large inventory represent a cost to a large-scale organisation.

**Materials management** is all about managing the way that materials are received and stored, and making sure that the materials are available in the operations system when required. Many organisations have large amounts of materials on hand to complete production. This is referred to as stock or **inventory**. A large inventory is held by an organisation to ensure that materials do not run out; however, this represents a cost to the organisation. Stock taking up storage space for lengthy periods can mean that the organisation misses the opportunity to invest money in other places. Materials can also have a ‘use-by date’, which means that they could become unusable after a period.
Some large-scale organisations (LSOs), such as Ford, reduce costs by having fewer materials held as inventory. Its efficient handling of materials keeps costs down, but when materials don’t arrive on time (as in the case of the strike by Chinese workers) the consequences can be devastating.

It is important that materials are handled efficiently at Ford to keep costs down.

One of the most important activities of materials management is materials handling. It refers to the handling of goods in warehouses and at distribution points. Adequate materials handling procedures and techniques can result in a more efficient production process and cost savings. Proper handling can also reduce accidents, breakage and spoilage.

**Materials planning**

The initial stages of operations planning involve the organisation establishing a production plan, listing the activities necessary to combine various resources to produce goods or services. The organisation needs to decide what goods or services to produce, how to produce it and in what quantity. This plan provides the basic information necessary for detailed materials management planning.

Modern large organisations typically complete materials planning by using software. Such planning includes master production scheduling (MPS) and materials requirements planning (MRP).

**Master production scheduling** (MPS) describes what is to be produced and when. It is a schedule linked to specific delivery dates or contracts for delivery in the future. Inability to meet this schedule may have serious business implications. It is important, therefore, that the productive capacity of the organisation has been correctly assessed. A business cannot increase its rate of production without increasing the amount of necessary inputs, as Boeing has found (see the ‘Did you know?’ feature). Decisions such as upgrading plant and equipment or employing additional staff may be related to ongoing problems in meeting this schedule.

**Materials requirements planning** (MRP) is completed after the organisation has a clear understanding of the quantities to be produced and the time frame involved. It is an itemised list of all materials involved in production to meet the specified orders. Such planning must consider:

- lead times required by suppliers; that is, whether items need to be ordered weeks or months in advance
- the exact number of inputs to complete the task
- the amount of stock (inventory) on hand
- purchasing procedures; for example, whether the organisation wishes to take advantage of bulk purchasing discounts offered by suppliers.

**DID YOU KNOW?**

Boeing had over 900 orders for its new plane, the 787 Dreamliner and was expecting to deliver the new plane to its customers before the end of 2008. This did not happen. Delays were caused by production problems, strikes and a shortage of fasteners. The shortage of fasteners occurred because the fastener industry was not able to keep up with Boeing, and Boeing’s competitors, boosting plane production rates to record levels. Boeing actually made the first delivery in 2011, but the delays cost the company billions of dollars.
Inventory control

Inventory control is a system used to ensure that costs associated with maintaining an inventory of materials are kept to a minimum. Costs can be minimised by not allowing materials to remain idle and by making sure that inputs are available for the operations system when needed. An operations system that runs out of materials will not perform at optimal level.

Modern organisations use bar coding and computerised stock records to control inventory. Computerisation can help to minimise loss or theft of stock and it provides precise, up-to-date information about stock levels. Signals can alert management when it is time to order new materials, and how much to order. Organisations also conduct stocktakes, physically counting stock and then comparing the count against what was expected to be available. Any differences would indicate problems with stock control.

A common strategy used by many organisations in Australia is the just in time (JIT) system of inventory control already mentioned on page 120. This approach makes sure that the right amount of materials arrive just as they are needed in the operations process, thus increasing competitiveness. However, supplier deliveries must be reliable, and materials must be received at the appropriate time.

Supply chain management

A typical supply chain, such as Ford’s, starts with the sourcing of natural resources, followed by manufacturing activities such as component construction and assembly. The supply chain moves on to storage facilities before reaching the consumer. It is from this range of suppliers that the organisation purchases materials and resources. The supply chain needs to be well managed because an operations system depends on the inputs. Supply chain management is critical for the following reasons:

- If materials are not on hand, nothing can be produced.

DID YOU KNOW?

Although the just in time approach was first used by the Ford Motor Company, it was adopted and publicised by Toyota as part of its production system. In the 1950s, Toyota did not have enough money to buy huge amounts of materials, and had little physical space for inventory. It reacted by reducing the amount of its inventory, holding a small amount of materials that would sustain production for a short period of time, and then reordering new materials.
• If materials are of inferior quality, it is difficult or costly to produce quality products.
• If the right quantity of materials is not available, the organisation cannot meet demand.

Supply chain management involves not only assessing the location in terms of distance to suppliers, but also considering the efficiency of delivery, the stock use rate, the uniformity of quality, and pricing and comparisons with other suppliers of similar product, to identify whether they can better meet the organisation's needs. In recent years, many LSOs have had to come to terms with developing more sustainable supply chains or 'greener supply chains'. For example, Australian road freight company Linfox uses aerodynamic trucks and trailers to maximise efficiency, has reduced power consumption at its offices and warehouses, and uses smarter vehicle routes to reduce its greenhouse gas emissions.

TEST your understanding
1 Explain, in your own words, what materials ‘management’ is about.
2 List the benefits of efficient materials handling.
3 Briefly outline the two key steps involved in materials planning.
4 What is inventory?
5 What is the main benefit of inventory control?
6 Explain how the just in time approach can improve productivity and reduce costs.
7 List potential problems that you can see with the just in time approach.
8 Why is it vital that the supply chain be well coordinated?
9 Match the following terms with their definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>inventory control</td>
<td>(a) the strategy involved with managing the use, storage and delivery of materials, to ensure the right amount of inputs are available when required</td>
</tr>
<tr>
<td>supply chain</td>
<td>(b) an inventory control approach that ensures that the exact amount of material inputs will arrive only as they are needed</td>
</tr>
<tr>
<td>materials requirements planning (MRP)</td>
<td>(c) the range of suppliers from which the organisation purchases materials and resources</td>
</tr>
<tr>
<td>master production scheduling (MPS)</td>
<td>(d) a system that ensures that costs are minimised, and that the operations system has access to the right amounts of inputs when required</td>
</tr>
<tr>
<td>materials management</td>
<td>(e) details what is to be produced and when</td>
</tr>
<tr>
<td>just in time</td>
<td>(f) developing an itemised list of all materials involved in production to meet the specified orders</td>
</tr>
</tbody>
</table>

APPLY your understanding
10 Chan is the operations manager of a large clothing manufacturer. Recently, the business is experiencing financial troubles as retail customers begin to recognise it as being a very poor supplier. The clothes are rarely delivered on time, and are always delivered in the wrong quantities. The main problem is that materials for the popular clothing lines keep running out, while the storage areas are filled with materials for the unpopular clothing lines.
(a) What are the costs of having too many materials in storage?
(b) What problems can occur when there are not enough materials on hand?
(c) Explain how Chan could use MPS and MRP to improve materials management.
(d) Suggest any other materials management approaches you think would help Chan optimise clothing operations. Explain your answer.

11 How can materials management be used to optimise operations?

12 To find out how a large-scale organisation deals with supply chain management use the ANZ supply chain weblink in your eBookPLUS. How many suppliers does the ANZ have? How does the LSO develop supply chain relationships with these suppliers? Does the LSO expect its suppliers to meet certain standards, and if so, what are the standards?
KEY CONCEPT Large organisations use quality management to make sure that their products meet customer expectations. Three quality strategies are quality control, quality assurance and total quality management (including employee empowerment, continuous improvement and improved customer focus).

Quality refers to the degree of excellence of goods or services and their fitness for a stated purpose.

Quality basically means that the customer gets what they wanted. A quality product has a high degree of excellence and achieves the purpose for which it was designed. A quality product should be reliable, easy to use, durable, well designed, and delivered on time. It should include after-sales services and have an agreeable appearance. Quality is very important to Ambulance Victoria. As an organisation that provides medical transport and pre-hospital care for patients, any mistakes or faults in its services can be life-threatening. As you continue reading this section, we will examine how Ambulance Victoria manages quality in its organisation.

When managing quality, LSOs will:
- minimise waste and defects
- strictly conform to standards
- reduce variance in final output.

Operations managers use a variety of strategies to maintain or improve quality. Ambulance Victoria uses quality control and quality assurance. Many organisations use an approach called total quality management.

Quality control
Ambulance Victoria uses quality control to optimise its production process. Quality control reduces problems and defects in the product, using inspections at various points in the production process. Many organisations such as Ambulance Victoria minimise errors and waste by ensuring that standards are met. Specifications or benchmarks are set before the physical checks are completed. Actual performance is then compared to the established criteria. If the established standards are met, it is likely that the business will be meeting customer expectations. Competitiveness increases as the costs associated with waste and faulty products are reduced.
As a service organisation, Ambulance Victoria monitors quality and response times. It uses a cardiac arrest registry to collect data on cardiac arrest patients who have used its ambulance service. Another service organisation such as a bank might use teller accuracy, speed and courtesy, as quality-control measures.

**Quality assurance**

Quality assurance is an integral part of Ambulance Victoria’s operations. A quality system is in place to ensure that set standards are achieved. Ambulance Victoria’s quality systems are certified to the ISO 9001:2008 standard. The ISO 9000 series of quality certifications is a widely used international standard. ‘ISO’ stands for International Organization for Standardization. Meeting these international standards is voluntary, but many organisations comply with ISO requirements to remain competitive locally and internationally. The ISO provides guidelines on how organisations should establish quality assurance systems by adopting specific procedures, controls, and recording and documentation measures. Ambulance Victoria’s effective quality system provides reassurance to customers that it is able to provide safe and reliable service.

**Total quality management**

Total quality management (TQM) is a commitment to excellence that emphasises continuous improvement in all aspects of an organisation’s operation by sharing responsibility among all the members of the organisation. Quality becomes both a commitment and the responsibility of every employee in the organisation. The aim of TQM is to create a defect-free production process, and maintain a customer focus in operations. The adoption of TQM can improve the price competitiveness of an organisation, but can also improve product quality, allowing the business to attain competitive advantage. To achieve TQM objectives, a number of approaches may be used. For example, employee empowerment, continuous improvement and improved customer focus.

W Edwards Deming is known as the ‘founder of the quality movement’. His ‘total quality management’ concept focuses on managing the total organisation to deliver quality to customers. He argued that if employees tried to build a product in the right way in the first place, then organisations would avoid the expense of inspection and the waste of rejected products. Improving quality, said Deming, can also help organisations increase their market share (as a result of better quality and lower priced products), ensure their future and provide more jobs.

**DID YOU KNOW?**

Beneath the green grass of the MCG lies 5 kilometres of PVC drainage pipe that stops the surface from becoming waterlogged. This pipe is made by Vinidex Pty Limited, Australia’s leading manufacturer of thermoplastic pipe systems for the transportation of fluid, data and energy. The high-quality pipes produced are also used to pump gas through vast pipelines in New South Wales and South Australia — a leaking pipe would be a disaster. Vinidex uses meticulous quality control as well as quality inputs to maintain excellent customer service. New materials, as well as the processing technology and manufacturing equipment, are carefully examined to make sure that Vinidex continues to achieve high standards in the pipes and fittings industry.
3.6 The management of quality

Quality circles improve the quality of production.

Quality circles are groups of workers who meet to solve problems relating to quality.

**Employee empowerment**

Deming believed that quality problems would be best solved with an emphasis on employee involvement. Many organisations use quality circles as a means of achieving employee empowerment. Under this approach, teams of up to 10 workers meet regularly to solve problems related to process, design or quality. The groups often make presentations to management with their ideas, in order to improve the performance of the organisation. Such programs have resulted in substantial cost savings for organisations. For example, at the Northrop Aircraft division that produces Boeing 747s, 55 individual quality circles halved the cost of parts within two years. At Chrysler, a quality circle discovered that heating rubber seals before installation could prevent car door leaks.

**Continuous improvement**

Continuous improvement involves an ongoing commitment to achieving perfection.

**DID YOU KNOW?**

Australian Arrow Pty Ltd, a designer and manufacturer of automotive products, uses quality circles as a method of problem solving. Issues such as product quality, employee performance and costs are discussed by team members who meet regularly under a ‘Circle facilitator’.

**DID YOU KNOW?**

Brambles Limited is a leading supply-chain logistics company with global headquarters in Sydney. One of its businesses, CHEP, moves 300 million pallets and containers for manufacturers, distributors and retailers in 45 countries. Brambles is committed to continuous improvement and this has led to increases in its cash flow. Continuous improvement is done by monitoring best practice, minimising its environmental impact and supporting local communities.

**DID YOU KNOW?**

Continuous improvement is a process that involves a constant evaluation of, and improvement in, the way things are done in an LSO. Higher and higher standards are set in the continual pursuit of improvement. Kaizen (Japanese for ‘improvement’) emphasises continuous improvement in all facets of an organisation, from the way the CEO manages to the way assembly line workers perform their jobs. Although perfection is practically impossible to achieve, it is the ‘striving’ which is important to organisational culture.
Customer focus

Deming believed that quality should be the responsibility of every employee. The TQM approach considers one of the most important questions an organisation should ask: ‘What does the customer require?’ All teams need to realise that they are serving a customer. This is as true for the employees that deal directly with external customers as for those that simply pass work on to other employees within the organisation.

DID YOU KNOW?

Australia Post receives over 100,000 letters for Santa each year. Australia Post has a strong commitment to customer service and this includes its younger customers. In 2010, Australia Post announced its Future Ready business renewal program, with the aim of creating a more customer-focused LSO.

TEST your understanding

1 Outline the main features of quality management.
2 Explain why quality control is important to organisations.
3 In what ways can organisations offer quality assurance to customers?
4 Explain what is meant by total quality management.
5 Outline the three approaches that make up total quality management.
6 Read the following definitions. If a definition is false, write out the correct definition.
   A Quality control involves the use of inspections at various points in the production process.
   B Quality assurance involves the use of a system where an organisation achieves set standards in production.
   C Total quality management is a commitment to quality that is applied to the organisation’s operations department.
   D Continuous improvement involves an ongoing commitment to the use of inspections.

APPLY your understanding

7 Kevin is the production manager for IBX technology, a manufacturer of Internet security software. Recently, the level of product defects has increased, although the production process has not changed.
   (a) Advise Kevin on strategies that he should use to determine the cause(s) of the defects.
   (b) Explain to Kevin the value of introducing a TQM approach.

8 The name of the Reject Shop suggests that it could not possibly sell quality products. Is this true? Use the Reject Shop weblink in your eBookPLUS to search its website and see how many references to quality you can find. How does the Reject Shop ensure that it receives quality products from suppliers?
3.7 Use of technology

**KEY CONCEPT** The acquisition of up-to-date technology is one strategy which operations managers use to optimise operations.

Imagine if Toyota tried to produce all of its cars with absolutely no technology, or if Telstra attempted to maintain customer records without the assistance of computers. It just could not be done. Large-scale organisations need to acquire up-to-date technology in order to compete effectively. In both the service and manufacturing sectors, technology can be used to speed up (or shorten) processes and maximise the use of raw materials. The use of technology means that goods and services can be produced using less labour. These factors make the operations process more cost effective. Technology can improve quality, leading to increased profitability.

### Office technology

Both service and manufacturing operations use office technology, but organisations providing a service are likely to make greater use of it. Office and communication technologies have enabled whole markets to open up as businesses can reach more customers around the world. Developments in business technologies have created the opportunity for people to do more work in less time, which means a greater range of tasks can be completed in work time. These technologies have also enabled office workers to work from locations outside the office. Some technologies used in business are shown in the diagram below:

**Customer relationship management**

Customer relationship management (CRM) refers to the systems that organisations are introducing to maintain customer contact. CRM software can be used to improve customer service and increase competitiveness, because it stores information about existing and potential customers.

**DID YOU KNOW?**

World Vision Australia, an overseas aid and humanitarian organisation, uses CRM software to track major donations and client accounts. CRM software allows regional offices and global teams to collaborate and communicate more easily. World Vision can now manage its transactions throughout every stage, whether viewing customers’ histories or rolling out and monitoring donation programs.
The information can be retrieved and entered by employees from different functions within the organisation, such as sales, marketing and operations. Because this approach improves services, which are now provided directly to customers, costs will be cut and productivity can improve.

**Manufacturing technology**

Robotics is a term used to describe special forms of technology capable of complex tasks (as shown in the figure below). Robots are used in engineering and specialised areas of research, as well as on assembly lines, where a programmable machine capable of doing several different tasks is required. Robotics allows a degree of precision and accuracy generally unmatched by human labour. In addition, robots work without complaint or demands for wage rises, in conditions that would be soul destroying and often dangerous for employees. Robots and robotics are high cost items that are unaffordable for most small and medium-scale manufacturers.

LSOs are increasingly incorporating automation — the use of computers to control the operations process — into their manufacturing operations.

**CAD/CAM/CIM**

Computer aided design (CAD) software generates three-dimensional diagrams from a set of given input data (parameters). Once the design has been created, it can be viewed from multiple angles, assisting both the designer and the end user to visualise what will be produced. It is used in a range of organisations.

From the design, material use can be calculated, as can time for the task to be completed. This enables costings of the project to be quantified. If the cost is too high, or if the design is too limited, the input parameters can be altered to reflect these requirements. CAD software can customise a series of options that meets the client’s or customer’s needs. Normal drafting processes would cost much more, take longer and be less accurate. CAD software can also design the sequence of steps that would need to be taken to create the desired product in the shortest possible lead time using the least material.

Computer aided manufacture (CAM) is software used to allow the manufacturing process to become computer directed by designing and controlling the process. The CAD software can be linked to CAM software to manufacture designs that are accepted by clients. CAM can also be used more broadly to calculate how much of each input would be required.
Computer integrated manufacturing (CIM) uses a computerised system to combine CAD and CAM to manage the entire production process. Product design, analysis, planning, purchasing, costing, inventory control and distribution can be controlled by computer.

Computer integrated manufacturing is a method of manufacturing in which the entire production process is controlled by a computer.

**TEST your understanding**

1. How can technology improve operations?
2. Explain the impact of technology on service organisations.
3. What types of tasks are robots useful for?
4. Explain the impact of technology on manufacturing organisations.
5. State two benefits and two costs of manufacturing technology.
6. Match the following terms with their definition:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer relationship management (CRM)</td>
<td>(a) a computerised design tool that allows business to create product possibilities from a series of input parameters</td>
</tr>
<tr>
<td>Robotics</td>
<td>(b) software program that LSOs are introducing to maintain customer contact</td>
</tr>
<tr>
<td>Computer aided design (CAD)</td>
<td>(c) software that designs and controls the manufacturing process</td>
</tr>
<tr>
<td>Computer integrated manufacturing (CIM)</td>
<td>(d) highly specialised forms of technology capable of complex tasks</td>
</tr>
<tr>
<td>Computer aided manufacture (CAM)</td>
<td>(e) a method of manufacturing in which the entire production process is controlled by a computer</td>
</tr>
</tbody>
</table>

**APPLY your understanding**

7. Explain how technology can be used to optimise operations in a large-scale organisation. Include the terms ‘computer aided design’, ‘computer aided manufacture’, ‘robotics’ and ‘customer relationship management’ in your answer.

8. Use both the Telstra and Toyota weblinks in your eBookPLUS to list the types of technology these organisations use and then make a comparison. Explain how the technologies used differed.
Six Sigma

Six Sigma is a quality management approach that was originally developed by former US telecommunications company, Motorola Inc., in the mid-1980s. Six Sigma is used to identify and remove the causes of problems in the operations process, so that an organisation only produces 3.4 defective parts per million opportunities. This translates to a perfection rate of 99.9997 per cent. It uses typical quality management methods, including statistical tools to measure variations in the operations process, empowerment of staff and training, a commitment to improving quality through the whole organisation and continuous improvement.

A special team of people within the organisation is established. This is composed of staff who have been given Six Sigma training, and are able to coordinate others in adopting methods to improve quality. A five-step process to problem solving applies to Six Sigma, commonly referred to as DMAIC. This is shown in the figure at right.

Boral Limited produces and distributes construction materials and building products. With almost $5 billion worth of sales, Boral has more than 14 000 employees working across 700 operating sites. In 2007, Boral introduced Six Sigma throughout its construction materials division in Victoria, New South Wales, ACT and Tasmania.

Regional General Manager of Boral Australian Construction Materials (ACM) NSW/ACT, Tony Charnock, claimed that in its first year, Six Sigma helped the New South Wales business achieve a profit of $5 million. In 2009, Boral announced that the implementation of Six Sigma led to the construction materials division identifying $45 million of cost reduction initiatives. Boral predicted that the initiatives would deliver three years of benefits from the 2009 financial year.

Boral has a strong focus on continuous improvement, and Six Sigma gave it a structured way to make cost savings and improvements. Tony Charnock regarded Boral’s improvement program as a never-ending process. ‘Once you start making improvements, new ones keep presenting themselves. That is the experience of major companies elsewhere with Six Sigma.’

At Boral, Six Sigma training is available to staff. Staff trained as Six Sigma project leaders are known as ‘black belts’ and ‘green belts’. Yellow belt training provides workplace team leaders with basic problem-solving skills. For projects to succeed, staff with belts must have the support of managers (‘project champions’).

(continued)
Once you start making improvements, new ones keep presenting themselves. That is the experience of major companies elsewhere with Six Sigma.

Boral’s ‘black belts’ started to investigate the company’s processes, looking for problems with or variations to the usual processes. This followed several months of compiling and validating data from the business. Then they came up with solutions to the problems.

One problem concerned unplanned stoppages because of products becoming trapped on conveyor systems and causing blockages. The team installed equipment, giving early warning of blockages. Maintenance and operational employees were trained in how to deal with the problem. The solution substantially cut the amount of down time caused by the unplanned stoppages.

On another project, Six Sigma’s statistical analysis was applied to a problem that involved concrete being poured from trucks. By analysing variations in strengths of concrete after it was poured, changes were made to the process used in order to achieve more consistency.

John Worden, Boral ACM’s Six Sigma champion in New South Wales, said, ‘That is how Six Sigma works. We look for sources of variation and identify ways to eliminate them or, if that is not possible, bring them under control.’

Once you start making improvements, new ones keep presenting themselves. That is the experience of major companies elsewhere with Six Sigma.

In Six Sigma, people trained as project leaders are known as black belts and green belts. Some organisations use other belt colours as well, such as yellow belts for employees that have basic training in Six Sigma.

TEST your understanding
1 Explain what is involved in the Six Sigma approach.
2 What aspects of Six Sigma make it a quality management approach?
3 Outline how Boral used Six Sigma to improve its operations and achieve its business objectives.

APPLY your understanding
4 Does Six Sigma seem like an original approach to you? Is it just another form of TQM? Is there anything about Six Sigma that makes it different to other quality approaches?
5 Critics of Six Sigma claim that it has had mostly negative effects on the organisations that have used it.

In 2006, Fortune magazine stated that most of the 58 large-scale US companies that announced Six Sigma programs had experienced a deterioration in business performance. Can you think of any reason why?

6 Use the Six Sigma weblink in your eBookPLUS and the case study provided, or find another example of a large-scale organisation that has adopted Six Sigma, to answer the following questions:
   (a) Why did the organisation decide to adopt the Six Sigma approach?
   (b) Describe how the organisation used the Six Sigma approach.
   (c) Explain the benefits to the organisation as a result of using Six Sigma.
High-quality paper envelopes business

Ask your teacher if you can complete this activity during class. The aim of this activity is to put your theoretical understanding of business management into practical use, as you solve problems and make operations management decisions.

INSTRUCTIONS
1. Arrange your class into groups of three or four. Each of these teams will become a business.
2. Your business has 10 minutes to produce as many ‘high-quality paper envelopes’ as possible. The following diagram shows you how to construct a simple envelope from A4 paper. You are welcome to develop your own design, add colour or individual flair, but remember... time is critical.
3. Before you begin, allocate responsibilities to the members in your team/business. It might be good if someone becomes the CEO. You might also need a quality manager and a materials manager. Make sure each team member’s role is clear.
4. Start producing the envelopes. Hurry, you only have 15 minutes.
5. The winner is the business with the most envelopes. Alternatively, the winner could be the team with the highest quality envelopes. After finishing the activity, complete the questions.

How to make high-quality paper envelopes

Divide A4 paper into thirds
Fold the bottom third up (and glue sides)
Cut the top two corners
Fold the top down. Voila!
You have a high quality paper envelope

Materials required
A4 paper
scissors
glue

TEST your understanding
1. List the elements of your operations system.
2. Was your business offering a service or manufacturing a product?
3. What responsibility did each team member in your group have?
4. How did your group manage the materials required?
5. How did your group make sure that quality was maintained in each envelope produced?
6. (a) What were the objectives for your business?
    (b) Did you achieve those objectives? How can you tell?

APPLY your understanding
7. If you were to turn your business into a serious ongoing venture, you would probably need to find new facilities. Design a new facilities layout for your business that would optimise operations.
8. To improve productivity, one strategy you could introduce would be the use of technology. What types of technology could you use in your business?
9. Can you think of any other ways to improve the operations of your business? How could you make improvements to productivity?
KEY CONCEPT  Operations managers must be aware of socially responsible and ethical management when pursuing organisational objectives.

You might not think that a bank would need to be concerned about its impact on the environment, or about the ethical and socially responsible practices of its suppliers, when it comes to operations management. National Australia Bank (NAB) does just that, however, as shown in its commitment to sustainable business practices. NAB's corporate responsibility policies outline how it will lower costs by improving efficiency and minimising waste, and how it will work with suppliers in an ethical and environmentally friendly manner.

Ethical management is about the application of moral standards to management behaviour. Socially responsible management refers to management's awareness of the social and environmental consequences of its actions.

It can be expensive and time consuming to manage an operations system in an ethical and socially responsible way. However, it does bring benefits. Behaving in a socially acceptable and honest manner can improve the reputation of an LSO, improve efficiency and reduce costs in the long term. The aspects of ethics and social responsibility that would concern an operations manager include:

1. Managing inputs appropriately
   An operations manager should attempt to use inputs that do not have a serious impact on the environment. The inputs used in a production process also create waste. In the desire to keep down the costs of production, organisations should not be tempted to use cheaper, illegal waste disposal methods.

2. Managing suppliers appropriately
   Many organisations work with their suppliers to ensure that they follow guidelines on ethical and socially responsible behaviour. It is also not appropriate for organisations to provide preferential treatment to suppliers that offer gifts such as free meals, trips or entertainment, or to select suppliers based on personal friendships.

3. Managing staff appropriately
   Operations managers must make sure that the organisation's facilities and technology contribute to the health and welfare of staff. Irregular or incomplete maintenance of production facilities can result in detrimental consequences. Toxic production processes can threaten the health of employees, as has been the case with asbestos mining and manufacturing.

4. Managing the customer relationship appropriately
   An operations manager needs to make sure that the goods produced are of the required quality, that they are safe and reliable. Dangerously defective or harmful products can result in the injury or death of consumers. The delivery of a product can raise issues around the ethical and socially responsible behaviour of managers, such as fair and equitable treatment of customers.

   It may appear that the ethical and socially responsible decisions that an operations manager needs to make are straightforward. In reality, however, the choice between what...
is best for the LSO and what is best for society and the environment is not always simple. At times, the pressure to make profit for the organisation can be overwhelming. Some of the solutions may involve the use of technology, which can result in job losses. Running an ethical and socially responsible organisation can actually be very challenging.

In an attempt to cover the four main aspects of ethics and social responsibility, NAB substantially reduced its greenhouse emissions from its buildings, air travel and vehicle fleets. Improving the design and operation of its buildings was one strategy. Replacing six cylinder cars with four cylinder cars and adding hybrid cars was another. NAB introduced Supplier Sustainability Principles to new contracts with key suppliers, stating its corporate responsibility requirements, which include environmental management, health and safety, and supply chain management.

NAB takes a preventative approach to health and safety, aiming to provide a safe and secure workplace through a positive health and safety culture. It introduced new online health and safety training programs for all of its Australian employees. To improve its relationship with customers, NAB ensures that customers have access to fair and affordable banking. The StepUP loan program, for example, is available for individuals and families living on a low income and offers personal, unsecured loans at low rates of interest. NAB ATMs in Australia are audio-enabled to assist visually impaired customers and feature multilingual options. Accessibility to branches has been improved for customers, including installation of automatic entrance doors and wheelchair accessible counters.

DID YOU KNOW?
James Hardie Industries manufactured and sold asbestos-related products for a large part of the twentieth century. It established a trust in 2001 to provide financial compensation for victims of asbestos-related diseases caused by its products, but the organisation has been criticised for not providing sufficient funds to settle claims.

NATIONAL AUSTRALIA BANK MANAGES ITS OPERATIONS SYSTEM IN AN ETHICAL AND SOCIALLY RESPONSIBLE MANNER. IT MANAGES CUSTOMER RELATIONSHIPS APPROPRIATELY, AS SEEN IN ITS PROVISION OF AUDIO-ENABLED ATMS WITH MULTILINGUAL OPTIONS. IT ALSO MANAGES INPUTS, SUPPLIERS AND STAFF APPROPRIATELY.

TEST your understanding
1. Outline the main reasons why operations managers must take ethical and socially responsible decisions very seriously.
2. What are the benefits and costs of managing an operations system in an ethical and socially responsible manner?
3. Should an organisation be concerned about the likely impact of new technology on employees and the community? Give reasons for your answer.
4. Outline how NAB covers the four aspects of ethics and social responsibility as it applies to operations management.

APPLY your understanding
5. If you were the manager of a waste management company, what factors would you consider in selecting a new facility site?
6. Discuss whether or not it is ethical to accept free gifts from suppliers.
7. Use the BSR weblink in your eBookPLUS to select a report that interests you. Read the article and outline the ethical and social responsibility issues involved. (Business for Social Responsibility provides information about the social and ethical responsibilities of businesses.)
EXTEND YOUR KNOWLEDGE: Socially responsible and ethical management

**KEY CONCEPT** An operations system should be managed ethically and with social responsibility.

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**Sustainable operations at Cadbury**

Cadbury’s Claremont factory is located on the bank of the Derwent River, north of Hobart. Tourists visit the Visitor Centre to learn about the materials that go into making Cadbury chocolate, including cocoa, sugar and milk, and the manufacturing process that is used to combine these inputs. They also discover the history of Cadbury and receive sample chocolates. There is no shortage of evidence of a high-quality, satisfying and delicious product.

The factory, however, also produces greenhouse gas emissions. The main source of Australia’s greenhouse gas emissions is from the burning of fossil fuels for energy, including for electricity and transport. When fossil fuels, such as gas, coal and petroleum, are burned the carbon stored inside the fuel bonds with oxygen to form carbon dioxide (CO₂), which is then released into the atmosphere. CO₂ is a greenhouse gas. It is a natural part of the atmosphere but too much CO₂ causes the overall temperature of the planet to increase. This results in global warming.

The Cadbury factory generates a relatively low level of greenhouse gas emissions by Australian standards. This is because almost 90 per cent of Tasmania’s electricity is sourced from wind power and hydroelectric power stations. Hydroelectricity is the production of electrical power through the use of flowing water.

Most of the emissions are generated through transport. Cadbury’s inputs must be brought to the factory and some of these inputs make long journeys. The sugar comes from Mackay in Queensland and the cocoa comes from Ghana in western Africa. Other materials, including cardboard and plastic, also need to be transported. All of the trucks and ships carrying these inputs produce carbon emissions.

However, Cadbury is aware of its impact on the environment. Teams work to make continuous improvements to the efficiency and sustainability of the factory. For example, an eco-efficiency team arranged for steam from an early stage in production to be captured and then re-used in later stages. This saves coal and water and produces less greenhouse gas emissions and waste. A project that utilises gas from the factory’s waste-water treatment plant and uses it as an energy source for a steam boiler reduced the amount of natural gas used by 3900 gigajoules, reducing CO₂ emissions by 200 tonnes. Cadbury now also uses biodegradable plastic material in its product packaging. The material is made from corn starch and, unlike other plastics, breaks down completely.

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*Teams have worked to make continuous improvements to efficiency and sustainability at the factory.*

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Cadbury’s chocolate operations in Tasmania does produce greenhouse emissions, but is taking steps to reduce those emissions.
When you see the Fairtrade logo on the shelves in Woolworths, Coles and Aldi, you know that consumers are voting with their dollar. Recent research reveals that more than two thirds of Australia’s consumers think it is important to choose products that support fair trade. While this is true, it is important to note that less than 15 per cent of shoppers routinely seek out fair trade goods.

What exactly does fair trade mean? Fair trade refers to a social movement that aims to help producers in developing countries create fairer trading conditions for themselves. Fair trade is about better, more reasonable payment to producers, decent working conditions for workers, and sustainable farming practices. Fair trading is governed by the standards set by the international certification body Fairtrade International. Products that display the Fairtrade label must meet international Fairtrade standards.

You might see the label on items such as coffee, cocoa, sugar, tea, cotton, wine and chocolate. Cadbury is a familiar brand that received Fairtrade certification in 2009. Cadbury’s Dairy Milk chocolate bar is Australia’s biggest selling chocolate bar, and it now sports the green and blue Fairtrade logo. Cadbury is not the first chocolate maker to support fair trade though, with brands such as Alter Eco, Chocolatier, Cocolo and Green & Black’s Maya Gold also supporting the fair trade movement.

Cadbury's move towards fair trade is significant for the movement. Fairtrade Australia & New Zealand has grown rapidly over the last five years and sales of Fairtrade Certified products increased from $191 million in 2011/12 to $238 million in 2012/13. Chocolate made up 62 per cent of sales, followed by coffee at 31 per cent.

While obtaining Fairtrade certification may bring many benefits, it also places responsibilities on member organisations, particularly in the area of operations management. The criteria that organisations must comply with involve adherence to International Labour Organization (ILO) agreements, such as prohibiting child and slave labour, ensuring workers have a right to join unions, and conservation and protection of the environment.

There is a responsibility to ensure that what is being sold as a Fairtrade product really upholds the principles of fair trade. In the case of chocolate, if the claim is that chocolate is made entirely from Fairtrade-certified cocoa beans, it is important that uncertified cocoa beans do not make their way into the supply chain.

Fairtrade certification . . . places responsibilities on member organisations, particularly in the area of operations management.

**TEST your understanding**

1. Read the article ‘Sustainable operations at Cadbury’. Explain how Cadbury’s operations produces greenhouse gas emissions.
2. List the ways that Cadbury has made an effort to reduce its greenhouse gas emissions.
3. Read the article ‘Cadbury and fair trade chocolate’. Explain what fair trade is and why Cadbury has opted to use the Fairtrade logo.
4. Explain the responsibilities that may impact on operations management when an organisation gains Fairtrade certification.

**EXTEND your understanding**

5. Use the Chocolate: the bitter truth weblink in your eBookPLUS to read about the 2010 British Broadcasting Corporation (BBC) broadcast that investigates the chocolate supply chain. Follow the links to various media reports and a response to the program from Fairtrade. After reading all of the information, how ethical and socially responsible do you think Cadbury’s operations are?
6. Explain how optimising the operations of an organisation can contribute to the objectives of an LSO, in terms of bottom line and social responsibility.
7. Use the Net Balance weblink in your eBookPLUS to find any articles related to operations management. What do they tell you about issues that relate to operations, such as efficiency, supply chain and workplace safety?
CHAPTER 3 review

Summary

The operations function and its relationship to business objectives and strategies
- Operations management is the function that combines the roles of planning, organising and controlling, in order to ensure that the organisation produces goods and services.
- Operations management is responsible for transforming inputs into outputs.

Characteristics of operations management within large-scale manufacturing and service organisations
- The characteristics of operations management differ according to whether the organisation is a manufacturer of goods or a provider of a service. Manufacturers produce tangible products while service organisations produce services, which are intangible.
- Most modern organisations produce a combination of both manufactured goods and services.

Key elements of an operations system
- The elements of an operations system are inputs (raw materials, capital equipment, labour, information, time and money), the transformation process, and outputs (the finished product or service).

Operations, productivity and business competitiveness
- The operations management function influences quality, cost and availability of an organisation's goods or services, which affects how the organisation achieves its other main objectives (profitability, market share, return for investors and social responsibility).
- Productivity measures the amount of output produced compared to the amount of inputs that go into production. Productivity improves if the level of inputs is reduced to obtain the same level of output, or if more output is produced from the same input.
- An organisation that can improve productivity will become more competitive.
- Business competitiveness refers to the ability of an organisation to sell products in a market. Organisations are competitive when they are able to do things better than competitors (competitive advantage).
- When organisations compete on cost, they provide customers with the same products as competitors, but at a lower cost. When organisations compete on differentiation, they deliver quality products for the same price as competitors or deliver products faster than competitors, for the same price.

Facilities design and layout
- Management of a facility's design and layout involves planning the layout of workspace, so that production flows smoothly. Equipment and technology within the operations system needs to be arranged in order to maximise efficiency of production.
- When choosing the best layout, an operations manager needs to consider physical space, what equipment and technology to use, location of stock and warehousing, links between stages of production, work environment and legal regulations (such as occupational health and safety and building constraints).
- The layout an operations manager chooses will depend on the type of operations conducted by the organisation. The main types include (beginning with the manufacturing layouts): fixed position layout (large-scale projects) and product layout (high-volume production). The process layout (or functional layout, which deals with high-variety and low-volume production with equipment and machinery grouped together according to function), retail layout (which should attract customers and allow easy movement) and office layout (which should allow
for efficient movement of information and access to resources) apply to all types of organisations.

**Materials management**
- Materials management is the strategy involved with managing the use, storage and delivery of materials, to ensure the right amount of inputs is available when required in the operations system.
- Materials planning is completed using master production scheduling (MPS) and materials requirements planning (MRP).
- Inventory control ensures that costs are minimised and that the operations system has access to the right amounts of inputs when required. A common approach used by many organisations in Australia is the just in time (JIT) system of inventory control.
- Supply chain management is a materials management approach that guarantees the supply of quality inputs. Organisations work with suppliers to make sure that materials are delivered efficiently and in the right quantities.

**The management of quality**
- Quality management is the strategy that an organisation uses to make sure that its product meets customer expectations. Three quality approaches are quality control, quality assurance and total quality management.
- Quality control involves the use of inspections at various points in the production process to check for problems and defects. Performance is measured in relation to set standards or benchmarks. If the established standards are met, it is then likely that the business will meet customer expectations and will compete effectively with competitors.
- Quality assurance involves the use of a system where an organisation achieves set standards in production. A widely used international standard is the ISO 9000 series of quality certifications.
- Total quality management (TQM) is an ongoing, organisation-wide commitment to excellence that is applied to every aspect of the organisation’s operation. Total quality management can improve product quality, making the organisation more competitive. A number of approaches may be used, such as employee empowerment, continuous improvement and improved customer focus.

**Use of technology**
- Technology can improve operations. Organisations need to acquire up-to-date technology in order to compete effectively.
- Technology is used in the manufacturing sector to speed up processes and enable fuller utilisation of raw materials. This improves productivity and makes the operations process more cost effective. Office and communications technology have enabled new markets to open up, costs to be cut and productivity to be improved.
- Robotics is a highly specialised form of technology that replaces something usually done by humans. Robots often undertake tasks that are too risky for employees to undertake.
- Computer aided design (CAD) is a computerised design tool that allows business to create products and modify them. Computer aided manufacturing (CAM) is software that designs and controls the process of producing a product.
- Customer relationship management (CRM) refers to the systems that organisations are introducing to maintain customer contact. CRM software stores information about existing and potential customers.

**Ethical and socially responsible management**
- Operations managers must be aware of socially responsible and ethical management when pursuing organisational objectives. Organisations that do so will benefit from improved organisational performance.
Review questions

TEST your understanding

1. Explain how the operations management function supports the organisation in achieving its objectives.
2. Compare and contrast the operations of a manufacturer and a service organisation.
3. Outline the role of an operations manager, using examples.
4. List the four strategies used by an operations manager.
5. Explain the three elements of an operations system, using examples.
6. What is meant by productivity and how can it be improved?
7. In what ways does productivity influence an organisation’s competitiveness?
8. Productivity is one performance indicator used by operations managers. List three others.
9. What does an operations manager need to consider when choosing the optimum facilities design and layout?
10. List the main types of facilities layout.
11. Why is materials management such an important strategy for optimising operations?
12. Differentiate between master production scheduling (MPS) and materials requirements planning (MRP).
13. Outline the importance of inventory control, using examples.
14. What is supply chain management?
15. How can quality management make an organisation more competitive?
16. Describe the main differences between quality control and quality assurance.
17. Explain what is meant by total quality management (TQM).
18. Outline how technology can be used to improve operations.
19. Differentiate between computer aided design (CAD) and computer aided manufacturing (CAM).
20. Explain what is meant by customer relationship management (CRM).
21. What are the benefits and costs of operations managers acting in an ethical and socially responsible manner?
22. Give three examples of ethical and socially responsible issues that may arise in operations management.

APPLY your understanding

23. Give examples of how an operations manager of a confectionery manufacturer might use the roles of organising and controlling in his or her job.
24. Choose a real-life example of a manufacturer and a service organisation. For each example, outline the inputs, processes and outputs of their operations.
25. Organisations compete on cost and on differentiation (delivering quality products for the same price as competitors or delivering products faster than competitors). Match the following business activities with the intended outcome.

<table>
<thead>
<tr>
<th>Business activity</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Tailor’ products to customers . . .</td>
<td>to compete on cost</td>
</tr>
<tr>
<td>Eliminate waste . . .</td>
<td>to compete on quality</td>
</tr>
<tr>
<td>Use automated production equipment . . .</td>
<td>to compete on speed of delivery</td>
</tr>
<tr>
<td>Strictly comply with design specifications . .</td>
<td>to compete on cost</td>
</tr>
<tr>
<td>Respond quickly to changes in demand . .</td>
<td>to compete on quality</td>
</tr>
</tbody>
</table>

26. One strategy used to improve operations is the use of technology. For example, if an organisation used labour-intensive operations (making extensive use of people to do the work) to manufacture cars, it may not be as efficient as another organisation using automated equipment. Fill in the following table by listing (and explaining

Digital doc:
- Missing word glossary quiz
  Test your knowledge of key terms from this chapter.
  Searchlight ID: DOC-5959
- Crossword
  Check your understanding by completing this crossword on key concepts from this chapter.
  Searchlight ID: DOC-5960
where necessary) strategies that an operations manager could use to achieve the stated business objectives. The first answer has been completed for you.

<table>
<thead>
<tr>
<th>Business objective</th>
<th>Operations strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase the quality of customer service</td>
<td>Technology — introduce customer relationship management system</td>
</tr>
<tr>
<td>Increase the quality of the product</td>
<td></td>
</tr>
<tr>
<td>Reduce production costs</td>
<td></td>
</tr>
<tr>
<td>Improve domestic and international competitiveness</td>
<td></td>
</tr>
<tr>
<td>Reduce waste</td>
<td></td>
</tr>
<tr>
<td>Improve productivity</td>
<td></td>
</tr>
<tr>
<td>Reduce the number of accidents</td>
<td></td>
</tr>
<tr>
<td>Improve work flow</td>
<td></td>
</tr>
</tbody>
</table>

27 Pick a large-scale organisation such as Australia Post or Coca-Cola Amatil Limited and list three of its business objectives. You could find this information on its website, in its annual report or in speeches made by one of its executive managers. For each objective, state what strategy the operations manager could use to help achieve the goal.

**Exam questions**

**Question 1**

(VCAA Business Management exam 2013, question 2)

d. Discuss the likely consequences of banks or other large-scale organisations introducing new technology to optimise operations.  

6 marks

**Question 2**

(VCAA Business Management exam 2013, question 3)

c. Alice wants The Traveller’s Helpmate to be seen as ethical and socially responsible. To meet this goal, she is reviewing the key elements of her operations system.  

Describe one ethical and social responsibility issue that Alice may consider from each of the three elements of the operations system.  

6 marks

**Question 3**

(VCAA Business Management exam 2012, question 1)

In the chocolate industry, four large-scale organisations dominate the market, collectively accounting for 92% of all chocolate sales. Currently these four organisations compete on price. The smallest of the four organisations, Websters, is less able to take advantage of economies of scale than the three larger organisations. As a result, Websters has decided to focus on competing on quality rather than price to ensure its long-term success.

Sam Webster, grandson of the founder of the business, is currently the CEO and has identified that numerous changes must be made.

As the focus of Websters shifts to quality, it will need to measure quality as part of its operations management. A human resources audit has identified that the current staff do not have the necessary capabilities to implement this change. To allow the staff to develop the necessary capabilities, Mr Webster has identified two preferred options.

- improve the capabilities of the current staff
- purchase and import state-of-the-art equipment from Belgium

(continued)
While the purchase of equipment will be more expensive initially, it will improve productivity and reduce waste and carbon emissions in the longer term.

b. Identify and explain two methods from the strategy of managing quality that Websters could use to ensure a high-quality chocolate product.

e. Describe one difference between the operations management of a manufacturing organisation, such as Websters, and a service organisation.

Question 4

Freda Campbell is setting up a new business in Melbourne that will manufacture and sell furniture.

c. Identify, describe and justify a facilities design and layout strategy that Freda could use for manufacturing the furniture.

School-assessed coursework

OUTCOME 3
Discuss and analyse strategies related to operations management.

ASSESSMENT task — case study

Time allowed: 50 minutes
Marks allocated: 40 marks (the marks for each question are indicated at the end of each question)
Conditions: closed book (no notes or textbooks may be used when completing this task)

Yakult Australia Pty Ltd commenced production in 1994. In Australia, it manufactures and sells Yakult Original and Yakult LIGHT, which are fermented milk drinks. Yakult contains probiotic bacteria known as the \textit{Lactobacillus casei} Shirota strain, which can help the digestive system to remain healthy. The factory now produces more than 300,000 bottles daily, supplying Yakult to Australian and New Zealand markets. Yakult's purpose-built factory and office complex in Dandenong was constructed in 1993. It cost $30 million.

Inside the automated factory, raw ingredients (skim milk powder, sugar and dextrose) are mixed together with filtered water and undergo sterilisation. Live \textit{Lactobacillus casei} Shirota strain is added to the milk to begin the fermentation process. Citrus flavour is added to the mixture. During fermentation, the bacteria rapidly multiply. The mixture is homogenised, so that it has a smooth consistency and then it is diluted with filtered water to produce the final product.

Yakult’s unique plastic bottles (they are very small — 65 mL) are created on-site and manufacturing staff monitor the quality of the product to ensure it meets the highest standards. A filling machine that has the capacity to fill 36,000 bottles per hour fills the bottles with Yakult. They are then capped with a foil lid, printed with a use-by date, sealed and transferred along the conveyor belt to the packaging facility. Yakult needs to be stored and distributed at temperatures below 4°C.
Quality at Yakult
Yakult’s quality management system (QMS) complies with the International Organization for Standardization’s relevant Standard (ISO 9001:2008). This means that Yakult meets the highest international food manufacturing standards. All company procedures are documented and are regularly audited. In terms of quality control, individual bottles are randomly inspected for incorrect printing and lid sealing. Product samples are collected and assessed for quality, composition and taste in Yakult’s on-site quality control area.

Waste management
Yakult Australia is very much aware of the need to minimise its environmental impact. Its waste management strategies, such as recycling of paper products and plastic waste, have resulted in more than 99 per cent of raw ingredients being used. Cleaning waste goes into a holding tank in the on-site water treatment facility.

1 Define the following terms using examples from the Yakult case study:
   - product layout
   - inventory control
   - automation.

2 Outline the inputs used by Yakult.

3 Describe the output of Yakult.

4 Identify and explain three considerations that would have been taken into account when Yakult planned the factory layout.

5 What are the main differences between the operations of a manufacturer and a service provider? Under which category does Yakult fit?

6 Explain what materials management is about. Describe all of the materials which Yakult needs to manage.

7 Discuss the benefits to Yakult of using Materials Requirements Planning (MRP).

8 Describe two quality strategies used at Yakult.

9 Outline another quality strategy that could be used by Yakult.

10 Explain how Yakult has incorporated social responsibility into its operations system.