DP IB Business Management: HL

Your notes

5.6 Production Planning

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Supply Chain Processes

Your notes

Local & Global Supply Chains

- **Supply chain management** (SCM) **coordinates and schedules manufacturing** to ensure that products are produced efficiently, on time and in the quantities needed
  - It refers to **all stages** from obtaining materials and components to delivery of the product to the end consumer
    - **Stock control:** planning, implementing and monitoring the movement of raw materials, components, work-in-progress and finished goods
    - **Quality control:** ensuring output meets standards so that the end product is safe and meets customer expectations
    - **Transport networks:** ensuring efficient deliveries of good to customers taking account of speed, reliability and costs
    - **Supplier networks:** developing strong relationships with suppliers willing to work collaboratively to improve quality
- **Global supply chains** require these activities to be coordinated **across international borders**
  - Some stages can be **completed at lower cost** in other countries
    - **China** has a reputation for producing high quality, low-cost electronics components
    - Labour-intensive processing such as clothes manufacturing is outsourced to countries with **low labour costs** such as **Vietnam**
  - **Scarce raw materials** may only be available in certain countries/regions
    - For example, more than half of the world's cobalt - an important raw material required in the manufacture of mobile phones - comes from the Democratic Republic of Congo

Just-in-time (JIT) Versus Just-in-case

- **Just in Time** involves **stocks** (raw materials and components) being delivered to a business **as and when they are needed** to be used in the production process
- **Just in Case** involves **holding spare** (buffer) **stock** to ensure that there is **always more than enough stock** to meet production requirements

A Comparison of Just in Time and Just in Case Approaches

Approach	Just in Time	Just in Case
Stock Levels	▪ Minimal stock levels ▪ Materials are ordered and delivered just in time for production ▪ Less need for storage space so lower security costs	▪ **Buffer stock** is held ▪ Protects against unexpected increases in demand, supply chain disruptions or production delays ▪ Aims to prevent **stockouts**
Costs	▪ Minimises stockholding costs ▪ Reduced wastage through **obsolescence** ▪ Bulk-buying discounts are unlikely	▪ Larger storage facilities increases indirect costs ▪ Holding obsolete or slow-moving stock items can be costly ▪ Risk of wastage through damage or theft
Flexibility	▪ Emphasis on efficiency and ability to respond to changes in demand ▪ Needs reliable and efficient suppliers	▪ A safety net against unexpected changes in demand or supply ▪ Less responsive to market change as buffer stock needs to be used up before new products can be made

Your notes

Examiner Tips and Tricks

The approach to stock management will often depend upon key decision makers' attitude to risk

Holding little or no stock means that a business is at greater risk from external factors outside of its control - a willingness to accept and develop systems that minimise these risks makes it more likely that just in time will be adopted by a business

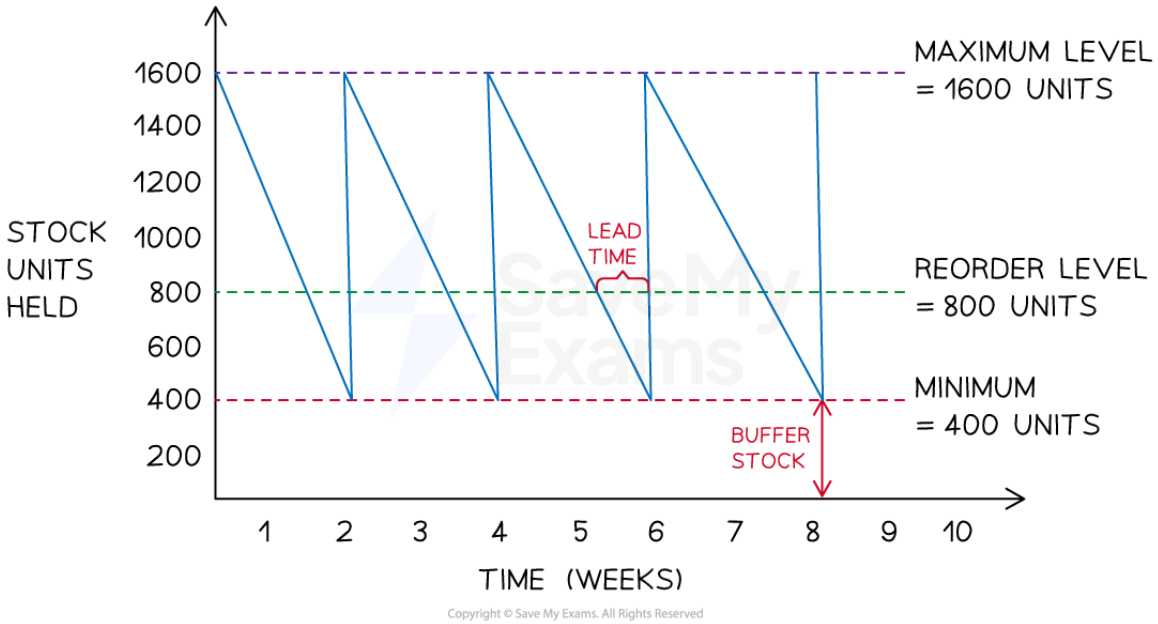
Stock Control Charts

Your notes

Understanding Stock Control Charts

- Stock control involves **carefully planning and controlling stock flow** to ensure that enough raw materials, **work-in-progress** and components are available to meet production demands
- A **stock control diagram** shows how stock (inventory) moves into and out of a business over time

Diagram: a stock control diagram for a small manufacturing business



An example of a stock control diagram for a small manufacturing business

Diagram analysis

- The **maximum stock level** is the maximum amount of stock a business is able to hold in normal circumstances (1600)
- The **reorder level** is the level at which a business places a new order with its supplier (800)
- The **minimum stock level** is also known as the **buffer stock** level and is the lowest level to which a business is willing to allow stock levels to fall (400)
- The **lead time** is the length of time from the point of stock being ordered from the supplier to it being delivered (1 week)

- The stock level line shows how stock levels change over the given time period
  - As stock is used up a downwards slope is plotted
  - When an order is delivered by a supplier the stock level line shoots upwards

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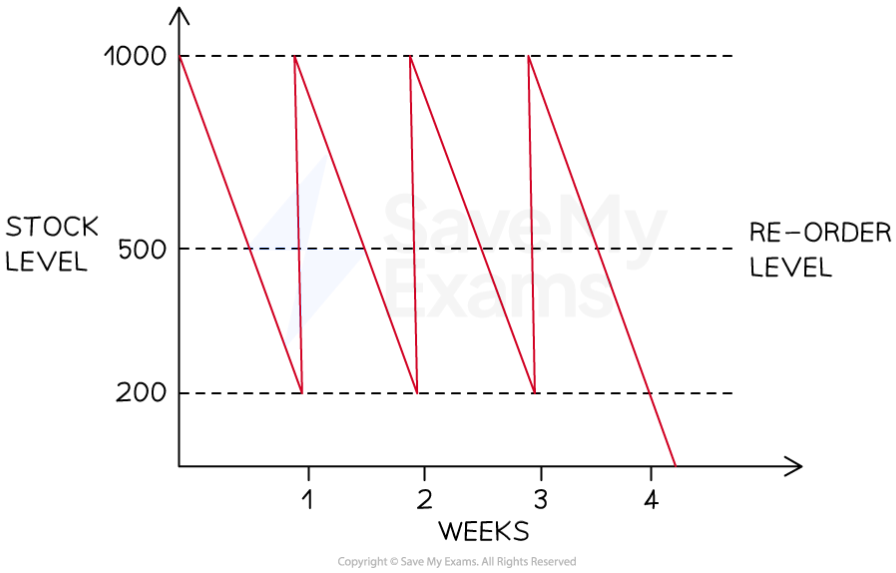
Worked Example

The diagram below shows stock movements of kitchen shelving units sold by *TamFix Ltd.*



Identify the following points:

1. the minimum stock level
2. the re-order level
3. the re-order quantity
4. the lead time for kitchen shelving units

[4 marks]

Step 1 – Identify the minimum stock level

The minimum stock level is identified by the bottom-most dotted line - in this case it shows that the minimum stock level is 200 units **(1)**

Step 2 – Identify the reorder level

The reorder level is clearly identified on the diagram - in this case it shows that the reorder level is 500 units **(1)**

Step 3 - Identify the reorder quantity

The reorder quantity is the difference between the maximum stock level (shown by the topmost dotted line) and the minimum stock level

1000 units - 200 units = 800 units

The reorder quantity is therefore 800 units **(1)**

Step 4 - Identify the lead time for kitchen shelving units

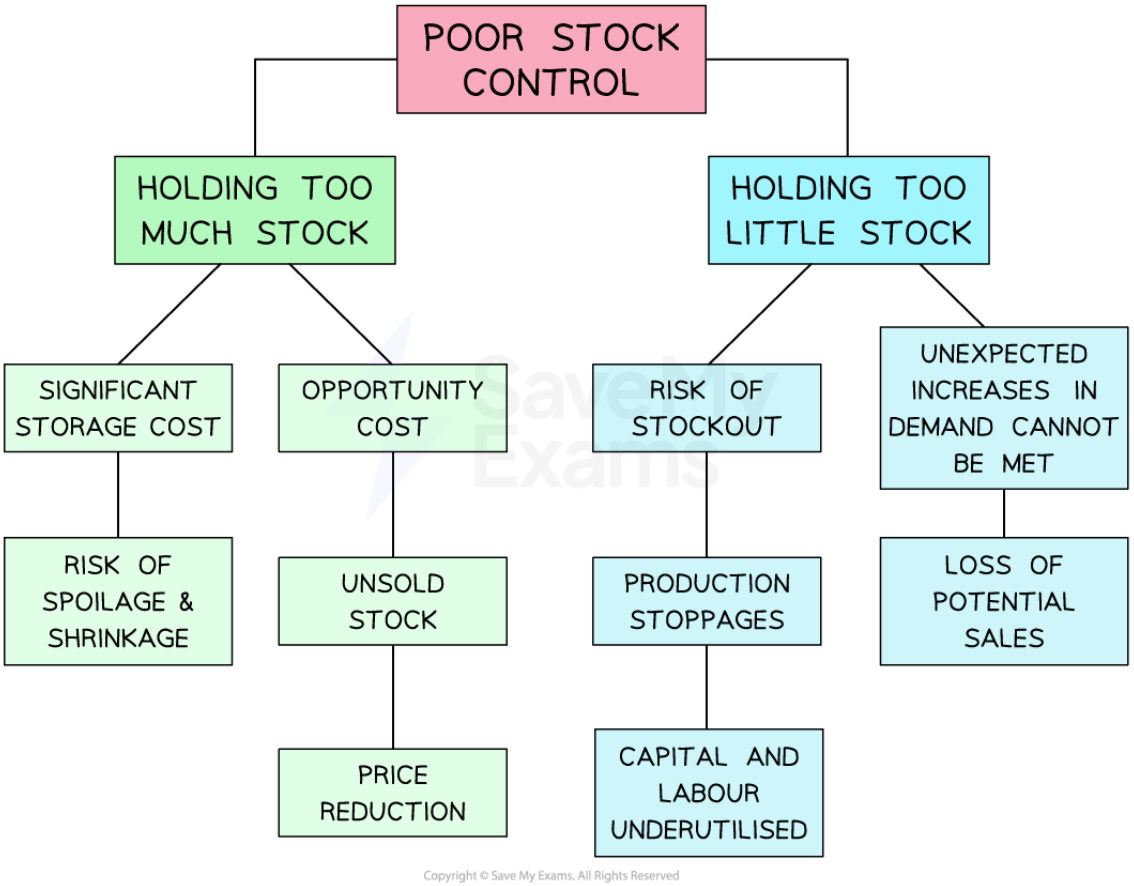
The lead time is the difference in time between an order for stock being placed and its delivery

In this case, assuming a five-day working week, the lead time for shelving units is two days **(1)**


Your notes

Diagram: to show the implications of poor stock control

Your notes



Poor stock control can involve holding too much or too little stock

- Problems may arise from holding **too much stock**
  - **Storage costs** (e.g. warehouse rental, security costs) will be higher than necessary
  - The risk of stock shrinkage or spoilage is increased
  - Excess stock may need to be sold at a lower price, reducing revenue
- Similarly, holding **too little stock** is risky
  - A business may **run out of stock**, resulting in production stoppages and higher unit costs due to underused capacity
  - A sudden increase in **demand may not be capable of being met**

Examiner Tips and Tricks

Even businesses that invest heavily in complex stock control technologies can be affected by external factors that have an unanticipated impact on their ability to receive, distribute or use stock

Stock control is therefore closely linked to aspects of contingency and crisis management

Your notes

Useful Production Metrics

Your notes

Capacity Utilisation

- Capacity utilisation measures **how effectively a business uses its assets to produce output**
- It **compares current output to the maximum possible output** a business can produce using all of its assets
- Capacity utilisation is calculated using the following formula and expressed as a percentage

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

Worked Example

Bäkkerei Lola produces specialist Indian and Bangladeshi breads which are sold to restaurants in the Munich area. Batch production is used in the factory to manufacture the range of breads and the factory can produce a maximum of 68,400 units per month. In May factory output was 51,420 units

Calculate *Bäkkerei Lola*'s capacity utilisation in May **[2 marks]**

Step 1 - Divide the current output by the maximum output

$$= \frac{51,420 \text{ units}}{68,400 \text{ units}}$$ **(1 mark)**

$$= 0.75$$

Step 2 - Multiple the outcome by 100 to obtain the percentage capacity utilisation

$$= 0.75 \text{ x } 100$$ **(1 mark)**
$$= 75\%$$

Examiner Tips and Tricks

In your exam, you may need to rearrange the capacity utilisation formula. You may be given the percentage of capacity utilisation and have to calculate the volume of output.

Your notes

The implications of under and over capacity utilisation

Under-utilisation

- Low capacity utilisation means **resources are being under-used**
  - This is likely to **increase unit costs** because **fixed costs** are spread over fewer units of output
  - Workers are **under-deployed** leading to fears of **redundancy**
- Operating under capacity provides **flexibility**
  - Workers are freed up to complete **maintenance tasks**
  - The business can respond to **sudden increases in demand**

Over-utilisation

- High capacity utilisation may mean **flexibility to respond to new orders** is lost
  - Staff are under pressure to increase output
  - Overworked staff may leave increasing **staff turnover**
  - Machinery operates at its limit and is more prone to **breakdowns** which **disrupts production**
- High capacity utilisation **minimises unit costs** and increases **competitiveness**
  - Busy workers **feel secure in their employment**
  - A busy business is likely to be **well thought-of** and attract customers who are willing to wait for delivery of products

Worked Example

Production Data for Pencil Manufacturers A and B

Manufacturer	Capacity Utilisation
A	55%
B	80%

Your notes

Explain **one** implication of the level of capacity utilisation for pencil manufacturer A, compared to manufacturer B. **[2 marks]**

Step 1 – Identify an implication

One implication is that manufacturer A's unit costs are likely to be higher than those of manufacturer B **(1 mark)**

Step 2: Develop the point with a reason

because resources such as workers and machinery are not being used to their full potential **(1 mark)**

Defect Rate

- The defect rate is the proportion of output that is judged to be **substandard** in a given time period
- It is expressed as a percentage and calculated using the formula

$$\text{Defect rate} = \frac{\text{Number of defective items}}{\text{Total output}} \times 100$$

Worked Example

HomeFlex manufactures high-strength universal charging cables for mobile phones. In 2022 it manufactured and tested 14,220 cables of which 213 were found to be defective

Calculate Homeflex's defect rate in 2022. **[2 marks]**

Step 1: Divide the number of defects by the total output

$$= \frac{213 \text{ cables}}{14220 \text{ cables}}$$ **(1 mark)**

$$= 0.015$$

Step 2: Multiply the outcome by 100 and express as a percentage

$$= 0.015 \times 100$$ **(1 mark)**

$$= 1.50\%$$

- Sometimes it is **not feasible to quality check every item** of output
- In these cases the defect rate is expressed as a percentage and is calculated using the formula

$$\text{Defect rate} = \frac{\text{Number of defective items}}{\text{Number of items tested}} \times 100$$

Your notes

Reasons to reduce the defect rate

- Businesses take steps to **reduce the defect rate** for several reasons
  - **Avoid loss of revenue** as faulty products can rarely be sold
  - Customers will likely complain about substandard products which causes **dissatisfaction** and impacts business **reputation**
  - Unsafe products may **harm customers** and could lead to **legal issues/prosecution**
  - Defective products are often **returned** and require **refunds, processing** and **disposal**

Examiner Tips and Tricks

The defect rate is likely to be much lower when businesses adopt a system of quality assurance, especially Total Quality Management (TQM)

However these approaches usually require a whole-business commitment to quality which may not be easy - or quick - to achieve

Businesses may therefore be willing to operate with a determined level of defects in order to avoid the upheaval and expense of moving to quality assurance

Measuring Productivity

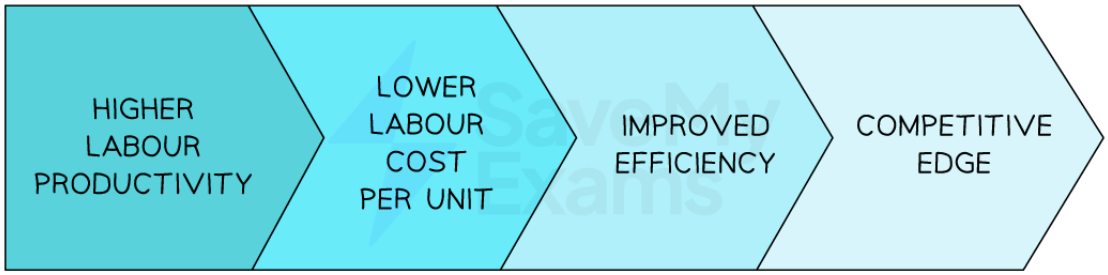
- **Productivity** is the output per input (person or machine) per hour
  - For example, an Ikea worker is able to produce 2 Poäng chairs per hour
- **Labour productivity** measures **output per worker** during a specified period of time
- It is expressed as a number of units and calculated using the formula

$$\text{Labour productivity} = \frac{\text{Output}}{\text{Number of workers}}$$

- Businesses aim to **increase the level** of labour productivity to **improve competitiveness**

Diagram: the link between high labour productivity and competitive edge

Your notes



Higher labour productivity improves businesses competitiveness

Worked Example

The table shows the number of pairs of luxury wool socks produced by *Sokkemani* in 2021 and 2022

Year	Units Produced
2021	46,000
2022	69,000

In 2021 *Sokkemani* employed 50 staff. In 2022 the number of staff employed by the business increased by 20%

Calculate the percentage change in labour productivity between 2021 and 2022. **[4 marks]**

Step 1 - Calculate the labour productivity for 2021

$$= \frac{46,000 \text{ units}}{50 \text{ workers}}$$ **(1 mark)**

$$= 920 \text{ units per worker}$$

Step 2 - Calculate the labour productivity for 2022

$$= \frac{69,000 \text{ units}}{60 \text{ workers}}$$ **(1 mark)**

$$= 1,150 \text{ units per worker}$$

Step 3 - Calculate the percentage difference between the two years ((new-old) / old)

$$= \frac{1,150 - 920 \text{ units}}{920 \text{ units}} \times 100$$ **(1 mark)**

$$= 25\ \%$$

Step 4 - Identify whether the percentage difference is an increase or decrease

Labour productivity has increased by 25% **(1 mark)**

- **Capital productivity** measures of the **output of capital employed** (e.g. machinery) during a specified period of time
- Capital productivity is expressed as a number of units and is calculated using the formula

$$\text{Capital productivity} = \frac{\text{Output}}{\text{Number of machines}}$$

- Businesses aim to **maximise capital productivity** as expenditure on machines is likely to be high

Ways to minimise lost production time due to breakdowns

- **Upgrading** and recalibrating machinery
- Regular **servicing** and **maintenance**
- **Training workers** using machinery
- Use good **quality raw materials** and components

Worked Example

Ferramenta forecasts that by the end of the year it will produce 250,800 units and that capital productivity will be 1,100 units per machine

Calculate the number of machines *Ferramenta* has in use. **[2 marks]**

Step 1 - Divide the output by the capital productivity

$$= \frac{250,800 \text{ units}}{1,100 \text{ units}}$$ **(1 mark)**

Your notes

= 228 machines **(1 mark)**

Your notes

Factors that determine productivity

- **Rivalry** is an incentive for managers and workers to increase productivity
- Investments in **technology** such as ICT improves worker productivity by allowing **flexible working** and **higher quality** output
- **Innovations** such as online scheduling software give employees **tools** to make their tasks more efficient
- Workers' **skills** and experience is improved by careful recruitment and ongoing training
- Business owners' or managers' **attitude towards risk** determines the steps taken to improve productivity

Cost to buy (CTB) and cost to make (CTM)

- **Make or buy decisions** occur when a business has to **choose** between **manufacturing a product itself** or **purchasing it from an external supplier**
- The business compares the **cost to buy** and the **cost to make**
- The **Cost to Buy (CTB)** is expressed as a monetary value and calculated using the formula

$$\text{Cost to buy} = (\text{Purchase price} \times \text{Quantity}) + \text{Delivery costs}$$

- The **Cost to Make (CTM)** is expressed as a monetary value and calculated using the formula

$$\text{Cost to make} = (\text{Average variable cost} \times \text{Quantity}) + \text{Fixed costs}$$

Worked Example

Orosi Valley Farm has decided to sell free range eggs in its popular shop. It could introduce chickens to the farm and sell the eggs they produce. Alternatively it could source eggs from a neighbouring farm. It expects to sell around 5,000 eggs per week.

Costs associated with each option are shown in the table below

	Purchase eggs from neighbouring farm	Source eggs from own chickens
Average cost per egg	7.2 pence	6.4 pence

Delivery cost	£5 per 1000	N/A
Fixed costs	N/A	£60 per week

Your notes

Recommend whether Orosi Valley Farm should make or buy eggs to sell in its shop. You are advised to show your calculations. [5 marks]

Step 1: Calculate the cost to buy the eggs

$= £0.072 \times 5,000$ **(1 mark)**

$= £360$

Then add delivery costs

$= £5 \times 5 = £25$ **(1 mark)**

$= £360 + £25$

$= £385$

Step 2: Calculate the cost to make the eggs

$= £0.064 \times 5,000$ **(1 mark)**

$= £320$

Then add fixed costs

$= £320 + £60$ **(1 mark)**

$= £380$

Step 3: Make a recommendation

Orosi Valley Farm should make the eggs as the cost to make is lower than the cost to buy **(1 mark)**

Make or Buy Decisions

- Comparison of the cost to buy and cost to make determines a businesses choice
  - If the **cost to buy is greater than the cost to make** production should be kept **in-house**
  - If the **cost to make is greater than the cost to buy** production should be **outsourced**

- A range of **non-financial factors** may be considered
  - This is particularly important if a potential **supplier is being used for the first time**


Your notes

Qualitative Factors in Make or Buy Decisions

Capacity	Quality
▪ Is there spare capacity in-house? ▪ Will further staff be required? ▪ Will other output be affected?	▪ Are standards met? ▪ What is the defect rate? ▪ How are problems resolved?
Reliability	**Core Competency**
▪ How quickly can products be made? ▪ Does the supplier have a good reputation? ▪ Have targets/deadlines/standards been met previously?	▪ Does the business specialise in producing this item? ▪ Could efforts be used more productively on other processes?

Examiner Tips and Tricks

When considering make or buy decisions, you must weigh up both the quantitative factors (calculations) and qualitative factors

Look for clues in the case study that can support your qualitative points and ensure that your decision is holistic - in other words, consider all of the evidence!