The nature of operations

Inputs, outputs and the transformation process

Operations and its role

Operations or operations management focuses on transforming inputs to outputs and covers a range of activities dealing with the practicalities of production including:

- contributing to decisions on product ranges
- implementing production methods
- designing equipment
- selecting suppliers who can deliver the right quality and price
- making sure quality standards are upheld
- ensuring health and safety standards are maintained
- deciding on appropriate levels of stock
- arranging for productivity levels to meet cost targets

Large businesses may have a defined operations department with dedicated managers, while smaller businesses may make these decisions without a formal operations functional area. In all cases, the operations function must work with other areas, e.g. human resources, marketing or finance.

Operations or operations management: the designing and controlling of systems that produce goods or services to meet customer requirements.

Expert tip

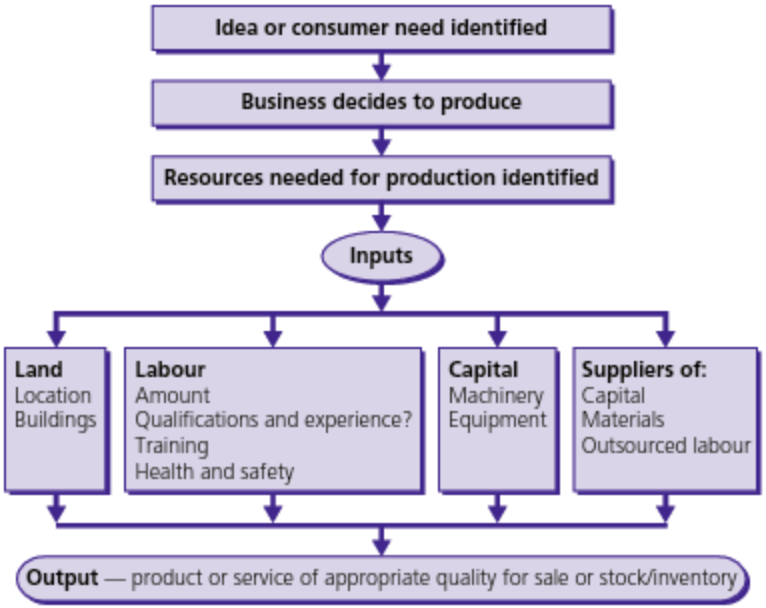
Operations is about the way resources are managed, controlled and integrated to achieve business objectives.

Process: from idea/need to final product/service

Operations deals with the process by which an idea is turned into a finished item or service that is put on sale. A key part is identifying and bringing together all the necessary inputs.

The operations process: from idea to product

The operations process is shown in Figure 1.



Resources: land, labour, capital

Operations deals with the way in which inputs of **land**, **labour** and **capital** are combined to give an output of a product or a service.

- **Land** includes land, buildings, minerals, oil and wood.
- **Labour** is the work done by people, either manually or mentally in managing and decision-making.
- **Capital** is machinery and equipment, including intellectual capital such as qualifications.

Operations determines how the transformation of inputs to an output will take place. It decides how inputs may be combined in different ways and in differing proportions to produce a final product or service.

The transformation process

Inputs can be combined in differing quantities. **Labour-intensive production** uses relatively more labour than capital so labour costs are a higher proportion of total costs than capital costs, e.g. a craft producer like a potter.

Capital-intensive production uses relatively more capital than labour so capital costs are a higher proportion of total costs than labour costs, e.g. an oil refinery.

The combination of land, labour and capital will determine how the transformation process leads to final product (see Figure 2).

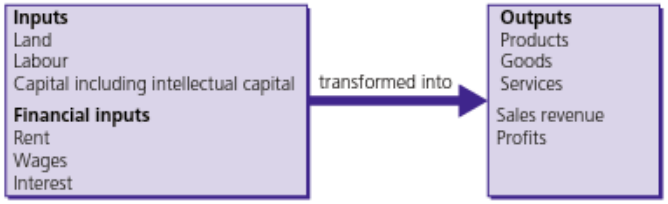


Figure 2 The transformation process

Operations efficiency measures the quantity of resources used in producing a given quantity of product. Efficient producers use fewer inputs for a given quantity of output so that unit costs are lower.

Operations effectiveness: a measure of how well the final product meets the needs of customers including function, availability, price and value for money.

Productivity: output per worker per time period and measures labour efficiency.

Effectiveness, efficiency and productivity

Difference between effectiveness and efficiency

Operations efficiency measures the quantity of resources used in producing a given quantity of product. Efficient producers use fewer inputs for a given quantity of output so that unit costs are lower.

Operations effectiveness is a measure of how well the final product meets the needs of customers, e.g.

- **Function** — how well the product does the job for which it is designed.
- **Availability** — how easy it is to obtain the product.
- **Price** — related to efficiency of production (costs).
- **Value for money** — a combination of price and function.

Productivity

Productivity is an efficiency measure usually applied to labour.

$$\text{labour productivity} = \frac{\text{output in units per time period}}{\text{number of employees}}$$

A garage employs six mechanics who work for nine hours per day and are paid $60 per day each. In one day they can, on average, repair or service 15 cars. Their labour productivity is:

$$\frac{15}{6} = 2.5 \text{ cars per mechanic per day}$$

4 Define labour productivity.

5 Outline two reasons why an increase in productivity may be beneficial.

6 Explain three methods to improve productivity.

7 Calculate labour productivity for an accountancy business that employs five accountants who each work 40 hours per week and deal with a total of 20 accounts per week.

8 What is the difference between efficiency and effectiveness?

Linking productivity and efficiency

Productivity helps determine the costs of production. In the above example the costs are as follows:

$$\text{total cost per day for 15 cars} = 6 \times 60 = \$360.00$$

$$\text{average labour cost} = \frac{360}{15} = \$24 \text{ per car}$$

If productivity rises so that each mechanic can deal with three cars per day the costs are as follows:

$$\text{total cost per day for 18 cars} = 6 \times 60 = \$360.00$$

$$\text{average labour cost} = \frac{360}{18} = \$20 \text{ per car}$$

This means the business has become more competitive and may be able to reduce its price and maintain its profit margin or maintain price and increase profit margin. If any of the factors of production can be made more efficient the same will be true.

Ways to increase productivity

Ways to increase productivity include:

- investing in more efficient capital or better maintenance and use of existing capital
- investing in more training for employees so there are fewer mistakes, faster working and better problem solving. This may be expensive and must be applied correctly
- improving employee motivation
- changing the culture to build efficiency improvements into all processes

All these methods incur costs, i.e. to buy new machinery, training costs, wage increases or implementing change, and to be worthwhile must be chosen correctly and implemented effectively.

11 Explain why the following might be capital intensive:

(a) a shipyard building ocean liners

(b) a major sweet manufacturer

12 Explain why the following might be labour intensive:

(a) an estate agent

(b) a market stall selling vegetables

Value added

A business adds value when it transforms inputs to output. At each stage the partly finished good is worth more than at the previous stage. Customers are also looking for their own added value — this is the additional value to the basic product that might persuade them to buy it.

Value added and marketing

Customers see added value as meeting their needs based on:

- improved performance and design
- discounted prices
- extras or accessories, quality assurance
- personal attention and after-sales service

This added value is often what differentiates a product from that of the competition and enables a business to charge a higher price and gain customer loyalty. This can be achieved through the product itself or by promotional activities that make a product appeal to customers.

Value added and the operations process

The operations process transforms a number of inputs into output via a number of stages. Each stage will become more valuable than the previous one because of the work that has been done. These stages may take place within one organisation or across several. For example, selling a cake involves taking basic ingredients, combining them and then arranging for distribution of the finished cake to a sales outlet (see Figure 3). Each stage adds value to the stage before and this is represented by an increase in money value. If the product is sold at one of the stages this added value is represented by sales revenue and profit.

Added value and operations decisions

Operations decisions aim to achieve a target added value or maximise added value so as to:

- increase efficiency and effectiveness
- lower unit costs
- increase sales revenue and/or profits
- meet customers' value added needs

Figure 3 Added value and the operations process in selling a cake

9 State two reasons why added value is important for:
(a) a business
(b) a customer

10 Explain three ways in which a business might add value to a product.

Labour-intensive production: uses relatively more labour than capital so labour costs are a higher proportion of total costs than capital costs, e.g. a craft producer such as a potter.

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Expert tip

Businesses can achieve added value and success by choosing a variety of capital intensities. What is most important is that the choice matches the business objectives, market, and product type.

Factors in deciding capital versus labour intensity

Products may be produced with a variety of combinations of capital and labour. Mass-produced cars are built on assembly lines with a large investment in machinery relative to the cost of employing people — robot lines require very few employees. On the other hand, custom sports cars are often built largely by hand with a much higher relative use of labour. The factors that decide the relative amounts of labour and capital include:

- **Production methods/the product** — mass production tends to be **capital intensive**, craft products labour intensive.
- **Relative costs of labour and capital** — low labour costs tend to lead to **labour-intensive production** as in agriculture and factories in developing countries.
- **Business size** — larger businesses tend to have more finance so can afford to be more capital intensive.
- **The level of personal service** involved in the product, e.g. manicures tend to be labour intensive, whilst manufacturing shampoo is capital intensive.
- **Customer's needs** — markets where personal service is important to the customer tend to be more labour intensive; compare a high-class restaurant service with a drive-thru' one.

Benefits and limitations of capital-intensive production

Benefits

- Mass production is possible on assembly line.
- Lower unit costs if capital is relatively cheap.
- Economies of scale are possible.
- Labour force is less skilled so recruitment is easy and labour costs low.

Limitations

- Not suitable for varying product types or short runs.
- Not suitable for personal services.
- High start-up costs due to cost of machinery.
- Machine-dependent so breakdowns are expensive and may stop production.
- Lack of variety might lead to unmotivated employees.
- Cannot vary capital in short run.

Benefits and limitations of labour-intensive production

Benefits

- Personal services can be delivered well.
- Possible to produce one-off or custom-made products.
- Low start-up costs.
- Lower unit costs if labour is relatively cheap.
- Easy to alter labour force by recruitment or retrenchment.

Limitations

- Difficult to produce on large scale.
- Economies of scale are difficult to achieve.