

Edexcel
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BS
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Unit 02
Resource management



Chapter 37 – production, productivity and efficiency

WHAT IS PRODUCTION?

Production takes place when resources, such as raw materials or components, are changed into 'products'. Land, labour, capital and enterprise, the factors of production, are used in the production process. The use of land and farm vehicles to grow cabbages is an example of production in primary industry. An example of secondary industry would be the use of wood, plastic, glue, screws, labour, drilling and cutting equipment to manufacture furniture.

JOB PRODUCTION

Job production involves the production of a single product at a time. It is used when orders for products are small, such as 'one-offs'. Production is organised so that one 'job' is completed at a time. There are a wide variety of goods and services which are produced or provided using this method of production.

The workforce is usually made up of skilled workers or specialists and the possibility of using labour-saving machinery is limited. Many businesses adopt this method of production when they are 'starting up'. The advantages and disadvantages of job production are shown in Table 1.

Advantages	Disadvantages
Quality is high because workers are skilled	High labour costs due to skilled workers
Workers are well motivated because work is varied	Production may be slow – long lead times
Products can be custom made	A wide range of specialist tools may be needed
Production is easy to organise	Generally an expensive method of production

▲ Table 1 The advantages and disadvantages of job production

BATCH PRODUCTION

Batch production may be used when demand for a firm's product or service is regular rather than a 'one-off'. An example might be a furniture factory, where a batch of armchairs is made to a particular design. Production is divided into a number of operations. A particular operation is carried out on all products in a batch. The batch then moves to the next operation. A baker uses batch production when baking bread. The operations in the baking process are broken down in Table 2.

1. Combine ingredients in a mixing container until a dough is formed.
2. Mix the dough for a period of time.
3. Leave the dough to rise for a period of time.
4. Divide the dough into suitable units (loaves) for baking.
5. Bake the loaves.
6. Allow loaves to cool.

▲ Table 2 Operations involved in the production of a batch of bread

Advantages	Disadvantages
Workers are likely to specialise in one process	More complex machinery may be needed
Unit costs are lower because output is higher	Careful planning and co-ordination is needed
Production is flexible since different orders can be met	Less motivation because workers specialise
More use of machinery is made	If batches are small, costs will still be high
	Money may be tied up in work-in-progress

▲ Table 3 The advantages and disadvantages of batch production

FLOW PRODUCTION

Most people will have some idea of flow production from pictures of motor car factories. Production is organised so that different operations can be carried out, one after the other, in a continuous sequence. Vehicles move from one operation to the next, on a production line. The main features of flow production are:

- the production of large quantities
- a simplified or standardised product
- a semi-skilled workforce, specialising in one operation only
- large amounts of machinery and equipment
- large stocks of raw materials and components.

Flow production is used in the manufacture of products as varied as newspapers, food and cement. It is sometimes called mass production, as it tends to be used for the production of large numbers of standard products, such as cars or confectionery.

The advantages and disadvantages of flow production are shown in Table 4. In the 1990s, flow production processes were changed in an attempt to solve some of the problems. Japanese manufacturers setting up businesses in the UK introduced methods to improve efficiency. Just-in-time manufacturing, for example, helped to reduce the cost of holding stocks. Some vehicle manufacturers attempted to introduce an element of job production into flow processes by customising products for clients.

Advantages	Disadvantages
Very low unit costs due to economies of scale	Products may be too standardised
Output can be produced very quickly	Huge set-up costs before production can begin
Modern plant and machines can allow some flexibility	Worker motivation can be very low – repetitive tasks
Production speed can vary according to demand	Breaks in production can be very expensive

▲ Table 4 The advantages and disadvantages of flow production

CELL PRODUCTION

Flow production involves mass producing a standard product on a production line. The product undergoes a series of operations in sequence on a continuous basis until a finished product rolls off the 'end of the line'.

Cellular manufacturing or cell production adopts a different approach and involves dividing the workplace into 'cells'. Each cell occupies an area on the factory floor and focuses on the production of a 'product family'. A 'product family' is a group of products that requires a sequence of similar operations.

Here are some advantages of cellular manufacturing:

- floor space is released because cells use less space than a flow production line
- product flexibility is improved
- lead times are cut
- movement of resources and handling time is reduced
- there is less work-in-progress
- teamworking is encouraged

PRODUCTIVITY

Output can be increased if productivity is raised. Productivity is the amount of output that can be produced with a given input of resources. It is common to measure the productivity of specific resources in a period of time. A

business may measure labour productivity - this is output per worker per period of time. For example, a factory producing standard mobile homes employed 40 workers in 2017. During the year a total of 1200 mobile homes were produced.

FACTORS INFLUENCING PRODUCTIVITY

Over time a business wants to improve productivity if possible. This is because costs will be lower and profit will be higher. Some of the key factors that can be used to influence productivity are outlined below.

Specialisation and the division of labour: One feature of modern business is specialisation. This is the production of a limited range of goods by an individual, business, region or nation.

Coca-Cola specialises in soft drinks, Toyota makes cars and Emirates provides air travel. Specialisation inside a business is also common. Departments specialise in different activities, such as marketing, production, finance, personnel and purchasing. Workers will also specialise in certain tasks and skills. This is called the division of labour. It allows people to concentrate on a limited range of tasks..

Education and training: The government can help improve the quality of labour by investing in education. This might involve providing more equipment for schools or improving the quality of teaching. Firms can also improve the productivity of their workers by providing their own training.

Motivation of workers: If people are motivated at work they will be more productive. Firms might use financial incentives, such as piece rates. Workers who are not motivated by money may respond to other incentives. For example, job rotation might be introduced. This involves an employee changing jobs from time to time. If people are trained to do different jobs, their time at work may be more interesting because there is more variety.

Working practices: The way labour is organised and managed can affect productivity. Working practices are the methods and systems that employees adopt when working.

Labour flexibility: Labour can be more flexible if workers are trained to do different jobs and can switch from one to the other at short notice.

Capital productivity: Productivity usually increases when new technology is introduced. This is because new technology is more efficient. Productivity is also likely to increase if production becomes more capital intensive. The benefits of more capital-intensive production are summarised in Table 5 at the end of this chapter.

PRODUCTIVITY AND COMPETITIVENESS

If businesses can raise productivity, they will be able to produce more output with the same level of resources. This will mean that costs will be lower, and they can charge lower prices than rivals. This makes businesses more competitive in the marketplace. As a result, they are likely to win more customers, increase market share and possibly threaten the survival of their rivals.

WAYS TO IMPROVE PRODUCTIVITY

Since there is a strong link between productivity and competitiveness, businesses will be keen to make improvements to productivity. How might they do this?

Improving labour productivity: A business might use a number of approaches to improving labour productivity.

- **Increase specialisation.** If workers become more specialised their performance is likely to improve and their output per day, for example, will increase. A business might reorganise working practices so that people can specialise more effectively.
- **Improve motivation.** Chapter 17 looked in detail at the different methods that businesses can use to improve the motivation of workers. Briefly, some financial methods include the introduction of piece rates, performance-

related pay, profit-related pay and bonuses. Non-financial methods of worker motivation, such as job enrichment, improving the working environment, empowerment, delegation and team working, might be introduced by a business.

- **Improve training.** Although training employees can be very expensive, investment in the right sort of training can help to improve productivity and also increase staff motivation. One area where more training might improve productivity in some countries is training in customer service. Customer service training is an area that might be overlooked by businesses.

- **Increase labour flexibility.** One way of making workers more flexible is by introducing job rotation. For example, if supermarket employees are trained in a range of different tasks, it might be possible to switch order-pickers or shelf-fillers to the tills when customer queues start to form.

Improving capital productivity: Some businesses use more capital than labour in their production processes, therefore increasing capital productivity will be more important to them. How might businesses improve capital productivity?

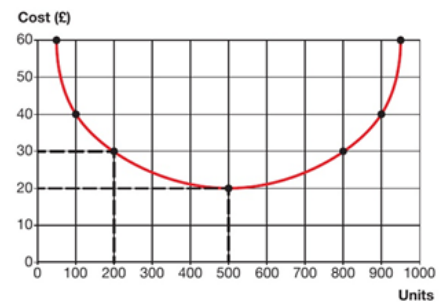
- **Improve service and maintenance.** Machinery and other expensive equipment will be more productive if it is serviced regularly and maintained effectively. It is easy for businesses to overlook the importance of regular servicing and thorough maintenance. This might be because machines seem to work well until they breakdown.

- **Update and replace old technology.** Productivity can be improved if businesses regularly update obsolete plant and machinery. Even if machines are in full working order it is possible that newer versions are more effective due to advances in technology.

- **Ensure that operatives are well trained.** Capital productivity will be higher if operatives are thoroughly trained in its uses. Operatives need to understand how to work safely with plant and machinery so that its efficiency can be maximised. Inadequately trained operatives are not likely to get the most out of machines and they may be a danger to themselves and their work colleagues.

EFFICIENCY

Efficiency is about making the best possible use of all a business's resources. A business will want to use its materials, labour and capital as effectively as possible. Businesses often use costs as a measure of efficiency. Production is said to be efficient if average costs are minimised. Figure 1 shows the average cost curve for a business. The diagram shows that average costs fall at first, reach a minimum and then rise again. In this example, the business will minimise its average cost when output is 500 units.



▲ Figure 1 The average cost curve for a business

FACTORS INFLUENCING EFFICIENCY AND HOW IT MIGHT BE IMPROVED

The efficiency of businesses can be influenced by a very wide range of factors. If a business can reduce average costs, efficiency will improve. Some of the measures that a business might use to reduce costs are outlined below.

Introducing standardisation: Standardisation involves using uniform resources and activities or producing a uniform product. It can be applied to tools, components, equipment, procedures and documents. For example, a construction company building an apartment block would benefit if all the flats were fitted with the same kitchen and bathroom units.

Outsourcing: It may be possible to improve efficiency by outsourcing specific business activities. This means that work currently done by a business is given to specialists outside the business that can do the same work at a lower cost or more flexibly.

Relocating: Moving the entire business to a new site is a drastic measure, but can result in much lower costs. By relocating, businesses might enjoy lower rents, lower wages and better transport links.

Downsizing: Downsizing involves reducing capacity, i.e. laying off workers and closing unprofitable divisions. The advantages of this for businesses can include:

- cost savings and increased profit
- a more focused and competitive operation
- removal of unprofitable or inefficient parts of a business
- profitable businesses no longer subsidising unprofitable ones.

However, downsizing can have drawbacks.

Delayering: Delayering also involves reducing staff. Cuts are directed at particular levels of a business, such as managerial posts. Many traditional organisational charts are hierarchical, with several layers of management. Delayering involves removing some of these layers to give a flatter structure.

Investing in new technology: New technology can often improve efficiency. New machinery may be quicker, more accurate, be capable of more tasks, and carry out work in more extreme conditions than older equipment or labour. Many machines are controlled by computers and can undertake very complex tasks. The use of information and communications technology has helped most businesses improve efficiency.

Lean production: Lean production is an approach developed by Toyota, the Japanese car manufacturer. Its aim is to use fewer resources in production. Lean producers use less of everything. This includes factory space, materials, stocks, suppliers, labour, capital and time. As a result, lean production:

- raises productivity
- reduces costs and cuts lead times
- reduces the number of faulty products

Kaizen: There is a strong link between kaizen and lean production. Kaizen is a Japanese word that means continuous improvement. There is a belief in Japan that everything can be improved. This means that workers are always coming up with ideas to improve quality, reduce waste or increase efficiency. The individual improvements may be very small, but over a long period of time they can have a huge impact.

Just-in-time production (JIT): This involves minimising or eliminating the amount of stock held by a business. It reduces all of the costs associated with stock holding. JIT is discussed in more detail in Chapter 39.

DISTINCTION BETWEEN LABOUR- AND CAPITAL-INTENSIVE PRODUCTION

One of the most important production decisions that operations managers have to make is what combination of capital and labour to use. **Labour-intensive production** techniques involve using a larger proportion of labour than capital. **Capital-intensive** production techniques involve employing more machinery relative to labour.

The best mix between labour and capital depends on a number of factors.

- The nature of the product. Everyday products with high demand, like newspapers, are mass produced in huge plants using large quantities of machinery. However, in modern developed economies an increasing number of the products supplied by businesses are services. Generally, the provision of services is labour intensive.
- The relative prices of the two factors. If labour costs are rising then it may be worth the company employing more capital instead. In countries like China and India where labour is relatively cheap, labour-intensive production methods are preferred.
- The size of the firm. As a firm grows and the scale of production increases, it tends to employ more capital relative to labour.

Competitive advantage from short product lead in terms

Businesses can gain a competitive advantage if they can reduce the amount of time it takes to develop and launch new products. Being the first into the market means they can exploit what may be called 'first-mover' advantages. First-movers:

- can make a lasting impression on customers, which can result in improved brand recognition and lasting brand loyalty
- may charge premium prices by exploiting early- adopters in the market
- have more time to develop their production processes to help perfect their products or services
- may be able to control resources in the industry, for example, they may win exclusive contracts with key suppliers or important human resources
- may enjoy a strategic advantage if it is expensive for customers to switch products later, for example, when selling high-value products like cars or expensive IT.

Capital-intensive strategies	
Benefits	
• Generally more cost effective if large quantities are produced	
• Machinery is often more precise and reliable	
• Machinery can operate 24/7	
• Machinery is easier to manage than people	
Drawbacks	
• Huge set-up costs	
• Huge delays and costs if machinery breaks down	
• Can be inflexible – much machinery is highly specialised	
• Often poses a threat to the workforce and could reduce motivation	
Labour-intensive strategies	
Benefits	
• Generally more flexible than capital – can be retrained for example	
• Cheaper for small-scale production	
• Cheaper for large-scale production in countries like China and India	
• People are creative and can therefore solve problems and make improvements	
Drawbacks	
• People are more difficult to manage than machines. They have feelings and react	
• People can be unreliable. They may be sick or leave suddenly	
• People cannot work without breaks and holidays	
• People sometimes need to be motivated to improve performance	

▲ Table 5 The benefits and drawbacks of capital- and labour-intensive strategies

SUBJECT VOCABULARY

batch production a method that involves completing one operation at a time on all units before performing the next.

capital-intensive production methods that make more use of machinery relative to labour.

capital productivity the amount of output each unit of capital (e.g. one machine) produces.

cell production involves producing a family of products in a small self-contained unit (a cell) within a factory.

division of labour specialisation in specific tasks or skills by an individual.

downsizing the process of reducing capacity, usually by laying off staff.

efficiency producing a level of output where average cost is minimised.

first-mover a company that is the first to sell a new product or provide a new service, when there are no other competing companies.

flow production large-scale production of a standard product, where each operation on a unit is performed continuously one after the other, usually on a production line.

job production a method of production that involves employing all factors to complete one unit of output at a time.

kaizen a Japanese term that means continuous improvement.

labour-intensive production methods that make more use of labour relative to machinery.

labour productivity the amount of output each unit of labour (e.g. one worker) produces.

lean production an approach to operations that focuses on the reduction of resource use.

outsourcing getting other people or businesses (subcontractors) to undertake work that was originally done in-house, often to reduce costs.

production the transformation of resources into goods or services.

productivity the output per unit of input per time period.

specialisation in business, the production of a limited range of goods.

standardisation using uniform resources and activities or producing a uniform product.

Chapter 38- Capacity utilization

CAPACITY UTILISATION

Capacity utilisation is about the use that a business makes of its resources. If a business is not able to increase output, it is said to be running at **full capacity**. Its capacity utilisation is 100 per cent. If a Mumbai to Ahmedabad coach with 52 seats had only 30 passengers it would be operating at less than full capacity and would have spare, unused, **excess or surplus capacity**.

MEASURING CAPACITY UTILISATION

Capacity utilisation can be measured by comparing actual or current output with the potential output at full capacity. The formula for capacity utilisation is:

$$\text{Capacity utilisation} = \frac{\text{Current output}}{\text{Maximum possible output}} \times 100$$

IMPLICATIONS OF UNDER-UTILISATION

A business might be **under-utilising** capacity if it has experienced a drop in demand, due for example to increased competition in the market. Some businesses have to deal with seasonal demand where at certain times of the year demand is expected to be low.

Drawbacks: If a business is working with under- utilised capacity it will not be making the most of its resources. It may be operating inefficiently because its unit costs are not minimised. Table 1 shows capacity utilisation, output, variable cost, fixed cost, total cost and average cost (unit cost) for a component manufacturer.

Benefits: It could be argued that operating at below capacity does have some benefits. For example, a business would be able to cope more easily with sudden increases in demand. A business that is not able to meet immediate customer needs may lose out in the long term. Customers might go to rivals that are able to deal with demand fluctuations.

Actual output (units)	120,000	160,000
Maximum possible output (units)	200,000	200,000
Capacity utilisation	60%	80%
Variable costs (€2 per unit)	€240,000	€320,000
Fixed costs	€50,000	€50,000
Total cost	€290,000	€370,000
Unit cost	€2.42	€2.31

▲ Table 1 Capacity utilisation, output, variable cost, fixed cost, total cost and unit cost for a component manufacturer

IMPLICATIONS OF OVER-UTILISATION

Many businesses would prefer to operate at close to full capacity because average costs are lower. However, if a business is running at full capacity it might be over- **utilising** its resources. This means that resources will be stretched uncomfortably.

Drawbacks: The pressure of constantly working at full capacity can put a strain on some of the resources. As well as causing stress and tiredness to the workforce, possibly increasing the risk of accidents or absence, machines may also be overworked to breaking point. If a business is using flow production techniques, breakdowns on a production line can be enormously expensive - especially if production is stopped completely for a period of time. Another problem is that a business may not be able to respond to an increase in demand.

Benefits: Average costs will be lower because fixed costs will be spread across more units of output. This will help to improve competitiveness and raise profits. Also, staff motivation might be good if workers feel secure in their jobs. People in the organisation may also be happier if there is lots of work with opportunities to increase their earnings by doing overtime.

DEALING WITH CAPACITY UNDER-UTILISATION

Reduce capacity: A business might decide to cut capacity, for instance, by rationalising. This involves reducing excess capacity by getting rid of resources that the business can do without. A business could take a number of measures.

- Reduce staff by making people redundant,
- Sell off unused fixed assets, such as machinery, vehicles, office space, warehouses and factory space.
- Review leasing capacity. For example, Debenhams has leased unused floor space in its stores to other retailers. Parts of a factory could also be leased to another manufacturer. The advantage of this is that the space may be returned if demand picks up again.

Move to smaller premises where costs are lower.

- Mothball some resources. This means that fixed assets, such as machinery, are left unused, but maintained, so that they can be brought back into use if necessary.

Increase sales: If a business sells more of its output, it will have to produce more. Therefore capacity utilisation will rise. A business might need to spend on promotion to increase sales, for example. However, if these costs are not covered by the extra revenue generated, raising capacity utilisation in this way may not be possible.

Increase usage: A problem that many businesses face is dealing with peak demand. Train operators can find that capacity utilisation is close to 100 per cent during the 'rush hour', but perhaps as low as 10 per cent late at night. Such businesses would like to increase capacity utilisation during off-peak hours. Incentives might include discounts for off-peak travel. For example, many rail companies offer some of their customers railcards to travel cheaply on off-peak trains.

Outsourcing: Capacity utilisation can vary considerably within a business. Where capital equipment has low utilisation rates, it might be more efficient for a major manufacturer of soap could accept contracts from rival soap manufacturers to improve its capacity utilisation. Outsourcing then becomes a strategy for increasing demand for the business.

Redeployment: If a business has too many resources in one part of the business, it may be possible to deploy them in another part. For example, a bank may ask some of its employees to work in another branch for a short period.

DEALING WITH CAPACITY OVER-UTILISATION

Increase inventories: If a business knows in advance that there is likely to be a future surge in demand, it can be prepared by building up stocks of finished goods. However, this approach is only helpful if a business has spare capacity during normal operating periods.

Raising prices: One way to deal with capacity over- utilisation caused by rising demand is to raise prices. Higher prices might reduce demand so that the pressure on production resources is reduced. However, although this approach will raise profit margins, it might be risky because too many customers might find cheaper alternatives and never return.

Outsourcing: Although outsourcing can be used to solve the problem of under-utilisation, it can also be used to help deal with over-utilisation. When working at full capacity a business can outsource work to other businesses in order to keep up with demand. This might be a good approach when there is a temporary surge in demand. Or when a business is unsure whether an increase in demand will continue.

Redeployment: Some businesses may be able to redeploy resources to deal with over-utilisation.

Acquiring the temporary use of resources: A business running at full capacity may be able to employ extra resources to help deal with over utilisation.

Expansion: In the long term, if a business is confident that rising demand will continue, it can expand the scale of its operations. By extending current premises, or relocating to larger buildings, a business can eventually build up capacity.

SUBJECT VOCABULARY

capacity utilisation the use that a business makes of its resources.

excess or surplus capacity when a business has too many resources, such as labour and capital, to produce its desired level of output.

full capacity the point where a business cannot produce any more output.

mothball leave machines, equipment or building space unused, but maintained, so they could be brought back into use if necessary.

over-utilising a business that is running at full capacity and 'straining' resources.

rationalising reducing the number of resources, particularly labour and capital, put into the production process, usually undertaken because a business has excess capacity.

under-utilising a business that is producing at less than full capacity.

Chapter 39 – Inventory control

WHAT IS INVENTORY?

Businesses purchase raw materials, semi-finished goods and components. A washing machine manufacturer, for example, may buy electric motors, computer chips, rubber drive belts, nuts, bolts, sheet metal, and a variety of metal and plastic components.

Raw materials and components: These are purchased from suppliers before production. They are stored by firms to cope with changes in production levels. Delays in production can be avoided if materials and components can be supplied from stores rather than waiting for a new delivery to arrive.

Work-in-progress: These are partly finished goods. In a television assembly plant, work-in-progress would be televisions on the assembly line which are only partly built.

Finished goods: The main reason for keeping finished goods is to cope with changes in demand. If there is a sudden rise in demand, a firm can meet urgent orders by supplying customers from inventory holdings. This avoids the need to step up production rates quickly.

INVENTORY CONTROL

One of the most important tasks in inventory control is to maintain the right level of inventories. This involves keeping inventory levels as low as possible, so that the costs of holding them are minimised.

Demand: Sufficient stocks need to be kept to satisfy normal demand. Firms must also carry enough inventory to cover growth in sales and unexpected demand. The term buffer stocks is used to describe inventory held to cover unforeseen rises in demand or breaks in supply. This is discussed later in this unit.

Stockpile goods: Toy manufacturers, for example, build up stocks in the few months up to December ready for the Christmas period. Coal-fired power stations build up inventory of fuel in the summer when demand for electricity is low so less coal is needed and the price of coal is lower.

The costs of inventory holding: If inventory is expensive to hold then only a small quantity will be kept. Furniture retailers may keep low inventory levels because the cost is high and sales levels are uncertain.

The amount of working capital available: A business that is short of working capital may not be able to purchase more inventory, even if it is needed.

The type of inventory: Businesses can only hold small stocks of perishable products. The inventory levels of food items and fresh ingredients will be very small. Almost the entire inventory of finished goods is often sold in 1 day.

Lead time: This is the amount of time it takes for a stock purchase to be ordered, received, inspected and made ready for use. The longer the lead time, the higher the minimum level of inventory needed.

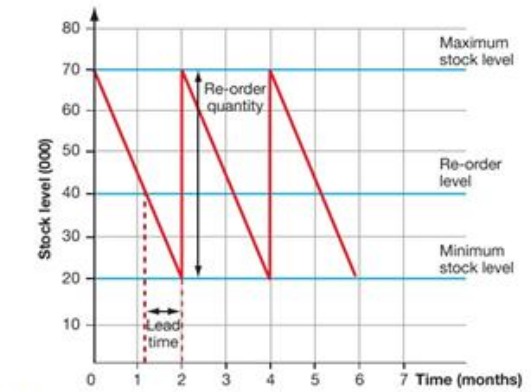
External factors: Fear of future shortages may prompt firms to hold higher levels of raw materials in inventory as a precaution.

INTERPRETATION OF A STOCK CONTROL DIAGRAM

The flow of stock in a business can be illustrated using a stock control diagram like the one shown in Figure 1. The diagram focuses on the re-order quantity (the amount of stock ordered when a new order is placed) and the re-order level (the level of stock currently held when an order is placed).

The stock control diagram shown in Figure 1 assumes that:

- 50,000 units are used every 2 months (25,000 each month)
- the maximum stock level, above which stocks never rise, is 70,000 units
- the minimum stock level, below which stocks should never fall, is 20,000 units, so there is a buffer against delays in delivery
- stock is re-ordered when it reaches a level of 40,000 units (the re-order level)
- the re-order quantity is 50,000 units - the same quantity is used up every 2 months
- the lead time is just under 1 month. This is the time between the order being placed and the date it arrives in stock



▲ Figure 1 Stock control diagram

BUFFER STOCKS

Some businesses keep **buffer stocks**. This is an emergency stock held in case there is a stock shortage. A business might hold buffer stocks of finished goods in case there is a sudden increase in demand. If a business is not able to meet a surge in demand it will miss out on sales opportunities. There is also the fear of losing regular customers, which is a serious long-term problem. Businesses that need to hold buffer stocks of finished goods are those that experience sharp fluctuations in demand.

IMPLICATIONS OF POOR INVENTORY CONTROL

Businesses need to hold the 'right' amount of inventory. Holding too much or too little inventory can both have a negative impact on the business.

Holding too much inventory: If too much inventory is held a business will incur unnecessary costs.

- **Storage.** Inventory of raw materials, components and finished goods occupy space in buildings.
- **Opportunity cost.** Capital tied up in inventory earns no rewards. The money used to purchase inventory could have been put to other uses, such as new machinery. This might have earned the business money.
- **Spoilage costs.** The quality of some inventory may deteriorate over time, for example perishable goods.
- **Administrative and financial costs.** These include the cost of placing and processing orders, handling costs and the costs of failing to anticipate price increases.

- **Unsold inventory.** If there is an unexpected reduction in demand, the firm may be left with inventory that it cannot sell.
- **Shrinkage.** Very large stocks might result in an increase in theft by employees. They may feel the business would not miss a small amount of stock relative to the total inventory.

Holding too little inventory: To reduce the costs of holding too much inventory a business may fall into the trap of holding too little. There are several problems with holding too little inventory.

The business may not be able to cope with unexpected increases in demand. This might result in lost customers if they are let down too often.

- If inventory deliveries are delayed, the firm may run out of inventory and have to stop production. This can lead to inactive labour and machinery while the firm waits for delivery.
- The firm is less able to cope with unexpected shortages of materials. Again, this could result in lost production.
- A firm which holds very low inventory may have to place more orders. This will raise total ordering costs. It might also miss out on discounts from bulk buying.

JUST-IN-TIME (JIT) MANAGEMENT OF INVENTORY

Just-in-time (JIT) manufacturing, developed in the Japanese shipbuilding industry in the 1950s and 1960s, reduces inventory and improves financial performance by requiring steel suppliers to deliver orders just hours before needed. It has since been adopted in other Japanese industries, including the car industry, and in the USA and Europe, with JCB® using JIT in its Rochester, UK plant.

WASTE MINIMISATION

A failure to control inventory adequately can result in wasted inventory. This is most likely to happen if inventory is perishable. Perishable stocks or goods are those which physically deteriorate after a certain amount of time and therefore cannot be used. Consequently they have to be thrown away.

Inventory can also be wasted if it has a limited lifetime and becomes obsolete after a certain amount of time. It is important for businesses that produce these types of goods to control inventory levels very carefully. They may adopt some of the methods outlined below to minimise waste.

- If goods are perishable, they must be placed in chilled storage. Fridges or freezers can prolong the life of perishable goods - particularly in warm weather.
- Businesses have to be especially conscientious when forecasting demand patterns for perishable goods. If they overestimate demand they could be left with a lot of unsold stock. Some businesses use complex quantitative techniques to predict the demand of perishable goods.
- A suitable stock rotation method should be adopted. With perishable goods the FIFO method (first in first out) is used. This means that the inventory that was delivered first must be issued first. Using this method ensures that older inventory is used up first.

Advantages	Disadvantages
• It improves cash flow since money is not tied up in stock	• A lot of faith is placed in the reliability and flexibility of suppliers
• The system reduces waste, obsolete and damaged stock	• Increased ordering and administration costs
• More factory space is made available for productive use	• Advantages of bulk buying may be lost
• The costs of stockholding are reduced significantly	• At risk of a break in supply and machinery breakdowns
• Links with and the control of suppliers are improved	• Difficult to cope with sharp increases in demand
• The supplier base is reduced significantly	• Possible loss of reputation if customers are let down by late deliveries
• More scope for integration within the factory's computer system	
• The motivation of workers is improved. They are given more responsibility and encouraged to work in teams	

▲ Table 1 Advantages and disadvantages of JIT

- Many businesses use computers to manage inventory control. Computerised systems are programmed to automatically order inventory when the re-order level is reached.
- Some businesses might be able to adjust product prices to help minimise waste. For example, if inventory remain high as the 'sell-by date' approaches, prices might be reduced to encourage purchases.
- Perishable goods need to be transported rapidly.
- To minimise waste, a business might find creative methods in the disposal of goods that have passed their sell-by date. For example, food products might be given to charities or sold as animal feed. Newspapers and magazines are likely to be recycled.

COMPETITIVE ADVANTAGE FROM LEAN PRODUCTION

The use of JIT stock control is often an important element if a business is adopting lean production. Lean production aims to use fewer resources in production. A range of

production techniques, such as kaizen, cell production, flexible manufacturing, teamworking, empowerment and multiskilling, are used to minimise waste. Lean producers are likely to have a competitive advantage because the reduction in waste and resource use will lower production costs. Specifically, competitiveness will be improved because lean production:

- raises productivity
- reduces costs and cuts lead times
- lowers the number of faulty products
- improves reliability and speeds up design time.

With these improvements businesses will be able to charge lower prices, offer better quality and reliability, and fight off rivals in the global marketplace.

SUBJECT VOCABULARY

buffer stocks stock held as a precaution to cope with unforeseen demand.

kanban a card or an object that acts as a signal to move or provide resources in a factory.

lead time the time between placing the order and the delivery of goods.

re-order level the level of current stock when new orders are placed.

re-order quantity the amount of stock ordered when an order is placed.

stock rotation the flow of stock into and out of storage.

work-in-progress partly finished goods.

Chapter 40 – Quality management

WHAT IS QUALITY?

Consumers, faced with many goods or services at similar prices, are likely to consider quality when making choices. Quality could be described as those features of a product or service that allow it to satisfy customers' wants. Take an example of a family buying a television. They may consider:

- physical appearance - they may want a certain style
- reliability and durability - will it last for 10 years?
- special features- does it have surround sound?
- suitability - they may want a portable television
- parts - are spare parts available?
- repairs does the shop carry out maintenance?
- after-sales service - how prompt is delivery?

They may also consider features which they perceive as important, such as:

- image is the manufacturer's name widely recognised?
- reputation - what do other consumers think of the business or product?

Poor designs may lead to problems with the materials and the functions of the finished good or service. It costs time and money to redesign poor products. Clients are unlikely to use businesses with poor designs again. Problems also occur with poor-quality production processes.

QUALITY CONTROL

Traditionally, in manufacturing, production departments have been responsible for ensuring quality.

Their objectives might have been to make sure that products:

- satisfied consumers' needs
- worked under conditions they were likely to face
- operated in the way they should
- could be produced cost effectively
- could be repaired easily
- met safety standards set down by legislation and independent bodies.

Quality control in many organisations, in the past, often meant quality controllers or quality inspectors checking other people's work and the product itself after production had taken place. By today's standards this is not quality control, but a method of finding a poor-quality product (or a problem) before it is sold to the consumer.

QUALITY ASSURANCE

Quality assurance is a commitment by a business to maintain quality throughout the organisation. The aim is to stop problems before they occur rather than finding them after they occur.

Quality assurance also takes into account customers' views when planning the production process.

QUALITY CIRCLES

Quality control circles or quality circles are small groups of workers (5-20) in the same area of production who meet regularly to study and solve production problems.

Quality control circles are only likely to work if they have the support of both management and employees. Businesses have to want worker participation and involvement in decision making, and set up a structure that supports this. Workers and their representatives also need to support the scheme. Employees must feel that their views within the circle are valued and must make a contribution to decisions.

TOTAL QUALITY MANAGEMENT (TQM)

Errors are costly for business. There are benefits if something is done right the first time. **Total quality management (TQM)** is a method designed to prevent errors, such as the creation of poor-quality products, from happening. The business is organised so that the manufacturing process is investigated at every stage. It is argued that the success of Japanese companies is based on their superior organisation. Every department, activity and individual is organised to take into account quality at all times. What are the features of TQM?

Quality chains: Great stress is placed on the operation of quality chains. In any business a series of suppliers and customers exists. The chain remains complete if the supplier satisfies the customer. It is broken if a person or item of equipment does not satisfy the needs of the customer. Failure to me

Company policy, accountability and empowerment: There will only be improvements in quality if there is a company-wide quality policy. TQM must start from the top with the most senior executive and spread throughout the business to every employee.

Control: Consumers' needs will only be satisfied if the business has control of the factors that affect a product's quality. These may be human, administrative or technical factors, shown in Figure 1 on the next page. The process is only under control if materials, equipment and tasks are used in the same way every time. Take the example of a firm making biscuits. Only by cooking in the same way can the quality be the same every time.

These methods can be documented and used to assess operations. Regular audits must be carried out by the firm to check quality. Information is then fed back from the customer to the 'operator' or producer, and from the operator to the supplier of inputs, such as raw materials.

Monitoring the process: TQM relies on monitoring the business process to find possible improvements. Methods have been developed to help achieve this. **Statistical process control (SPC)** involves collecting data relating to the performance of a process. Data is presented in diagrams, charts and graphs. The information is then passed to all those concerned.

SPC can be used to reduce variability, which is the cause of most quality problems. Variations in products, delivery times, methods, materials, people's attitudes and staff performance often occur.

Teamwork: TQM stresses that teamwork is the most effective way of solving problems. The main advantages are:

- a greater range of skills, knowledge and experience can be used to solve the problem
- employee motivation is often improved
- problems across departments are better dealt with
- a greater variety of problems can be tackled
- team 'ideas' are more likely to be used than individual ones.

Consumer views: Firms using TQM must be committed to their customers. They must respond to changes in people's needs and expectations. To do this, information must be gathered on a regular basis and there must be clear communication channels for customers to express their views. Consumers are often influential in setting quality standards. For example, holiday companies issue questionnaires to their customers on the way back from a package holiday. The information can be used to identify the strengths and weaknesses of their operations. Such information can be used to monitor and upgrade quality standards.

Zero defects: Many business quality systems have a zero-defect policy. This aims to ensure that every product that is manufactured is free from defects. A business that is able to guarantee zero defects in customers' orders is likely to gain a good reputation. This could lead to new clients and improved sales.

Quality circles: TQM stresses the importance of teamwork in a business. Many businesses have introduced quality circles into their operations. In order for quality circles to be successful certain conditions must exist.

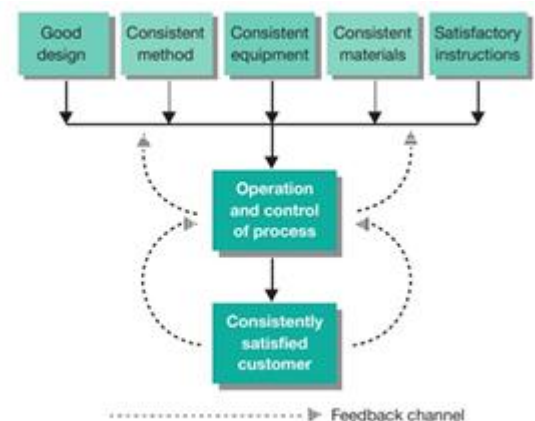
- A steering committee should be set up to manage the whole quality circle programme.
- A senior manager should ideally chair the committee. Managers must show commitment to the principle of quality circles.
- At least one person on the committee should be accountable for the programme.
- Team leaders should be properly trained.

Using TQM: TQM helps companies to:

- focus clearly on the needs of customers and
- relationships between suppliers and customers
- achieve quality in all aspects of business, not just product or service quality
- critically analyse all processes to remove waste and inefficiencies
- find improvements and develop measures of performance
- develop a team approach to problem solving
- develop effective procedures for communication and acknowledgement of work
- continually review the processes to develop a strategy of constant improvement

There are, however, some problems.

- There will be training and development costs of the new system.
- TQM will only work if there is commitment from the entire business.
- There will be a great deal of bureaucracy and documents, and regular audits will be needed. This may be a problem for small firms.
- Stress is placed on the process and not the product.



▲ Figure 1 The systematic approach to quality management

KAIZEN

Figure 2 shows examples of the techniques, principles and practices. They should result in ongoing improvements. This approach argues that a day should not pass without some kind of improvement being made somewhere in the business.

There are a number of features of kaizen that affect a business.

Continuous improvement: Kaizen has been the main difference between the Japanese and the Western approaches to management in the past. The attempts of Western businesses to improve efficiency and quality have tended to be 'one-offs'. In Figure 3 the solid line illustrates the Western approach. Productivity remains the same for long periods of time, then suddenly rises. The increase is followed by another period of stability, before another rise. Increases in productivity may result from new working practices or new technology. The dotted line shows the Japanese approach. Improvements are continuous. They result from changes in production techniques, which are introduced gradually.

Eliminating waste: The elimination of waste (called muda in Japan) in business practices is an important part of kaizen. Waste is any activity that raises costs without adding value to a product.

Implementing continuous improvement: It is often difficult for workers in a business to look for continuous improvement all the time. Japanese businesses tried to solve this problem by introducing the PDCA (Plan, Do, Check, Action) cycle. It is a series of activities that lead to improvement.

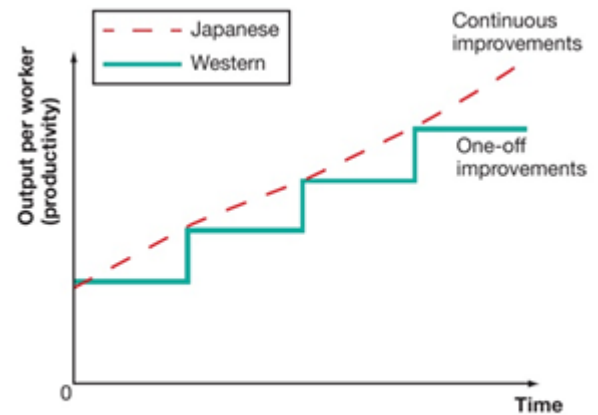
- **Plan.** Businesses must identify where improvement is needed. Data must be gathered and used to develop a plan which will result in improvement.
- **Do.** Once the plan has been finalised it must be carried out. The plan is likely to be implemented by workers, on the production line perhaps.
- **Check.** The next stage in the cycle is to check whether or not there has been an improvement. This task may be carried out by inspectors.
- **Action.** If the plan has been successful, it must be introduced in all parts of the business.

COMPETITIVE ADVANTAGE FROM QUALITY MANAGEMENT

High-quality goods and services can significantly benefit businesses by increasing sales, reducing costs, and developing a unique selling proposition (USP). This differentiation allows businesses to charge higher prices, allowing them to gain flexibility in pricing. Delivering quality also provides a competitive advantage, allowing firms to win customers, increase market share, raise revenue, and improve profitability. British firms have successfully achieved this through quality marketing in overseas markets.



▲ Figure 2 The kaizen umbrella



▲ Figure 3 The Western and Japanese approaches to improvement

SUBJECT VOCABULARY

quality features of a product that allow it to satisfy customers' needs. It may refer to some standard of excellence.
quality assurance a method of working for businesses that takes into account customers' wants when standardising quality. It often involves guaranteeing that quality standards are met.

quality chains when employees form a series of links between customers and suppliers in business, both internally and externally.

quality circles groups of workers meeting regularly to solve problems and discuss work issues.

quality control making sure that the quality of a product meets specified quality performance criteria.

statistical process control the collection of data about the performance of a particular process in a business.

total quality management (TQM) a managerial approach that focuses on quality and aims to improve the effectiveness, flexibility and competitiveness of the business.

Revision questions

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