The big picture

Businesses work hard to match their supplies with consumer demand. However, in recent years, supply chain challenges have led to shortages. Sony and Microsoft, for example, have had to cut production of next gen games consoles due to shortages of semiconductors. And with increased demand for electric bikes, e-bike producers have found it difficult to scale up production due to a shortage of parts. Many e-bike producers have had to manage rising unit costs due to rising supply chain costs, whilst also reconsidering where their bikes are produced.

Production planning refers to the organisation of resources to establish what, where, how and when something can be produced. Planning production can be extremely challenging with changes in the internal and external environment. Businesses need to continuously review their production planning to ensure that they can maximise efficiency.

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Figure 1. Production planning in action.

Credit: andresr, Getty Images

More information for figure 1

An individual with long hair, wearing a checkered shirt, is observing a large whiteboard filled with various sketches, diagrams, and colorful sticky notes. The content on the board seems to relate to production planning, including flowcharts and handwritten notes. There are colorful sticky notes placed across the board, some with symbols or icons that may represent different aspects of a production process. The scene suggests an environment where ideas are actively being developed and organized visually.

[Generated by AI]

Making connections

Production planning requires tools to ensure that steps in a production process are organised efficiently. Two tools that you have been introduced to in this course are the Gantt chart (Section 5.3.5 (/study/app/business-hl/sid-351-cid-762729/book/tool-gantt-chart-id-39488/)) and critical path analysis (Section 5.3.6 (/study/app/business-hl/sid-351-cid-762729/book/tool-critical-path-analysis-id-39489/)).

Learning objectives from the IBDP Business Management guide with assessment objective level:

- **Explain** the local and global supply chain process (AO2)
- **Distinguish** between and evaluate ‘just-in-time’ and ‘just-in-case’ production (AO3)
- **Draw** and **analyse** a stock control chart, including the following: (AO2, AO4)
  - lead time
  - buffer stock
  - reorder level
  - reorder quantity
- **Calculate** and **comment** on the following operations management calculations: (AO2, AO4)
  - capacity utilisation rate
  - defect rate
  - productivity rate

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- labour productivity
- capital productivity
- operating leverage

- **Calculate** cost to buy (CTB) and cost to make (CTM) and discuss to buy or to make decisions (AO3, AO4)

5. Operations management / 5.6 Production planning (HL)

The local and global supply chain process

Local and global supply chains (HL)

A supply chain refers to all the stages of production through which a product passes, from the extraction of raw materials to the delivery of finished products or services to customers. A supply chain may involve a number of different businesses. A simple supply chain for a wooden table might be as follows (**Figure 1**):

1. Trees are grown in a commercial forest, and then felled.
2. The trees are sold and shipped to a sawmill, which turns them into timber.
3. A carpenter buys the timber and manufactures a table.
4. A retailer sells the table to the consumer.

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Student view

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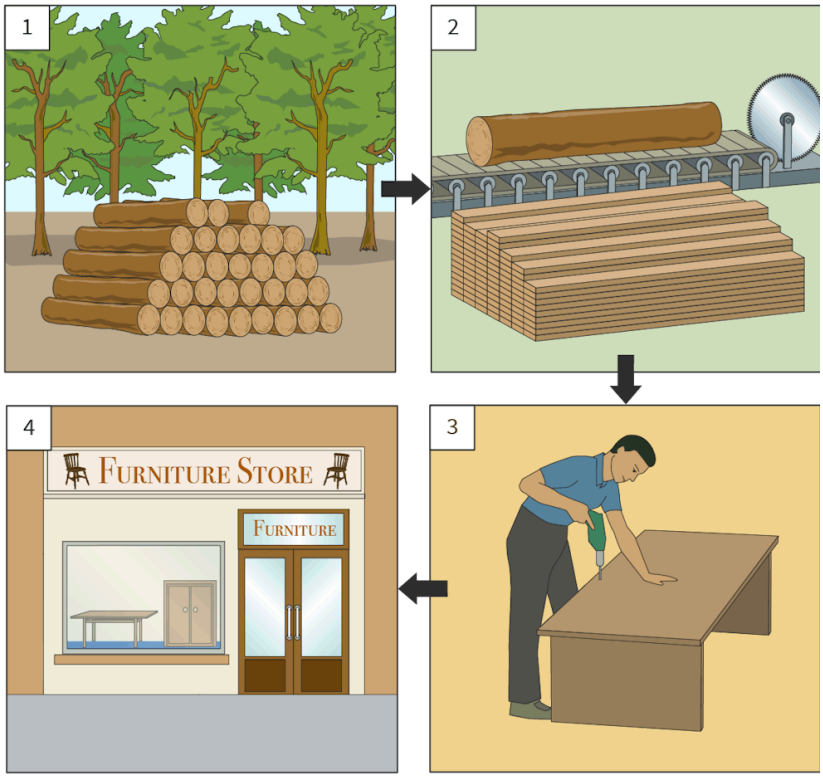

Figure 1. The supply chain for a wooden table.

More information for figure 1

The image is a diagram depicting the supply chain process for a wooden table, divided into four stages. Each stage is illustrated in a separate numbered section.

1. The first section shows trees in a commercial forest with logs piled up, indicating the initial stage where trees are felled.

2. The second section illustrates the logs being processed in a sawmill, where they are converted into timber. A conveyor and saw blade show the cutting process.

3. The third section depicts a carpenter manufacturing a table using the timber. The carpenter is shown working with tools on a table.

4. The fourth section shows a furniture store, representing the final stage where the table is sold to consumers. The store has a display window with furniture visible inside, indicating commercial sale.

[Generated by AI]

Student view

In reality, supply chains are complex for many businesses. IKEA, for example, purchases products from more than 1800 suppliers in over 50 countries. The company makes use of

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trading services to manage suppliers and negotiate favourable prices, whilst monitoring suppliers to ensure quality and sustainability targets are met.

In car manufacturing, a single car has about 30 000 parts – counting every item down to the smallest screw. Some of these parts are made inhouse; others are purchased from external suppliers. For example, Toyota's suppliers make seats, wheels, steering wheels, windscreens, headlights and meters. Many of these suppliers are located close to the Toyota factory so that they can meet the company's just-in-time requirements. When Tesla built their giga factories in Shanghai and Austin, Texas, many of their suppliers began locating within close proximity to meet Tesla's rapidly growing demand for resources.

Supply chain management is the process of working with all of a business's suppliers to ensure reliable and quality production and delivery of components and final goods. It is key to maximising efficiency and to ensuring multi-stakeholder value. Supply chain managers will consider many different factors when selecting suppliers, including:

- **Impact on multiple stakeholders.** It is important to consider the wellbeing of people and the planet in supply chain management. The choices a business makes about who, what, where and how to supply goods will impact workers and communities across the globe and the natural environment. Conscientious businesses will take their global–social and global–ecological responsibilities (Section 1.3.4 (/study/app/business-hl/sid-351-cid-762729/book/ethical-objectives-and-corp-social-resp-csr-id-36520/)) seriously.
- **Cost.** Because of purchasing economies of scale, supply costs may be reduced if large orders are placed. For this reason, some manufacturers prefer to use a small number of suppliers, with each one providing more than one component.
- **Reliability.** Reliability is about consistency and keeping promises. For manufacturers using just-in-time production, reliability will be a key factor when selecting a supplier. If a delivery is late or incorrect, the entire production line could be stopped.
- **Product quality.** Product quality involves meeting an agreed standard. Poor quality components from a supplier can lead to a fall in overall product quality and a loss of reputation. Purchasing from the lowest cost company may seem better for profitability, but weaker regulations may impact quality.
- **Lead times.** Lead time is how long it takes for a supplier to make a delivery. Lead times will vary depending on the industry and size of the order. An overseas supplier may take many weeks to fulfil an order, while lead times in a just-in-time manufacturing system may be measured in hours. In recent years, the supply chain has been prone to shocks such as the global COVID-19 pandemic, which caused many factories to shut down and resulted in longer lead times.

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Theory of Knowledge

In order to better manage their stock (inventory), companies are using more and more data systems to monitor stock control levels and predict changes in demand.

- To what extent can the human sciences provide accurate predictions?

Local versus global procurement

Some companies are now choosing to procure their supplies locally rather than globally. Procurement refers to the processes required in order to acquire the necessary resources to conduct operations. When procuring supplies locally, a business seeks suppliers within the country borders in which it operates, rather than purchasing resources from another country. Some businesses are building a competitive advantage by promoting their locally sourced goods to attract consumers who are concerned either about the carbon footprint associated with goods transported over long distances, or with the ethical issues associated with exploited workers in other countries.

The demand for locally sourced products is growing, and many businesses are now recognising that a number of consumers consider sustainability and supply chain transparency important when purchasing products. Consumers like to know where their goods come from, and they want to support ethical and sustainable supply chains with their spending. The benefits and drawbacks of using local and global supply chains are explained in **Table 1**.

Table 1. Advantages and disadvantages of local and global supply chains.

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	Advantages	Disadvantages
Local supply chains	**Greater control, less risk.** It is easier to monitor logistics, quality management and ethical practices locally than globally. These issues are increasingly important to consumers, who may demand products with transparent and ethical supply chains. **Lower transport costs.** Increasing trade tariffs, rising fuel prices and taxes on carbon emissions make long distance transport more costly; shorter journeys will save money. **Local—social and global—ecological benefits.** Purchasing from nearby suppliers supports stronger local communities and networks. You learned about generative businessesgenerative businesses (undefined) in Section 1.5.6 (/study/app/business-hl/sid-351-cid-762729/book/generativeregenerative-business-id-36546/); these are easier to develop in a local setting.	**Higher production costs.** Local suppliers may not be able produce large quantities, reducing economies of scale economies of scale (undefined). These higher costs can lead to higher prices for consumers. **Less choice.** There may be fewer suitable suppliers offering the needed resources or products, especially for businesses in remote locations.
Global supply chains	**Greater choice.** Global markets have more potential suppliers with a wider variety of materials. Some materials, such as rare earth metals, may only be available in a limited number of places. **Lower costs of production.** Global suppliers may offer resources or products at lower cost, because they pay workers less, have to comply with fewer regulations, or because they have technologies to produce more efficiently.	**Greater risk.** Complex global supply chains may have greater risks due to exposure to multiple geopolitical tensions. Trade barriers, armed conflict, disrupted shipping routes, rising fuel prices, natural disasters and changing regulations are all issues. **Lack of transparency and control.** It is more difficult to monitor logistics, quality management, and ethical labour and environmental practices globally than locally. These issues are increasingly important to consumers, who may avoid products with supply chains that are unethical or not transparent.

Concept

Sustainability and ethics

Sustainability is ‘meeting the needs of the present without compromising the ability of future generations to meet their own needs’ (United Nations, 1987). Business decisions should consider the impacts on people, planet and profit; the ‘triple bottom line’.

Student view

- **Sociocultural sustainability (people).** Businesses provide for human needs and are interdependent with the communities they serve. They have a responsibility to support the wellbeing of all stakeholders through generative and distributive practices. This is particularly true in both local and global supply chains, where businesses have the opportunity to contribute positively to the wellbeing of workers elsewhere in the world by paying good wages, providing healthy work conditions and supporting employee development.
- **Environmental sustainability (planet).** Businesses should do more than minimise the negative impact of their activities. Instead, they should strive to be regenerative, working to improve the ecosystems on which humans depend. Businesses can do this through regenerative environmental practices that actively work to improve natural ecosystems both locally and globally in their supply chains.

  Here you can see the intersection of sustainability and ethics. Ethics refers to moral principles that govern the behaviour of a person or groups. Ethical responsibilities in business come from the relationships and networks that are formed when business organisations are established. Businesses have a duty to engage positively in reciprocal relationships with their stakeholders and their natural environment.

You learned about businesses' responsibility to their local and global communities through the Doughnut Economics model in Section 1.1.2 (/study/app/business-hl/sid-351-cid-762729/book/the-doughnut-economics-model-id-36500/).

Case study

Vendease is an online marketplace operating in Nigeria. The company provides a digital service that allows restaurants and other businesses to buy straight from manufacturers or local farmers. The aim of the company is to digitise the process of placing orders for food produce. Vendease says it has helped more than 100 restaurants, hotels and other businesses to save on food ordering costs.

The Vendease app is a digital service that helps restaurants and food businesses place orders with suitable suppliers. The app enables filtering of suppliers based on quality and price, generating relevant suppliers to which orders can be assigned. Vendease then helps to ensure 24-hour delivery of these orders, either through its own delivery network or via third parties. The app can also help businesses manage inventory, predict market demand and manage rising prices for food items.

Vendease states that it is focusing on three key areas:

- Promoting local sourcing of vegetables, fruit, dairy, meat, eggs and other harvested food. The company's aim is to guarantee quality whilst helping to support local farming communities.
- Investing financially into the local supply chain — to help support vendors and farmers — and partnering with Grow Africa to engage better with markets. The

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company also states that it is helping small farmers to access markets by assisting with the transport of produce to businesses that place orders via the app.

- Improving sustainability by reducing food waste. Vendease states that, by helping companies to source suppliers via its app, they are helping rural farmers to sell their produce in the city and avoid wastage.

Questions

1. Define the term supply chain. [2 marks]
2. Explain **two** benefits to businesses from being able to order food resources via the Vendease app. [4 marks]
3. Analyse **one** ethical and **one** sustainability benefit of this method of ordering food resources. [4 marks]

Question 1

A supply chain is a network between a company and its suppliers. This network enables a business to acquire materials or distribute finished products.

Define is an AO1 level command term, requiring the precise meaning of a term.

- One mark is given for a vague definition.
- Two marks are given for a complete definition.
- Definitions do not require application to the stimulus material.

Question 2

Procurement refers to the processes needed to acquire the necessary resources to conduct operations.

One benefit of using the Vendease app is that it offers businesses such as restaurants convenience when ordering resources. The app connects directly to suppliers and offers a broad list of potential suppliers, which makes the process of finding and ordering resources much more efficient. This can enable businesses to buy good quality food items at better market prices.

Another benefit of the app is that the company provides 24-hour delivery. As the restaurants and businesses are buying locally from local suppliers, this reduces the lead times and allows for faster delivery. For restaurants this may also mean that the food is fresher, thereby increasing the quality.

Explain is an AO2 level command term, requiring a detailed account including reasons or causes. Explain *why*, explain *how*.

- Only one benefit and one limitation need to be explained. Other responses are possible and would be rewarded if appropriate.
- To achieve full marks, you must always include theory and application to the case study in your responses to the explain command term.

Question 3

Student view

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Ethics refers to the moral decisions a business may make. Sustainability refers to the ability to meet the needs of the present without compromising the needs of the future.

An ethical benefit of using the Vendease app is that businesses that purchase using the app are helping to support local suppliers within the community. This means that they are helping to provide stable incomes to farmers and other local suppliers, increasing the welfare of these stakeholders. This is ethically better than purchasing from larger foreign suppliers, through importing, which does not have any benefit for the local communities and results in financial capital leaving the country. It strengthens local business ecosystems.

A sustainability benefit of using the Vendease app is that increased demand for local produce from businesses is likely to avoid issues of food wastage. By connecting rural suppliers with businesses in the city, the app helps to reduce the issues farmers face in not being able to sell their produce. This reduces the amount of excess supply that perishes and which would result in the depletion and waste of scarce resources.

Analyse is an AO2 level command term, meaning to break down in order to bring out the essential elements or structure. In this case, you are breaking down an explanation of moving from JIT to JIC into benefits and limitations.

- One ethical and one sustainability benefit need to be addressed. Other responses are possible and would be rewarded if appropriate.
- To access full marks, you must always include theory and application to the case study in your responses to the **analyse** command term.

3 section questions

Question 1

What term describes the time taken for a supplier to make a delivery?

Lead time ✓

Accepted answers

Lead time

Explanation

Lead time is the time taken from placing an order to the point where the order has been received. There are a number of factors that influence lead time, including the proximity to suppliers, speed of logistics, and external factors such as border controls.

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Question 2

What term describes the ability to lower average costs based on buying larger quantities of goods?

Purchasing economies of scale ✓

Accepted answers
Purchasing economies of scale

Also accepted
Economies of scale, Economy of scale, Purchasing economy of scale

Explanation
Purchasing economies of scale refers to the ability to bring down average costs by buying larger quantities of goods. There will be more discounts for larger bulk purchases.

Question 3

An expensive restaurant is looking for a new company to provide all its fresh food. Which factor may be least important when it is selecting the new supplier?

1 Price ✓

2 Quality

3 Reliability

4 Flexibility

Explanation
An expensive restaurant is likely to have high profit margins. This means that costs of supplies (price) will be less important than other factors. It is likely that high-quality ingredients will be essential if the restaurant wants to maintain an effective unique selling point (USP).

Factors such as quality, reliability and flexibility will be essential to help the restaurant meet the needs of its target market.

Student view

5. Operations management / 5.6 Production planning (HL)

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Just-in-time and just-in-case production

The difference between JIT and just-in-case (HL)

This section addresses how much stock (inventory) a business should hold. Depending on the business and the conditions it faces, it might be beneficial to hold large amounts of stock, or it might be better to get deliveries of resources shortly before those resources are needed, in order to avoid holding stock.

Just-in-time (JIT) production

Just-in-time (JIT)Just-in-time (JIT) (undefined) production is the principle of placing smaller, regular orders for resources, which are delivered just in time for them to be used. This reduces storage costs and waste. You learned about just-in-time production in Subtopic 5.3 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39339/).

Just-in-time production has been challenged in recent years by a variety of 'supply shocks' within the global supply chain. These shocks include international trade wars, a global pandemic, shipping costs and disrupted shipping routes, geopolitical tensions and shortages of key resources such as rare earth metals, which are used to make semiconductors for electronics. **Table 1** outlines the benefits and limitations of just-in-time (JIT) production. This is the same table that you met in Section 5.3.1 (/study/app/business-hl/sid-351-cid-762729/book/lean-production-id-39484/).

Table 1. Benefits and limitations of just-in-time production for a business.

Benefits of just-in-time production	Limitations of just-in-time production
Improved cash flow and reduces costs. Businesses can reduce costs by reducing the stock (inventory) they hold. They can then use the money saved for other operations (Subtopic 3.7 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39317/)).	**Reduced economies of scale.** Businesses will make smaller orders, possibly reducing purchasing economies of scale (Section 1.5.2 (/study/app/business-hl/sid-351-cid-762729/book/internal-and-ext-economies-id-36534/)).
Improved operations. Employees know they need to be careful in operations, because there is no spare stock (inventory) to rely on.	**High risk.** Production may halt if a small part of the supply chain breaks down. Any delay in delivery becomes critical for production.

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Benefits of just-in-time production	Limitations of just-in-time production
Improved cash flow and reduces costs. Businesses can reduce costs by reducing the stock (inventory) they hold. They can then use the money saved for other operations (Subtopic 3.7 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39317/)).	**Reduced . Businesses** will make smaller orders, possibly reducing purchasing economies of scale (Section 1.5.2 (/study/app/business-hl/sid-351-cid-762729/book/internal-and-ext-economies-id-36534/)).
Increased capacity. With less storage space needed for stock (inventory), more space can be allocated to production.	**Reduced resilience.** Businesses may be unable to adapt to changes in the internal or external environment (related to risk). JIT may not be suitable for businesses with seasonal demand.

Just-in-case (JIC) production

Buffer stocksBuffer stocks (undefined) are additional quantities of stock (inventory) kept by a company in case of need. Just-in-case (JIC) stock control involves holding relatively large levels of buffer stocks so that a business can continue to operate when faced with an unforeseen event. This will result in higher storage costs, but it makes the business more resilient to disruptions.

Figure 1. Just-in-case systems hold buffer stock, making the business more resilient to disruptions.

Credit: Sasin Tipchai, Getty Images

Student view

Concept

Change

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External factors, which you learned about in Section 1.1.5 (/study/app/business-hl/sid-351-cid-762729/book/tool-swotsteeple-analysis-id-36504/) (STEEPLE), have an impact on business supply chains. For example, geopolitical conflict between countries has led to an increased number of tariffs on trade, leading some companies to switch to local suppliers that do not need to ship products across borders.

In addition, recent global events — including the COVID-19 pandemic — have exposed flaws within the supply chain. This has resulted in changes to the reliability and cost effectiveness of lean production methods such as just-in-time (JIT) systems, which you learned about in this section and in Section 5.3.1 (/study/app/business-hl/sid-351-cid-762729/book/lean-production-id-39484/). Some businesses are changing suppliers; others are moving to just-in-case (JIC) systems in order to increase inventories. And some businesses are implementing new technologies to better monitor supply chains.

Table 2 analyses the main benefits and limitations of just-in-case (JIC) stock control systems.

Table 2. The benefits and limitations of just-in-case (JIC) stock control.

Benefits of just-in-case stock control	Limitations of just-in-case stock control
Resilience. Production can continue for a time, even with disruptions to supply chains. Unexpected orders can be filled.	**Less working capital.** Purchasing large quantities of stock reduces liquidity (Subtopic 3.5 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39042/)); less cash is available for operations.
Economies of scale. The business can order larger quantities of supplies, resulting in lower costs through purchasing economies of scale.	**Higher storage costs.** Holding large quantities of stock is costly due to space needs.
Less risk. The business is less exposed to changes in the external environment, such as increases in resource costs.	**Waste.** A business may not be able to use all of the large quantities of stock it purchased, resulting in wasted resources, particularly with perishable goods.

Exam tip

You may be asked to evaluate whether a company should adopt a just-in-time (JIT) approach to stock control. Generally, this can be a good idea, but only if the business has a reliable supplier and demand is predictable. If these conditions are not met, then

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just-in-case (JIC) may be a better suggestion.

Case study

During and after the COVID-19 pandemic, bicycle manufacturers were hit by supply chain issues. Factories in China and Malaysia were closed, shipping costs increased, containers were unavailable, tariffs were implemented and semiconductors for e-bikes were in short supply.

In addition to this, there is now growing demand for bicycles, including e-bikes. With inventories falling and demand rising, just-in-time systems have been unable to operate efficiently and production has not been able to scale up. This is putting significant pressure on bicycle manufacturers, who are unable to meet demand. As shipping containers are limited, it is taking longer to receive parts. As a result, it is taking longer to deliver finished bicycles to retailers.

Bicycle businesses are trying to find ways to manage the supply chain issues. Some businesses are reshoring production because the benefits of outsourcing, such as lower labour costs, have been cancelled out by increased costs in other parts of the supply chain. Some businesses are also increasing inventories. Other businesses are looking to 'digitise' their supply chain and use timely stock information to improve ordering, rather than making a complete switch from a JIT to a JIC system.

Questions

1. Define just-in-time production. [2 marks]
2. Explain **two** external factors that have impacted the just-in-time production of bicycle manufacturers. [4 marks]
3. Analyse **one** benefit and **one** limitation of bicycle manufacturers switching from a JIT to JIC system. [4 marks]

Question 1

Just-in-time production refers to the principle of placing smaller, regular orders for resources, which are delivered just-in-time for them to be used. This reduces the cost of holding stock.

Define is an AO1 level command term, requiring the precise meaning of a term.

- One mark is given for a vague definition.
- Two marks are given for a complete definition.
- Definitions do not require application to the stimulus material.

Question 2

Just-in-time production was defined in Question 1.

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One factor that has affected just-in-time production of bicycles is the reliability of suppliers. Reliability refers to the ability to deliver the necessary parts on time. Given that there are issues mentioned with the bicycle supply chain, such as a lack of shipping containers, the delivery time of bicycle parts has been impacted. If parts are not available for a period of time, this might mean that bicycle production is interrupted.

Another factor affecting the just-in-time production of bicycles is the lack of components or resources. If resources are not available, then a business may have to stop production. In this case there has been a shortage of key parts for e-bikes, especially semiconductors. This means that e-bike manufacturers cannot get the necessary parts on a regular basis, which makes just-in-time production problematic.

Explain is an AO2 level command term, requiring a detailed account including reasons or causes. Explain *why*, explain *how*.

- Two factors need to be explained. Other responses are possible and would be rewarded if appropriate.
- To achieve full marks, you must always include theory and application to the case study in your responses to the **explain** command term.

Question 3

A just-in-case (JIC) system is when a business holds a buffer stock of resources, in case of fluctuations in demand or supply or disruptions to the supply chain.

One benefit of switching from JIT to JIC would be greater resilience. By holding a buffer stock of inventory, including necessary parts and resources, e-bike manufacturers would be less exposed to problems in the supply chain. In this case, if e-bike manufacturers had larger stocks of semiconductors, they may not be faced with shortages that stop their production. This would enable the e-bike producers to meet the increased demand for e-bikes.

One limitation of switching to a JIC system is that cash would be tied up in inventory. This means that e-bike manufacturers would spend more cash purchasing stock and parts, lowering their liquidity. Not only would they need to spend more on stock, but they would also need to spend on storing the stock, which leaves less cash available for operations and worsens cash flow.

Analyse is an AO2 level command term, meaning to break down in order to bring out the essential elements or structure. In this case, you are breaking down an explanation of moving from JIT to JIC into benefits and limitations.

- One benefit and one limitation of the change need to be addressed. Other responses from **Table 2** in this section are possible and would be rewarded if appropriate.
- To access full marks, you must always include theory and application to the case study in your responses to the **analyse** command term.

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3 section questions

Question 1

What is the term used to describe the minimum amount of stock a business needs to store on site in order to continue to operate effectively?

Buffer stock ✓

Accepted answers
Buffer stock

Also accepted
Minimum stock

Explanation
A buffer stock is a minimum stock level that a business would hold in order to ensure that it can continue operations and meet demand. The buffer stock held is usually based on previous sales trends.

Question 2

When might a just-in-case (JIC) strategy be suitable for a business?

1 When suppliers are not reliable ✓

2 If a company has high demand

3 If cash flow is a problem

4 If stocks are perishable

Explanation
If it is essential that production continues no matter what external constraints a company faces, then a just-in-case (JIC) strategy may be justified. This will allow customer orders to be met, even if supply chains are disrupted. The level of demand has little bearing on whether a company decides to use just-in-time (JIT) production.

The other two options are arguments for using just-in-time production.

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Question 3

Which of the following is an advantage of using a just-in-case (JIC) strategy?

1 Unexpected orders can be fulfilled easily. ✓

2 Staff are more likely to be motivated to work efficiently.

3 Production speed will increase.

4 Storage costs will be reduced.

Explanation

Larger stocks will allow companies to meet unexpected orders. It may be possible for a company to build a unique selling point (USP) based upon its reliability in meeting these unexpected orders.

The other answer options are more likely to be associated with just-in-time (JIT) production.

5. Operations management / 5.6 Production planning (HL)

Stock control charts

Stock control charts (HL)

A stock control chartstock control chart (undefined) is an easy way to monitor and analyse stock levels and better control costs. A stock control chart records when stocks are delivered and when they are sold. It can then be used to make decisions about when to order new stocks and in what quantities. The main parts of a stock control chart are:

- **Maximum stock level.** This is the total amount of inventory a company wishes to hold, using current storage facilities.
- **Buffer stock level.** This refers to stock that is held just in case there is an unexpected order or late delivery. Buffer stock is a backup so that customers' needs can still be met if something unforeseen occurs.
- **Lead time.** This is the time it takes a supplier to fulfil an order; the difference between when an order is placed and when it is delivered.
- **Reorder level.** This is the point when new stock is ordered from a supplier. It takes into account the lead time and buffer stock level.

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- **Reorder quantity.** This is the amount of stock that is ordered from a supplier.

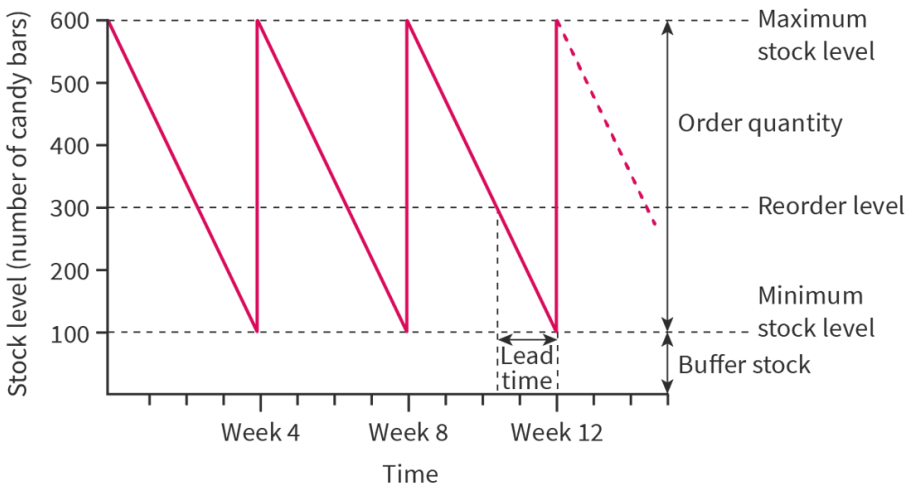


Figure 1. A simple stock control chart for a candy (sweet) shop. Notice the axis labels and labels of the main parts of the chart.

More information for figure 1

The graph depicts a stock control chart for a candy shop over a period of 16 weeks.

- **X-axis:** Represents time, labeled with intervals at Week 4, Week 8, Week 12, and Week 16.
- **Y-axis:** Indicates stock level in number of candy bars, ranging from 0 to 600 in increments of 100.
- **Stock Trends:**
- For the first three cycles, the stock starts at 600 candy bars and decreases linearly to 0 by the end of each 4-week period.
- At each 4-week interval, the stock is restocked back to 600.
- The fourth cycle has a dashed line starting at approximately 300 candy bars, showing a lead time where stock is ordered.
- **Labels and Levels:**
- "Maximum stock level" is at 600 candy bars.
- "Order quantity" is the amount restocked every 4 weeks.
- "Reorder level" appears around 300 candy bars, indicating when to reorder.
- "Minimum stock level" is at 0 candy bars.
- "Buffer stock" is the difference between the maximum stock level and reorder level.
- "Lead time" is represented by a dotted line on the second-to-last interval showing the time taken to reorder.

The chart illustrates the buffer stock and lead time concepts in maintaining adequate candy stock levels.

Student view

[Generated by AI]

Overview (/study/ap hl/sid-351-cid-762729/o

Figure 1 shows a stock control chart for a candy (sweet) shop that has the following stock conditions:

- The shop is only large enough to hold 600 candy bars; this is the maximum stock level. Each time a candy bar is sold, it is recorded on the chart. Sales are represented by the downward sloping parts of the chart.
- When the shop has only 300 candy bars left (the reorder level), it will place an order of 500 bars with its suppliers. 500 is the reorder quantity.
- The time it takes for the suppliers to deliver new stock is referred to as the lead time. It is measured on the *x*-axis from the time of reorder to the time of delivery. In this case, the lead time is just under two weeks.
- In weeks 4, 8 and 12 new stock is delivered. This is represented by the vertical lines on the chart.
- The owners of the candy shop never want to be in the situation where they have no candy bars left to sell. They have therefore set a minimum stock levelminimum stock level (undefined) of 100 bars.

The simple chart in **Figure 1** is useful for gaining an understanding of the main parts of a stock control chart. However, the reality is usually much more complicated. Late deliveries, seasonal demand and production delays create unpredictable stocks. At times, companies may hold a quantity of stock below their buffer stock level, or may even run out completely. Conversely, low sales levels can result in storerooms becoming full and the business having to find new places to keep unsold stock. **Figure 2** shows how this candy store stock control chart may look in reality.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

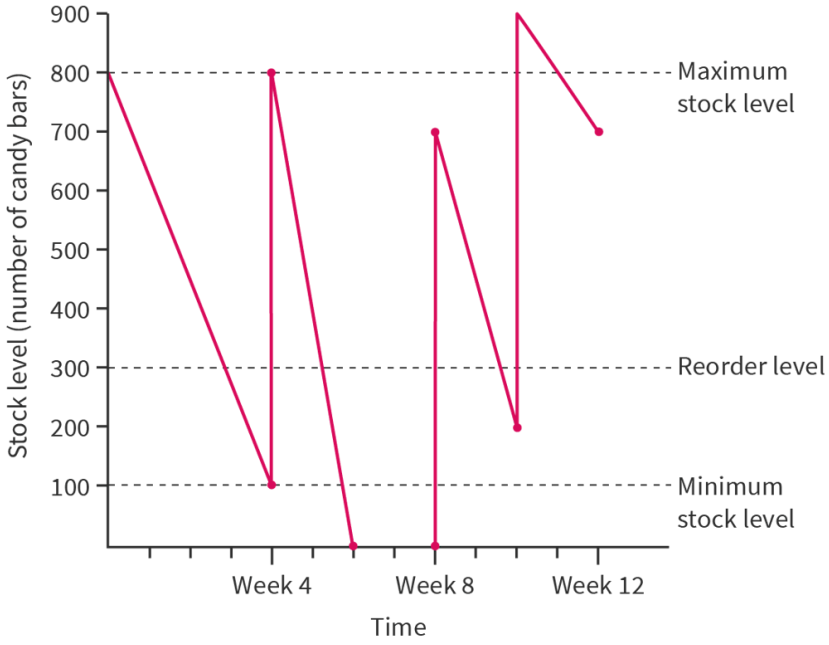


Figure 2. A more realistic stock control chart for the candy (sweet) shop.

More information for figure 2

The chart illustrates the stock control of candy bars over a 12-week period. The X-axis represents the time in weeks, marked as Week 4, Week 8, and Week 12. The Y-axis represents the stock level, labeled as 'number of candy bars', ranging from 0 to 900. Horizontal dashed lines indicate the Minimum stock level, Reorder level, and Maximum stock level.

The graph shows fluctuating stock levels, reflecting dynamic changes. Starting from Week 0, the line graph descends rapidly from about 800 candy bars to around 100 by Week 4, reaching near the Minimum stock level. It peaks back to 800 by the end of Week 4, drops sharply again below the reorder level, rises sharply to near the maximum level in the middle, and ends with a moderate drop by Week 12. These fluctuations highlight unpredictable and variable stock levels due to factors like late deliveries or changing demand.

[Generated by AI]

Concept

Creativity

Technological innovation, including process innovation (Subtopic 5.8 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39044/)), can improve stock control systems. Real time data gathering has enabled many businesses to manage their stock levels by analysing consumer behaviour patterns and forecasting future demand more accurately.

Student view

Overview (/study/app/business-hl/sid-351-cid-762729/o

The use of computer systems and artificial intelligence (Subtopic 5.9 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39043/)) has enabled some companies to use robotics within warehouses. Robots can track stock, locate products and select and move orders in order to aid inventory management.

Stock control management software can be used to manage stock, sales, orders and deliveries. Such systems can make stock control more efficient, improve communications between key stakeholders, reduce delays and improve delivery times. This can have a positive impact on customer service too.

Making connections

Artificial intelligence (AI) is a subject covered in Subtopic 5.9 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39043/). AI is being implemented by businesses to predict or forecast sales trends and demand, automate inventory management, analyse data to manage logistics, and use robots to monitor warehouse inventory. Thus, AI is a key piece of digital technology used to improve stock control and reduce the irregularities shown in **Figure 2**.

Activity

Learner profile: Knowledgeable
Approaches to learning: Thinking skills (transfer)

Questions

1. Use the information in **Table 1** to draw a stock control chart for 4 months (16 weeks), for the mushroom stock of Giovanna's restaurant. Mushroom use is expected to be constant over the time period.

Table 1. Mushroom stock for Giovanna's restaurant.

Opening stock	600kg
Maximum stock level	700kg
Minimum stock level	200kg
Reorder quantity level	300kg

Student view

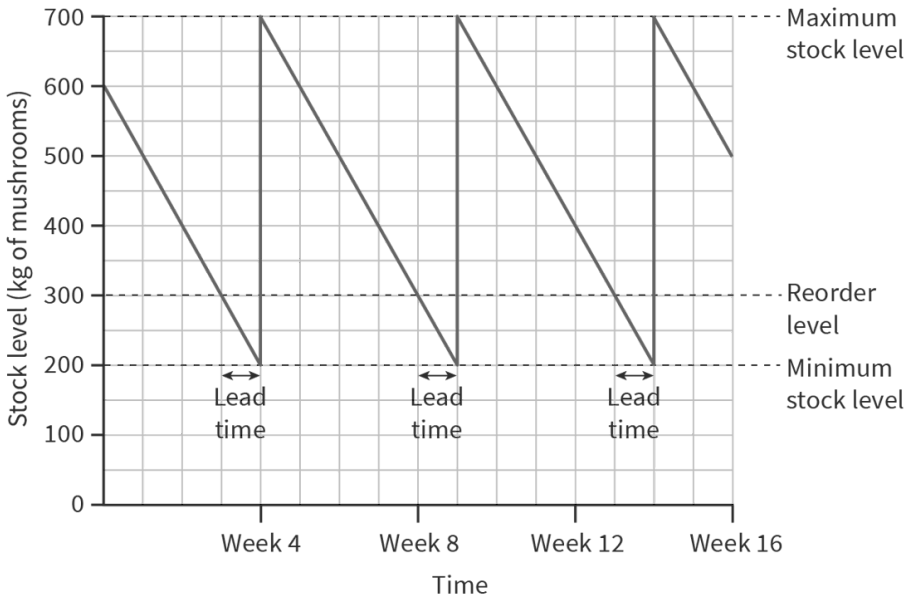
Overview (/study/ap hl/sid-351-cid-762729/o

Reorder quantity	500kg
Quantity used per week	100kg
Lead time	1 week

2. Explain some consequences of poor stock control for the restaurant.

3. Explain how a delay of two extra weeks for delivery might impact the restaurant.

Question 1



Mushroom stock control chart for Giovanna's restaurant.

Question 2

Poor stock control could result in shortages of stock. This may mean that the restaurant cannot meet demand for certain menu items. And this could result in some customers being disappointed when visiting the restaurant. If a restaurant is regularly unable to meet demand for certain menu items, it may develop a poor reputation and receive negative reviews from customers.

On the other hand, if a restaurant is purchasing excess stock, this is likely to negatively impact cash flow. The cost of sales is likely to be high, but if the demand is not high, the restaurant will struggle to make sufficient revenue. Cash will be tied up in stock, which is likely to impact liquidity. Furthermore, the stock may perish (waste) and the expenditure on stock will not be recuperated.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

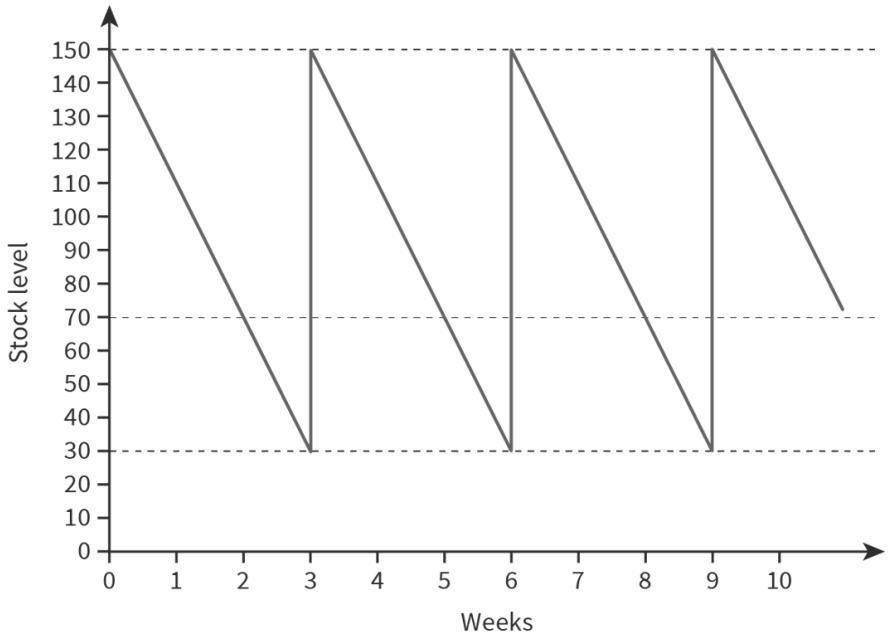
Question 3

A delay of two extra weeks would result in the company reaching 0 kg of mushrooms before the order is received. The restaurant would run out of stock.

3 section questions

Question 1

Look at this stock control graph. What is the maximum stock level?



More information

150 units

Accepted answers
150 units

Also accepted
150, One hundred and fifty

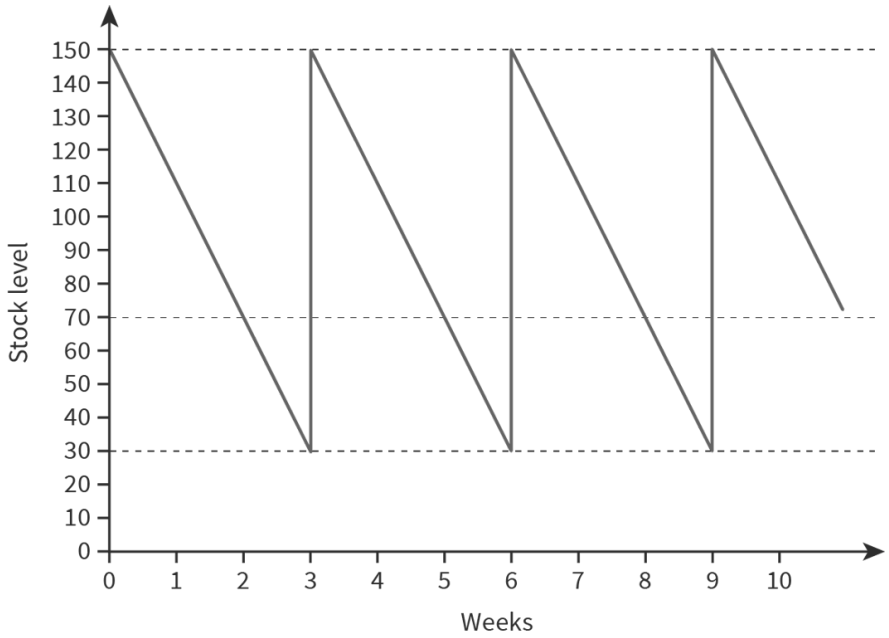
Explanation
On a stock control graph, the maximum stock level is represented by the upper horizontal line. In this case the maximum stock level is 150 units.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Question 2

Look at this stock control graph. What is the reorder level?



More information

1 70 units ✓

2 30 units

3 1 week

4 150 units

Explanation

The reorder level is 70 units. 150 is the maximum stock level; 30 is the minimum stock level; 1 week is the lead time.

Question 3

What is the term for the quantity of stock that indicates that the business needs to order new stock from suppliers?

Reorder level ✓

Accepted answers

Reorder level

Also accepted

Re-order level, Re order level

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Explanation

The reorder level is the amount of stock that indicates that a business needs to order new stock from suppliers. This level takes into account the lead time and reorder quantity.

Reorder quantity is the amount of stock that is reordered.

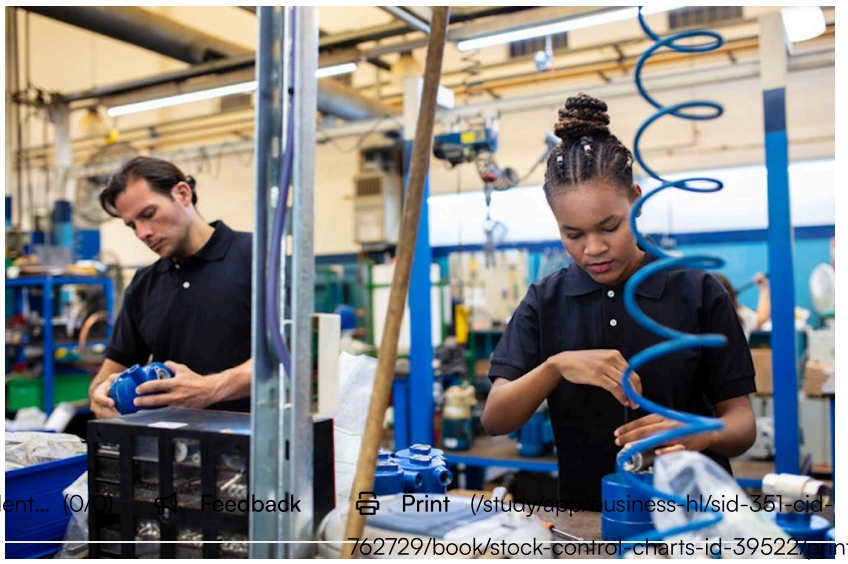
Operations calculations

Capacity utilisation rate (HL) Defect rate (HL) Productivity (HL)

Section Student... (0/0) Feedback Print (/study/app/business-hl/sid-351-cid-762729/book/operations-calculations-i-id-39523/print/) Assign

Operations managers need tools to track the performance of their departments. Quantitative tools are particularly useful for operations management. Businesses use a number of common performance indicators for operations including:

- productivity rate
- labour productivity
- capital productivity
- defect rate
- operating leverage
- capacity utilisation rate



Section Student... (0/0) Feedback Print (/study/app/business-hl/sid-351-cid-762729/book/stock-control-charts-id-39522/print/) Assign

Figure 1. Workers on the production line have their productivity measured.

Credit: alvarez, Getty Images

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Productivity

ProductivityProductivity (undefined) rate measures the average efficiency of production and is expressed as a ratio of output to inputs within the production process. Productivity rate is calculated using the following formula:

$$\text{Productivity rate} = \frac{\text{total output}}{\text{total input}} \times 100$$

Labour productivityLabour productivity (undefined) measures the output per worker over a defined period of time (for example, per hour). It is calculated using the formula:

$$\text{Labour productivity} = \frac{\text{total output}}{\text{number of employees}}$$

For example, suppose a team of people is employed to proofread books for publication. If the team is made up of eight people and they can proofread 40 books per month, this would mean that labour productivity is five books per employee per month.

Activity

Learner profile: Knowledgeable
Approaches to learning: Thinking skills (critical thinking)

Generally, businesses want to improve productivity because doing so lowers their costs of production and improves profits. Imagine that a hotel chain wants to improve productivity within its hotels.

In groups or alone, and using what you know from this Business Management course, identify and explain a few strategies that the business could use to improve productivity at the hotel. Your learning from Unit 2 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39053/) on human resource management may be particularly helpful.

The business could use the following strategies to improve productivity at its hotels:

- Improve training and staff motivation. Skilled staff who are motivated will work harder and become more efficient than those who are not. Subtopic 2.4 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39054/) explains in detail the different theories of staff motivation, while methods of training are covered in Subtopic 2.1 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39053/). Hotels may utilise on-the-job training using experienced mentors or coaches to help support inexperienced staff within the hotel reception. Additionally, non-financial incentives such as job enrichment or job design may be utilised within the

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

hotel so staff carry out interesting and meaningful tasks, which add value to their working day. For example, hotel chefs could be given more autonomy over the menu design.

- Improve management techniques. The style in which a manager organises and leads their team can have a significant effect on the team's efficiency. There is no correct or incorrect management style; the most efficient method will typically depend on the situation. See Subtopic 2.3 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39392/) for more on this.
- Increase the use of technology. Appropriate technology can assist employees and make them more productive. For example, staff in the hotel may be able to use computer software that can help with room bookings, monitor stock levels within the hotel restaurant or provide cleaning staff with guidance on which rooms need cleaning at different times. Kitchen staff may use technology to help manage restaurant orders better. Technology can save time and reduce average costs.

Capital productivityCapital productivity (undefined) measures how efficiently a business utilises its capital (such as machinery or other fixed assets) to generate output. The higher the capital productivity rate, the more efficient a business is at utilising its fixed assets. For example, a drinks manufacturer has a factory that is capital intensive. The business will monitor the output of machines to establish how efficient the capital is.

To calculate capital productivity, a business uses the following formula:

$$\text{Capital productivity} = \frac{\text{total output}}{\text{capital input}}$$

For example, two machines may be capable of producing 50 000 drinks in one day. The calculation for capital productivity will be as follows:

$= \frac{50\,000}{2}$

= 25 000 drinks per machine

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

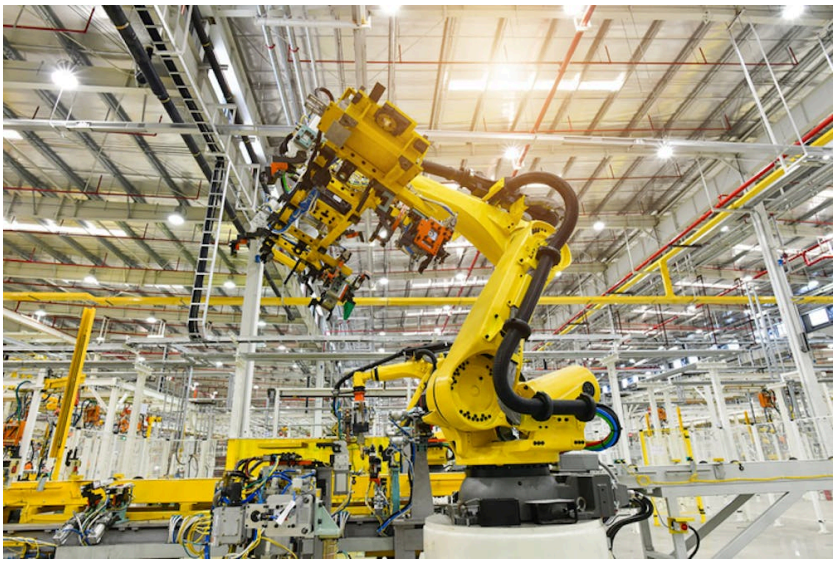


Figure 2. The higher the capital productivity rate, the more efficient a business is at utilising its fixed assets.

Credit: Sumith Nunkham, Getty Images

Productivity and costs

Productivity is an important metric for business. The more productive labour and capital is, the lower the unit costsunit costs (undefined). The value of unit costs is measured using the following formula:

$$\text{Unit costs} = \frac{\text{total cost}}{\text{output}}$$

This calculation does not appear in the Business Management guide, but it is fundamental to understanding operations management, so it is worth taking the time to understand it. This is simply the average cost of making a *single* unit of output.

Lower unit costs improve profit margins because lower unit costs should reduce total costs, all other things being equal. If total revenue stays the same but total costs fall, then profit would increase and so would the profit margin (PM).

The relationship between productivity and costs can be seen in **Table 1**. Assume that a publishing business pays each staff member a salary of $1000 per month. If each worker proofreads five books per month, the average cost would be $200. If, through training, that worker can double productivity to 10 books per month, the average cost would be halved to $100. If technology then helps increase productivity further to 20 books per month, the average cost would fall to $50.

Student view

Table 1. The effect of increasing labour productivity on costs of production.

Overview (/study/ap hl/sid-351-cid-762729/o

Output (books)	Salary or labour costs ($ per worker)	Average cost ($5 per book)
1	1000	1000
5	1000	200
10	1000	100
20	1000	50

Defect rate

There is a risk that pushing workers and capital to produce more can cause more mistakes, called product defects. The defect ratedefect rate (undefined) is the percentage of output that does not meet expected quality standards. Quality control systems are discussed in Subtopic 5.3 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39339/). The defect rate is calculated using the following formula:

$$\text{Defect rate} = \frac{\text{defects}}{\text{output tested}} \times 100$$

For example, imagine that a toy business has 60 defects for every 1000 units it produces. The defect rate will be 6%. This may seem relatively small, but if even a small percentage of defective toys reach the market, this could cause a number of problems, such as:

- harm to customers caused by the defect itself
- the need to recall defective products, which is very expensive and lowers profits
- the undermining of confidence in all the products the business makes, harming sales revenues
- possible costly legal action if the business has been negligent

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Figure 3. The pressure to increase productivity can lead to defects.

Credit: andresr, Getty Images

Operating leverage

High levels of fixed costs relative to variable costs (and therefore total costs) make it more difficult for a business to break even. Thus, knowing the relative proportion of fixed costs in operations – called the operating leverageoperating leverage (undefined) – can help a business to judge how difficult it may be to become economically sustainable. It can also help to predict how much any increase or decrease in sales revenues will affect profits.

High operating leverage means that the business spends relatively large sums on fixed costs such as research and development, physical capital or marketing. An example of an industry where operating leverage is high is the pharmaceutical industry. Businesses that produce medicines and vaccines must invest very large sums in research and development and in fixed capital, such as production plants. Large retailers, on the other hand, have a lower operating leverage. Global retailer Carrefour, for example, has relatively lower fixed costs and higher variable costs. This is because a large portion of its costs will be for the food and other consumer products that it sells in its stores. Operating leverage is calculated using the following formula:

$$\text{Operating leverage} = \frac{\text{quantity} \times (\text{price - variable cost per unit})}{\text{quantity} \times (\text{price - variable cost per unit}) \text{ - fixed costs}}$$

In this formula, quantity is based on the number of goods sold. The price is the price at which each product is sold. A business will incur fixed costs, which it will need to pay regardless of whether it sells a small or large number of products. The variable cost will be dependent on how many items are sold.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

For example, a biscuit manufacturer has fixed costs of $800 000. The cost of production per packet of biscuits is $0.04. Suppose that the business sells 1 000 000 packets of biscuits at a price of $4 per packet. The following calculation can be made:

$$\text{Operating leverage} = \frac{(1\,000\,000 \times (4 - 0.04))}{(1\,000\,000 \times (4 - 0.04) - 800\,000)}$$

$$\text{Operating leverage} = \frac{(3\,960\,000)}{(3\,160\,000)}$$

Operating leverage = 1.25

This means that every 10% increase in sales will lead to a 12.5% increase in profits. This can be used to check potential changes in profit based on price and output changes. As fixed costs would be expected to remain the same, if prices change and/or number of units sold changes, then the changes in profit could also be calculated.

Making connections

Subtopic 5.5 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39338/) on break-even analysis is connected to operating leverage. The operating leverage ratio measures the ability of a business to cover costs and increase revenue. It can be used as a method for calculating the break-even point.

- Can you spot the concept of contribution per unit and total contribution in the formula for operating leverage? Try to simplify the formula to see what that reveals.

Capacity utilisation

As businesses have fixed costs to pay, capacity utilisationcapacity utilisation (undefined) is important. Capacity utilisation is the percentage of a company's total capacity that is currently being used. When capacity utilisation rates are higher, the average fixed costs will fall because they will be divided by a larger output. The capital utilisation rate can be calculated using the following formula:

$$\text{Capacity utilisation rate} = \frac{\text{actual output}}{\text{productivity capacity}} \text{ x } 100$$

Student view

Capacity is the total output a company can produce using its current resources. If a clothing manufacturer can produce 1000 items per day, its daily capacity is 1000. Capacity utilisation is the percentage of the maximum potential output (capacity) that is currently being produced. If

the same clothing manufacturer produces 800 units per day, then it is using 80% of its potential capacity.

If a hotel has 800 rooms but, on a given day, the number of rooms it fills is 300, then the capacity utilisation rate is just 37.5%. This may be an issue as staff salaries, utilities, rent, marketing costs and so on will still need to be paid. Service sector businesses such as airlines, restaurants, hotels, theme parks and sports and musical venues need to ensure that capacity utilisation is high to ensure that fixed costs are covered and average costs are lower.

Table 2. The effect of increasing labour productivity on costs of production.

Key Term	Short definition	Hotel example	Example as a number
Capacity	**Maximum possible output.**	**The number of rooms available for booking.**	**800 rooms**
Output	The current level of output at a point in time.	The number of room bookings.	300 rooms
Spare capacity	Potential additional output that is not currently being realised.	The number of empty rooms.	500 rooms
Capacity utilisation	The percentage of potential output that is currently being used.	The percentage of rooms booked by guests.	37.5%

High capacity utilisation means that a company is using its resources efficiently. This should reduce average costs and hopefully increase profits. This is important, for example, for hotels operating within large cities where fixed costs (such as rents and salaries) are often much higher. These city-based hotels would need to ensure that they are full so that the fixed costs can be spread across the higher output, reducing the average cost per unit as a result.

The downside of a company having an extremely high capacity utilisation rate is that workers and/or machines will be working flat out. This can raise stress levels of staff and leave little time for maintenance, either of which can lead to a drop in quality. In the context of a hotel, this could mean that there is a lot of pressure on staff to clean rooms, provide services to guests and ensure high levels of customer service are maintained. It could also mean that customers may not be able to book rooms, which they could find frustrating. If a business is regularly operating at an extremely high capacity utilisation rate, this may be an indication to the business that they need to expand, adding additional capacity.

Overview (/study/ap hl/sid-351-cid-762729/o

Activity

Learner profile: Knowledgeable
Approaches to learning: Thinking skills (transfer)

1. Use the figures in the table to calculate the various factors listed for Company A.

Factor	Figures	Fina
Defect rate	**Number of defective products: 1500** **Total number of products tested: 4000**	
Labour productivity	**Total output: 12 000** **Number of employees: 21**	
Operating leverage	Total output: 12 000 Price per unit: $2000 Variable cost per unit: $1000 Fixed costs: $2 000 000	
Capacity utilisation	Total output: 12 000 units Potential output 16 000 units	
Capital productivity	Total output: 12 000 Capital input: 150 000	

2. Comment on what these calculations may suggest. Here is some additional information to compare against.

- Industry average defect rate: 20%
- Average labour productivity in the industry: 370 units per worker
- Industry average operating leverage: 1.3
- Average capacity utilisation rates (1 year): 87%
- Previous year's capital input: 0.15

Question 1

Factor	Figures	Final answer
Defect rate	Number of defective products: 1500 Total number of products tested: 4000	$= \frac{1500}{4000} \times 100$ $= 37.5\%$

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Factor	Figures	Final answer
Labour productivity	Total output: 12 000 Number of employees: 21	$= \frac{12\,000}{21}$ $= 571.42 \text{ units}$
Operating leverage	Total output: 12 000 Price per unit: $2000 Variable cost per unit: $1000 Fixed costs: $2 000 000	$= \frac{12\,000 (\$2000 - \$}{12\,000 (\$2000 - \$1000)}$ $= 1.2$
Capacity utilisation	Total output: 12 000 units Potential output 16 000 units	$= \frac{12\,000}{16\,000 \times 100}$ $= 75\%$
Capital productivity	Total output: 12 000 Capital input: 150 000	$= \frac{12\,000}{150\,000}$ $= 0.08$

Question 2

The **defect rate** is 37.5%. The higher the defect rate, the more defects that have been detected. However, it is often difficult to determine whether the rate is high or low as this depends on the business and the industry average. In this case, the defect rate is well above the industry average, which suggests there may be an issue within the production process.

Labour productivity is 571.42 units per worker. This may seem high, but it depends on the product. To understand whether this is high or low you would need to compare the output of workers, relative to their previous work, other workers and industry averages (if available).

Operating leverage is 1.2. This means that for every 10% increase in sales, there will be a 12% increase in profits. This is slightly lower than the industry average, which is 1.3. A higher operating leverage in the industry means that, across the industry, fixed costs are relatively higher compared to variable costs than at Company A. (Or it means that Company A's variable costs are relatively higher compared to fixed costs than the industry average.)

Capacity utilisation is 75% but the average across the year has been 87%. This would indicate the capacity utilisation rate has fallen, perhaps due to falling demand comparative to previous time periods. It could indicate that there is an issue, or it could simply be a seasonal or cyclical change that is common for the industry. It is important to consider the context when analysing capacity utilisation rates.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Capital productivity is 0.08. This seems low but it is better to compare to other information to assess. The previous year's input was higher, which suggests that the productivity rate has fallen. This could be due to things like technical faults, depleted output due to usage over time or operational issues.

Exam tip

You should always use the following rule when asked to calculate anything:

Formula → Figures → Final answer

If you display the correct working but fail to get the correct final answer, you will still receive marks.

Note that you must remember units (such as $) or quantity produced, as you could be penalised for failure to write the correct unit of measurement.

3 section questions

Question 1

Use the following information to calculate the unit cost:

Factor	Amount
Total output	500 units
Total costs	$5500
Total number of workers	36
Productive capacity	600 units

1 $11 ✓

2 $152.78

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

3 $5500

4 $9.17

Explanation

$\text{Unit cost} = \frac{\text{total cost}}{\text{output}}$
$= \frac{(\$5500)}{(500)}$
= $11

Question 2

Use the following information to calculate the company's labour productivity:

Factor	Amount
Total output	500 units
Total costs	$5500
Total number of workers	36
Productive capacity	600 units

1 13.89 units ✓

2 13:89:1

3 $13.89

4 13.89%

Explanation

Labour productivity measures the average output of a company's workforce. Productivity is always expressed in the number of units produced.

$\text{Labour productivity} = \frac{\text{total output}}{\text{total number of workers}}$
$= \frac{(500 \text{ units})}{(36 \text{ workers})}$
= 13.89 units of production

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Question 3

The following data relates to a small manufacturing company.

Factor	Amount
Total output	500 units
Total costs	$5500
Total number of workers	36
Productive capacity	600 units

What is the company's capacity utilisation rate?

1 83.3% ✓

2 120%

3 60%

4 $120

Explanation

Capacity utilisation is the percentage of a company's total capacity that is currently being used.

$$\text{Capacity utilisation rate} = \frac{(\text{actual output})}{(\text{productivity capacity} \times 100)}$$
$$= \frac{(500)}{(600 \times 100)}$$
=83.3%

5. Operations management / 5.6 Production planning (HL)

Make or buy decisions

Cost to buy (HL) Cost to make (HL)

Section Student... (0/0) Feedback Print (/study/app/business-hl/sid-351-cid-762729/book/make-or-buy-decisions-id-39524/print/) Assign

Student view

Overview (/study/app/business-hl/sid-351-cid-762729/o

Businesses make decisions every day about how to produce their products. For example, sportswear retailers such as Nike, Adidas, Under Armour, Puma, Asics and Fila can decide whether to produce a product themselves (make a product inhouse), or whether to hire another company to produce the product on their behalf, which is known as outsourcing (subcontracting)outsourcing (subcontracting) (undefined).

Factors affecting make or buy decisions

There are a variety of quantitative and qualitative factors that businesses consider when deciding whether to make or buy the products they sell. These are listed in **Table 1**.

Table 1. Quantitative and qualitative factors affecting make or buy decisions.

Quantitative factors	Qualitative factors
Total and average costs.	Quality management.
Defect rates.	Reputation and public relations.
Capacity utilisation.	Ethical implications (such as the working conditions in factories in other countries).
Productivity rates.	Availability of factors of production (such as skilled labour or access to raw materials).
Cost of logistics (such as shipping costs).	Changing demand.
Capital expenditure (such as the cost of building a factory or buying machinery).	Supply chain reliability and lead times.
Profitability.	Specialisation (such as access to specialist equipment and expertise).

The cost of making or buying is an important factor that a business will consider in the make or buy decision. Businesses can calculate how much it would cost to make the product inhouse and compare that to the cost of outsourcing production. When making these calculations, businesses must consider both the fixed costs and variable costs (Subtopic 3.3 (/study/app/business-hl/sid-351-cid-762729/book/the-big-picture-id-39300/)).

Student view

In the context of a sportswear manufacturer, the fixed costs would include the cost of the factory, the machinery and expenses (overheads). The variable costs would include the materials used in the sportswear. Businesses are likely to outsource production to another

producer if it costs them less than making the product themselves.

Cost to make

The cost to make (CTM)cost to make (CTM) (undefined) is the total cost of production if manufacturing is kept inhouse. The formula for cost to make is as follows:

Cost to make = (average variable costs x quantity) + fixed costs

Cost to buy

The cost to buy (CTB)cost to buy (CTB) (undefined) is the total cost of subcontracting production to a supplier. The formula for cost to buy is:

Cost to buy = price x quantity

Figure 1. Deciding whether to make or buy can be a complex decision.

Credit: DNY59, Getty Images

Reasons to make

Weighing up the factors involved in the make or buy decision is complex. There are a number of reasons why a business would want to make, instead of buy, a product:

- **Quality and cost control through vertical integrationvertical integration** (undefined)**.** If a business owns multiple (or all) stages of the supply chain, it can have more control over quality and costs. For example, a sustainable fashion producer might consider

owning its own cotton farms if it wanted to ensure that regenerative agricultural practices – critical to its brand – were being used on the land.

- **Protecting intellectual property.** Production secrets and patents do not need to be shared with a third party. This is important because outsourcing increases the risk of copycat brands or fakes occurring, potentially damaging the sales and/or the brand image.
- **Meeting global and local responsibilities.** The business can ensure that it is meeting its local and global responsibilities to people and planet (Section 1.3.4 (/study/app/business-hl/sid-351-cid-762729/book/ethical-objectives-and-corp-social-resp-csr-id-36520/)). It can ensure healthy and fair working conditions for employees and robust environmental protection.

Figure 2. A sustainable fashion producer might consider owning its own cotton farms to ensure regenerative agricultural practices are used.

Credit: Oliver Strewe, Getty Images

For-profit social enterprises and non-profit social enterprisesnon-profit social enterprises (undefined) will likely weigh up the issues of quality and local/global responsibilities to the social foundation and planetary boundaries differently from a for-profit commercial enterprise for-profit commercial enterprise (undefined). Remember that social enterprises are working to regenerate natural and human systems and distributing value more widely to stakeholders. This means that costs of production will be less important in make or buy decisions.

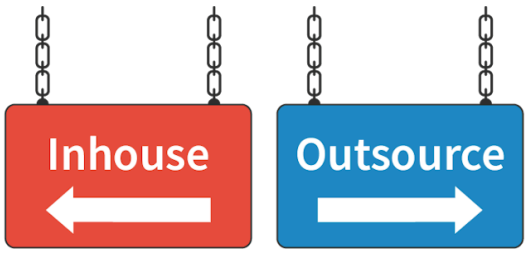


Figure 3. A business needs to decide whether to produce inhouse or to outsource.

Overview (/study/app/business-hl/sid-351-cid-762729/o

Reasons to buy

There are, however, times when buying products from a subcontractor makes more sense for a business. These include:

- **Specialisation and expertise.** Sometimes a business simply does not have the expertise to make the product it wants to sell. In this case, it makes sense to outsource the work to a producer who does have the expertise.
- **Low costs due to economies of scale.** A business may be able to outsource the production to a subcontractor who can combine the work with other products in order to achieve economies of scale, thereby lowering costs of production.
- **Lower fixed costs.** The business may not want to invest in the large-scale capital, such as a factory, needed to produce the product, especially if it is unsure about its success. Outsourcing to a producer who already has production facilities makes more sense in this case.

Figure 4. Sometimes it costs less to outsource the production to a subcontractor who can combine the work with other products.

Credit: Westend61, Getty Images

International Mindedness

Globalisation has enabled many businesses to set up factories in countries with low-cost labour and weak environmental protections. However, some businesses are considering reshoring, as supply chains become less reliable, costs of production and transportation increase, and there is increased demand for locally produced products.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Activity

Learner profile: Inquirer
Approaches to learning: Research skills (information literacy)

Why might outsourcing result in lower quality?

- Research examples of companies that outsource production to other companies. You could, for example, look at a fashion brand you know and find out about their make or buy decisions. Use these supporting questions to help with your research:
  - What issues may have occurred as a result of outsourcing production?
  - Is the company considering bringing production back inhouse?
- Research what is meant by a 'smart factory'. Find an example of a technology that could be used within a 'smart factory' and examine how it can:
  - reduce the number of defects
  - improve quality
  - lower costs
- Research your own school. Does the school subcontract any particular service? Are any online classes available, for example? What factors would your school have considered when making those make or buy decisions?

3 section questions

Question 1

The following data relates to Business Y, a small consumer electronics company, which is considering whether to make or buy a product.

Quantity of units required	**120**
Price to buy one unit from a supplier	$6.50
Fixed costs	$365
Variable cost per unit	$1.00

What is the cost to buy for Business Y?

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

1 $780 ✓

2 $720

3 $1265

4 $1145

Explanation

Cost to buy is the total cost of subcontracting production to a supplier.

Cost to buy = price × quantity
= $6.50 × 120
= $780

Question 2

The following data relates to Business Y, a small consumer electronics company, which is considering whether to make or buy a product:

Quantity of units required	**120**
Price to buy one unit from a supplier	$6.50
Fixed costs	$365
Variable cost per unit	$1.00

What is the cost to make the product for Business Y?

1 $485 ✓

2 $365

3 $245

4 $4850

Explanation

Cost to make is the total cost of production if manufacturing is kept inhouse.

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Cost to make = (variable costs × quantity) + fixed costs
= ($1.00 × 120) + $365
= $485

Question 3

Which of the following is **least** likely to be an important factor for a make or buy decision for most businesses?

1 Packaging ✓

2 Proximity to suppliers

3 Quality

4 Cost

Explanation

The proximity to suppliers, quality and cost would all be important considerations when considering whether to make or buy. Businesses would need to ensure the cost is viable, the quality meets the standards set by the brand and the proximity to suppliers is sufficient to ensure reliable delivery of key resources needed in production.

The packaging is not likely to influence a make or buy decision in most cases.

Terminology exercise

Section Student... (0/0) Feedback Print (/study/app/business-hl/sid-351-cid-762729/book/terminology-exercise-id-39525/print/) Assign

Student view

Overview (/study/ap hl/sid-351-cid-762729/o

Interactive 1. Mastering Production Planning Concepts.

Checklist

Section Student... (0/0) Feedback Print (/study/app/business-hl/sid-351-cid-762729/book/checklist-id-39526/print/) Assign

Student view

What you should know

By the end of this subtopic, you should be able to:

Overview (/study/ap hl/sid-351-cid-762729/o

- define the following terms: (AO1)
  - just-in-time (JIT)
  - just-in-case (JIC)
  - stock control chart
  - lead time
  - buffer stock
  - reorder level
  - reorder quantity
  - capacity utilisation rate
  - defect rate
  - productivity rate
  - labour productivity
  - capital productivity
  - operating leverage
  - cost to buy (CTB)
  - cost to make (CTM)
- explain the local and global supply chain process (AO2)
- distinguish between and evaluate ‘just-in-time’ and ‘just-in-case’ production (AO3)
- draw and analyse a stock control chart, including the following parts: (AO2, AO4)
  - lead time
  - buffer stock
  - reorder level
  - reorder quantity
- calculate and comment on the following operations management calculations: (AO2, AO4)
  - capacity utilisation rate
  - defect rate
  - labour productivity
  - capital productivity
  - operating leverage
- calculate cost to make (CTM) and cost to buy (CTM) and discuss make or buy decisions (AO3, AO4)

Student view

Reflection

Teacher instructions

The goal of this section is to encourage students to pause at the end of the subtopic and to reflect on their learning. Students can use the questions provided below to guide their reflection. The questions encourage students to look at the bigger picture and to consider how the subtopic's contents might have impacted the way they view the subject.

The following table shows you how each prompt aligns to the DP *Business management guide*:

Prompt #	Syllabus alignment
1	**Learner profile:** Caring
2	**Learner profile:** Thinkers
3	**Concept:** Sustainability
4	**Concept:** Creativity

Students can submit their reflections to you by clicking on 'Submit'. You will then see their answers in the 'Insights' part of the Kognity platform.

Reflection

In this subtopic you learned about production planning.

Take a moment to reflect on your learning so far. You can use the following questions to guide your reflection. If you click 'Submit', your answers will be shared with your teacher.

1. A global supply chain can be efficient and at the same time environmentally damaging. Do businesses always need to face such trade-offs?

Overview (/study/ap hl/sid-351-cid-762729/o

2. Think of the procurement at your school. To what extent is your school vulnerable to supply chain disruptions? Which STEEPLE analysis factors (see Section 1.1.5 (/study/app/business-hl/sid-351-cid-762729/book/tool-swotsteeple-analysis-id-36504/)) can potentially affect your school's procurement?
3. Is just-in-case (JIC) production wasteful?
4. What is more important — productivity/efficiency or creativity?

⚠ Once you submit your response, you won't be able to edit it.

0/2000

Submit

Rate subtopic 5.6 Production planning (HL)

Help us improve the content and user experience.

☆ ☆ ☆ ☆ ☆

Student view