



Capacity and capacity utilisation

This new series of articles examines some of the trickier topics at AS and A2. Here, Andrew Gillespie explains the significance of capacity and capacity utilisation, highlighting the difference between the two

The capacity of a business is the maximum output it can produce or process given its existing resources. It might be the maximum number of items a factory can produce, or the maximum number of guests in a hotel, patients in a hospital or passengers on a plane.

A firm's capacity will depend on factors such as:

- its existing technology and capital equipment
- the number and skills of its employees
- the physical space available
- the way production is organised

The capacity of a business matters because it provides an upper limit to the firm's possible output and therefore its sales and income. If you are a plumber working for yourself, you may only be able to work physically, or want to work, 40 hours a week. This is your capacity which places a limit on the number of jobs you can do and therefore your earnings. If

you run a cinema and only have seats for 200 people, this determines the maximum money you can earn from showing a film. If you have a restaurant with 30 tables, this limits the maximum number of people that can be served at any moment.

Capacity and demand

Managers will want to have enough capacity to meet demand; otherwise they are losing business. If their capacity is too small, they may have to turn people away, start a waiting list, ration demand (e.g. by increasing prices) or subcontract. However, if they have too much capacity, this means that some of their resources are not being used. They will have staff doing nothing, idle machines, empty seats or systems not being fully utilised.

Getting the right capacity for the level of demand at any moment is therefore important but by no means easy. There are several reasons for this:

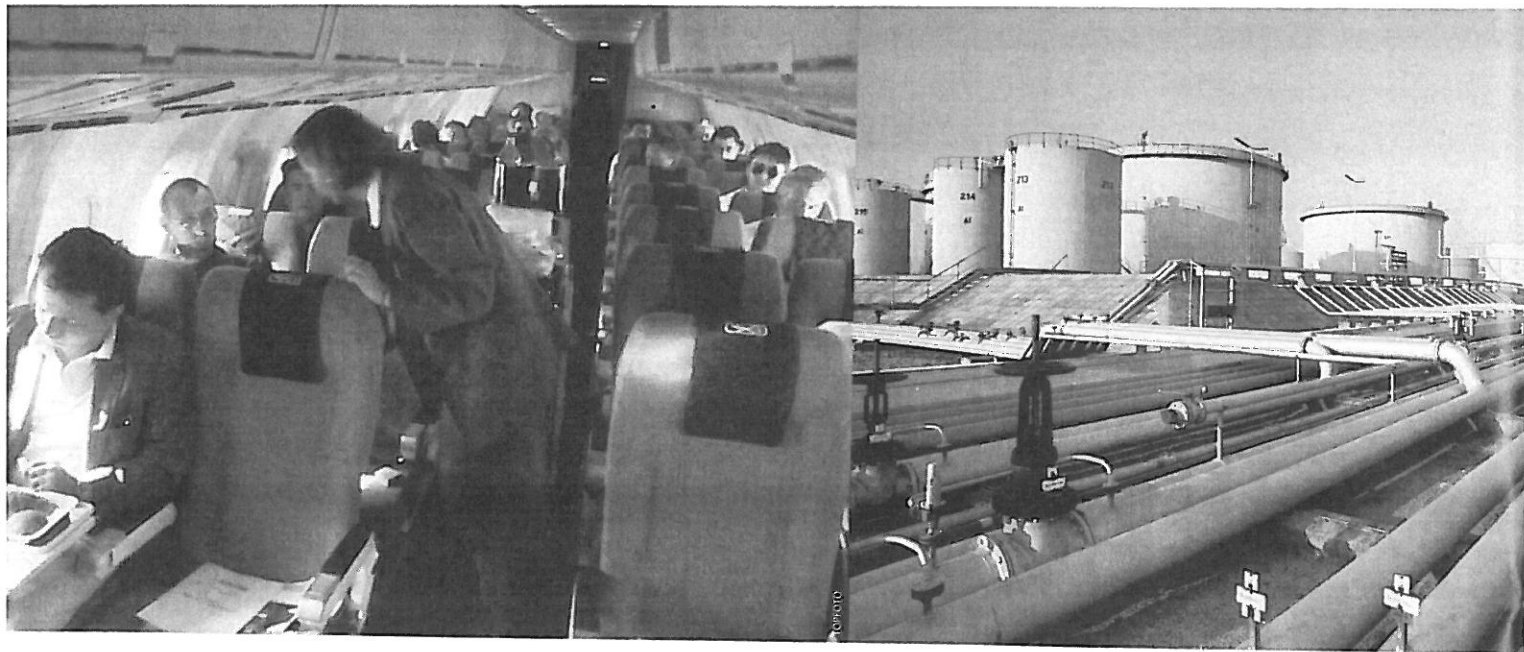
- **Forecasting demand can be difficult.**

You have to decide how much risk to take when forecasting demand. Should you be cautious and choose a relatively low capacity level, but then you may have to let customers down and lose their goodwill? Or should you plan optimistically in which case you could have excess capacity and excessive fixed overhead costs?

- **Demand is often irregular.** Restaurants will be busier in the evenings than during the day, ice cream will sell more in the summer, and gloves will be needed more in the winter. Firms want enough capacity for the high levels of demand but this may mean they have too much the rest of the time. Irregular demand is a particular problem in the service sector because goods cannot be stored up for the busy period — supermarkets have to cope with extra customers when there is a sudden rush in demand; the emergency services have to be able to cope if there is a major accident.

- **Adjusting capacity can be difficult.**

It may not be possible to adjust capacity upwards or downwards by small amounts. If you are producing chemicals, for example, then a decision to increase capacity may involve a new chemical



processing plant. This will lead to a significant upward shift in capacity — there is no easy way of just producing 'a bit more'.

• **You may be constrained.** Although you may want to increase capacity, you may not have the funds yet; or the right premises in the right location may not be available at the moment.

Capacity utilisation

The extent to which capacity is being used at any moment is measured by capacity utilisation:

$$\text{capacity utilisation} = \frac{\text{present output}}{\text{capacity}} \times 100$$

The precise way of measuring capacity utilisation will depend on the business. It may be the percentage of rooms that are occupied in a hotel, the percentage of tables full in a restaurant, the percentage of students in a class compared to the maximum number, or the percentage of tills in use at a supermarket.

If capacity utilisation is low, then relatively little is being used of the potential output. For example, a capacity utilisation of 20% means the firm is making 20% of the amount it is able to produce. If capacity utilisation is high, then output is nearer to its maximum level. In the glass industry, for example, global capacity utilisation is around 90% (due to the fast growth of demand from China in recent years). This means the industry is producing 90% of its maximum output.

When capacity utilisation is low, the firm's fixed costs are spread over relatively few units; this means the cost per unit is high. This can damage a firm's

Table 1 Falling unit costs (assume fixed costs are £10,000, variable costs per unit £2)

Output (units)	Fixed costs (£)	Variable costs (£)	Total costs (£)	Unit costs — total costs/output (£)
0	10,000	0	10,000	—
1,000	10,000	2,000	12,000	12
2,000	10,000	4,000	14,000	7
3,000	10,000	6,000	16,000	5.33
4,000	10,000	8,000	18,000	4.5
5,000	10,000	10,000	20,000	4

competitiveness. This is a problem in industries with high fixed costs, such as the car industry, the steel industry, telecommunications, railways and airlines. These all require heavy investment to create the desired capacity in the first place. If capacity is underutilised, the unit costs increase significantly which squeezes profit margins. Due to worldwide excess capacity in the car industry (which swept away Rover cars), neither of the

American giants General Motors and Ford are making profits at the moment from producing and selling cars. As capacity utilisation increases, unit costs fall (see Table 1); the impact of this is greater when fixed costs are high.

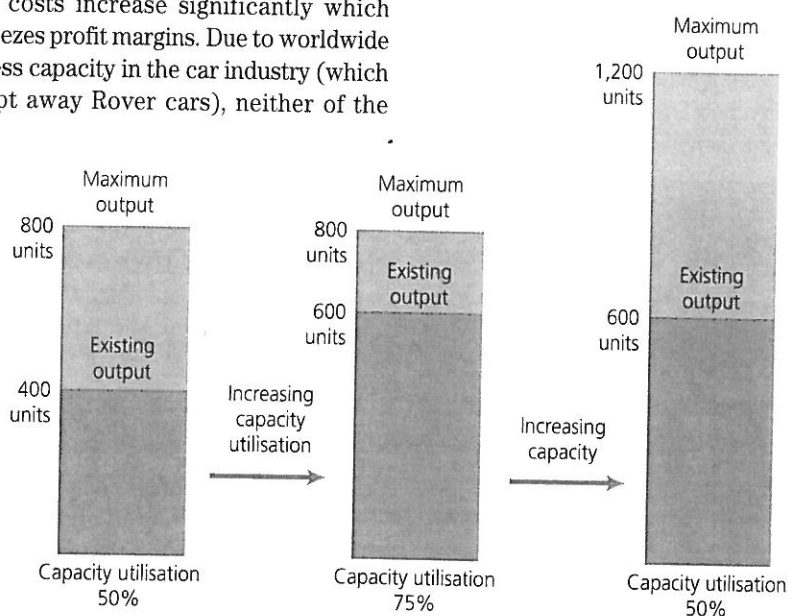
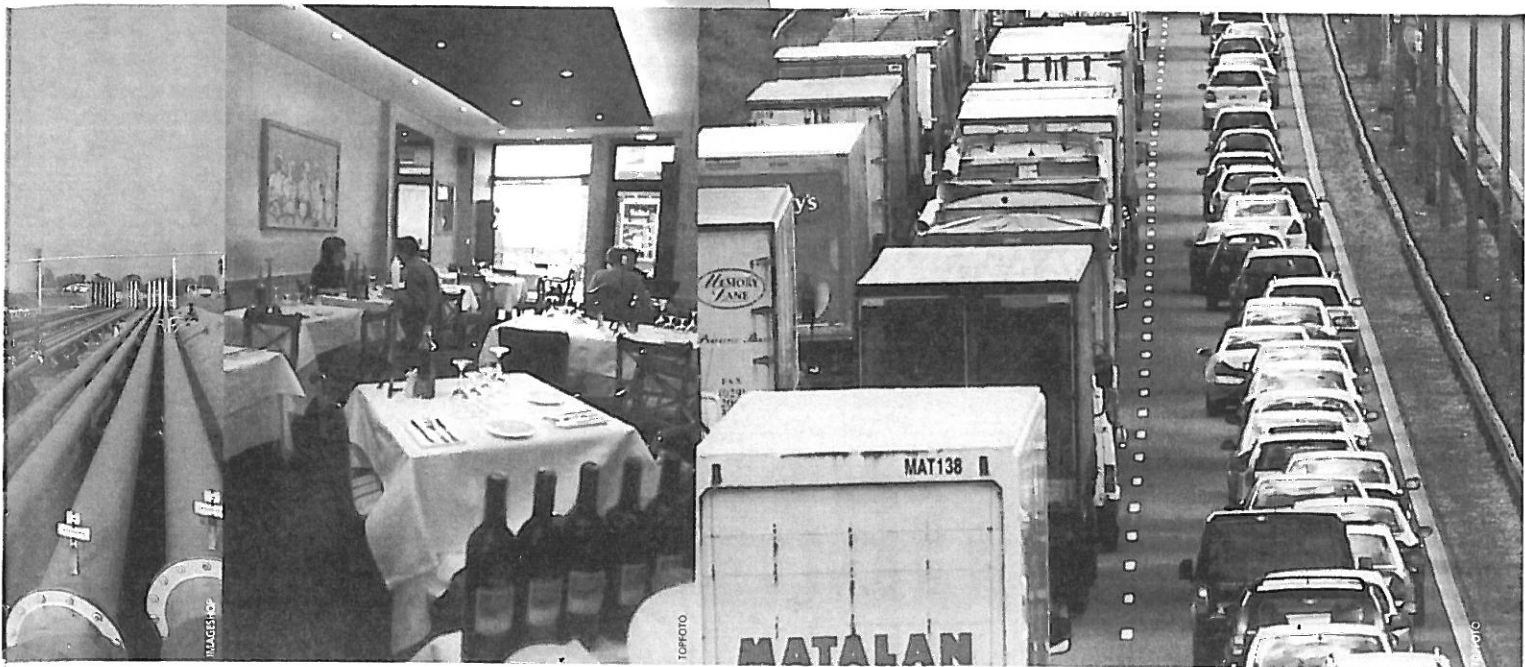


Figure 1 Measuring capacity and capacity utilisation



Matching capacity to demand

Ideally, supply will be flexible so managers can easily adjust it up or down to match the demand. Managers may try to bring capacity and demand into line by changing capacity or by changing demand.

- **Changing capacity.** The capacity of a business is not fixed. Resources can be adjusted to change the maximum possible output level. For example, more staff can be hired, more investment can be made in equipment, or the business can provide the service more regularly, e.g. show a film more times a day. Much of the move behind lean production has been to increase the flexibility of organisations so they can adjust their supply more easily. For example, staff are given flexible contracts so they are employed only when needed; machines are made more flexible to be able to switch to other products when required.
- **Changing demand.** As well as affecting

supply, firms can also use their marketing to influence demand and make it fit more closely with capacity. For example, prices can be adjusted or promotional campaigns can be used to boost demand in the quiet periods, or to smooth the pattern of demand throughout the year. Restaurants often have special lunchtime offers to boost demand in the day; theme parks and holiday companies charge different prices outside of the school holidays and mobile phone companies change their tariffs according to when a call is made.

Summary

Matching supply and demand is a key element of operations management. Have too little capacity, and your marketing department might never forgive you. Have too much, and your finance department might not. The challenge is particularly great where capacity changes involve sub-

Capacity depends on the type of business — it might be the number of seats on an aircraft, or the volume of car users on a road network

stantial investment and flexibility is not easy to achieve. It is easier if it is simply a question of increasing or decreasing the number of temporary staff you use. The right level of capacity enables you to meet demand and keep unit costs relatively low; the wrong level leads to inefficiency and/or dissatisfied customers.

Andrew Gillespie is an established author, a senior examiner with a leading awarding body for A-level business studies and an editor of BUSINESS REVIEW.

Box 1 Capacity and capacity utilisation in the exams

There are four things to remember in the exam:

Increasing output does not necessarily increase capacity, it simply increases the capacity utilisation. This is because the firm is using the resources it already has. Filling up the seats on an aeroplane is increasing capacity utilisation; capacity only increases if another plane is bought.

Greater capacity does not automatically mean more sales. Being able to produce more is one thing, having the demand for it is another (production does not necessarily equal sales).

Greater capacity can mean lower capacity utilisation if the actual output does not increase at the same rate. Imagine a football club doubles the size of its stadium but the number of people attending falls. Capacity is higher but utilisation is lower.

The ease with which a firm can increase capacity varies from sector to sector. It can vary from getting in an extra helper, to opening another store, to building a nuclear reactor. It can take hours, weeks or years. The decision about increasing capacity may have to be made a long time in advance. This can make it a high-risk decision.

Discussion points

- (1) Sometimes there are long queues for tickets for a band's concert or for a football match. Why does this mismatch between supply and demand occur?
- (2) How do airlines attempt to ensure that their planes are always full?
- (3) The road network in the UK is said to lack sufficient capacity for the growing volume of car users. What do you think the government should do?
- (4) How easy is it for your school or college to increase capacity?
- (5) Congestion and waiting lists are signs that capacity and demand are out of line with each other. What other examples can you think of that show excess supply or excess demand. Why do they occur?