

OPERATIONS PLANNING (4.2)

(Chapter 23 - AS level 4.2)

Operations planning is preparing input resources and managing those resources and systems to meet expected demand.

Decisions undertaken by operations managers are often influenced by :

- **Marketing factors** - If sales forecasts are accurate, operations managers should be able to match demand, reduce wastage of materials and keep inventory levels to a minimum as they know the exact amount of products they need to produce and don't need to hold on to any extra materials
- **The availability of resources** - the production of all goods and services require resources. The need for resources is so great that it often may cause a business to relocate to a location that has the necessary raw materials for production
- **Technology** - the use of technology in production has helped increase the efficiency of most processes, as through use of automation there are less mistakes made due to human error. The 2 most important technological innovations have been **CAD** and **CAM**

Computer aided design (CAD)

A computer software that draws **accurate** items being **designed more quickly** and allows them to be rotated, zoomed in and viewed from all angles. Although it can be complex and require **extensive employee training**. (\$\$\$)

Computer aided manufacturing (CAM)

Computers monitor the production process and control machines and robots- similar to automation. Allows manufacturing to be **precise, fast, flexible** and produces **better quality products**. It can however be **expensive**, and if there is a **technological issue** it can interrupt production.

Advantages of technology in production

- Greater productivity
- Greater job satisfaction among workers as boring, routine jobs are done by machines
- Better quality products
- Quicker communication and less paperwork
- More accurate demand levels are forecast since computer monitor inventory levels
- New products can be introduced as new production methods are introduced

Disadvantages of technology in production

- Unemployment rises as machines and computers replace human labour (demotivating.)
- Expensive to set up
- New technology quickly becomes outdated and frequent updating of systems will be needed- this is expensive and time-consuming.
- Employees may take time to adjust to new technology or even resist it as their work practices change

Flexibility and innovation

As it's been said time and time again, for a business to survive it'll need to be flexible in order to keep up with changing consumer demands, the actions of competitors and economic changes.

This will require **flexibility in product design, flexibility in the amount of product they're able to produce** and having **flexible delivery times**. This will all require having employees who are easily able to adapt.

An important way of achieving flexibility is through **process innovation**, which is the use of a new or much improved production method or service delivery method. This is done through using automation, robots, the internet and faster machines.

However, it can be **expensive** to purchase high quality machinery/robots, training may be needed to teach employees how to operate said machines and the introduction of automation may cause redundancies.

Methods of production

There are several different ways in which goods and services can be produced. They are usually classified into:

1. **Job production**
2. **Batch production**
3. **Flow production**
4. **Mass customisation**

1. Job production

Where products are made specifically to order, customised for each customer. Most suitable for one-off products and personal services. (wedding cakes, tailored suits, films etc.)

Advantages of job production :

- ✓ The product meets the exact requirement of the customer
- ✓ Workers will have more varied jobs as each order is different, improving morale
- ✓ Very flexible method of production

Disadvantages of job production :

- ✗ Skilled labour will often be required which is expensive, job production firms are also usually very labour-intensive so many employees to pay
 - ✗ Production often takes a long time
 - ✗ Since they are made to order, any errors may be expensive to fix
 - ✗ Materials may have to be specially purchased for different orders, which is expensive
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2. Batch production

Where similar products are made in batches or blocks. A small quantity of one product is made, then a small quantity of another. Workers and machines must be flexible to quickly switch to making batches of other designs. (cookies, building houses of the same design etc.)

Advantages of batch production :

- ✓ Flexible way of working- production can be easily switched between products
- ✓ Gives some variety to workers - more interesting
- ✓ Even if one product's machinery breaks down, other products can still be made
- ✓ More variety means more consumer choice

Disadvantages of batch production :

- ✗ Can be expensive since finished and semi-finished goods will need to be moved/stored
 - ✗ Machines have to be reset between production batches which delays production
 - ✗ Lots of raw materials will be needed for different product batches, which can be expensive
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3. Flow production

Where large quantities of products are produced in a continuous process on the production line. There is a high output of standardised (identical) products. (Coca cola..)

Advantages of flow production :

- ✓ Costs are low in the long run and so prices can be kept low
- ✓ Can benefit from economies of scale in purchasing (buying in bulk to get discounts.)
- ✓ Automated production lines can run 24×7
- ✓ Goods are produced quickly and cheaply
- ✓ Capital-intensive production (robots/computers), so reduced labour costs and increased efficiency as less chance for human error

Disadvantages of flow production :

- ✗ Lots of raw materials and finished goods need to be held in inventory- this is expensive
- ✗ Capital cost of setting up the flow line is very high - business may be unable to afford the initial set up
- ✗ If one machinery breaks down, entire production will be affected

4. Mass customisation

The use of flexible computer aided production systems to produce items that meet individual customers' requirements at mass-production cost levels. It's basically like flow production with a lot of identical materials being used to create a range of different products.

An example of mass customisation is the clothing industry, where firms use computer-controlled machines to cut fabrics that match multiple individual body measurements. (XS, S, M, L...)
Another example would be Dell computers, who make a customised computer to suit your specific needs using standardised components.

Advantages of mass customisation :

- ✓ Low unit costs (materials can be bought in bulk.)
- ✓ Flexible enough to meet customers individual needs

Disadvantages of mass customisation :

- ✗ Will require skilled workers - who may need training (\$\$\$)
- ✗ Will need expensive, flexible equipment and machinery

Factors that affect which production method to use :

- **The nature of the product:** Whether it is a personal, customised-to-order product, in which case job production will be used. If it is a standard product, then flow production will be used
- **The size of the market:** For a large market, flow production will be required. Small local and niche markets may make use of batch and flow production. Goods that are highly demanded but not in very large quantities, batch production is most suitable.
- **The nature of demand:** If there is a fair and steady demand for the product, it would be more suitable to run a production line for the product. For less frequent demand, batch and job will be appropriate.
- **The size of the business:** Small firms with little capital access will not produce using large automated production lines, but will use batch and job production.

Problems that come with changing production methods

- **Time consuming**, takes a lot of planning and capital
- May be **resisted by the workforce** - I.e changing from job to batch would mean an increased need for machinery, which may lead to the business reducing the workforce
- Loss of production and **disruption** during the changeover
- Possible **impact on motivation**, if employees go from having variation to repetitive work

Location decisions

Owners need to decide a location for their firm to operate in, at the time of setting up, when it needs to expand operations, and when the current location proves unsatisfactory for some reason.

Location is important because it can **affect the firm's costs, profits, efficiency** and the **market base** it reaches out to.

An **optimal location** choice would mean a business location that gives the best combination of both *quantitative factors* (cost of transport, cost of rent, government grants etc.) and *qualitative factors* (safety, preference, ethics, environment etc.)

Factors that affect the location decisions of a manufacturing firm (factories etc.)

- **Production Method:** when job production is used, the business will operate on a small scale, so the nearness to components/raw materials won't be that important. For flow production, on the other hand, production will be on a large scale- there will be a huge amount of components and transport costs will be high- so components need to be close
- **Market:** if the product is a consumer good and perishable, the factories need to be close to the markets to sell out quickly before it perishes.
- **Raw Materials/Components :** the factories may need to be located close to where raw materials can be acquired, especially if the raw material must be processed fresh
- **External economies:** the business may locate near other firms that support the business by providing services- eg: business that install and maintain factory equipment.
- **Availability of labour :** Businesses will need to locate near areas where they can get workers of the skills they need in the factory. If lots of unskilled workers are needed in the factories, firms locate in areas of high unemployment. Wage rates also vary by location and firms will want to set up in locations where wage rates are low.
- **Government Influence:** the government sometimes gives incentives and grants to firms that set up in low-development, rural and high-unemployment areas. There may also be government rules and restrictions in setting up, e.g. in some areas of great natural beauty. The business needs to consider these.
- **Transport & Communication infrastructure:** the factories need to be located near areas where there are good road/rail/port/air transport systems. If goods are to be exported, they need to be set up near ports.
- **Power and water supply:** factories need water and power to operate and a reliable and steady supply of both should be ensured by setting up in areas where they are available.
- **Climate:** not the most important factor but can influence certain sectors. Eg: the dry climate in Silicon Valley aids the manufacturing of silicon chips.

Factors that affect the location decisions of a service-sector firm (restaurants etc.)

- **Customers:** service-sector businesses that have direct contact with customers need to locate in customer-accessible and convenient places, like malls and outlets.
- **Technology:** today, with increasing use of IT to shop and make payments, customers do not need direct access to services and proximity to the market/customer is not a very important factor in location decisions. They locate away from customers in places where there are low rent and wage rates. Eg: banks
- **Availability of labour:** if a large number of workers are required in the firm, then it will need to be located close to residential areas. If they want certain types of worker skills, they will need to locate in places where such skilled workers can be found. However, with work-from-home and technology, this is not that big of a factor nowadays.
- **Climate:** tourism services need to be located in places of good climate.
- **Nearness to other business:** some services serve the needs of large companies, such as firm equipment servicing and so they need to be very close to such businesses. Businesses may also set up where close competitors are to watch them and snatch away their customers.
- **Rent/taxes** - some locations/buildings will be cheaper, but may be cheaper for a reason (poor quality = poor perception from consumers.)

Factors that affect the location decisions of a retailing firm (clothing outlets etc.)

- **Shoppers:** retailers need to be located in areas where shoppers frequent, like malls, to attract as many customers as possible.
- **Nearby shops:** being located to other shops that are visited regularly will also attract attention of customers into the shop. Being near competitors also helps keep an eye on competition and snatch away customers.
- **Customer parking availability:** when parking is available nearby, more people will find it convenient to shop in that area.
- **Availability of suitable vacant premises:** Obviously, there needs to be a vacant premise available to set up the business. Vacant premises can also help the business expand their premises in the future.
- **Rent/taxes:** rents and taxes on the locations need to be affordable.
- **Access to delivery vehicles:** if the retailer has home delivery services, then delivery vehicles will be required.
- **Security:** high rates of crime and theft can happen in shops. Shopping complexes with security guards will thus be preferred by firms.

Additional info :

Governments influence location decisions :

- to encourage businesses to set up and expand in areas of high unemployment and under-development. **Grants and subsidies** can be given to businesses that set up there
- to discourage firms from setting in areas that are overcrowded or renowned for natural beauty. **Planning restrictions** can be put into place to do so.

Re-location decisions

Relocation refers to the movement of a business from one region or location to another.

A **single site business** is a business that operates from only one location. These businesses tend to have better communication and coordination, however aren't as convenient for customers and lack opportunities for expansion. (example: a family owned convenience store.)

A **multi-site business** is a business that operates from more than one location. Some businesses, such as hotels, banks and hairdressers must operate from more than one location in order to expand. A multi-site business :

- (✓) Is more convenient for customers - more locations to visit
- (✓) Has lower transport costs as not just transporting from one place
- (✓) Allows for delegation, which helps boost worker morale
- (✗) May end up with coordination and communication problems
- (✗) Can lack control and direction from senior management
- (✗) Stores may be too close together, one takes sales from the other

Relocation can be done both within the business's country (**national relocation**), or to a different country. (**international relocation**)

National relocation

A business relocating within its own country can be because they need a larger space to work from, they found a cheaper place to work from, because the area is more convenient or because they were offered a government grant to relocate there. (low employment area.)

Relocating in the same country means the business will still operate within the rules and legislation that they are familiar with, the workforce will be happier as most of them will not lose their jobs (as opposed to relocating internationally, where most will) and this helps the business avoid bad publicity as they aren't sacking the majority of their workforce to go exploit a 3rd world country.

International relocation

Offshoring refers to the relocation of a business process from one country to another.

Businesses that operate in more than one country are called **multinational companies** (MNCs)

Why do businesses relocate in different countries?

- **New markets overseas** - chance of profit + spreading risks
- **Cheaper** or **new raw materials** available in other countries
- **Cheaper** and/or **skilled workers** are available overseas (lower minimum wages etc.)
- **Rent / taxes are lower**
- **Availability of government grants** and other incentives to encourage them to relocate
- **Avoid trade barriers and tariffs:** when exporting goods to other countries, there will be some tariffs, rules and regulations to get by. In order to avoid this, firms start operating in the country itself, since there is no exporting/importing involved now.

Issues with relocating to another country :

- Language barriers
- Cultural differences
- Ethical differences
- Trade barriers
- Exchange rates

Scale of operations

The scale of operations (the size) of a business can be determined by :

- **The owners decisions** of remaining small or expanding the business
- **The nature and size of the market** - a very small market (niche) will not require large-scale production
- **Capital available** - if the business does not have the funds to expand they must remain small
- **The number + size of its competitors** - the market share of each firm may be small if there are many rivals
- **Business age** - a new business will most likely not be operating a large scale production

As output increases (as the business expands), a firm's average cost decreases.

Economies of scale are the factors that lead to a *reduction in average costs* as a business increases in size.

The five economies of scale are :

- **Purchasing** economies: For large output, a large amount of components have to be bought. This will give them some bulk-buying discounts that reduce costs
- **Marketing** economies: Larger businesses will be able to afford their own vehicles to distribute goods and advertise on paper and TV. They can cut down on marketing labour costs. The advertising rates costs also do not rise as much as the size of the advertisement ordered by the business. Average costs will thus reduce.
- **Financial** economies: Bank managers will be more willing to lend money to large businesses as they are more likely to be able to pay off the loan than small businesses. Thus they will be charged a low rate of interest on their borrowings, reducing costs.
- **Managerial** economies: Large businesses may be able to afford to hire specialist managers who are very efficient and can reduce the business' costs.
- **Technical** economies: Large businesses can afford to buy large machinery such as a flow production line that can produce a large output and reduce average costs.

Diseconomies of scale is when going big goes wrong. These are the factors that lead to an *increase in the costs* of a business as it grows beyond a certain size.

The 3 diseconomies of scale are :

- **Poor communication**: as a business grows large, more departments and managers and employees will be added and communication can get difficult. Messages may be inaccurate and slow to receive, leading to lower efficiency and higher average costs
- **Low morale**: when there are lots of workers in the business and they have non-contact with their senior managers, the workers may feel unimportant and not valued by management. This would lead to inefficiency and higher average costs.
- **Slow decision-making**: As a business grows larger, its chain of command will get longer. Communication will get very slow and so any decision-making will also take time, since all employees and departments may need to be consulted with.

How to avoid diseconomies of scale?

- **Improve coordination throughout the organisation** - this will help improve communication and low morale
- **Decentralisation** - decision making is delegated, this should speed up the process and help workers feel more valued and trusted
- **Reduce diversification** - stop the business from undertaking multiple projects, instead focus on what is most important and what they're best at

Enterprise resource planning (ERP)

Enterprise resource planning (ERP) refers to a type of software that organisations use to manage day-to-day business activities such as accounting, project management, risk management and supply chain operations. It helps to improve a business's efficiency.

Supply chain management (SCM) is an ERP software that analyses the stages of the supply chain.

ERP automates demand planning, creating demand upon receiving orders. When an order is received, the software implements scheduling. Team members are able to see real-time information about how resources are being used in production and can better plan production jobs and product delivery to satisfy customers.

Benefits of ERP :

- Supplies only according to demand - helps prevent wastage
- Reduces costs at all stages of the supply chain
- Improved delivery times and better customer service
- Departments coordinated more closely together by the single database

Limitations of ERP :

- Costly to set up
- Time consuming to implement
- May take awhile for employees to adapt