Operations management

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 and the processes they use to optimise production.

WHAT YOU WILL LEARN

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

- 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
- The relationship between operations management and business objectives
- Characteristics of operations management within manufacturing and service businesses
- Key elements of an operations system: inputs, processes and outputs
- Strategies to improve the efficiency and effectiveness of operations in the area of 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 in the area of materials including forecasting, master production schedule, materials requirement planning and just in time
- Strategies to improve the efficiency and effectiveness of operations in the area of quality including quality control, quality assurance and total quality management

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 business information and ideas
- apply operations management knowledge to practical and/or simulated business situations
- compare and evaluate the various strategies used in operations management
- propose and justify strategies for improving the efficiency and effectiveness of operations.

VCE Business Management Study Design extracts © VCAA; reproduced by permission.
Toyota's operations system

Operations is the part of the business that ‘gets the job done’. At Toyota, that means producing more than 10 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 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 products or producing services though. Many businesses strive to produce the best product or service on the market. Toyota uses the concept of continuous improvement to do this (referred to in Japanese as kaizen). This means that all company activities — from the assembly line to customer service — are continually scrutinised, so that new and better ways of doing things are introduced if needed.

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

Toyota uses technology to its advantage. For example, the welding 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’.

Welding on the assembly line at Toyota. Toyota is credited widely for its high quality, low cost, short lead time and flexible production system.
### 5.1 The relationship between operations management and business objectives

#### KEY CONCEPTS

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

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.

A restaurant will make use of operations management. Inputs such as ingredients, labour and equipment are combined through a production process to produce a meal, which hopefully exceeds customer expectations.

#### Operations management

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

---

**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 managing director and CEO, Ahmed Fahou said, ‘We have also streamlined our operations through automation and process improvement, which has delivered productivity improvements of 5 to 6% 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.’

---
Relationship between operations and business objectives

The core objective of all businesses is to maximise profit. This aim therefore requires businesses to maximise efficiency and effectively use resources to produce goods or services at the lowest possible price. 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 nature and type of operations vary considerably from one type of good or service to another and from one type of business to another. The responsibility for the operations area in small businesses tends to be held by the owner-operator or one or more employees. Larger-sized businesses will usually establish an operations department (see the business structure diagram below). 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 (see the table below for more examples of how operations strategies can be used to help the business achieve its objectives).

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.

How operations strategies can support business 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.

DID YOU KNOW?

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

DID YOU KNOW?

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


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.

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.

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

**DID YOU KNOW?**

**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 bake a cake (your finished product).
3 Outline some of the tasks that Harry Souris carries out as national operations manager.
4 Explain the main differences between goods and services.
5 In your own words, describe the relationship between operations management and business objectives.
6 Compare the main characteristics of a manufacturer with those of 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 hand beater to mix a cake batter might not be as efficient as using an electric beater. 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>
<td></td>
</tr>
</tbody>
</table>

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

10 Use the Internet, or look at the employment section of the newspaper, to find a job advertisement for an operations manager (sometimes called a production manager or a factory manager). The advertisement will most probably outline responsibilities involved in the position. List the skills required to fulfill these responsibilities.
5.2 Key elements of an operations system

**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.

**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 six categories of inputs:

1. **Materials** includes raw materials, components and parts consumed or converted by the transformation process.
2. **Capital equipment** includes the plant, machinery, equipment and property necessary to conduct operations.
3. **Labour** refers to people involved in the operations function.
4. **Information from a variety of sources** contributes to the transformation process. 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.
6. **Money** is generally considered to be the most flexible of all resources, because it can easily be converted into any quantity or combination of materials, capital or labour.

Inputs differ between manufacturing 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.
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.

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

The transformation process involves using resources to produce the final goods or services. Many businesses continually work to improve the way they transform resources into finished products.
Outputs refer to the end result of a business's efforts — the service or product that is delivered or provided to the consumer.

**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
- Money

**Transformation Process**
- Design
- Manufacturing
- Quality control

**Output**
- Building product

**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
- Money

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

**Output**
- Delivery of financial services to customer

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

So far, we have drawn a distinction between service and manufacturing operations, but, in many cases, businesses carry out both types of operations. 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.

**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 six categories of inputs. The mind map at right has been started for you.

**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 your eBookPLUS 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 your eBookPLUS to identify the inputs, transformation processes and outputs that Monash Health would use to provide its services.
5.3 Technological developments

KEY CONCEPT  The use of up-to-date technology is one strategy which operations managers use to improve the efficiency and effectiveness of operations.

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

Office technology

Both service and manufacturing operations use office technology, but 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 diagram below:

Customer relationship management

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

The information can be retrieved and entered by employees from different functions within the business, such as sales, marketing and operations. Because this
approach improves services, which are now provided directly to customers, costs will be cut and productivity can improve.

**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 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 develop its website 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 also be developed to 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.

**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 on the next page). Robots are used in engineering and specialised areas of research.

---

**Procurement** refers to the process of researching and selecting suppliers, establishing payment terms, negotiating contracts, and the actual purchasing of resources that are vital to the operations of the business.

---

**Robotics** is a highly specialised form of technology capable of complex tasks.
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 soul destroying and often dangerous for employees. Robotics is a high cost form of technology that can be unaffordable for many small and medium-scale manufacturers.

**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) is software used to allow the manufacturing process to become computer directed by designing and controlling the process. The CAD software can be linked to CAM software to manufacture designs that are accepted by clients. CAM can also be used more broadly to calculate how much of each input would be required.

**Computer integrated manufacturing** (CIM) uses a computerised system to combine CAD and CAM to manage the entire production process. Product design, analysis, planning, purchasing, costing, inventory control and distribution can be controlled by computer.
Computer aided design allows more scope to design complex structures, such as giant waterslides.

**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 manufacturing technology.
7. Match the following terms with their definition:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer relationship management (CRM)</td>
<td>(a) a computerised design tool that allows business to create product possibilities from a series of input parameters</td>
</tr>
<tr>
<td>Automated production line</td>
<td>(b) software program that LSOs are introducing to maintain customer contact</td>
</tr>
<tr>
<td>Computer aided design (CAD)</td>
<td>(c) software that designs and controls the manufacturing process</td>
</tr>
<tr>
<td>Computer integrated manufacturing (CIM)</td>
<td>(d) 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>(e) 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 optimise operations in a business. Include the terms ‘computer aided design’, ‘computer aided manufacturing’, and ‘automated production lines’ in your answer.

9. Use both the Telstra and Toyota weblinks in your eBookPLUS to list the types of technology these companies use and then make a comparison. Explain how the technologies used differed.
5.4 Materials management

**KEY CONCEPTS** Materials management is used by operations managers to improve the efficiency and effectiveness of operations. Materials management involves managing the use, storage and delivery of materials to ensure the right amount of inputs are available when required.

Vehicle manufacturer Toyota 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 2016, Toyota was forced to suspend production of Japanese vehicles for a week after an explosion stopped work at the factory of one of its key suppliers, Aichi Steel Corporation. Managing materials so that they arrive in the right places, in the right quantities and at the right time is an important area of operations management.

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

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

**Inventory** is the goods and materials held as stock by a business.

Huge warehouses holding a large inventory represent a cost to a large business.

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

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

**Materials management** is all about managing the way that materials are received and stored, and ensuring that the materials are available in the operations system when required. Many businesses 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 Toyota, 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 explosion at the supplier’s factory) the consequences can be devastating.

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

**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 it 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

---

**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.

It is important that materials such as these huge steel rolls are handled efficiently at Toyota to keep costs down.

**Materials handling** is the physical handling of goods in warehouses and at distribution points.

**Forecasting** is a materials planning tool that relies on data from the past and present and analysis of trends to attempt to determine future events.

---

**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.
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’.

**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 master production schedule (MPS) and materials requirements planning (MRP).

A master production schedule (MPS) is a plan that describes what is to be produced and when. Materials requirements planning involves developing an itemised list of all materials involved in production to meet the specified orders.

**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 management planning involves developing an itemised list of all materials involved in production to meet the specified orders. Such planning includes master production schedule (MPS) and materials requirements planning (MRP).

**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 stocktaking, physically counting stock and then comparing the count against what was expected to be available. Any differences would indicate problems with stock control.

A common strategy used by many businesses in Australia is the just in time (JIT) system of inventory control already mentioned on page 150. 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.
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 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 the following terms with their 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 management approaches you think would help Chan optimise clothing operations. Explain your answer.
13 Explain how can 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 your eBookPLUS. Why do businesses need to forecast? How can a business create a forecast and what should be done with it?

Weblink
Role of forecasting
KEY CONCEPT Businesses use quality management to make sure that their products meet customer expectations. Three quality strategies are quality control, quality assurance and total quality management (including employee empowerment, continuous improvement and improved customer focus).

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

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

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. Ambulance Victoria makes use of quality control and quality assurance. Many businesses use an approach called total quality management.

Quality control

Ambulance Victoria uses quality control to optimise its production process. Quality control reduces problems and defects in the product, using inspections at various points in the production process. Many businesses and enterprises such as Ambulance Victoria minimise errors and waste by ensuring that standards are met. Specifications or benchmarks are set before the physical checks are completed. Actual performance is then compared to the established criteria. If the established standards are met, it is likely that the business will be meeting customer expectations. Competitiveness increases as the costs associated with waste and faulty products are reduced.

As a service enterprise, Ambulance Victoria monitors quality and response times. It uses a cardiac arrest registry to collect data on cardiac arrest patients who have used its ambulance service. Another service 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.

Quality assurance

Quality assurance is an integral part of Ambulance Victoria’s operations. A quality system is in place to ensure that set standards are achieved. Ambulance Victoria’s quality systems are certified to the ISO 9001:2008 standard. The ISO 9000 series of quality certifications is a widely used international standard. ‘ISO’ stands for International Organization for Standardization. Meeting these international standards is voluntary, but many 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. Ambulance Victoria’s effective quality system provides reassurance to customers that it is able to provide safe and reliable service. 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 a time-consuming one. Large contributions could possibly be required from those employees who are involved in introducing and maintaining the standards.

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 improve the price competitiveness of a business and can also improve product quality, allowing the business to attain competitive advantage. 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.

DID YOU KNOW?

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

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 reads: ‘Total quality control on the B-2 begins with me’.

Total quality management is an ongoing, business-wide commitment to excellence that is applied to every aspect of the business’s operation.
Deming’s quality philosophy

To achieve TQM objectives, a number of approaches may be used. For example, employee empowerment, continuous improvement and improved customer focus.

W Edwards Deming is known as the ‘founder of the quality movement’. His ‘total quality management’ concept focuses on managing the total 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.

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.

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’ which is important to a business’s corporate culture.

Quality circles

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

**DID YOU KNOW?**

Australia Post receives over 100,000 letters for Santa each year. Australia Post has a strong commitment to customer service and this includes its younger customers. Australia Post Retail Customer Experience Program (Retail CX) conducted more than 480,000 surveys with Customers in 2013 and 2014 with the aim of improving their in-store experience.

---

**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.
6. Explain what is meant by total quality management.
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 the Reject Shop weblink in your eBookPLUS to search its website and see how many references to quality you can find. How does the Reject Shop ensure that it receives quality products from suppliers?

---

Australia Post receives over 100,000 letters for Santa each year reflecting a strong commitment to its younger customers.
5.6 Waste minimisation

**KEY CONCEPTS** 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 involving the reduction of 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** 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.

**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 production is an approach that improves the efficiency and effectiveness of operations by eliminating waste and improving quality.

Minimising waste is a win-win situation — it reduces costs and cares for the environment. Woolworths launched a tracking system for finding the thousands of trolleys that go “feral” each year. The Trolley Tracker system targets the 15,000 shopping trolleys that go missing from Woolworths and Big W stores nationally each year. Abandoned trolleys cost the company $50 million each year; it costs more than $150 to replace a broken or lost trolley.

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

The concept of lean management, waste reduction, and improving productivity are crucial in modern manufacturing and service industries.
Lean production focuses on ...

- Eliminating waiting time
- Not adding more value to a product than customers want
- Reducing excess transportation
- Reducing unnecessary movement of machines and products between the processes
- Avoiding overprocessing
- Not making more than is required or making it earlier than required
- Avoiding defects (or errors)
- Avoiding excess motion
- Reducing unnecessary movement of workers and products within the process
- Minimising storage required
- Avoiding excess inventory
- Avoiding overproduction

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.

**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 over-production 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.

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.
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.

TEST your understanding

1 What is waste minimisation and how can it be performed 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 What are the benefits or strengths of lean manufacturing and what are its limitations or weaknesses?
6 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.
7 How did Hallmark develop this solution?

APPLY your understanding

8 The work cell approach relies on workers being able to do a variety of tasks, not just one task. Give one advantage and one disadvantage associated with workers becoming multiskilled.
9 Why do you think work cells would rely more heavily on teamwork than individual achievement?
10 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 final solution?
11 Use the Lean manufacturing weblink in your eBookPLUS to describe how creating brilliant processes for producing goods or delivering services is just as important as finding brilliant workers.

WebLink

Lean manufacturing
Six Sigma is a quality management approach that was originally developed by former US telecommunications company, Motorola Inc., in the mid-1980s. Six Sigma is used to identify and remove the causes of problems in the operations process, so that 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 at left.

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

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

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

APPLY your understanding
4. Does Six Sigma seem like an original approach to you? Is it just another form of TQM? Is there anything about Six Sigma that makes it different to other quality approaches?
5. Critics of Six Sigma claim that it has had mostly negative effects on the 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?
6. Use the Six Sigma weblink in your eBookPLUS and the case study provided, or find another example of a business that has adopted Six Sigma, to answer the following questions:
   (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.
APPLY YOUR SKILLS  Managing materials, quality and waste minimisation

High-quality paper envelopes business

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

Instructions

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

Materials required

- A4 paper
- scissors
- glue

How to make high-quality paper envelopes

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

TEST your understanding

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

APPLY your understanding

7. 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?
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:

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

2. **Managing suppliers appropriately**
   Many businesses work with their suppliers to ensure that they follow guidelines on socially responsible behaviour. Suppliers can be expected to provide materials that come from socially responsible sources, such as environmentally sustainable supplies and workplaces that are free of exploitation. It is also not appropriate for businesses to provide preferential treatment to suppliers that offer gifts such as free meals, trips or entertainment, or to select suppliers based on personal friendships.

3. **Managing staff appropriately**
   Operations managers must make sure that the business’s facilities and technology contribute to the health and welfare of staff, above and beyond what is required by legislation. Irregular or incomplete maintenance of production facilities can result in detrimental consequences. For example, toxic production processes can threaten the health of employees, as has been the case with asbestos mining and manufacturing.

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

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

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

National Australia Bank manages its operations system in a socially responsible manner. It manages customer relationships appropriately, as seen in its provision of audio-enabled ATMs with multilingual options. It also manages inputs, suppliers and staff appropriately.

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

**DID YOU KNOW?**
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, CommlSure, removed medical files and forced doctors to change their diagnoses so that claims could be refused. The bank’s chief executive officer, Ian Narev, was forced to apologise and said that ethics are a core value of the Commonwealth Bank.

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

**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. Should a business be concerned about the likely impact of new technology on employees and the community? Give reasons for your answer.
4. Outline how NAB covers the four aspects of 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. Use the BSR weblink in your eBookPLUS to select a report that interests you. Read the article and outline the social responsibility issues involved. (Business for Social Responsibility provides information about the social responsibilities of businesses.)
**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 (CO₂), which is then released into the atmosphere. CO₂ is a greenhouse gas. It is a natural part of the atmosphere but too much CO₂ causes the overall temperature of the planet to increase. This results in global warming.

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

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

However, Cadbury is aware of its impact on the environment. Teams work to make continuous improvements to the efficiency and sustainability of the factory. For example, an eco-efficiency team arranged for steam from an early stage in production to be captured and then re-used in later stages. This saves coal and water and produces fewer greenhouse gas emissions and waste. A project that collects gas from the factory’s waste-water treatment plant and uses it as an energy source for a steam boiler reduced the amount of natural gas used by 3900 gigajoules, reducing CO₂ emissions by 200 tonnes.

Cadbury now also uses biodegradable plastic material in its product packaging. The material is made from corn starch and, unlike other plastics, breaks down completely.

**Cadbury and fair trade chocolate**

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

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

• Teams work to make continuous improvements to the efficiency and sustainability of the factory.

• Fairtrade certification . . . places responsibilities on member businesses, particularly in the area of operations management.
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 $300 million in 2014–15. Chocolate made up 55 per cent of sales, followed by coffee at 34 per cent.

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.

TEST your understanding
1. Read the article ‘Sustainable operations at Cadbury’. Explain how Cadbury's operations produces greenhouse gas emissions.
2. List the ways that Cadbury has made an effort to reduce its greenhouse gas emissions.
3. Read the article ‘Cadbury and fair trade chocolate’. Explain what fair trade is and why Cadbury has opted to use the Fairtrade logo.
4. Explain the responsibilities that may impact on operations management when a business gains Fairtrade certification.
5. Use the Chocolate: the bitter truth weblink in your eBookPLUS to read about the 2010 British Broadcasting Corporation (BBC) broadcast that investigates the chocolate supply chain. Follow the links to various media reports and a response to the program from Fairtrade. After reading all of the information, how socially responsible do you think Cadbury's operations are?
6. Explain how optimising the operations of a business can contribute to the objectives of that business, in terms of bottom line and social responsibility.
7. Use the EY Climate Change and Sustainability Services weblink in your eBookPLUS to find any articles related to operations management. What do they tell you about issues that relate to operations, such as efficiency, supply chain and workplace safety?
5.8 Global issues in operations management

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

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, 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.

**Global sourcing** is the practice of seeking the most cost efficient materials and other inputs, including from countries overseas.

**Strengths**
- Reduced 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.

Many businesses source inputs from low-cost manufacturers in China.
Overseas manufacture

Overseas manufacture is also referred to as offshoring, 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.

Dexion is a storage solutions manufacturer that moved its manufacturing to Malaysia in 2014 to reduce costs and make the business more competitive. Dexion did this to increase profit through the development of new products and new markets. Dexion’s sales, design and installation, and customer support teams remain in Australia.

A businesses 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 section below). 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.

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).

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.
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 when a specific business operation is 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 to her 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 your eBookPLUS. 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?
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.

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 while 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 (raw materials, capital equipment, labour, information, time and money), 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 have 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.
- Customer relationship management (CRM) refers to the systems that businesses make use of to maintain customer contact. CRM software stores information about existing and potential customers.
- 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 businesses 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).
- 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. Performance is measured in relation to set standards or benchmarks. If the
established standards are met, it is then likely that the business will meet customer expectations and will compete effectively with competitors.

- Quality assurance involves the use of a system where a business achieves set standards in production. A widely used international standard is the ISO 9000 series of quality certifications.
- Total quality management (TQM) is an ongoing, 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 issues 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.

REVIEW QUESTIONS

TEST your understanding

1. Explain how the operations management area supports the business in achieving its objectives.
2. Compare the operations of a manufacturer and a service business.
3. List the four strategies used by an operations manager.
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 in 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.
21 Explain what the term ‘global sourcing of inputs’ means.
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>Improve the quality of customer service</td>
<td>Technology — introduce customer relationship management system</td>
</tr>
<tr>
<td>Increase the quality of the product</td>
<td></td>
</tr>
<tr>
<td>Reduce production costs</td>
<td></td>
</tr>
<tr>
<td>Improve domestic and international competitiveness</td>
<td></td>
</tr>
<tr>
<td>Reduce waste</td>
<td></td>
</tr>
<tr>
<td>Improve productivity</td>
<td></td>
</tr>
<tr>
<td>Reduce the number of accidents</td>
<td></td>
</tr>
<tr>
<td>Improve work flow</td>
<td></td>
</tr>
</tbody>
</table>

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.

**SCHOOL-ASSESSED COURSEWORK**

**OUTCOME 3**

Analyze 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: 75 minutes
Marks allocated: 40 marks (the marks for each question are indicated at the end of each question)
Conditions: closed book (no notes or textbooks may be used when completing this task)
Yakult Australia Pty Ltd commenced production in 1994. In Australia, it manufactures and sells Yakult Original and Yakult LIGHT, which are fermented milk drinks. Yakult contains probiotic bacteria known as the *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 9001:2008). This means that Yakult meets the highest international food manufacturing standards. All company procedures are documented and are regularly audited. In terms of quality control, individual bottles are randomly inspected for incorrect printing and lid sealing. Product samples are collected and assessed for quality, composition and taste in Yakult’s on-site quality control area.

**Waste management**

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

---

1. Define the following terms using examples from the Yakult case study:
   - automated production line
   - 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.