CHAPTER 5
Operations management

5.1 Overview

5.1.1 Why it is 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 businesses actually make their good or service as well as how they maximise the efficiency and effectiveness of their production processes and meet the needs of stakeholders.

TOYOTA’S OPERATIONS SYSTEM

Operations is the part of the business that ‘gets the job done’. At Toyota, that means producing almost 9 million vehicles each year, of which approximately 14,000 are manufactured each day in Japan. The process of producing vehicles at Toyota’s many manufacturing plants around the world 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 and global 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 assembly line.

Operations is not just about making goods or producing services though. Many businesses strive to produce the best good 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 required for making the shell of a car involves hundreds of welding processes and parts. Robots on the automated production line do many of the welding jobs and the remainder are carried out by workers. Toyota says they are automated, but 'with a human touch'.

5.1.2 What you will learn

Key knowledge

Use each of the points below from the VCE Business Management Study Design as a heading in your summary notes.

- Global considerations in operations management including global sourcing of inputs, overseas manufacture, global outsourcing and an overview of supply chain management
- Corporate social responsibility considerations in an operations system, including the environmental sustainability of inputs and the amount of waste generated from processes and production of outputs
- Strategies to improve the efficiency and effectiveness of operations through waste minimisation in the production process, including the principles of lean management
- Strategies to improve the efficiency and effectiveness of operations related to quality including quality control, quality assurance and Total Quality Management
- Characteristics of operations management within both manufacturing and service businesses
- Key elements of an operations system: inputs, processes and outputs
- Strategies to improve the efficiency and effectiveness of operations related to technological developments, including the use of automated production lines, computer-aided design, computer-aided manufacturing techniques and website development
- Strategies to improve the efficiency and effectiveness of operations related to materials including forecasting, master production schedule, materials requirement planning and Just In Time

Key skills

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

- Define, describe and apply relevant business management terms
- Research and analyse case studies and contemporary examples of management applicable to managing production in a business
- Interpret, discuss and evaluate business information and ideas
- Apply operations management knowledge to practical and/or simulated business situations
- Compare and evaluate strategies used in operations management
- Propose and justify strategies for improving the efficiency and effectiveness of operations


Resources

- Digital doc: Key terms glossary (doc-29448)
5.2 The relationship between operations management and business objectives

**KEY CONCEPTS**

- Operations management is about producing goods and/or services based on business objectives.
- The characteristics of operations management within manufacturing businesses are different to those of service businesses.

5.2.1 Operations management

If you have ever attempted to prepare a meal, you will know that you need ingredients and a recipe, or a method, to create a final product. Just like you, businesses will follow a recipe when they are producing their good or service. The area of management that is responsible for this is known as operations.

In some way, all businesses must consider the challenges of **operations management**. This area of management is concerned with the strategies that are used to create, operate and control the transformation of inputs from a variety of resources into output, or goods and services, to satisfy the demands of customers. Operations managers make use of strategies including management of materials, quality, waste and use of technology.

**HOW IMPORTANT IS OPERATIONS TO A BUSINESS?**

Operations is vital to any business, because this area of management produces the good or service. Without a product to sell there would be no business.

South32 is a global mining and metals company that operates in Australia, Southern Africa and South America. The area of operations is vital to its performance. In a statement to the ASX in 2016, South32 Chief Executive Officer, Graham Kerr, said, ‘We will continue to focus on the things that we can control; safety, volume, costs and capital expenditure, as we seek to optimise the performance of our operations. This strategy to maximise value rather than volume, our high quality operations and well-defined financial policies underpin our resilience at current commodity prices and we remain exceptionally well positioned for any improvement in industry fundamentals.’

Australia Post is another business that highly values operations. Australia Post is the government-owned corporation that is responsible for postal services in Australia. In a business briefing by Australia Post’s former managing director and CEO, Ahmed Fahour said, ‘We have also streamlined our operations through automation and process improvement, which has delivered productivity improvements of 5 to 6 per cent, per annum. We have 3000 less people and run a very lean and efficient operation, handling 20 million items, 11 million addresses and 1 million customers in our shops every business day. These changes are necessary to provide the contemporary services and solutions that Australian government, businesses and citizens need.’
5.2.2 Efficiency, effectiveness and business competitiveness

Two key areas that the operations area of management responsibility must focus on are effectiveness and efficiency. We briefly examined these concepts in relation to business objectives in chapter 1; effectiveness refers to the degree to which a business has accomplished its stated objectives, while efficiency refers to how well a business uses resources in achieving these objectives. If a business’s objective is to make profit, then improving profit from one year to the next means that the business is considered to be effective. Operations strategies such as the management of materials, quality, waste and use of technology should reduce costs and improve quality, contributing to the attainment of objectives such as making a profit and increasing sales. Of particular importance to operations is improving productivity — a measure of the amount of output compared to the amount of inputs going into production. An improvement in productivity is typically associated with reduced costs and waste, meaning that the business is using resources more efficiently. Efficiency and effectiveness are covered in more detail in subtopic 5.3.

Businesses that can improve productivity and/or quality will become more competitive. Business competitiveness refers to the ability of a business to sell products in a market. A business will be competitive when it is able to produce goods or services at the same level or better than competitors. Cost, the quality of the product and speed of delivery are all areas that a business can compete on. Approaches to competitiveness are covered in more detail in chapter 6.

DID YOU KNOW?

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

5.2.3 Relationship between operations and business objectives

The core objective of all businesses is to maximise profit. This aim therefore requires businesses to efficiently use resources to produce goods or services at the lowest possible cost. Operations management is responsible for achieving this objective. Businesses such as South32 and Australia Post are successful in achieving their objectives because they focus on the management of quality, customer service, productivity, technological development, management of materials, waste minimisation and speed of delivery. Efficient and effective operations should lead to satisfied customers, sales, and consequently, the achievement of business objectives. Besides profit, these objectives include increasing market share, fulfilling a social need and providing a reasonable return for investors.

The operations area also contributes to the attainment of business objectives in less obvious ways. Keep in mind that the nature and type of operations will vary considerably from one type of good or service to another and from one type of business to another. For example, the responsibility for the operations area in small businesses tends to be held by the owner-operator or one or more employees. It is very likely that the owner of a small business will determine business objectives and ensure that operations strategies meet those objectives. However, larger-sized businesses will usually establish an operations department (see the business structure diagram on the next page). The manager responsible for operations will be involved in determining business objectives, along with the other senior managers. This manager will also need to ensure that the strategies being used within operations align with the objectives and strategies of the entire business.
The operations department will work closely with other areas in the business. Operations may, for example, work closely with the Human Resource Management department to recruit and select new staff to work in the area of operations. Additionally, operations strategies can be used to achieve objectives by supporting strategies in other areas of the business. The table below shows more examples of how operations strategies can be used to help the business achieve its objectives.

<table>
<thead>
<tr>
<th>Business objectives</th>
<th>Operations objectives</th>
<th>Operations strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>To make a profit</td>
<td>Reduce costs</td>
<td>Through Just In Time</td>
</tr>
<tr>
<td>Increase market share</td>
<td>Improve quality</td>
<td>Quality control</td>
</tr>
<tr>
<td>Provide a return for shareholders</td>
<td>Increase productivity</td>
<td>Introduce automated production lines</td>
</tr>
<tr>
<td>Contribute to the wellbeing of the community</td>
<td>Minimise waste</td>
<td>Establishment of lean management</td>
</tr>
</tbody>
</table>

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

An operations manager in a large business is likely to be part of the senior management team. A large business is also likely to have many managers who report to the operations manager, such as a production manager, warehouse manager and quality manager.
INTERVIEW WITH AN OPERATIONS MANAGER

Harry Souris: National Operations Manager
Company: M&J Chickens
Studied: Business Management, University of Western Sydney

What are your primary roles and responsibilities in your job?
I am responsible for the operational side of the business on a national level; I liaise with our teams across Australia on a daily basis to maintain stock control and to generally make sure that things are running smoothly. In doing so I’m also required to travel regularly and conduct meetings and training for our management teams to then pass onto their staff.

How did you get to where you are today?
Together with my siblings I have been actively involved with the business since we were old enough to walk and talk; I remember packing product into boxes at the tender age of eight years old. These days we all play an active part in the running of the business on a national level, being based and having worked in the Sydney head office we endeavour to maintain all of our warehouses at the level of quality and service that is synonymous with the M&J Chickens name which is ultimately our family’s reputation.

What tools and/or software do you use on a daily basis?
We operate using a software system called Clear Objective; this system processes all our sales orders and purchase orders, I refer to this system as the ‘brains’ behind our business because it allows us to maintain stock control and forecast stock moving forward to ensure we are not caught off guard.

What is your biggest frustration in your job?
If I were to get frustrated it would be on the rare occasion when something goes wrong that is out of my control, for example a supplier not being able to fulfil our product needs in order for us to produce product for a client is the ultimate frustration for me because letting down our clients is always the worst case scenario. I would exercise every possible option before letting down the client.


5.2.4 Characteristics of operations management within both manufacturing and service businesses

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 business 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.
The characteristics of operations management within manufacturing and service businesses

<table>
<thead>
<tr>
<th>Manufacturing businesses</th>
<th>Service businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produce goods that are tangible (can be touched)</td>
<td>Produce services that are intangible (cannot be touched)</td>
</tr>
<tr>
<td>Manufactured goods can be stored for later use</td>
<td>Services cannot be stored</td>
</tr>
<tr>
<td>Little customer involvement in production — the consumer is typically not present when the good is produced</td>
<td>Customer is involved in production — the consumer typically has to be present when the service is produced</td>
</tr>
<tr>
<td>Production process and consumption are not linked</td>
<td>Production process and consumption typically occur at the same time</td>
</tr>
<tr>
<td>Manufactured goods tend to be homogenous or standardised</td>
<td>Services tend to be differentiated or tailored to individual customers</td>
</tr>
<tr>
<td>Examples include bread, clothing, cars</td>
<td>Examples include haircut, transport, education</td>
</tr>
</tbody>
</table>

In reality, many businesses 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.

Regardless of whether a business manufactures a good or produces a service, most large businesses 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 area uses will differ according to whether the business manufactures a good or provides a service. A bank, for example, would not be as concerned with the management of materials as a car manufacturer would be.

Training courses are an example of a service, as they are not a physical product.

**DID YOU KNOW?**

An operations manager can select strategies from four areas to achieve optimal operations: use of technology, materials management, management of quality and waste minimisation.
5.2 Activities

TEST your understanding

1. Define what you understand by the term ‘operations management’.

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 make a pizza (your finished product).

3. Outline some of the tasks that Harry Souris carries out as National Operations Manager.

4. In your own words, describe the relationship between operations management and business objectives.

5. Explain the main differences between goods and services.

6. Outline the differences between the characteristics of operations management within a manufacturing business and a service business.

7. Why do modern businesses combine goods and services?

APPLY your understanding

8. One strategy to produce goods more quickly is to use better technology. For example, using a manual grater to grate cheese might not be as efficient as using an electric grater. Fill in the table below 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>Operations strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase the quality of service provided</td>
<td>Introduce Total 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>Minimise impact on the environment</td>
<td></td>
</tr>
<tr>
<td>Increase profit</td>
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</tbody>
</table>

9. Pick a business such as BHP or Woolworths Group Limited, and list at least three of their business objectives. This information can be found on the company’s website, in its 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. Use the internet to find a job advertisement for an operations manager (sometimes called a production manager or a factory manager). The advertisement will probably outline responsibilities involved in the position. List the skills required to fulfill these responsibilities.

EXAM practice

11. Explain the importance of the relationship between operations management and business objectives.  
   (2 marks)

12. Leading Pharma Group Ltd is a manufacturer of pharmaceutical products. Describe two differences between the operations management of a manufacturing business, such as Leading Pharma, and a service business.  
   (4 marks)

13. Compare the main characteristics of a manufacturer with those of a service business.  
   (4 marks)
5.3 EXTEND YOUR KNOWLEDGE Efficiency and effectiveness of operations

**KEY CONCEPTS**
- Efficiency and effectiveness work together to enable a business to achieve objectives.
- All operations strategies are used to improve the efficiency and effectiveness of operations.

It is vital that you understand the concepts of efficiency and effectiveness as you examine operations management. As you consider each operations management strategy, make sure that you can relate it back to how it affects efficiency and effectiveness.

A business must monitor and evaluate its operations systems. A business should be constantly asking whether or not the operations strategies that have been implemented or are about to be implemented improve the effectiveness of the production process (achieving stated objectives). Likewise, a business should also be asking whether or not operations strategies are improving the efficiency of the production process (how well the business has used resources in achieving its objectives).

**EFFECTIVENESS — ‘DOING THE RIGHT THINGS’**

Effectiveness refers to the degree to which a business accomplishes the objectives it set out to achieve. In other words, the business is ‘doing the right things’. For example, it might be asked, ‘did the business make a profit, or did the business not make a profit?’ If a business’s objective was to make profit, and it did so, then we would say it has been effective in achieving its objectives.

Operations strategies should support the business in achieving objectives such as to make a profit. For example, one materials strategy is ‘Just In Time’. By ensuring that the right amount of materials arrive just as they are needed for storage costs are reduced and the risk of waste occurring is reduced (also minimising costs).

Reduced costs impact positively on profit (profit is defined as what remains after business expenses have been deducted from revenue). Further, the right materials arriving in the right places, in the right quantities and at the right times mean that a business’s production process will operate as planned. Effective operations will contribute to the attainment of business objectives such as profit.

Another example of an operations strategy being used to improve effectiveness relates to technological developments. New technologies, such as automated production lines and website development, can be incorporated into the production process of a business. Technology can be used to increase production and improve the quality of the product, as well as to reduce errors and waste — thereby reducing costs. In this way, technological developments are able to support the business in achieving its objectives, such as making a profit, increasing sales and increasing market share.
EFFICIENCY — ‘DOING THINGS RIGHT’

Efficiency refers to how well a business uses resources to achieve objectives. In other words, the business is ‘doing things right’. The most efficient use of resources generally occurs when the benefits arising from the use of resources are greater than the costs of the resources utilised. Essentially, this is referring to productivity — how many inputs (resources) it takes to produce output (goods or services). If a business reduces the amount of waste produced while achieving its objectives, then this is also considered to be efficient.

Let’s take a closer look at productivity. Using our definition — the amount of output compared to the amount of inputs that go into production — there are two ways in which productivity can increase. Productivity can be improved by reducing the amount of input that is required to obtain the same level of output (or even increased output). Alternatively, productivity may rise if input remains the same but output increases. Both situations occur because a business has been able to get more out of the input. The two ways of improving productivity are illustrated in the diagram below.

Current productivity (situation a) may be improved by producing more output from the same input (situation b) or by reducing the level of input for the same output (situation c).

It is worth noting that productivity is more straightforward to measure in a manufacturing business than it is for a service business. A manufacturer may measure productivity by simply comparing the amount of goods it produces to its inputs; for example, machinery used, equipment, staff hours. A car manufacturer may improve productivity by producing more cars with the same amount of input, or the same number of cars using a smaller amount of input. Measuring the productivity of a service business is slightly more complex. It is not always possible to increase output because so much of the input will be staff hours. An increase in the number of customers might correspond with a decline in customer service as employees rush to complete as many tasks as possible. For this reason, one of the ways that a service business measures productivity is by gauging customer service and satisfaction.

There are a number of strategies that businesses can use to produce more output from the same input or reduce the level of input for the same output. Improved communication between management and employees can boost production. Management styles (see subtopic 2.5) that involve the employee in the decision-making process can increase worker productivity, as can human resources strategies such as career advancement and training programs aimed at improving worker motivation (see chapters 3 and 4). Automating production lines to
reduce the labour required to perform a task and increase output is also a strategy used in many businesses. The use of robots in car manufacturing plants is now commonplace.

Returning to our discussion on efficiency, operations strategies should support the business in using resources efficiently in achieving objectives. Just In Time can be used by a business to improve efficiency. By ensuring that the right amount of materials arrives just as they are needed for production, the business does not need to maintain inventory. This reduces the risk of inputs becoming damaged, lost or perishing, or never used, thereby minimising waste. Because the business does not need an oversupply of materials, the actual amount of inputs used can be reduced, improving productivity. Just In Time ensures that the operations process only produces what is needed, when it is needed, and in the quantity required at the right time.

Technological developments, such as automated production lines and website development, can be incorporated into the production process of a business to improve efficiency. Technology allows the operations process to occur faster, increasing the rate at which output is produced. Furthermore, costs are reduced as technology reduces errors. In addition, the use of technology reduces waste.

It is important to note that efficiency and effectiveness work together to enable a business to achieve objectives. It is difficult for a business to be effective if it is not being efficient and, likewise, it is difficult for a business to be efficient if it is not being effective. For example, a business that improves productivity (efficiency) is also likely to find that profit improves (effectiveness) as the reduced costs associated with productivity improvements reduce expenses.

However, for any given time period, it is possible for a business to have been effective (that is, it has achieved its objectives, such as profit) yet inefficient (for example, productivity may have declined over the same period). Nevertheless, efficiency and effectiveness will usually move in the same direction.

Businesses that can improve effectiveness and efficiency are likely to be more competitive, because they are able to produce more outputs at lower cost, provide higher quality products to customers and deliver them without delay.

### The relationship between efficiency and effectiveness

<table>
<thead>
<tr>
<th>Use of resources—efficiency</th>
<th>Efficiency</th>
<th>Inefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective and efficient</td>
<td>Doing the right things and doing them right</td>
<td>Ineffective and inefficient (not producing enough at high cost)</td>
</tr>
<tr>
<td>Effective but inefficient</td>
<td>Doing the right things in the wrong way</td>
<td>Doing the wrong things in the wrong way</td>
</tr>
</tbody>
</table>

### Pursuit of objectives—effectiveness

<table>
<thead>
<tr>
<th>Efficient</th>
<th>Inefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective but inefficient (costs are high)</td>
<td>Ineffective and inefficient (not producing enough at high cost)</td>
</tr>
<tr>
<td>Doing the right things in the wrong way</td>
<td>Doing the wrong things in the wrong way</td>
</tr>
</tbody>
</table>

### 5.3 Activities

**TEST your understanding**

1. Identify three ways in which a manufacturing business could improve productivity.
2. Identify three ways in which a service business could improve productivity.
3. Explain the difference between the efficiency and effectiveness of operations.
4. Outline how a business can use one operations strategy to improve effectiveness.
5. Describe one operations strategy that a business can use to improve efficiency.
EXTEND your understanding

6. Productivity can be calculated by using the formula \[ \text{Productivity} = \frac{\text{Output}}{\text{Input}} \]

(a) Calculate the labour productivity (output per employee) of bakeries A–D in the following table.
(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.

<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>

7. Research and explain why it can be easier to increase productivity in a manufacturing business than in a service business.

8. In your own words, explain how a business can be both:
   (a) effective and efficient
   (b) effective but not efficient
   (c) efficient but not effective.

9. Use the internet to research a business that has improved productivity. You could search for either a private limited company or a public listed company. Prepare a report that covers:
   (a) how the business improved productivity
   (b) whether or not you believe that the business is effective
   (c) whether or not you believe that the business is efficient.

5.4 Key elements of an operations system

\textbf{KEY CONCEPTS}
- The elements of an operations system are inputs, transformation processes and outputs.
- The operations system used in a manufacturing business will be different to the operations system used in a service business.

The key elements of an operations system are inputs, processes and outputs. These elements differ between manufacturing and service businesses. The management of the operations system is important because it will determine how efficiently and effectively the business produces goods or services to meet the needs of customers.
5.4.1 Inputs

Inputs are the resources used in the process of production. Some resources are owned by the business, while others are from suppliers. There are five 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. Businesses do not always account for the value of this resource, because it cannot be easily quantified as an asset.
5. **Time** and its efficient use are critical to all businesses. 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.

Differences between the inputs of manufacturing and service businesses

Inputs differ between manufacturing businesses and service businesses. Manufacturers tend to make more use of capital equipment and materials and use less labour and information. A hospital is an example of a business 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.
5.4.2 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.

The production of yoghurt goes through a transformation process, where inputs such as labour, raw materials and machinery are combined and converted into output.

Differences between the processes of manufacturing and service businesses

It is important to understand that the transformation process differs between manufacturing businesses and service providers. A manufacturer transforms inputs into tangible products (goods that can be touched). A service business transforms inputs into intangible products (services that 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 businesses continually work to improve the way they transform resources into finished products.

5.4.3 Outputs

Essentially, outputs are the result of a business’s efforts — the final good or service that is delivered or provided to the consumer. Manufacturing businesses transform inputs into tangible products, or goods. Goods tend to be homogenous, which means that they are basically all the same or similar. Service businesses transform inputs into services. Services tend to be differentiated, that is, they are provided to individual customers and are modified to suit each customer.
An operations system for a manufacturing company producing building products

**Inputs**

- **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**

**Transformation process**

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

**Output**

- **Building product**

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 bank or financial institution, delivering financial services.

**Inputs**

- **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**

**Transformation process**

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

**Output**

- **Delivery of financial services to customer**
5.4.4 The operations systems of manufacturing and service businesses

So far, we have drawn a distinction between service and manufacturing operations, but, in many cases, businesses carry out both types of operation. Toyota, for example, separates its vehicle manufacturing operation from its customer service operation, although both elements are critical to the business’s overall success. All businesses 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.

The operations manager must be able to link transformation processes to the activities performed by other areas of the business. 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 business.

Operations management is a delicate balancing act.

5.4 Activities

TEST your understanding

1. Identify the 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 businesses.
   (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. Construct a mind map to illustrate the five categories of inputs. The mind map below has been started for you.

```
Input (resources)

Materials: consumed/converted by the process
```

APPLY your understanding

7. 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 the Resources tab to identify the inputs, transformation processes and outputs that Rio Tinto would use to produce its products.

8. Monash Health provides health services through major hospitals and community health facilities across south-eastern Melbourne. Use the Monash Health weblink in the Resources tab to identify the inputs, transformation processes and outputs that Monash Health would use to provide its services.

EXAM practice

9. Explain the difference between inputs and outputs. (2 marks)

10. Describe the key elements of an operations system. Illustrate your answer using a service business. (4 marks)

11. T&A Windows and Doors Pty Ltd is a manufacturer of timber and aluminium windows and doors. Identify and explain the key elements of T&A Windows and Doors’ operations system. In your answer provide one example of each key element. (6 marks)

Resources

- Weblink: Rio Tinto
- Weblink: Monash Health

5.5 Technological developments

**KEY CONCEPTS**

- The use of technological developments is one strategy that operations managers use to improve the efficiency and effectiveness of operations.
- Four strategies related to technological developments are the use of automated production lines, computer-aided design, computer-aided manufacturing techniques and website development.

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. Businesses need to utilise up-to-date technology in order to compete with other businesses. In both the service and manufacturing
sectors, technological developments can be used to speed up (or shorten) processes and maximise the use of materials. The use of technology means that goods and services can be produced using less labour. These factors reduce costs and maximise efficiency. The use of technological developments can also improve quality; as sales increase and as costs are reduced, a business should increase its profitability (or effectiveness).

There are a huge range of technologies available to a business. For VCE Business Management, four strategies that you must be aware of related to technological developments are the use of automated production lines, computer-aided design, computer-aided manufacturing techniques and website development.

### EXAM TIPS

- The outcome for **Unit 3, Area of Study 3** states that you need to ‘evaluate strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should know the advantages/strengths and disadvantages/limitations of each strategy related to technological developments, as well as each strategy’s impact on improving the efficiency and effectiveness of operations.
- The outcome for **Unit 3, Area of Study 3** states that you need to ‘propose strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should put forward a technology strategy for consideration or action when asked. This involves writing a little more than simply just identifying or suggesting the strategy. You should be able to define the technological development as well as explain a little about it.

### 5.5.1 Office technology

Both service and manufacturing operations use office technology, but businesses 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 following diagram.
5.5.2 Website development

Most modern businesses require a website. A website can be used for marketing but it can also be developed for operations purposes. The operations department may work with technology support to develop ways to make it easier for customers to purchase goods or services online or to share information. Online sales functions may be added to the website or upgraded. For example, an upgrade might involve improving a shopping cart or a checkout process. A website can be developed to allow customers to make bookings or appointments. A business will need to ensure that a website that will handle private and sensitive personal information provided by customers can effectively protect this information. Additionally, a business may make use of website development to increase the amount of information it gets from its customers and analyse this information.

A business may also develop its website to provide information to employees, customers and suppliers. A section for policies, such as a privacy policy or a returns policy, and an FAQ section for addressing the most frequently asked questions of a support team could be included on a website for customers.

A website can provide detailed information to suppliers. For example, it can make procurement activities available to potential suppliers. Furthermore, a portal for suppliers might be established to identify and obtain qualified suppliers.
As well as delivering consistent messages to customers and suppliers and being used to gain customer feedback, a website means that a business is accessible 24 hours a day, 7 days a week. A website also reduces the costs of labour and of leasing or purchasing physical space. However, designing, registering and publishing a website may initially be expensive and time consuming. Websites do crash, so the loss of access to the business when there is a malfunction may prevent customers or other stakeholders dealing with the business. Operating a website may require employees to be trained in website design and maintenance, and a lack of this skill set may lead to employees losing their jobs.

5.5.3 Automated production lines

An automated production line is comprised of machinery and equipment arranged in a sequence with components added to the good as it proceeds through each step. The good usually moves along the line on a conveyor belt. An automated production line does not need employees directly involved in its operation as all or part of the process is controlled by automation; that is, it is self-operating or controlling. Computers manage the process and humans are likely to be given the task of monitoring the operations system.

A typical key feature of an automated production line is the use of robotics — a form of technology that is capable of complex tasks (as shown in the figure above). Robots are used in engineering and specialised areas of research, as well as on automated production lines, where a programmable machine capable of doing several different tasks is required. Robotics allows for 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 repetitive, difficult or even dangerous for employees. Robotics is a high-cost form of technology that can be unaffordable for many small and medium-scale manufacturers.
5.5.4 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 businesses.

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 manufacturing (CAM) involves using software to direct and control the manufacturing process. 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.

Like other forms of technological developments, CAD and CAM (as well as CIM) offer advantages such as faster production at reduced cost.

However, computer software can crash, resulting in the possible loss of work or production ceasing, and software and systems can be expensive. The cost and time involved in training staff can also deter many businesses from the use of CAD and CAM (as well as CIM). As with other types of technology, the use of these strategies can lead to the loss of jobs as less employees are likely to be required to complete tasks.
DID YOU KNOW?
Australian Waterslides and Leisure Pty Ltd uses the latest computer-aided design programs to provide quality and safety in its waterslide projects. The information can be collated quickly for a very accurate presentation of ideas and information.

5.5 Activities

TEST your understanding
1. How can technology improve operations?
2. Explain the impact of technology on service businesses.
3. In what ways can the development of a website be beneficial to the operations area?
4. What is an automated production line?
5. Explain the impact of technology on manufacturing businesses.
6. State two benefits and two costs of technology.
7. Match each of the following terms with its definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website development</td>
<td>(a) A computerised design tool that allows a business to create product possibilities from a series of input parameters</td>
</tr>
<tr>
<td>Automated production line</td>
<td>(b) The creation and/or improvement of a connected group of pages on the internet that will be maintained by a business to promote and sell its products</td>
</tr>
<tr>
<td>Computer-aided design (CAD)</td>
<td>(c) Machinery and equipment arranged in a sequence with components added to the product as it proceeds through each step, with the process controlled by computers</td>
</tr>
<tr>
<td>Computer-aided manufacturing (CAM)</td>
<td>(d) A method of manufacturing in which the entire production process is controlled by a computer</td>
</tr>
</tbody>
</table>

APPLY your understanding
8. Explain how technology can be used to improve the efficiency and effectiveness of operations in a business. Include the terms ‘website development’, ‘computer-aided design’, ‘computer-aided manufacturing’, and ‘automated production lines’ in your answer.
9. Use both the Telstra and Toyota weblinks in the Resources tab to list the types of technology these companies use and then make a comparison. Explain how the technologies used differ.

EXAM practice
10. Define the term ‘website development’. (1 mark)
11. Distinguish between automated production lines and computer-aided design. (2 marks)
12. Discuss the likely consequences of a business introducing technological developments to improve its operations. (6 marks)
5.6 Materials management

**KEY CONCEPT** Materials management is used by operations managers to improve the efficiency and effectiveness of operations. It involves managing the use, storage and delivery of materials to ensure the right amount of inputs are available when required. Four strategies related to materials are forecasting, master production schedule, materials requirement planning and Just In Time.

5.6.1 Materials management

Vehicle manufacturer Hyundai Motor 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 August 2017, Hyundai was forced to suspend production at four of its factories in China after a supplier refused to provide parts due to delays in payment. *Materials management* is an important area of operations management that ensures that materials are received and stored in the right quantities and at the right time, so that they are available in the operations system as required.

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

- Receiving materials
- Controlling the release of materials into the production process
- Reducing holdings of surplus stock
- Identifying ongoing materials requirements
- Storing materials safely
- by ensuring timely purchase of materials
- by forecasting
Many businesses will have large amounts of materials on hand to complete production. This is referred to as stock or inventory. A large inventory may be held by the business to ensure that materials do not run out; however, this represents a cost to the business. Stock taking up storage space for lengthy periods can mean that the business 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 businesses, such as Hyundai, 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 supplier refusing to provide parts) the consequences can be devastating.

One important aspect 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.

It is also important that the operations area carries out forecasting and materials planning (including a master production schedule and materials requirement planning), as well as inventory control (such as Just In Time). These strategies are illustrated in the diagram on the next page and covered in the sections that follow.
The process for managing materials

- Customer orders
- Forecasting
- Master production schedule
- Materials requirement planning
- Inventory control
- Just In Time
- Current inventory levels

**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.

5.6.2 Forecasting

One of the initial stages of the management of materials involves forecasting. The operations area will use forecasting to develop a production plan and reduce the uncertainty of future events. A business needs to forecast the quantity and timing of demand for its good or service and then match supply with demand. This will allow the business to decide what goods or services to produce, how to produce them and in what quantity. In this way, it can estimate or predict what materials are needed, and in what quantities. A business may also forecast the costs of materials and transportation.

A business will use forecasting to ensure that it maintains an appropriate level of materials for the operations system without overproducing. This would result in the business carrying too much inventory and stock would remain in storage, representing a cost to the business. At the same time, a business does not want to find itself in the situation where it does not have enough inventory for the operations to function. This could lead to underproduction.

Forecasts can be for the short term, for example for the next hour, day, a week, month or year; or for the longer term, for example for the next three to five years or for the life of a product.

Forecasting methods fall into two broad categories: qualitative and quantitative. Qualitative forecasting is subjective, that is, it gathers information that is usually based on the opinions of people, such as through market research and open-ended questions on questionnaires. Quantitative forecasting makes use of data in numerical form. For example, a business might develop a forecasting model where it would try to predict future demand for its good based on an analysis of numerical facts or historical patterns in statistics from the previous five years.

While forecasting will allow a business to predict its materials needs, making use of historical data does not necessarily guarantee that past events will continue into the future. It is always possible that unforeseen or unexpected events will occur. Forecasting, to some degree, will always be inaccurate. This strategy provides a ‘guesstimate’ — a mixture of a ‘guess’ and an ‘estimate’.
**DID YOU KNOW?**

Forecasting future conditions is vital for the success of business and materials planning. By the end of World War II, Curtiss-Wright was the largest aircraft manufacturer in the United States. Unfortunately, the management of the company failed to accurately forecast the market for jet aircraft and instead invested in improved piston engines. This eventually led to the closure of its entire aeroplane division.

5.6.3 Materials planning

The production plan provides the basic information necessary for detailed materials management planning. Modern businesses typically complete materials planning by using software. Such planning includes a master production schedule (MPS) and materials requirements planning (MRP).

**Master production schedule**

A master production schedule (MPS) is a plan that describes what is to be produced, in what quantities, how and when. The plan is 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 business has been correctly assessed. A business cannot increase its rate of production without increasing the amount of necessary inputs, as Boeing found (see the ‘Did you know?’ feature at the end of section 5.6.1). Decisions such as upgrading plant and equipment or employing additional staff may be related to ongoing problems in meeting this schedule.

**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.

**Materials requirement planning**

Materials requirement planning (MRP) is completed after the business has a clear understanding of the quantities to be produced and the time frame involved. It involves producing 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 business wishes to take advantage of bulk purchasing discounts offered by suppliers.

Hyundai Motors uses a master production schedule to ensure that shortages and excesses of inventory in its operations system are minimised.
Like forecasting, both MPS and MRP allow a business to avoid overproducing (which is likely to result in an excess of inventory) or underproducing (which is likely to result in shortages). Too much inventory can represent a cost to a business, whereas not enough inventory can prevent a business from continuing production. By completing a master production schedule, an operations manager will be able to predict the future needs of the business and determine the materials required. Both MPS and MRP can be used by a business to make adjustments to production in response to fluctuations in demand. Furthermore, both strategies allow a business to schedule changes when new products are introduced. These benefits provide a business with flexibility. MRP improves efficiency in the location of production resources, providing accurate estimates of materials requirements and delivery dates, allowing the business to control costs.

However, there are a number of limitations related to MPS and MRP. Both strategies rely on accurate information — if incorrect information is used, it is likely that errors will occur in the materials planning process. The cost of implementing both strategies can be inhibitive for many businesses. Software and other resources may need to be purchased to facilitate each strategy, and training may also be required. While MPS and MRP can both provide a business with flexibility, the use of each strategy may potentially have the opposite effect. Using MPS and/or MRP may result in a business not being able to adapt quickly enough to any changes or problems because all materials needs are tied in to a production schedule. Once materials are ordered and employees are scheduled to work it can be difficult to interrupt the process and make changes.

EXAM TIPS
- The outcome for Unit 3, Area of Study 3 states that you need to ‘evaluate strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should know the advantages/strengths and disadvantages/limitations of each strategy related to materials, as well as each strategy’s impact on improving the efficiency and effectiveness of operations.
- The outcome for Unit 3, Area of Study 3 states that you need to ‘propose strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should put forward a materials strategy for consideration or action when asked. This involves writing a little more than simply just identifying or suggesting the strategy. You should be able to define the materials strategy as well as explain a little about it.

5.6.4 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 businesses 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. Businesses 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.

Just In Time
The Just In Time (JIT) system of inventory control is a common strategy used by many businesses in Australia. This approach makes sure that the right amount of materials arrive just as they are needed for production. It can reduce storage costs and reduce the risk of any waste occurring in storage, thus increasing competitiveness. However, supplier deliveries must be reliable, and materials must be received at the appropriate time. As discussed, car manufacturers such as Hyundai Motors only have a limited amount of materials available in inventory at any given point in time. One Hyundai car is comprised of more than 20 000 parts; in 2017,
the failure to receive just a single part on time at Hyundai’s factories in China brought the production line to a halt.

Inventory control software provides managers with precise knowledge of quantities and locations of stock.

**5.6 Activities**

**TEST your understanding**

1. Explain, in your own words, what ‘materials management’ is about.
2. List the benefits of efficient materials handling.
3. Explain the purpose of forecasting.
4. List the benefits and any possible limitations of using forecasting.
5. Briefly outline the two key steps or strategies involved in materials planning.
6. (a) Identify the benefits of MPS and MRP.
   (b) Suggest any possible limitations for a business using MPS and MRP.
7. What is inventory?
8. What is the main benefit of inventory control?
9. Explain how the Just In Time approach can improve productivity and reduce costs.
10. List potential problems that you can see with the Just In Time approach.
11. Match each of the following terms with its definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasting</td>
<td>(a) 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>(b) A materials planning tool that relies on data from the past and present and analysis of trends to attempt to determine future events</td>
</tr>
<tr>
<td>Master production schedule (MPS)</td>
<td>(c) Details what is to be produced and when</td>
</tr>
<tr>
<td>Just In Time</td>
<td>(d) Developing an itemised list of all materials involved in production to meet the specified orders</td>
</tr>
</tbody>
</table>

**APPLY your understanding**

12. Chan is the Operations Manager of a small clothing manufacturer. Recently, the business has been 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 strategies you think would help Chan to improve the efficiency and effectiveness of his operations. Explain your answer.

13. Explain how materials management can be used to optimise operations.

14. To find out how a business might deal with forecasting, use the Role of forecasting weblink in the Resources tab. Why do businesses need to forecast? How can a business create a forecast and what should be done with it?

**EXAM practice**

15. Define the term ‘master production schedule’. **(1 mark)**
16. Explain the difference between materials requirement planning and Just In Time. **(2 marks)**
17. Describe a strategy that a business could use to improve the efficiency and effectiveness of its operations in relation to materials. **(3 marks)**
5.7 The management of quality

**KEY CONCEPT** Businesses use quality management to make sure that their products meet customer expectations. Quality strategies are used to improve the efficiency and effectiveness of operations. Three quality strategies are quality control, quality assurance and Total Quality Management (including employee empowerment, continuous improvement and improved customer focus).

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 Tatura Milk Industries, a wholly owned subsidiary of Bega Cheese Limited. The business manufactures quality dairy products from milk supplied by dairy farms in regional northern Victoria. In the following sections, we will examine how Tatura Milk manages quality.

When managing quality, a business 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. Tatura Milk makes use of quality control and quality assurance. Many businesses use an approach called Total Quality Management.

**EXAM TIPS**
- The outcome for **Unit 3, Area of Study 3** states that you need to ‘evaluate strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should know the advantages/strengths and disadvantages/limitations of each strategy related to quality, as well as each strategy’s impact on improving the efficiency and effectiveness of operations.
- The outcome for **Unit 3, Area of Study 3** states that you need to ‘propose strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should put forward a quality strategy for consideration or action when asked. This involves writing a little more than simply just identifying or suggesting the strategy. You should be able to define the quality strategy as well as explain a little about it.
5.7.1 Quality control

Tatura Milk uses quality control to maximise efficiency and effectiveness in its operations process. Quality control reduces problems and defects in the product, using inspections at various points in the production process. Many businesses such as Tatura Milk 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. Efficiency, and therefore competitiveness, increases as the costs associated with waste and faulty products are reduced. Effectiveness should increase as sales increase and as costs are reduced — improvements in quality should lead to an increase in profit.

Quality control is a traditional approach to quality management and is product orientated. The strategy is generally said to be a reactive one because it detects defects in goods and services that have already been produced. It is important to note that not every business will use quality control to inspect absolutely every product — quality control typically involves the selection of samples.

At Tatura Milk, every load of milk is individually tested as it is delivered to the factory. Data can be provided back to the farmer through a secure website. The plant has an onsite laboratory where teams of scientists and technicians conduct routine quality testing at all stages of the production process. A service business such as a bank might use teller accuracy, speed and courtesy as quality-control measures.

While quality control is able to reduce problems and defects in a business’s product, using this quality strategy does represent a cost. Rejected products will end up as waste, unless they can be reworked, and more time needs to be added to the production process to inspect products.

Qualified professionals, such as chemists or engineers, may be employed by the business to carry out testing or inspections. Furthermore, because quality control often involves the selection of random samples that are subjected to inspections, it is possible that poor-quality products will still be provided to customers (as a sample may not be representative of an entire batch of products).

DID YOU KNOW?

Northrop, a US company involved in the production of B-2 aircraft, required each employee to sign a giant scroll that was then hung over the plant assembly line. The inscription on the scroll read: ‘Total quality control on the B-2 begins with me’.

Businesses such as Tatura Milk conduct testing or inspections throughout the operations process — this strategy is known as quality control.
5.7.2 Quality assurance

Quality assurance is an integral part of Tatura Milk’s operations. Quality assurance involves the use of a system that will assure customers that the products of a business are fit for purpose. It does this by achieving set standards throughout the production process, thereby preventing quality issues before they occur. For this reason, quality control is said to be a proactive strategy and is process oriented. All employees in a business that has implemented quality assurance will be responsible for quality, not just those directly involved in production. There are a number of examples of quality systems, including process checklists, audits and the development of standards. Many businesses make use of external organisations that audit the operations of the business against national and international standards.

Tatura Milk has a quality system in place to ensure that set standards are achieved. Its quality assurance system is based on the ISO 9001 series. This is a widely used international standard that sets out the criteria for a quality management system. ‘ISO’ stands for International Organization for Standardization. Meeting these international standards is voluntary, but many businesses comply with ISO requirements to remain competitive locally and internationally. The ISO provides guidelines on how businesses should establish quality assurance systems by adopting specific procedures, controls, and recording and documentation measures. Tatura Milk’s quality system provides reassurance to customers that it is able to provide a safe, quality product. Its system includes the factory and staff, the calibration and maintenance of equipment, as well as hygiene and workplace health and safety.

Like quality control, quality assurance should lead to efficiency, and therefore competitiveness, as the costs associated with waste and faulty products are reduced. As customers are likely to feel assured that they are purchasing a quality product, sales would be expected to increase, and as costs are reduced, improvements in quality should lead to an increase in profit. Therefore, quality assurance should also lead to effectiveness. While quality assurance is able to improve business competitiveness and customer satisfaction, introducing a quality assurance system can be expensive, particularly for smaller businesses. There may also be heavy emphasis on documentation, making the process time-consuming. Large contributions could possibly be required from those employees involved in introducing and maintaining the standards.
5.7.3 Total Quality Management

Total Quality Management (TQM) is a commitment to excellence that emphasises continuous improvement in all aspects of a business’s operation by sharing responsibility among all the members of the business. Quality becomes both a commitment and the responsibility of every employee in the business. The aim of TQM is to create a defect-free production process, and maintain a customer focus in operations. The adoption of TQM can reduce costs throughout the business and, because it leads to a reduction in defects, should result in improved efficiency. Improved cost competitiveness and improved product quality, along with increased customer satisfaction, should allow the business to attain a competitive advantage and become more effective.

However, introducing Total Quality Management can be expensive and time consuming. This strategy relies on the full participation of all employees, but it is possible that its introduction may be resisted as employees are required to change their way of thinking and attitude. Staff will need to be trained in customer service and problem solving, and it will take time for improvements to be seen across the business.

DEMING’S QUALITY PHILOSOPHY

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

To achieve TQM objectives, a number of approaches may be used. These approaches include the empowerment of employees, continuous improvement and improved customer focus.

Employee empowerment

Deming believed that quality problems would be best solved with an emphasis on employee involvement. Many businesses 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 business. Such programs have resulted in substantial cost savings for businesses. 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.
**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’.

**Continuous improvement**  
*Continuous improvement* is a process that involves a constant evaluation of, and improvement in, the way things are done in a business. Higher and higher standards are set in the continual pursuit of improvement. *Kaizen* (Japanese for ‘improvement’) emphasises continuous improvement in all facets of a business, 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’ that is important to a business’s corporate culture.

Brambles Limited is a logistics company committed to continuous improvement.

**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 achieved by monitoring best practice, minimising its environmental impact and supporting local communities.
Customer focus
Deming believed that quality should be the responsibility of every employee. The TQM approach considers one of the most important questions a business 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 business.

5.7 Activities
TEST your understanding
1. Outline the main features of ‘quality management’.
2. Explain why quality control is important to businesses.
3. Briefly outline the benefits and limitations of quality control.
4. In what ways can businesses offer quality assurance to customers?
5. List the benefits and limitations for a business using quality assurance.
7. Outline the three approaches that make up Total Quality Management.
8. Suggest possible benefits and limitations for a business making use of Total Quality Management.
9. 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 a business achieves set standards in production.
   (c) Total Quality Management is a commitment to quality that is applied to the business’s operations department.
   (d) Continuous improvement involves an ongoing commitment to the use of inspections.

APPLY your understanding
10. 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.
11. The name of the Reject Shop suggests that it could not possibly sell quality products. Is this true? Use internet sources to find the Reject Shop website. 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?

EXAM practice
12. Distinguish between ‘quality control’ and ‘quality assurance’. (2 marks)
13. Describe a strategy that a business could use to improve the efficiency and effectiveness of its operations in relation to quality. (3 marks)
14. MRC Accountants’ objective is to provide quality, independent advice. However, it has recently been suffering quality issues and the director of the business has decided to implement Total Quality Management in response. Explain and justify the use of Total Quality Management at MRC Accountants.
5.8 Waste minimisation

**KEY CONCEPT** Operations managers make use of waste minimisation in the production process to improve the efficiency and effectiveness of operations. One waste minimisation strategy is lean management.

Waste minimisation is a process that involves reducing the amount of unwanted or unusable resources created by the business’s production process in an attempt to improve the efficiency and effectiveness of operations. Waste minimisation strategies include:

- redesigning products and packaging
- procurement of materials made from recycled materials
- reusing scrap material
- improving quality control
- exchanging waste with other businesses
- introducing all systems approaches, such as lean production.

Minimising waste reduces the costs of production of the business, such as the costs of waste removal, and also improves productivity across the operations area. Furthermore, minimising waste demonstrates concern for the natural environment; this can contribute to improving the reputation of the business.

Minimising waste is a win–win situation — it reduces costs and cares for the environment. Woolworths launched its Trolley Tracker tracking system to help find the approximately 15,000 trolleys that ‘go feral’ each year, disappearing from Woolworths and Big W stores around the nation. Abandoned trolleys cost the company $50 million each year; it costs more than $150 to replace a broken or lost trolley.

Dumped shopping trolleys also damage the environment; they end up in creeks and backyards. Residents who see abandoned trolleys can use the Trolley Tracker App or website, or call a national toll-free number to report the location and enter a draw to win a $1000 monthly reward.
5.8.1 Lean management

The concept of **lean management** derived from the Toyota production system. Lean production, or lean manufacturing as it is also known, was originally developed in post-war Japan for Toyota and the manufacturing of automobiles. Lean management is an approach to operations management that attempts to improve efficiency and effectiveness by eliminating waste and improving quality — 'lean' in this case means no excess, just as lean meat has as little fat as possible. A business using this approach would carefully analyse each stage of the operations system and remove any inefficiencies that do not add value to the product. According to the principles of lean management, waste is anything that reduces the speed of production or stops production occurring at the lowest possible cost. As waste is reduced, production times and costs are cut. Today, the approach is used widely in the automobile industry as well as many other industries, both in manufacturing and in the production of services.

**study on**

There are a number of different areas of waste that a business can focus on, as seen in the following diagram. A business may choose to eliminate, reduce or avoid any one or more of the following wastes: excess transport, defects (or errors), excess motion, overproduction, excess inventory, waiting time and overprocessing. For example, a manufacturing business could attempt to minimise waste through the avoidance of excess motion by reducing unnecessary movement of workers and materials between production processes. A service business might also endeavour to avoid excess motion by reducing unnecessary movement. For example, rather than making customers queue several times in order to receive a service, a service business could provide a one-stop service. Reducing the time that employees wait for work to come through in a manufacturing business could eliminate the waste that may occur during waiting time. This could be achieved by ensuring that production flows continuously. Similarly, a service business might reduce or eliminate waiting time by cutting the time that customers have to wait for service by removing queues completely from the operations process. This may be achieved, for example, by using technology so that customers sign in to a digital kiosk instead of waiting in line, and receive an SMS when it is their turn. Alternatively, a business may make use of self-service checkouts.
Lean management identifies seven wastes that a business should work towards eliminating: excess transport, defects (or errors), excess motion, overproduction, excess inventory, waiting and overprocessing.

**EXAM TIP**

There are a large number of wastes to learn for lean management, but the acronym TIMWOOD may help: T is Transportation, I is Inventory, M is Motion, W is Waiting time, the Os are Overprocessing and Overproduction and D is Defects.

**A LEAN HISTORY**

A good understanding of lean management can be gained by understanding its history. Given that lean manufacturing has its origins in the automobile industry, it is necessary to consider the development of the car, which was invented in 1880.

Early in the twentieth century, mass production became an important focus for businesses. In 1910, Henry Ford developed an assembly line approach to automobile manufacturing that involved employees, components, machines and tools arranged along a production line called a conveyor belt system. This approach reduced the hours spent on the assembly of a car from 728 to just 1.5.

The assembly line approach to manufacturing emphasised efficiency. For the following 50 years it was assisted by developments in technology such as automation and computers. The United States became the largest producer of goods and services in the world, but after World War II, Japan began to compete with the Americans by developing a new manufacturing approach. This new approach arose out of necessity.

The development of lean manufacturing was based on the needs of Japan’s economy. Demand was low and there was little point in focusing on economies of scale (mass production at the lowest cost per item). Toyota
realised that production should be driven by actual sales of vehicles and that overproduction should be avoided. The company could not afford to have resources locked up in excess equipment or materials in production. Originally named Just In Time production (JIT), the Toyota production system was developed with the aim of minimising waste and fully utilising the capabilities of employees so that only minimal inventory was needed. Part of Toyota’s philosophy of waste minimisation was the use of cellular manufacturing — efficiencies were gained through grouping machines and people into separate ‘cells’ that produce similar items or require a similar process of production.

Workers constructing a Model-T car on an assembly line in a Ford Motor Company factory, circa 1914.

There are three main lean management practices involved in Toyota’s production system:

1. Kaizen — a practice focused on making positive changes on a regular basis, often referred to as continuous improvement.
2. JIT — the right amounts of materials are delivered to the operations system just as they are needed for production, in the exact amount needed and where they are needed.
3. Jidoka — a Japanese word that means automation. However, Toyota interprets the word as meaning ‘automation with a human touch’. This basically means that quality is embedded in the company’s operations system. If, for example, a Toyota employee sees an abnormality such as a defect, they are able to intervene and bring production to a halt. This allows the defect to be corrected before more problems can occur, and can prevent further damage or even injury.
Cochlear, a medical device manufacturer, employs the ‘lean’ philosophy in its manufacturing process. Systematically eliminating waste enables Cochlear to reduce overproduction, reprocessing and defects, and increase recycling and paperless operation documentation. Redesigned packaging and flexible printing have also reduced packaging waste. Cochlear adopts continuous improvement programs, which incorporate lean manufacturing principles and ongoing investment in new manufacturing technologies.

FOUR PRINCIPLES’ APPLICATION OF LEAN MANAGEMENT

Four Principles is a business that was created in 2010 to make the philosophy of kaizen (continuous improvement) more accessible and simpler to implement. The founders of the business took the lean principles of the Toyota Production System and distilled them into four core principles. The result is a more memorable structure that can easily be adopted by businesses in any industry — whether in manufacturing, retail, banking, health care, government, electronics or transportation.

The business uses its lean methodology to help other businesses to establish lean programs and eliminate waste, reduce costs and increase profitability. Four Principles’ application of lean management involves four complementary, interconnected principles:

- **Pull** — this relates to avoiding overproduction and stockpiling. By enabling customer demand to dictate the rate at which products are delivered, a business is more likely to minimise waste as it will only be producing the outputs that will be sold. The costs of inventory will be reduced, as will the likelihood of stock becoming lost, damaged or perishing. In this way, customers ‘pull’ value through the production process, leading to efficiency and effectiveness.

- **One piece flow** — this largely relates to eliminating waiting time or idle time. One piece flow involves a piece of production moving through the operations process one at a time. All steps in the operations process must be focused and aligned to adding value, one piece at a time, removing all wasteful and unnecessary activities. By producing in a smooth, uninterrupted manner, idle time is minimised. This improves efficiency, as costs are reduced and waste minimised. Quality is improved, enabling the business to be more effective.
• **Takt** — this refers to the rate of production needed to meet customer demand. Takt time is the average time that passes between production starting on one unit of a product and the start of production of the next unit, in order to meet demand. If a business, for example, has a takt time of ten minutes, this means every ten minutes a finished product is completed because, on average, a customer buys a product every ten minutes. This is important for a business that is making use of lean principles, as it must know the minimum level of resources that are necessary in order to produce enough to meet customer demand. Takt helps the business to establish a consistent workflow following a smooth pattern that is flexible and easy to regulate as demand rises or falls.

• **Zero defects** — this is all about the business striving for perfection. Errors or defects need to be identified as closely as possible to where they occur. By doing so, and by not accepting or passing on defects, issues will be resolved quickly and levels of waste will be reduced. This improves efficiency, as resources are utilised with minimum waste, and avoids quality issues, leading to increasing profitability.

Lean management can be used to improve the effectiveness of a business’s operations. By eliminating waste, it reduces costs that may lead to an improvement in profit. Furthermore, lean management can lead to increased customer satisfaction, which can result in increased sales and, subsequently, an improvement in profit. Lean management can also be used to improve the efficiency of a business’s operations. Through the use of lean management, as a business reduces the amount of waste produced while working towards achieving objectives, productivity increases and resources should be used more efficiently. The use of lean management has other strengths, as outlined in the diagram below. However, the use of lean management does have a number of weaknesses or limitations, also outlined in the diagram below.

EXAM TIPS

• The outcome for Unit 3, Area of Study 3 states that you need to ‘evaluate strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should know the advantages/strengths and disadvantages/limitations of waste minimisation strategies including lean management, as well as the strategy’s impact on improving the efficiency and effectiveness of operations.
• The outcome for Unit 3, Area of Study 3 states that you need to ‘propose strategies to improve the efficiency and effectiveness of business operations’. This suggests that you should put forward a waste minimisation strategy (such as lean management) for consideration or action when asked. This involves writing a little more than simply just identifying or suggesting the strategy. You should be able to define the waste minimisation strategy as well as explain a little about it.

HALLMARK GOES LEAN

Hallmark Cards adopted lean management 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!

Hallmark produces several billion cards globally per year. Hallmark Australasia, which has approximately 700 employees, has in recent years transferred its manufacturing operations to China in order to increase efficiency.

5.8 Activities

TEST your understanding

1. What is waste minimisation and how can it be practised by a business?
2. Define the term ‘lean management’.
3. List the seven wastes according to the principles of lean management.
4. Briefly outline where the idea of lean management originated.
5. Outline the three main lean management practices involved in Toyota’s production system.
7. What are the benefits or strengths of lean manufacturing and what are its limitations or weaknesses?
8. Read the ‘Hallmark goes lean’ case study.
   (a) Explain how Hallmark was able to reduce the time it took to make a greeting card just by changing the design and layout of its facilities.
   (b) How did Hallmark develop this solution?

APPLY your understanding

9. The work cell approach relies on workers being able to do a variety of tasks, not just one task. Outline one advantage and one disadvantage associated with workers becoming multiskilled.
10. Why do you think work cells would rely more heavily on teamwork than individual achievement?
11. Imagine that you are the president of Hallmark in the early 1980s, and you have just been asked to make redundant almost one-quarter of your staff. Evaluate the issues involved in making this decision. What would be your solution?
12. Use the Lean manufacturing weblink in the Resources tab to describe how creating brilliant processes for producing goods or delivering services is just as important as finding brilliant workers.
EXAM practice
13. Explain the principles of lean management.  (2 marks)
14. Describe one strategy to improve the efficiency and effectiveness of operations through waste minimisation in the production process.  (4 marks)
15. Precision Tools Pty Ltd has experienced increasing levels of wastage and recently decided to implement lean management. Justify the use of the principles of lean management in reducing the level of wastage at Precision Tools.  (4 marks)

Resources
Weblink: Lean manufacturing

5.9 APPLY YOUR SKILLS Managing technological developments, materials, quality and waste minimisation

PRACTISE YOUR SKILLS
- Define, describe and apply relevant business management terms
- Research and analyse case studies and contemporary examples of management applicable to managing production in a business
- Interpret, discuss and evaluate business information and ideas
- Apply operations management knowledge to practical and/or simulated business situations
- Compare and evaluate strategies used in operations management
- Propose and justify strategies for improving the efficiency and effectiveness of operations

5.9.1 Six Sigma

SIX SIGMA AT BORAL
Six Sigma is a measurement-based approach and methodology designed to strive for near perfection in the operations process through the elimination of defects. It 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 a business produces only 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 business and continuous improvement.

A special team of people within the business 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 on the next page.
The fur seals and sea lions at the Great Southern Oceans exhibit at Taronga Zoo put on a spectacular show for up to 950 people in their new home. Boral supplied substantial quantities of concrete to the project. Boral is a company that has successfully implemented Six Sigma.

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, the 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 and predicted that these would deliver three years of benefits. Boral continues to make use of Six Sigma, as well as lean management and continuous improvement.

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’).
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.’

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

5.9.1 Activities

TEST your skills

1. Explain what is involved in the Six Sigma approach.
2. Some people believe that Six Sigma is a quality management approach. Outline the aspects of Six Sigma that make it a quality management approach.
3. Some people believe that Six Sigma is a lean management approach. Describe the aspects of Six Sigma that make it a lean management approach.
4. Outline how Boral used Six Sigma to improve its operations and achieve its business objectives.
5. 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?

6. Critics of Six Sigma claim that it has had mostly negative effects on the businesses 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?

7. Use the Six Sigma weblink in the Resources tab and the case study provided, or find another example of a business that has adopted Six Sigma, to answer the following.
   (a) Why did the business decide to adopt the Six Sigma approach?
   (b) Describe how the business used the Six Sigma approach.
   (c) Explain the benefits to the business as a result of using Six Sigma.

8. The task word (sometimes referred to as command word or instructional word) ‘compare’ generally requires you to comment on the similarities and differences between two things. Compare Total Quality Management and lean management.

5.9.2 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.

Materials required
- Recycled A4 paper
- Scissors
- Glue

Instructions
1. Arrange your class into groups of three or four. Each of these teams will become a business.
2. Your business has 15 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 would 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 have only 15 minutes!
5. At the end of the 15 minutes, compare outputs across groups to determine a winner. This might be the business with the most envelopes. Alternatively, the winner could be the team with the highest quality envelopes.
6. Complete the 5.9.2 Activities to apply your skills to an analysis of this task.
How to make high-quality paper envelopes

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

5.9.2 Activities

TEST your skills
1. List the elements of your operations system.
2. Was your business offering a service or manufacturing a product?
3. Describe the responsibility of each team member in your group.
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 skills
7. Your business probably produced a lot of waste. Identify some waste minimisation strategies that you could implement in order to reduce production costs and operate in a sustainable manner.
8. To improve the efficiency and effectiveness of your operations, 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?
10. The task word (sometimes referred to as command word or instructional word) ‘compare’ generally requires you to comment on the similarities and differences between two things. Compare forecasting and Just In Time.
11. The task word (sometimes referred to as command word or instructional word) ‘evaluate’ generally requires you to consider both sides of something, and then provide an overall conclusion or judgement related to which argument is the more persuasive and why. Evaluate the use of website development for your paper envelopes business.
12. The task word (sometimes referred to as command word or instructional word) ‘propose’ generally requires you to put forward an idea, argument or suggestion for consideration or action. This involves writing a little more than simply just identifying or suggesting something. The task word ‘justify’ requires you to show how the statement or statements that you have made are correct or to provide evidence to support your argument.
(a) Propose one quality strategy that could be used to improve the efficiency and effectiveness of operations at your paper envelopes business and justify the use of this strategy.
(b) Propose and justify a strategy that your paper envelopes business could use to improve the efficiency and effectiveness of its operations in relation to waste minimisation in the production process.
5.10 Corporate social responsibility considerations in an operations system

**KEY CONCEPT** Operations managers must be aware of socially responsible management when pursuing business objectives. Corporate social responsibility considerations in an operations system include the environmental sustainability of inputs and the amount of waste generated from processes and production of outputs.

You might not think that a bank would need to be concerned about its impact on the environment, or about the 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 environmentally friendly manner.

Corporate social responsibility 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 a socially responsible way. However, it does bring benefits. Behaving in a socially acceptable manner can improve the reputation of a business, improve efficiency and reduce costs in the long term. The aspects of corporate social responsibility that would concern an operations manager include:

- managing inputs appropriately
- managing suppliers appropriately
- managing staff appropriately
- managing the customer relationship appropriately.

In particular, operations managers must consider the environmental sustainability of inputs and the amount of waste generated from processes and production of outputs.

**DID YOU KNOW?**
Toyota Australia’s Five-Year Environment Action Plan sets objectives to reduce energy usage and carbon emissions in all areas of its operations.

5.10.1 The environmental sustainability of inputs

**Environmental sustainability** refers to a business making decisions that will allow it, and the rest of society, to interact with the environment both now and into the future. An operations manager should ensure that the inputs used in the production process do not have a serious or negative impact on the environment (as well as community health and social conditions). Food manufacturer, Mars, is a business that considers the environmental sustainability of inputs. It recently announced that it would invest approximately $1 billion to combat climate change. The company will introduce renewable energy initiatives, source sustainable ingredients and support farmers who use sustainable methods of production. For example, Mars plans to have wind-powered operations in eleven countries across the world, including Australia.

**DID YOU KNOW?**
Downer Group is an Australian company that provides infrastructure management and engineering services to the transport, energy, infrastructure, communications and resources sectors. Its Supplier Requirements outline how it expects suppliers to be socially responsible corporate citizens. Downer will deal only with suppliers who have high standards of ethical business behaviour, including having regard for the protection of the environment.
5.10.2 The amount of waste generated from processes and production of outputs

The inputs used in a production process create waste. In the desire to keep down the costs of production, businesses should not be tempted to use cheaper, illegal waste disposal methods. By the end of 2015, Mars achieved its goal of sending zero waste to landfill from all of its factories worldwide. The company continues to strive towards maintaining this objective.

Businesses also need to consider how outputs are produced, packaged and marketed. For example, Mars has Packaging Sustainability Guidelines to reduce the amount of material and energy used in its packaging process, as well as to ensure it uses recycled materials and reduces waste.

Mars will introduce renewable energy initiatives, source sustainable ingredients, and support farmers who use sustainable methods of production to ensure the environmental sustainability of inputs. The company has Packaging Sustainability Guidelines to reduce the amount of material and energy used in its packaging process, as well as to ensure it uses recycled materials and reduces waste. This relates to the amount of waste generated from its processes and production of outputs.
The following table summarises the corporate social responsibility considerations in an operations system.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Processes</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring that suppliers provide materials that come from socially</td>
<td>Facilities and technology should contribute to the health and</td>
<td>Focus on creating high-quality products that provide real value –</td>
</tr>
<tr>
<td>responsible sources (such as environmentally sustainable supplies and</td>
<td>welfare of staff (above and beyond what is required by legislation).</td>
<td>products that are fit for their intended purpose</td>
</tr>
<tr>
<td>workplaces that are free of exploitation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A business could purchase inputs from local suppliers (rather than</td>
<td>A business could conduct production locally (in doing so, it can show its</td>
<td>A business could make use of environmentally friendly</td>
</tr>
<tr>
<td>from overseas) to reduce emissions as a result of transportation – this</td>
<td>concern for local communities).</td>
<td>packaging (for example, packaging could be minimised to reduce the</td>
</tr>
<tr>
<td>can also demonstrate support for the local community by providing</td>
<td>Part of the transformation process can involve recycling and</td>
<td>amount of material and energy used as well as to reduce waste, and</td>
</tr>
<tr>
<td>employment for members of the community.</td>
<td>remanufacturing of materials or waste.</td>
<td>recyclable or biodegradable packaging could be used).</td>
</tr>
<tr>
<td>Inputs should be environmentally sustainable (for example, recyclable</td>
<td>All employees should have ongoing access to training, as well as</td>
<td>A business must ensure that its product is safe and reliable –</td>
</tr>
<tr>
<td>materials could be used, a business might use green energy to reduce</td>
<td>fair pay and work conditions (above and beyond what is required by</td>
<td>dangerously defective or harmful products can result in the injury or</td>
</tr>
<tr>
<td>carbon emissions, and energy-efficient equipment could be used to</td>
<td>legislation).</td>
<td>death of consumers.</td>
</tr>
<tr>
<td>reduce energy use).</td>
<td></td>
<td></td>
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<tr>
<td>DID YOU KNOW?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 company has been criticised for not providing sufficient funds to settle claims.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CSR CONSIDERATIONS IN NAB’S OPERATIONS SYSTEM

In an attempt to respond to corporate social responsibility considerations in its operations system, NAB manages the environmental sustainability of its inputs and the amount of waste generated from its processes and production of outputs. The company is focused on the key environmental issues of climate change, resource scarcity and natural value. According to its 2017 Sustainability Report, NAB has committed to increasing its current environmental financing commitment from $18 billion by 2022, to $55 billion by 2025 to assist its transition to a low-carbon economy. The business has 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.

To minimise its dependency on grid-supplied electricity and its carbon emissions, NAB has installed solar panels on many of its branches and Business Banking Centres. It has also installed more than 2000 solar panels on its Knox data centre. Improving its recycling rates is also a priority for NAB, from the recycling of e-waste, to the recycling of organic waste by employees.
According to its 2017 Sustainability Report, when compared to the previous year:

- net energy use decreased by 13 per cent
- greenhouse gas emissions decreased by 15 per cent
- waste generation (combined waste to landfill and recycled materials) decreased by 18 per cent
- paper use decreased by 26 per cent
- potable water use decreased by 19 per cent.

NAB works actively with its suppliers to go beyond contract requirements and deliver the best outcomes for NAB, the supplier and the communities in which the business operates. The company introduced Supplier Sustainability Principles to new contracts with key suppliers, stating its corporate responsibility requirements, which include environmental management, human rights, workforce policies and workplace health and safety. According to NAB's 2017 Sustainability Report, 90 per cent of material suppliers are compliant with its Supplier Sustainability Principles.

DID YOU KNOW?
Commonwealth Bank was accused of not managing the customer relationship appropriately when its insurance division was accused of unethical behaviour in 2016. ABC's *Four Corners* and Fairfax Media uncovered several cases where claims assessors rejected payouts to terminally ill customers. It was also alleged that the insurance division, Comminsure, removed medical files and forced doctors to change their diagnoses so that claims could be refused. The bank's then-Chief Executive Officer, Ian Narev, was forced to apologise and said that ethics are a core value of the Commonwealth Bank.

5.10 Activities

TEST your understanding

1. Outline the main reasons why operations managers must take socially responsible decisions very seriously.
2. What are the benefits and costs of managing an operations system in a socially responsible manner?
3. Using examples, explain the considerations a business might need to make in the area of:
   (a) environmental sustainability of inputs
   (b) the amount of waste generated from its processes and production of outputs.
4. Outline how NAB covers the considerations of corporate 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 socially responsible to do business with suppliers who employ child labour in overseas countries.
7. Business for Social Responsibility (BSR) provides information about the social responsibilities of businesses. Use the BSR weblink in the Resources tab to select a report that interests you. Read the article and outline the social responsibility issues involved.

EXAM practice

8. Explain how a business can ensure environmental sustainability of inputs in its operations system. (2 marks)
9. Identify and describe one operations management strategy. Outline the benefits to a business of adopting corporate social responsibility considerations in this area. (4 marks)
10. Explain how corporate social responsibility considerations can influence the decisions made by management in relation to an operations system. (4 marks)
5.11 EXTEND YOUR KNOWLEDGE Socially responsible operations management

**KEY CONCEPT** An operations system should be managed with corporate social responsibility in mind.

### SUSTAINABLE OPERATIONS AT CADBURY

Cadbury’s Claremont factory is located on the bank of the Derwent River, north of Hobart. The materials that go into making Cadbury chocolate include cocoa, sugar and milk, and are combined with other inputs, such as the staff working there, the machinery and the factory itself, through the manufacturing process. The output is high-quality, satisfying and delicious chocolate.

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 ($CO_2$), which is then released into the atmosphere. $CO_2$ is a greenhouse gas. It is a natural part of the atmosphere but too much $CO_2$ 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 reused in later stages. This saves coal and water and produces fewer greenhouse gas emissions and waste. A project that collects gas from the factory’s wastewater treatment plant and uses it as an energy source for a steam boiler reduced the amount of natural gas used by 3900 gigajoules, reducing $CO_2$ 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.
CADBURY AND FAIR TRADE CHOCOLATE

When you see the Fair trade logo on the shelves in Woolworths, Coles and Aldi, you know that consumers are voting with their dollar. 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 was significant for the movement. Fairtrade Australia & New Zealand continues to grow rapidly, with sales of Fairtrade Certified products increasing from $50 million in 2008–09 to more than $370 million in 2016–17. Chocolate and coffee represent a significant proportion of these sales.

While obtaining Fairtrade certification may bring many benefits, it also places responsibilities on member businesses, particularly in the area of operations management. The criteria that businesses 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.

In late 2016, the makers of Cadbury, Mondelēz International, and Fairtrade announced a new partnership to help more cocoa farmers, families and their communities. The new partnership involves Fairtrade becoming a partner for Cadbury’s Cocoa Life program. This is a sustainable cocoa-sourcing program involving a US$400 million investment over 10 years into cocoa communities. Cadbury Dairy Milk chocolate will remain Fairtrade certified throughout 2017 in Australia. From 2018, the Cocoa Life logo was located on the front of Cadbury Dairy Milk wrappers.

Kjetil Undhjem, Director Marketing Chocolate Australia and New Zealand at Mondelēz International, suggested that Cadbury’s proud heritage of sourcing cocoa sustainably and has been working with farmers in Ghana for over 100 years. He said, ‘in more recent years, Cadbury’s cocoa sustainability program has progressed with the Cadbury Cocoa Partnership launched in 2008 and evolving in 2009 when we partnered with Fairtrade. Since the launch of Cocoa Life in 2012, we’ve touched more than 795 cocoa farming communities around the world. We’re proud to share independent verification which shows that Ghanaian farmers’ incomes have increased by 49 per cent more than farmers outside of the program. Through Cocoa Life, we want to build on the program’s success by becoming an accountable partner for our cocoa farmers, not just a buyer.’
Fairtrade Australia & New Zealand CEO Molly Harriss Olson said that Cadbury’s determination to embed fair trade principles in its supply chain made it an industry leader, and the partnership between Fairtrade and Cocoa Life will have many more opportunities to increase positive impacts for cocoa farmers. She said, ‘The evolution of our partnership with Cadbury and Cocoa Life is an exciting development, embedding impact, values, principles and unique relationships with farmer networks into the Cocoa Life program. In doing so, together we can increase the scale and impact of Cocoa Life, towards a common goal in which cocoa farmers, their organisations and communities are empowered, can invest in their own future, and go from just surviving, to thriving.’

The program faced a backlash following the announcement by Mondelēz International and Fairtrade. However, Mondelēz said that Fairtrade would still verify the cocoa supply chain. There was concern that the move to the Cocoa Life logo could undermine the Fairtrade movement by confusing consumers with multiple standards and logos.

5.11 Activities

TEST your understanding

1. Read the ‘Sustainable operations at Cadbury’ case study. Explain how Cadbury’s operations produces greenhouse gas emissions.
2. List the ways in which 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 opted to use the Fairtrade logo.
4. Explain the responsibilities that may impact on operations management when a business gains Fairtrade certification.
5. Why did Mondelēz International decide to switch from the Fairtrade logo on Cadbury chocolate products to the Cocoa Life logo?
6. Outline the criticism of the change to Cocoa Life and Mondelēz’s response.

EXTEND your understanding

7. Use the Chocolate: the bitter truth weblink in the Resources tab 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 socially responsible do you think Cadbury’s operations are?
8. Using internet sources, research more arguments for and against the decision for Cadbury wrappers to carry the Cocoa Life logo instead of the Fairtrade logo. List each argument.
9. Explain how optimising the operations of a business can contribute to the objectives of that business, in terms of bottom line and social responsibility.
10. Use the EY Climate Change and Sustainability Services weblink in the Resources tab 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?
5.12 Global considerations in operations management

**KEY CONCEPT** Businesses may need to contend with global issues in operations management including global sourcing of inputs, overseas manufacture, outsourcing and supply chain management.

5.12.1 Global sourcing of inputs

Just as you might purchase products from overseas, businesses can also buy inputs from markets in other countries. This is referred to as **global sourcing**. Many businesses today do this to exploit efficiencies that can be gained from the global delivery of products, including low-cost skilled labour, low-cost raw materials and other economic factors such as lower taxes and low trade tariffs due to free trade agreements.

Global sourcing initiatives form an integral part of the materials planning strategy of many businesses. SunRice, one of Australia’s largest exporters of processed rice, and rice-based and other snack foods, adds to its locally produced inventory of rice by purchasing rice from global sources in order to meet the demand for its rice products. Businesses such as ANZ, Telstra and EnergyAustralia make use of call centres staffed with low-wage English-speaking workers in countries including India and the Philippines. Australian clothing and footwear businesses such as Rip Curl, Triangl and Holster purchase products manufactured in China using low-cost labour.

### The strengths and weaknesses of global sourcing

**Strengths**
- Reduces costs
- The opportunity to learn how to do business in a potential market
- Accessing skills or resources that are unavailable domestically
- Developing alternative suppliers/sources of inputs
- Increasing capacity of total supply

**Weaknesses**
- Hidden costs associated with different cultures and time zones
- Exposure to potential high risk, both financial and political
- Long lead times (for manufactured goods)
- The risk of ports shutting down and interrupting supply
- Difficult to monitor the quality of inputs
DID YOU KNOW?

In 2016, surf wear company Rip Curl was ‘caught out’ sourcing products from North Korea with ‘Made in China’ labels. Employees at a factory near Pyongyang, North Korea’s capital city, were photographed by Fairfax Media making some of Rip Curl’s winter range of clothing. Workers in North Korea often endure harsh conditions. Rip Curl blamed a supplier who diverted production orders to an unauthorised subcontractor for the practice. Rip Curl said that when it found out it immediately took steps to investigate and resolve the issue.

Overseas manufacture

Overseas manufacture is also referred to as off-shoring, meaning a good is produced in a country that is different to the location of the business’s headquarters. Determining how and where to complete manufacturing is an important problem for the operations area. Many businesses successfully manufacture their goods locally, but manufacturing in countries outside Australia can enable a business to get its product to the market more quickly, reduce the cost of production and reduce delivery costs.

A business may choose to manufacture overseas to reduce labour, overhead and component costs, while keeping research and development, design and short-run manufacturing in Australia. This allows the business to focus on what they do best.

Some businesses will gradually increase their commitment to overseas manufacturing and may initially move into this strategy by outsourcing their manufacturing (see the following section). In this case, it is important that the business finds a way to contract the work or go into a partnership with an overseas manufacturer without losing control of the product. As a business expands, it may move from outsourcing its manufacturing through to ownership of overseas factories.

The weaknesses of overseas manufacture are very similar to those of global sourcing of inputs. There may be hidden costs associated with operating in different cultures and time zones. By producing in other countries, the business exposes itself to risks, both financial and political. Speed of delivery can increase, but if manufactured items need to be brought back to the business’s country of origin, then lead times may increase. The extra transport required may also negatively impact on the environment. Furthermore, this strategy can lead to local job losses. It may also be difficult for the head office of a business to monitor the quality of production in another country.
Global outsourcing

The term outsourcing is a common one these days. Outsourcing means that some part of a business’s operations is transferred to an external person or business. For some time, tasks that are not part of a business’s core activities, such as accounting or customer service, have been contracted to another business. For example, Qantas contracts its information technology, including customer management, to several external businesses, both in Australia and overseas. More recently, many businesses have decided to even outsource the production and delivery of goods and services that are considered to be their core business. For a business, this outsourcing is carried out because it can bring positive benefits such as cost savings, improvements to quality and access to operational expertise (an external person or business may have expertise in managing a task that the business does not have).

The strengths and weaknesses of global outsourcing

**Strengths**

- Improved quality because of access to expert knowledge and high-quality service
- The business is able to focus on its core activities.
- Costs can be reduced (for example, instead of employing a full-time driver, a business can use contracted drivers as required).
- Production may be quicker as the outsourced provider should be able to focus on the task they specialise in.

**Weaknesses**

- Management may have less control over the production process.
- It may be difficult to maintain quality.
- Loss of local jobs and career prospects (sometimes resulting in low morale in the local workforce)
- There may be security and confidentiality issues.
- There may be communication issues that lead to customer service problems.

Global outsourcing means that business operations can be contracted out to countries all around the world. Many people disapprove of the practice of sending tasks to overseas countries, because of its impact on local jobs and local suppliers. Rossi Boots, an Adelaide-based footwear company, was rejected in 2014 for a Department of Defence contract to supply non-combat boots. Instead, another Australian company manufactured the boots in Indonesia, at a lower cost.

Supply chain management

A typical supply chain 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 business 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.
• 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 business 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 business’s needs. In recent years, many businesses 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.

However, at times, the management of the supply chain can be very expensive to implement. Successful supply chain management requires preparation and training of staff. Furthermore, a supply chain can be complex and specific parts of the chain may be difficult to manage. Some aspects of the supply chain may be in another part of the country or overseas. If one part of the chain breaks down, the ability of the business to deliver products to customers may be negatively impacted. For example, if the business cannot get materials, if a website crashes, if inventory cannot be located in a warehouse or if a delivery vehicle breaks down, a business’s operations system may come to a standstill.

**DID YOU KNOW?**
Many businesses today realise that their supply chain contributes to their social and environmental performance. McDonald’s uses Socially Responsible Supply Guidelines for its suppliers.

**study on**

An overview of supply chain management Summary screen and practice questions

**5.12 Activities**

**TEST your understanding**

1. Suggest why businesses obtain inputs from global sources.
2. Define the term ‘overseas manufacture’.
3. Briefly outline the benefits and costs of outsourcing.
4. Why is it vital that the supply chain be well coordinated?
5. Complete the following sentences by filling in the blanks.
   (a) Global sourcing is the practice of seeking the most _______ efficient materials and other inputs, including from countries _______.
   (b) Overseas manufacture refers to the production of a good in a _______ that is different to the location of the business’s _______.
   (c) Outsourcing is the practice of a specific business operation being contracted to an _______ person or business.
   (d) A supply chain is the range of _______ from which the business purchases _______ and _______.

**APPLY your understanding**

6. Bridie is planning a new business that will sell swimwear online. She believes that manufacturing in Australia is too expensive and therefore will need to organise the manufacture of her products with an overseas business. Evaluate the use of overseas manufacture and global outsourcing as strategies that Bridie could use for the manufacturing of her swimwear. Suggest which strategy would be most useful in her situation.
7. To find out how a large business deals with supply chain management, use the ANZ supply chain weblink in the Resources tab. How many suppliers does the ANZ have? How does the company develop supply chain relationships with these suppliers? Does ANZ expect its suppliers to meet certain standards and, if so, what are the standards?

EXAM practice
8. Define the term ‘supply chain management’. (1 mark)
9. Distinguish between overseas manufacture and global outsourcing. (2 marks)
10. Discuss the likely consequences of a business making use of global sourcing of inputs in its operations. (6 marks)

5.13 APPLY YOUR SKILLS Comparing, evaluating, proposing and justifying operations management strategies

PRACTISE YOUR SKILLS
- Define, describe and apply relevant business management concepts and terms
- Research and analyse case studies and contemporary examples of management applicable to managing production in a business
- Interpret, discuss and evaluate business information and ideas
- Apply operations management knowledge to practical and/or simulated business situations
- Compare and evaluate strategies used in operations management
- Propose and justify strategies for improving the efficiency and effectiveness of operations

5.13.1 Quality control and quality assurance

ISO’S DEFINITION OF QUALITY CONTROL AND QUALITY ASSURANCE
ISO (the International Organization for Standardization) is a worldwide federation of national standards organisations. Through its members, it develops voluntary and market relevant international standards. International standards ensure that products are safe, reliable and of good quality for consumers across the world. They are also influential in enabling international trade. For businesses, international standards assist with the reduction of costs by minimising waste and errors and increasing productivity. They also help businesses to access new markets. The ISO 9000 family of standards provides the fundamental concepts, principles and vocabulary for quality management systems and provides the foundation for other quality management systems standards.

In the ISO 9000:2015 standard, clause 3.3.6 defines quality assurance as ‘part of quality management focused on providing confidence that quality requirements will be fulfilled’.

Clause 3.3.7 defines quality control as ‘part of quality management focused on fulfilling quality requirements’.
5.13.1 Activities

TEST your skills
1. Define the term ‘quality’.
2. Describe the purpose of international standards.
3. Distinguish between quality control and quality assurance.

APPLY your skills
4. (a) Working in a small group, copy the table below. Use the first column to outline similarities between quality control and quality assurance. In the second column, outline the differences between the two strategies. One row has already been completed for you.

<table>
<thead>
<tr>
<th>Similarities</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both quality control and quality assurance involve the use of a set of quality management standards.</td>
<td>Quality control involves the business inspecting its goods or services at various points in the production process to check that they adhere to a set of standards, whereas quality assurance involves the use of a system that will assure customers that the products of a business are fit for purpose — it does this by achieving set standards throughout the production process.</td>
</tr>
</tbody>
</table>

(b) The task word (sometimes referred to as command word or instructional word) ‘compare’ generally requires you to comment on the similarities and differences between two things. Using the information you have recorded in the table above, compare quality control and quality assurance.

5. (a) Using tables similar to the one used in question 4, outline the similarities and differences of the following strategies:
   i. automated production lines and computer-aided design
   ii. forecasting and master production schedule
   iii. Total Quality Management and lean management
   iv. global sourcing of inputs and overseas manufacture.

(b) Using the information you have recorded in your tables for part (a), compare the following strategies:
   i. automated production lines and computer-aided design
   ii. forecasting and master production schedule
   iii. Total Quality Management and lean management
   iv. global sourcing of inputs and overseas manufacture.

5.13.2 Technological developments and lean management

HOW LEAN IS SECURING THE FUTURE OF THIS DIGITAL ADVERTISER

How do you keep up with a market changing at the speed of light? The Chief Inventor of an Australian digital company explains how they are using lean to safeguard their future.

REA Group is a digital advertising company specialising in property and the lifestyles that go with it, headquartered in Melbourne, Australia (we are also present in six other countries). We help people buy and rent houses, and find commercial properties for business through our websites and apps, but also get finance and learn about renovation and the market. How we got to become a $9 billion company doing that is quite interesting, and that’s the story I’d like to tell in this article.
We have spent the past two decades building a global business, but the truth is that in real estate the only thing that matters is whether you are a great business in your neighbourhood. The challenge for us is to essentially act as if we had 2500 realestate.com.au websites and apps uniquely tailored to each suburb in Australia, and more again for our Asian customers. Sometimes those apps are not for people fortunate enough to be choosing a new home for their family to live in — we also work with homeless people and contributed to the development of an app called Ask Izzy to connect Australia’s homeless to resources for them.

Our 20-person Consumer Research Lab — which constantly works on perfecting our offerings based on the key customer expectations of time, transparency and trust — hosts or visits five people every day. That’s up to 1000 people a year, which generates a lot of data that we can then use to segment the ecosystem, and understand how to cater to each of its parts (whether it’s landlords, renters, investors, renovators or estate agents). We pay these folks to come in, relying on an external agency that recruits individuals from a specific demographic or geographical area, like Perth’s Central Business District or a suburb of Adelaide. We interview them, but most importantly observe them as they use our technology.

For example, we might ask them to wear a pair of Tobii glasses that record how they interact with our website or our app (it is fascinating to see how quickly they can scroll through the results and pick up a newly-listed property they haven’t seen yet) or we might decide to track their movements and behaviours as they go on a virtual reality walk through an apartment.

We never stop experimenting with technology and we strive to invent something new every day.

A market in transition

Our commitment to research and experimentation is made in response to the dramatic changes our sector is undergoing. The internet has completely transformed the search for real estate, and we are moving closer and closer to a point where rather than search we will be required to facilitate matching properties and information to prospective buyers or renters. For this reason, there is a lot of fear that the role of traditional intermediaries (estate agents) could soon be a thing of the past, and that technology will take their place.

We believe that there is still an important role for people as intermediaries (at least, for good ones), but it is obvious that things have changed a lot in the past few years. A combination of an agent plus technology is becoming the norm to be competitive, and in the future, that tech will also involve more AI. We need to become better channels for people interested in property. Our tools and data sets need to be improved, and some of our value streams will necessarily change.

As ever, the internet has provided both great challenges and great opportunity, and REA Group has largely been able to ride that wave through continuous innovation. In many ways, we have revolutionised the market, but we are now being disrupted by global competitors that were not traditionally property-focused — Google, Facebook, Airbnb, Amazon and WeChat. We are facing the typical innovator’s dilemma: can we get our mind around this disruption and create a new, more valuable offering? That’s what we are focused on as a company.

Artificial intelligence will make it possible to complete the transition to matching properties to people: prospective buyers or renters will find the right property in their inbox or home screen notifications when they wake up in the morning, perhaps together with an article on renovating kitchens — perhaps their most pressing need — and the name and number of a person they can talk to about a mortgage extension for the renovation. Technology in general has really brought a lot of change to our industry: imagine how much time you could save by using virtual reality to view an apartment!

Our journey of transformation

Four years ago, we decided to change the structure of the organisation to become much more customer focused in everything we do, starting from an Agile ‘factory’ — an ideas factory rather than a manufacturing one, delivering apps and software, not cars. The biggest consequence of the reorganisation was a switch to multidisciplinary teams; most internet companies (including the big ones) operate a bit like a cult led by designers, engineers or product people, whereas at the REA Group we ensure these three roles work together on a daily basis to serve customers and consumers.

We believe that collaborative learning can achieve incredible things. That’s why we pair up programmers (a bigger investment up front that will save you tonnes later on in coding changes, as software will need custodian-ship for up to five years) and, like at Spotify, we assign our people to small, multifunctional teams — large tribes of 150 people are focused on a customer segment like residential real estate; squads of 10 build products, and guilds that allow a ‘craft’ or ‘trade’ such as security engineering to stay in touch and share knowledge across the business silos.

The first lean experiment outside our software development teams was for the team most curious about agile methods, with the toughest waste problem – the lawyers from our Legal team. At the time, with strong demand
for their services, we had a huge bottleneck when the process reached them: not only did every deal have to go through them, but our product structure was so complex that each contract was customised. As a team, they regularly worked 70-hour weeks.

After participating in many product stand-up meetings, they decided to try and visualise their own work. They got confirmation that it was a pretty horrific value stream, with what felt like a million steps, and lots of wait time, but for the first time they were able to see the problems. We came to the realisation that the value stream is not complete until the first dollar is paid into a contract, and decided to come up with a system of prioritisation of jobs. A miracle occurred: duplication was reduced, and the bottlenecks started to disappear.

In that instance, we also learned how detrimental interruptions can be (we measured it takes 20 minutes to get back to your regular pace of working after a distraction) and introduced a system by which teams now have a flag that signals the one ‘interruptable’ person in the group.

After all this, the lawyers became great ambassadors for a new way of working. As we flipped the company structure to being multidisciplinary, they were deployed as internal consultants supporting every line of business, attending many stand-ups and seeing more and more people asking for their help. They also began to automate legal processes and create self-service tools — humans and technology working in harmony.

People are naturally curious at REA Group, and before too long, our People and Culture team picked it up (they sat next to Legal). Then Finance learned about it, just as they were trying to figure out how to get a new finance system off the ground and needed a quick way to summarise it on a board for their stakeholders and team.

Change reached different parts of the organisation fuelled by curiosity, which is a trait we actively look for in the people we recruit — together with resilience and the ability to think critically. The habits that define us as a company are something you can’t avoid learning if you work here: we don’t have a manual of the ‘REA Way’ (much like Toyota didn’t have a TPS manual) but encourage sharing at all levels and that’s how we create a common culture and set of behaviours. Culture and behaviours are led from the top by our CEO Tracey Fellows, along with creating a sense of challenge and a clear ‘why’ for our people to engage with. We are changing the way people experience property around the world.

Source: Nigel Dalton, Planet Lean.

### 5.13.2 Activities

**TEST your skills**

1. Define the term ‘website development’.
2. Read the ‘How lean is securing the future of this digital advertiser’ case study. Explain how REA Group attempts to understand how its customers think and behave.
3. Outline how the author of the article sees artificial intelligence transforming the real estate industry.
4. Describe the process by which lean management was introduced to REA Group.

**APPLY your skills**

5. The task word (sometimes referred to as command word or instructional word) ‘propose’ generally requires you to put forward an idea, argument or suggestion for consideration or action. This involves writing a little more than simply just identifying or suggesting something. The task word ‘justify’ requires you to show how the statement or statements that you have made are correct or to provide evidence to support your argument.
(a) Propose one quality strategy that could be used to improve the efficiency and effectiveness of operations at REA Group and justify the use of this strategy.

(b) Propose and justify a strategy that REA Group could use to improve the efficiency and effectiveness of its operations in relation to materials.

6. (a) Working in a small group, copy the table below. Use the first column to outline the strengths of lean management. In the second column, outline the weaknesses of lean management. One row has already been completed for you.

<table>
<thead>
<tr>
<th>Lean management</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lean management reduces costs and this may lead to an improvement in profit. If a business’s objective was to make profit, then improving profit would improve a business’s effectiveness.</td>
<td>The use of lean management can involve high implementation costs, which may have a negative effect on profit.</td>
</tr>
</tbody>
</table>

(b) The task word (sometimes referred to as command word or instructional word) ‘evaluate’ generally requires you to consider both sides of something, and then provide an overall conclusion or judgement related to which argument is the more persuasive and why.

Using the information you have recorded in your table in part (a), evaluate the use of lean management as a strategy for improving the efficiency and effectiveness of REA Group’s operations.

7. (a) Using tables similar to the one used in question 6, outline the strengths and weaknesses of the following strategies.

   i. Computer-aided manufacturing
   ii. Materials requirement planning

(b) Using the information you have recorded in your tables for part (a), evaluate the use of the following strategies in improving the efficiency and effectiveness of a business’s operations.

   i. Computer-aided manufacturing
   ii. Materials requirement planning

5.14 Review

5.14.1 Summary

The relationship between operations management and business objectives

- Operations management is the area of management that is concerned with the activities used to produce goods and services.
- Operations management is responsible for transforming inputs into outputs.
- Two key areas that the operations area of management responsibility must focus on are effectiveness and efficiency. Effectiveness refers to the degree to which a business has accomplished its stated objectives. Efficiency refers to how well a business uses resources in achieving these objectives.

Characteristics of operations management within manufacturing and service businesses

- The characteristics of operations management differ according to whether the business is a manufacturer of goods or a provider of a service. Manufacturers produce tangible products whereas service businesses produce services, which are intangible.
- Most modern businesses produce a combination of both manufactured goods and services.
Key elements of an operations system

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

Technological developments

- Technology can improve operations. Businesses 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 better utilisation of raw materials. This improves productivity and makes the operations process more cost effective. Office and communications technology has enabled new markets to open up, costs to be cut and productivity to be improved.
- A website can be developed for operations purposes. A website can make it easier for customers to purchase products or to find information online. A business may develop its website to increase the amount of information it gets from its customers and analyse the information. A business may also develop its website to provide information to employees and to communicate with suppliers.
- An automated production line is comprised of machinery and equipment arranged in a sequence with components added to the product as it proceeds through each step. The product usually moves along the line on a conveyor belt and computers control the process.
- Computer-aided design (CAD) is a computerised design tool that allows a business to create products and modify them. Computer-aided manufacturing (CAM) is software that designs and controls the process of producing a product.

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 forecasting, a master production schedule (MPS) and materials requirements planning (MRP).
- Forecasting is a tool that relies on data from the past and present and analysis of trends to attempt to determine future events. A master production schedule (MPS) is a plan that details what the business will produce, in what quantities, how and when. Materials requirements planning (MRP) refers to producing an itemised list of all materials involved in production to meet specified orders.
- 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 businesses in Australia is the Just In Time (JIT) system of inventory control.

The management of quality

- Quality management is the strategy that a business 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. It is a reactive strategy that measures performance 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 a business achieves set standards in production. It is considered to be a proactive strategy. A widely used international standard is the ISO 9000 series of quality certifications.
- Total Quality Management (TQM) is an ongoing, business-wide commitment to excellence that is applied to every aspect of the business’s operation. Total Quality Management can improve product quality, making the business more competitive. A number of approaches may be used, such as employee empowerment, continuous improvement and improved customer focus.
Waste minimisation

- Waste minimisation is a process involving the reduction of the amount of unwanted or unusable resources produced by a business in an attempt to improve the efficiency and effectiveness of operations.
- One strategy for minimising waste is lean management. This approach improves the efficiency and effectiveness of operations by eliminating waste and improving quality.

Corporate social responsibility considerations in an operations system

- Operations managers must be aware of corporate social responsibility when pursuing business objectives. Businesses that do so will benefit from improved performance.
- An operations manager needs to consider the use of environmentally sustainable inputs and the amount of waste that is generated by the business’s operations.

Global considerations in operations management including global sourcing of inputs, overseas manufacture, global outsourcing and an overview of supply chain management

- Global sourcing of inputs refers to the practice of businesses seeking the most cost-efficient materials and other inputs, including from countries overseas.
- Overseas manufacture refers to the production of goods in a country that is different to the location of the business’s headquarters.
- Global outsourcing is the contracting of a specific business operation to an external person or business, in an overseas country.
- A supply chain is the range of suppliers from which the business purchases materials and resources. A well-managed supply chain guarantees the supply of quality inputs. Businesses will work with suppliers to make sure that materials are delivered efficiently and in the right quantities.

5.14.2 Key terms

- automated production line: comprises machinery and equipment arranged in a sequence with components added to a good as it proceeds through each step, with the process controlled by computers
- business competitiveness: the ability of a business to sell products in a market
- computer-aided design: a computerised design tool that allows a business to create product possibilities from a series of input parameters
- computer-aided manufacturing: the use of software to design and control manufacturing processes
- computer-integrated manufacturing: a method of manufacturing in which the entire production process is controlled by a computer
- continuous improvement: an ongoing commitment to achieving perfection
- environmental sustainability: a business making decisions that will allow it, and the rest of society, to continue to interact with the environment
- forecasting: a materials planning tool that relies on data from the past and present and analysis of trends to attempt to determine future events
- global sourcing: the practice of seeking the most cost-efficient materials and other inputs, including from countries overseas
- inputs: resources used in the process of production
- intangibles: services that cannot be touched
- inventory: goods and materials held as stock by a business
- inventory control: ensures that costs are minimised and that the operations system has access to the right amounts of inputs when required
- Just In Time: a materials management strategy that ensures that the right amount of material inputs will arrive only as they are needed in the operations process
- lean management: an approach that improves the efficiency and effectiveness of operations by eliminating waste and improving quality
- master production schedule: a plan that details what is to be produced and when
- materials handling: the physical handling of goods in warehouses and at distribution points
5.14.3 Review questions

TEST your understanding

1. Explain how the operations management area supports the business in achieving its objectives.
2. Distinguish between efficiency and effectiveness.
3. Compare the operations of a manufacturer and a service business.
4. Explain the three elements of an operations system, using examples.
5. Outline how technology can be used to improve operations.
6. Suggest the benefits for operations of a business developing a website.
7. Explain what is meant by the term ‘automated production line’.
8. Differentiate between computer-aided design (CAD) and computer-aided manufacturing (CAM).
9. Why is materials management such an important strategy for optimising operations?
10. Why do businesses use forecasting in the area of materials management?
11. Differentiate between the master production schedule (MPS) and materials requirements planning (MRP).
12. Outline the importance of inventory control, using examples.
13. Identify the benefits and costs of using Just In Time as an inventory system.
14. How can quality management make a business more competitive?
15. Describe the main differences between quality control and quality assurance.
16. Explain what is meant by Total Quality Management (TQM).
17. Identify five waste-minimisation strategies.
18. Outline the main principles of lean management.
19. What are the benefits and costs of operations managers acting in a socially responsible manner?
20. Give three examples of issues related to corporate social responsibility that may arise in operations management.
22. Distinguish between overseas manufacture and global outsourcing.
23. What is supply chain management?

**APPLY your understanding**

24. Choose a real-life example of a manufacturer and a service business. For each example, outline the inputs, processes and outputs of their operations.

25. One strategy used to improve operations is the use of technology. For example, if a business used labour-intensive operations (making extensive use of people to do the work) to manufacture cars, it may not be as efficient as another business using automated equipment. Fill in the following table by listing (and explaining 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 workflow</td>
<td></td>
</tr>
</tbody>
</table>

26. Pick a large-scale business 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 practice**

27. Analyse the relationship between business objectives and operations management. **(4 marks)**

28. Outline three differences between the operations of a service business and the operations of a manufacturing business. Illustrate your answer with examples from a business you have studied this year. **(6 marks)**

29. Explain the elements of an operations management system. In your response, use examples that you have studied this year. **(6 marks)**

30. Compare the use of automated production lines to computer-aided design. **(4 marks)**

31. Evaluate the use of Just In Time in relation to improving the efficiency and effectiveness of operations. **(6 marks)**
32. Sandra’s marketing consultancy business has received complaints from customers that the quality of its service is poor. Propose and justify a strategy related to quality that Sandra’s business could use to improve the efficiency and effectiveness of its operations. (4 marks)

33. Propose and evaluate one strategy to improve the efficiency and effectiveness of operations through waste minimisation in the production process. (8 marks)

34. Describe two corporate social responsibility considerations in an operations system. (4 marks)

35. Discuss the use of supply chain management as a global consideration in operations management. (4 marks)

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**5.14.4 School-assessed coursework**

**OUTCOME 3**

Analyse the relationship between business objectives and operations management, and propose and evaluate strategies to improve the efficiency and effectiveness of business operations.

ASSESSMENT task — case study

**Time allowed:** 65 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**

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 *Lactobacillus casei* Shirota strain, which can help the digestive system to remain healthy. Yakult’s objective is reflected in its global corporate philosophy, which is to ‘contribute to the health and happiness of people around the world through pursuit of excellence in life sciences in general and our research and experience in microorganisms in particular’.

Yakult’s purpose-built factory and office complex in Dandenong was constructed in 1993. It cost $30 million. The factory now produces more than 300,000 bottles daily, supplying Yakult to Australian and New Zealand markets.

Inside the automated factory, raw ingredients (skim milk powder, sugar and dextrose) are mixed together with filtered water and undergo sterilisation. Live *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 Standardisation’s relevant Standard (ISO 9001:2015). 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 onsite 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 onsite water treatment facility.

Read the case study above, then answer the following questions.

1. Define the following terms using examples from the Yakult case study.
   (a) Automated production line
   (b) Waste minimisation

2. Outline the inputs used by Yakult.

3. Describe the output of Yakult.

4. Outline the relationship between Yakult’s business objectives and operations management.

5. Distinguish between the operations of a manufacturer and a service provider. Under which category does Yakult fit?

6. Explain what materials management is. In your response refer to the terms ‘forecasting’, ‘master production schedule’ and ‘materials requirement planning’.

7. Compare the use of quality control and quality assurance at Yakult.

8. Discuss the use of Total Quality Management and suggest whether or not you believe it would be suitable for Yakult’s operations.

9. Identify and describe two ways in which Yakult has incorporated corporate social responsibility considerations into its operations system.

10. Explain two reasons why Yakult would need to manage its supply chain.