

Operations management

A-Level Business

What operations management does

Operations 运营 is the part of a business that makes the product. **Operations management** 运营管理 is the job of turning **inputs** 投入 into **outputs** 产出 well.

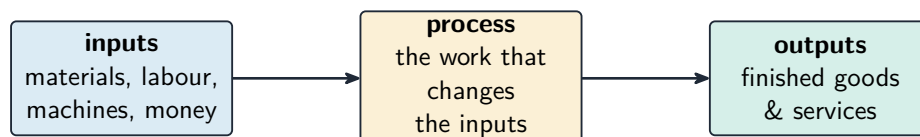


A distribution centre: operations management turns inputs into finished goods ready for customers.

Image: Peka, CC BY-SA 4.0 (commons.wikimedia.org)

This is the **transformation process** 转化过程:

- **inputs** —raw materials, labour, machines and money.
- **process** —the work that changes the inputs.
- **outputs** —finished goods and services for the customer.



the output is worth more than the inputs $\Rightarrow$ value added

Operations turn inputs into outputs, adding value along the way

Good operations **add value** 增值: the output is worth more than the inputs used to make it. Using **raw materials** 原材料 (the basic materials a business starts with) well is a big part of this.

Productivity and efficiency

Productivity 生产率 measures how much output you get from your inputs:

$$\text{productivity} = \frac{\text{output}}{\text{input used}}$$

Efficiency 效率 means making products with as little waste of time, materials and money as possible. Higher productivity and efficiency lower the cost of each unit, so the firm can charge less or earn more.

Worked example. A factory of 20 workers makes 800 units in a day. Find the output per worker.

$$\text{productivity} = \frac{800}{20} = 40 \text{ units per worker per day.}$$

If training raised output to 1000 units with the same 20 workers, productivity would rise to 50 units each —the same staff cost now spread over more units, so each unit is cheaper to make.

Capital- and labour-intensive operations

- a **capital-intensive** 资本密集型 operation uses mostly machines (e.g. a car factory). It has high set-up costs but low cost per unit, and is good for large amounts.
- a **labour-intensive** 劳动密集型 operation uses mostly people (e.g. a hair salon). It is flexible and good for personal service, but quality can vary.



A car assembly line is capital-intensive. The robots cost a fortune to install, but once running they turn out many identical cars at a low cost each —the trade-off that defines capital-intensive operations

Image: Steve Jurvetson, CC BY 2.0 (commons.wikimedia.org)

Methods of production

A firm chooses how to organise production to suit its product and demand.



A car assembly line: flow production of identical units, one stage after another

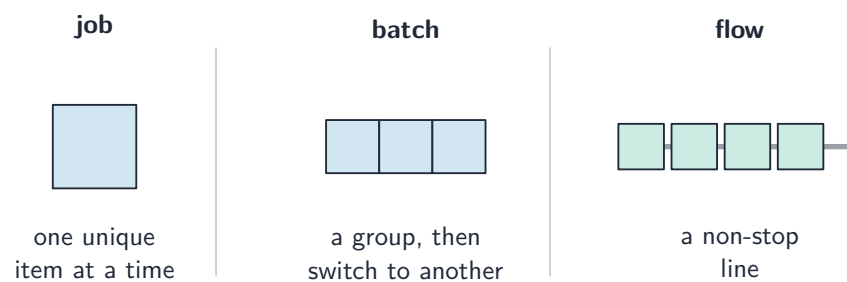
Image: Marek Ślusarczyk (Tupungato) Photo portfolio, CC BY 3.0 (commons.wikimedia.org)

Method	What it is	Best for
job production 单件生产	making one unique item at a time	a wedding cake, a bridge
batch production 批量生产	making a group of the same item, then switching	bread in flavours
flow production 流水线生产	making items non-stop on a line	bottled drinks, cars
mass customisation 大规模定制	a flow line that still lets customers choose options	cars with chosen colours



The opposite of the car line above. This potter makes one unique pot at a time by hand —job production. It is flexible and personal, but slow and costly per item, so it suits one-off or bespoke goods rather than mass markets

Image: Courtesy of the artist, CC BY-SA 4.0 (commons.wikimedia.org)



The three methods of production

Job production is flexible but costly per unit. Flow production has a low unit cost but needs high, steady demand.

Sustainability and technology

Sustainability 可持续性 means meeting today's needs without harming the future or the planet. Sustainable operations cut waste, use less energy, recycle, and use materials that can be replaced.

Technology 技术 is widely used in operations. **Automation** 自动化 (machines and robots doing tasks) raises output, improves quality and lowers cost, but it has a high set-up cost and can replace jobs.

Inventory and why it matters

Inventory 库存 (stock) is the goods a business holds: raw materials, part-finished goods, and finished goods waiting to be sold.

A firm holds inventory so it can keep producing and meet customer orders quickly. But holding inventory has costs:

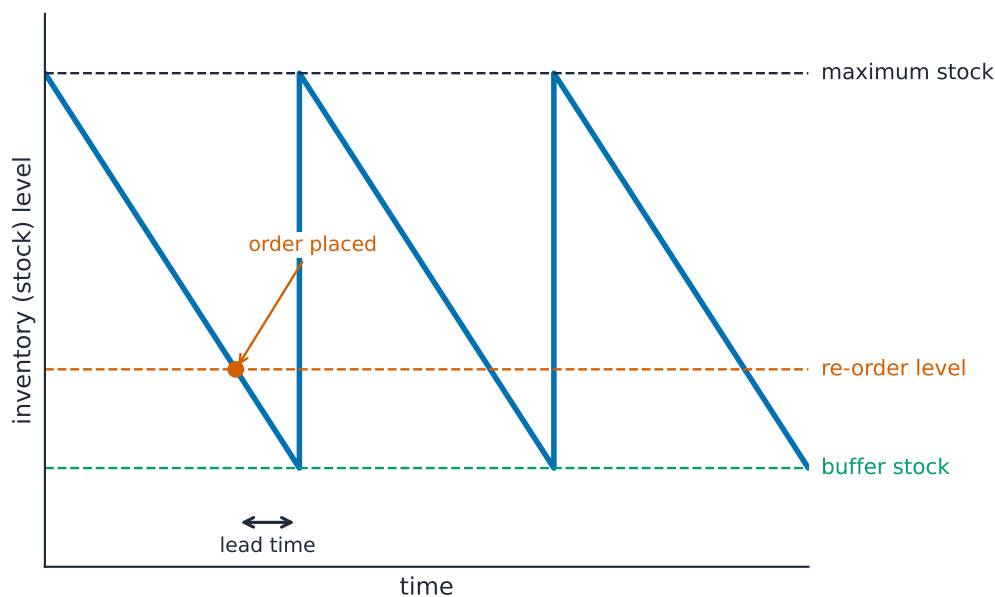
- **holding costs** 持有成本—storage, insurance, and money tied up in stock.
- the risk that goods go out of date or are damaged.

Holding too little stock is also risky: the firm may run out and lose sales.

Inventory control charts

An **inventory control chart** 库存控制图 shows how stock rises when an order arrives and falls as it is used. Key terms:

- **re-order level** 再订货水平—the stock level at which a new order is placed.
- **lead time** 交货周期—the time between placing an order and receiving it.
- **buffer inventory** 缓冲库存—a minimum "safety" stock kept in case of delays or extra demand.
- **maximum inventory** 最大库存—the most stock the firm wants to hold.

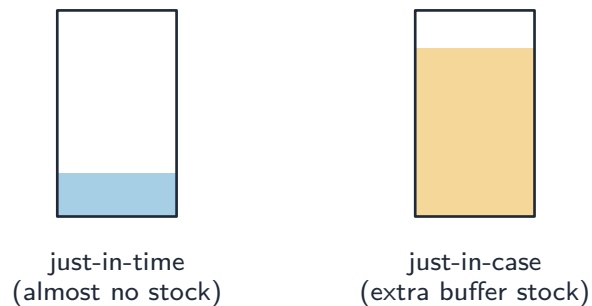


Stock is used up, then replenished when a new order arrives after the lead time

Just-in-time and just-in-case

There are two main ways to manage stock.

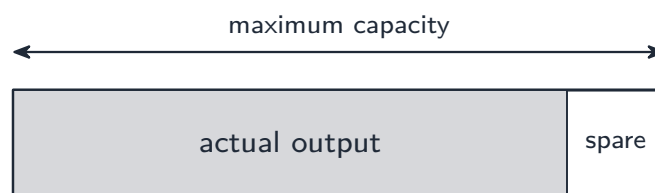
- **just-in-time** 准时制 (JIT) —stock arrives only as it is needed, so almost no inventory is held. This cuts holding costs and waste, but a late delivery can stop production.
- **just-in-case** 备货制—extra stock is held in case of problems. This is safer but costs more to store.



Just-in-time holds almost no stock (low cost, but risky if a delivery is late); just-in-case keeps a buffer (safer, but more to store)

Capacity utilisation

Capacity 产能 is the most a business can produce with its current resources. **Capacity utilisation** 产能利用率 shows how much of that capacity is being used:



Capacity utilisation: how much of the maximum output is used

$$\text{capacity utilisation} = \frac{\text{actual output}}{\text{maximum possible output}} \times 100\%$$

- **under-utilisation** 产能利用不足 (a low figure) means resources sit idle, so the fixed cost spread over each unit is high.
- **over-utilisation** 产能过度利用 (very close to 100%) leaves no time for repairs, can tire staff, and may lower quality.

Most firms aim for a high but not full level, around 85–90%.

Worked example. A factory can make 5000 units a week but currently makes 4000. Find its capacity utilisation.

$$\text{capacity utilisation} = \frac{4000}{5000} \times 100\% = 80\%.$$

This leaves 20% spare. Winning an order for another 500 units a week would lift utilisation to 90%, spreading the fixed costs over more units without needing new machines.

Outsourcing

Outsourcing 外包 means paying another firm (a **supplier** 供应商) to do work the business used to do itself, such as cleaning, IT or making parts.

Benefits: it can be cheaper, lets the firm focus on what it does best, and adds flexibility. Drawbacks: less control over quality, possible delays, and the risk of sharing secrets with another firm.

Exam tips

- Calculate **capacity utilisation** and **productivity**; high utilisation spreads fixed costs but leaves no slack for breakdowns or new orders.
- Read an **inventory control chart** (re-order level, lead time, buffer stock, maximum stock).
- Compare **JIT vs JIC** (low holding cost but delivery risk vs security of supply but higher cost).
- Match the **production method** (job, batch, flow) to the product and the size of the order.