





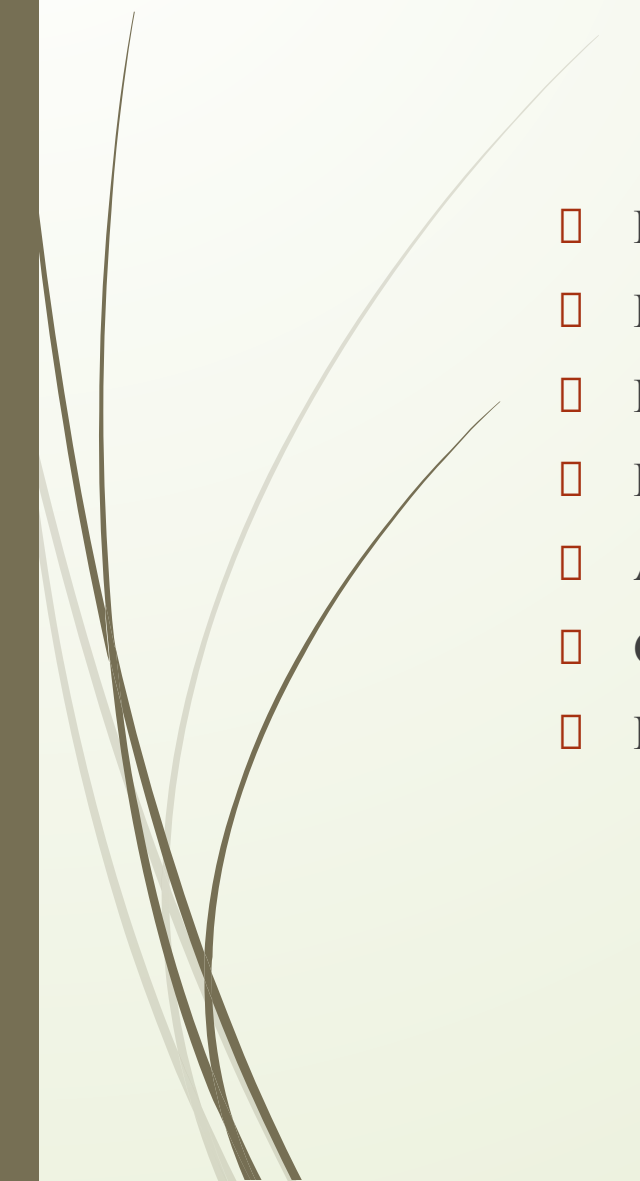
# Module 3 Technical Profile



- ❑ Type of raw material to be used
- ❑ Demand and supply position of raw material
- ❑ Availability of substitutes of raw material
- ❑ Details about production process and production methods
- ❑ Technical details about production technology and availability of substitutes
- ❑ Costs involved in operation and maintenance of technology.




# What are the factors that affect demand?

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- ❑ Product price
  - ❑ Buyer income
  - ❑ Buyer preference
  - ❑ Buyer expectation
  - ❑ Available substitutes
  - ❑ Complementary products
  - ❑ Market size

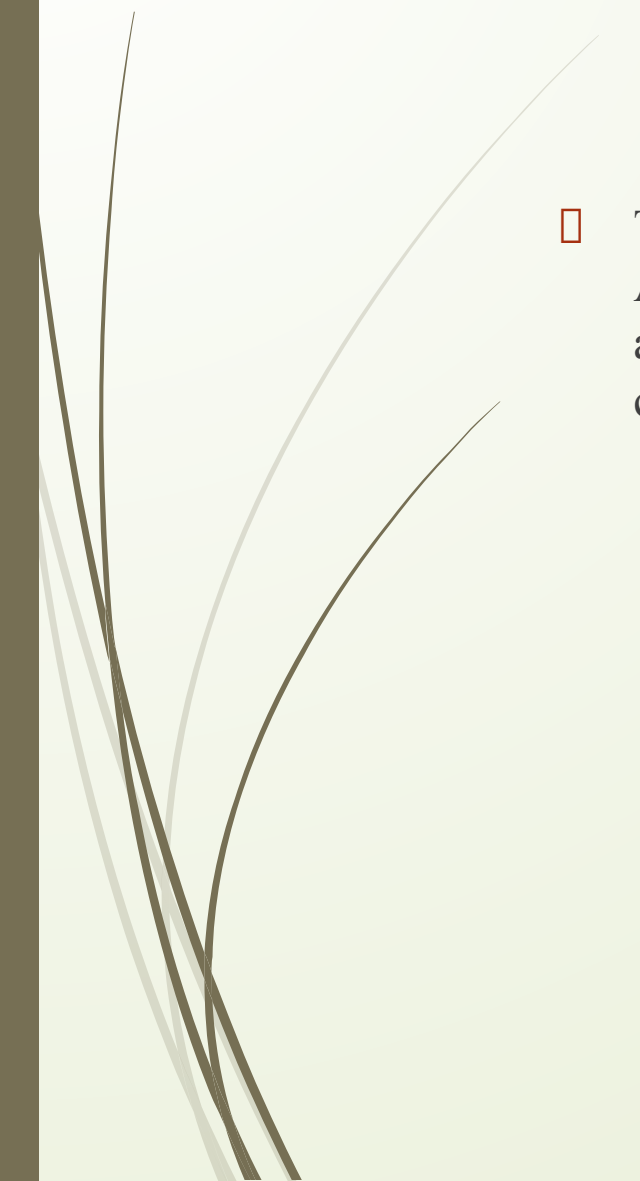


# Product price

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- As the price of a commodity increases, the consumer demand for it decreases. People will buy fewer items of the pricier commodity and look around to find other less expensive options.




# Buyer income

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- The buyer's income will determine their purchasing capacity and the demand for a product. An increase in income will lead to a higher purchasing capacity and a rise in demand, while a decrease in income will lower purchasing capacity and demand. There is also a correlation between income and quality of commodities.




# Buyer preference

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- Changes in trends affect buyers' preferences for a product, as do changes in societal customs and habits. Popular products will experience rising demand, but that can change swiftly when trends change.




# Buyer expectation

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- The demand for a product can rise if buyers think it is going to be scarce, unavailable or more expensive in the near future. Going by their expectations, they will buy and stock more of it in the present time, so there is a definite connection between current demand and future pricing.



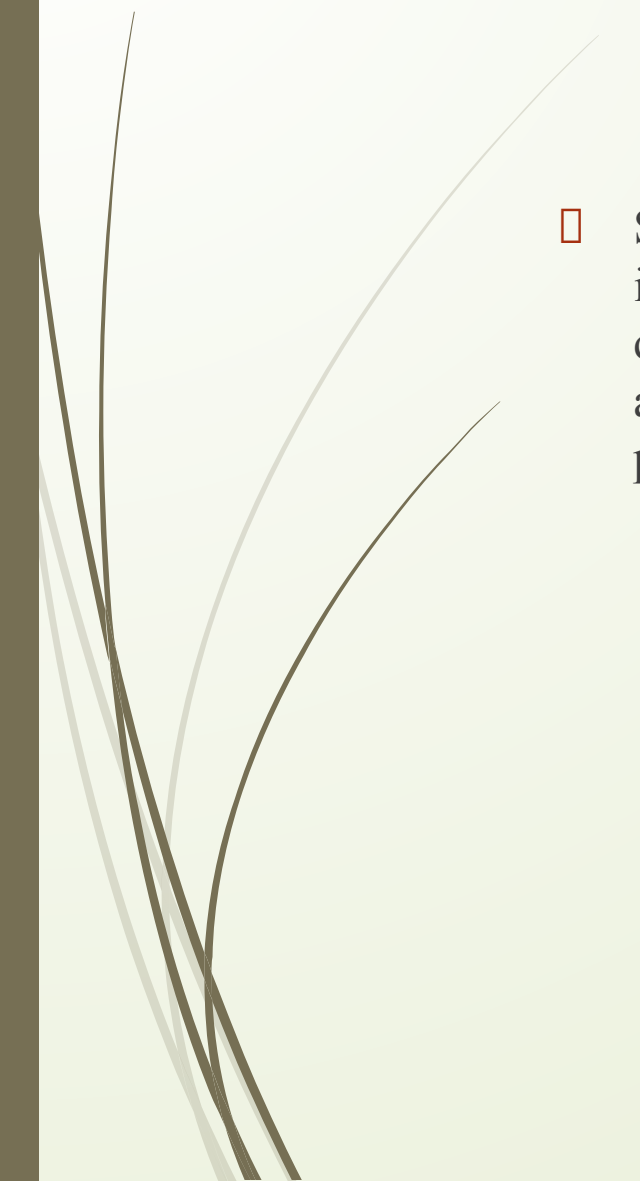
# Available substitutes

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- If a particular commodity becomes pricier, the demand for substitute commodities will increase. For instance, if you have always bought a specific type of cereal and its price increases to the point it becomes unaffordable, you may begin buying a similar, less expensive type of cereal. As a result, the demand for the less expensive and available cereal will increase.






# What is supply?

- Supply is the relationship between the prices of products and services and their availability in the market. If the prices go up and stay high, the sellers will supply the product in larger quantities to make a profit. Supply depends on demand and price changes and quickly adjusts to these. The changes in demand and price may be seasonal, temporary or permanent, and the seller must adjust their supply accordingly.
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# What are the factors that affect supply?

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- ❑ Production capacity
  - ❑ Production costs
  - ❑ Competitors
  - ❑ Availability of materials
  - ❑ Supply chains




# Production capacity

- Production capacity is the product output compared to resource input. If there is a rise in market demand, the manufacturer will increase the output to provide more supplies.
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# Production costs

- Production costs are manufacturing expenses like materials, employee wages and utilities like electricity and water. If the production costs are high, the product market prices will increase. If the market can sustain high prices, the supply will increase. If it can't, there will be a decrease in supply.
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# Competitors

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- Competitors are any companies that produce the same product or service in a similar price range. Competitors could make it difficult for a company to continue producing a supply of products at a reasonable price if consumers choose alternatives. They may reduce production or diversify to other goods to get a better market outcome.




# Availability of materials

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- The availability of inexpensive raw materials can help increase production and the supply of products. If the raw materials are not easily available or are too expensive, the production will decrease and result in a lower supply to the market.




# Supply chains

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- The producer should have a well-managed, affordable and reliable supply chain in place at every stage of the production process, from procuring raw materials to producing the product to moving them in the market-bound phase. That will ensure an efficient market supply to meet consumer demand.



# Availability of substitutes of raw material- Material Substitution

- ❑ Materials that are developed or promoted to substitute another due to e.g. functional, environmental, ethical, legal, economic or cultural concerns and the possible changed practices due to material substitution.
  - ❑ A common material substitute is that of vegan alternatives to animal-based products such as meat and leather.
  - ❑ Material substitution is a result of an ever-changing dynamic society.
  - ❑ Here the availability of different material substitutes can both challenge and stabilise markets.
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# Challenges



- ❑ A material's technical, functional and emotional aspects can be compromised.
- ❑ Material substitutes can be more expensive and difficult to get hold of.
- ❑ Lack of transparency/information may contribute to 'green washing'.
- ❑ It is necessary to have a holistic approach to material substitution as other aspects may become problematic.



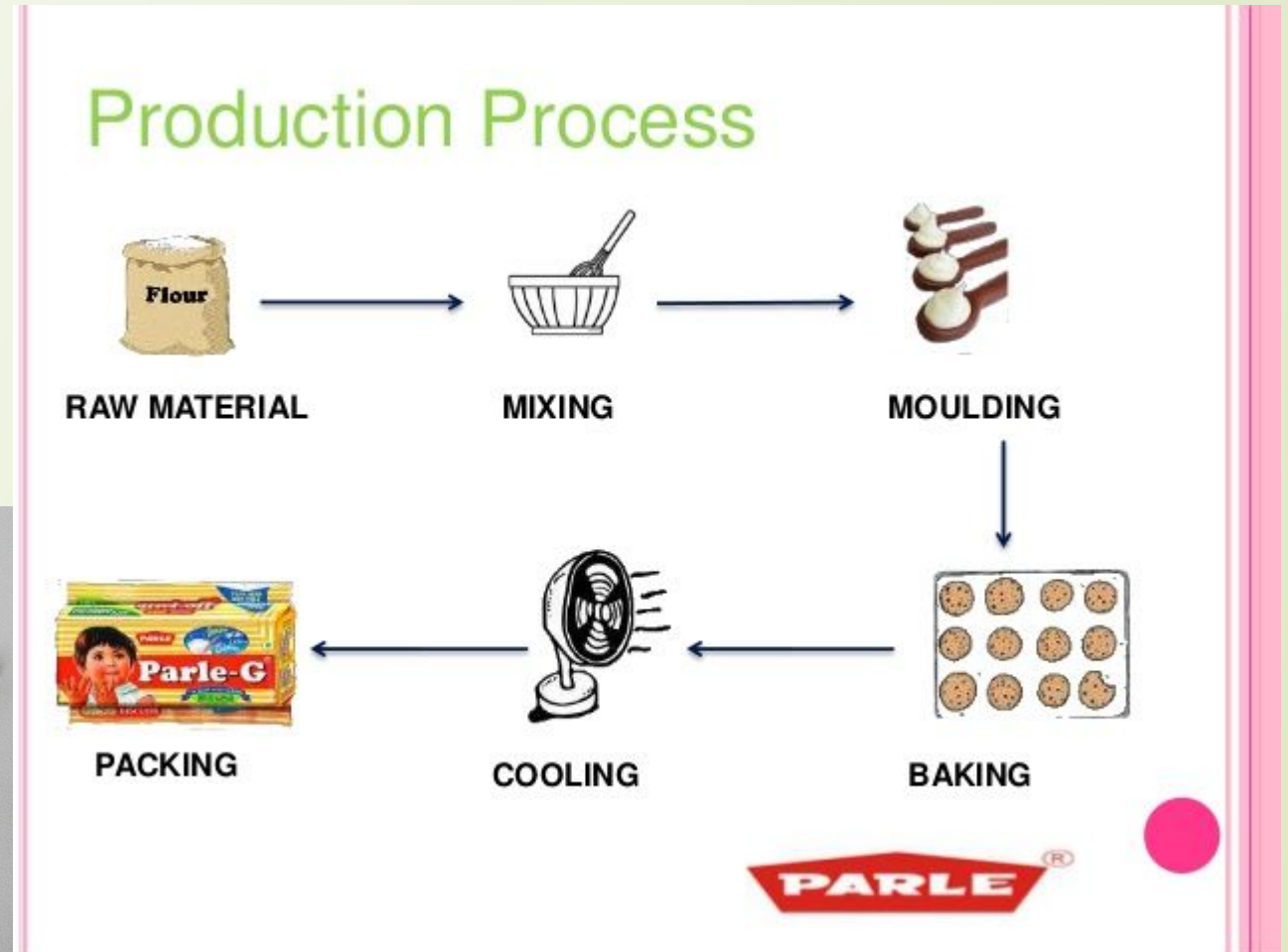
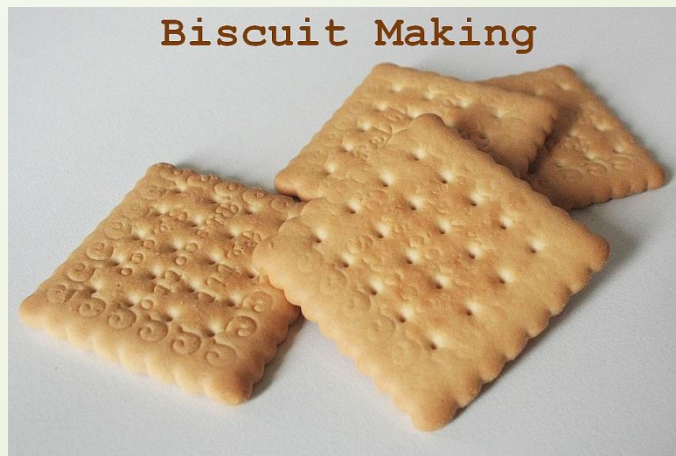
# production process



- The production process is defined as the process in which the factors of production, i.e. inputs of resources, are turned into beneficial outputs.
- **Factors of production** means capital, labour, technology, land, and other resources that are used to create output, or goods and services.

# The factors of production are explained in detail below:

- ❑ Capital
- ❑ Labour
- ❑ Technology
- ❑ Land



# Capital

- Capital includes the amount invested in the process of production. Investment can be in terms of monetary investments or assets like machines, vehicles, etc.



## Biscuit Production Line

Multi-Function Automatic Biscuit Making Machine





# Labour


- Labour refers to the people involved and the time and efforts that were put into the process.





# Technology

- The technology that is used, whether the kind of machinery, the programming of machinery, the capacity of machinery, etc.

	OG				First-class				Average Joe				Bottom of the barrel			
																
	Chocolate Fingers	Shortbread	Bourbons	Cookies												
																
	Fig Rolls	Chocolate Digestives	Party Rings	Madeleines												
																
	Weetabix	Rich Tea	Jaffa Cakes	Garibaldi												
																
	Pink Wafers	Custard Creams	Ginger Nuts	Jammie Dodgers												



# Land

- Natural resources such as land, energy, etc. that are used in the process of production are counted under the category 'land'.





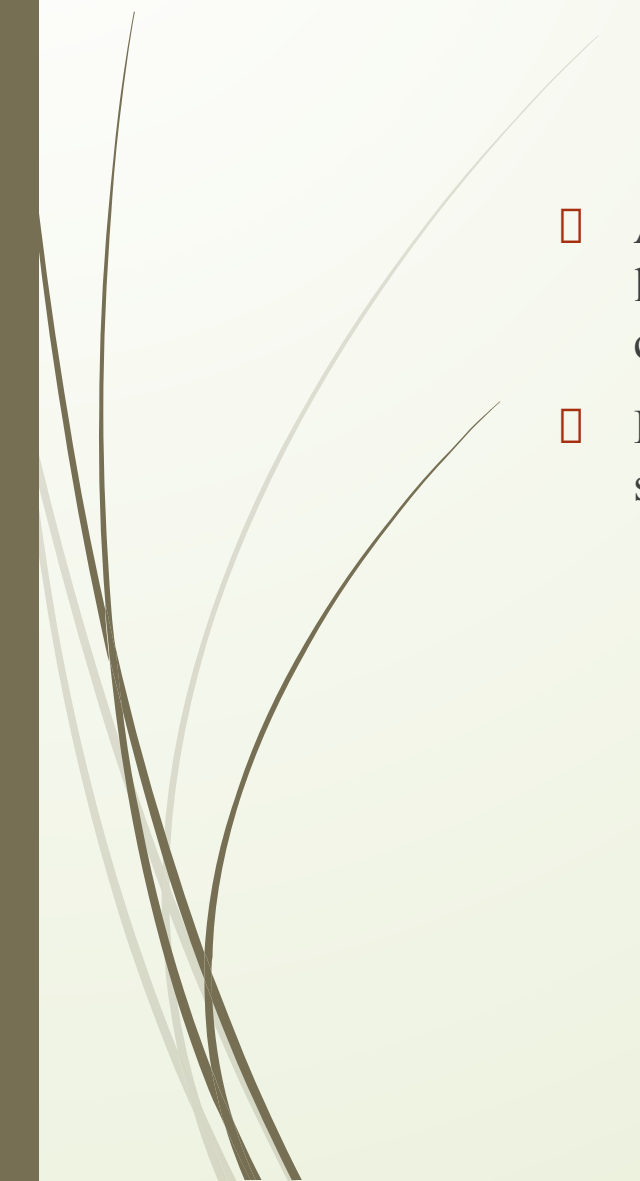
# Examples of the production process

- Let's explore the production process with the example of biscuit production. To set up this production process, the company requires a **place or land** to set up the whole production unit.
- Secondly, in the production of biscuits, the organization will need the machines to mix all the necessary ingredients. It will also need an oven to bake the biscuits. In addition, it will need machinery for making the biscuits' packaging and labelling, which will all become **capital investment** for the company.
- The company will also need **labour** to mix all the ingredients together, separate them into batches of production and different flavours, set the output levels of the machines and temperature of the ovens, decide on the labeling function, and oversee the overall production system.



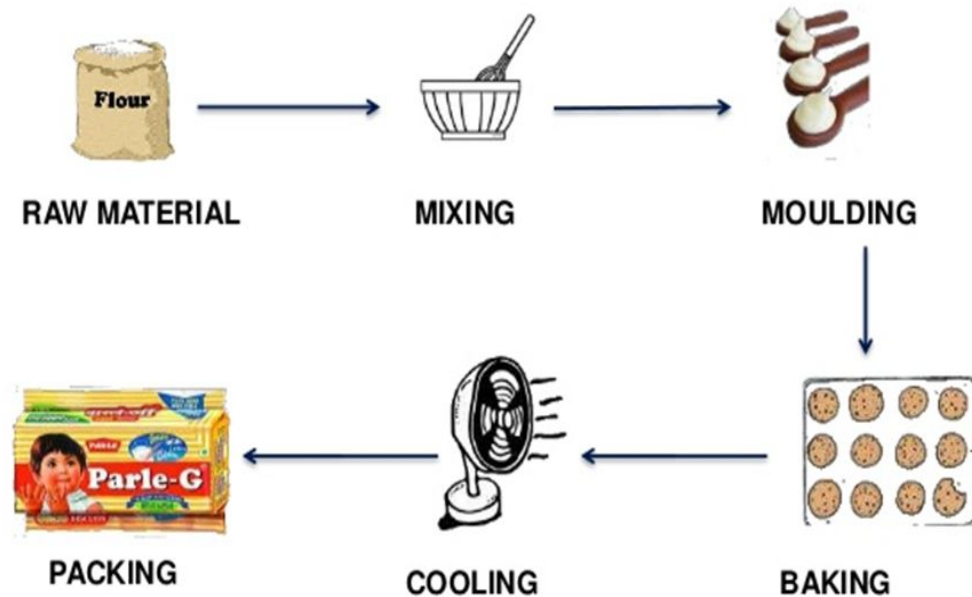


# Examples of the production process

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- Another important function and need of the production process is **technology** to ensure the labels are correct, the names of the product are rightly mentioned, the temperature is set correctly, and all other necessary technical aspects that do not require human intervention.
  - If all of the above factors of production are in place, the production process of biscuits runs smoothly and can match the requirement of the business and customers.

# Production process flow chart

## Production Process



Planning

Routing


Scheduling

Dispatching

Expediting



# Production process flow chart

- ❑ Planning: usually the basic requirement of all production processes. This stage helps to define the purpose and how the goals of production can be achieved properly.
  - ❑ Routing: This is the next stage in the production process where the raw materials may be procured, processed, finished, quality checked, and distributed. Decisions are made regarding the quantity and quality of goods and services as well as on the place of production. This is a crucial stage in the production process.
  - ❑ Scheduling: Scheduling means deciding the timings of the production process. For example, how much time should each stage of production involve? How long should each person work on a particular workflow?
  - ❑ Dispatching: This stage is the actual start of the production. It may involve the provision of necessary items, the maintenance of records, the monitoring of workflows as planned, the recording of the number of times a machine works, machine idling time, etc.
  - ❑ Follow-up: Follow-up is the last stage of the production process. Follow-up measures the actual versus the expected productions. Follow-up helps to detect the problems and remove them to help with the smooth functioning of the process.
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# Mass-customised Production







# Mass-customised Production

- Mass-customised production is similar to craft production. However, the customised selection is produced in mass quantity. The customisation may be on the basis of shape, colour, pattern, product material, etc.
  - For example, Coca-Cola may have custom 500ml bottles in glass produced in larger quantities according to need. Generally, production processes may share similar factors of production with land, labor, capital, and technology. The process may change relative to demand. The stages of production remain more or less the same from planning to routing, scheduling to dispatching, and finally, follow-up. The types of production, however, may change as per demand for the product and/or the requirements of the organization, in terms of sizes, colour, customisation, etc.
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# Availability of Substitutes

## Direct Substitute Goods

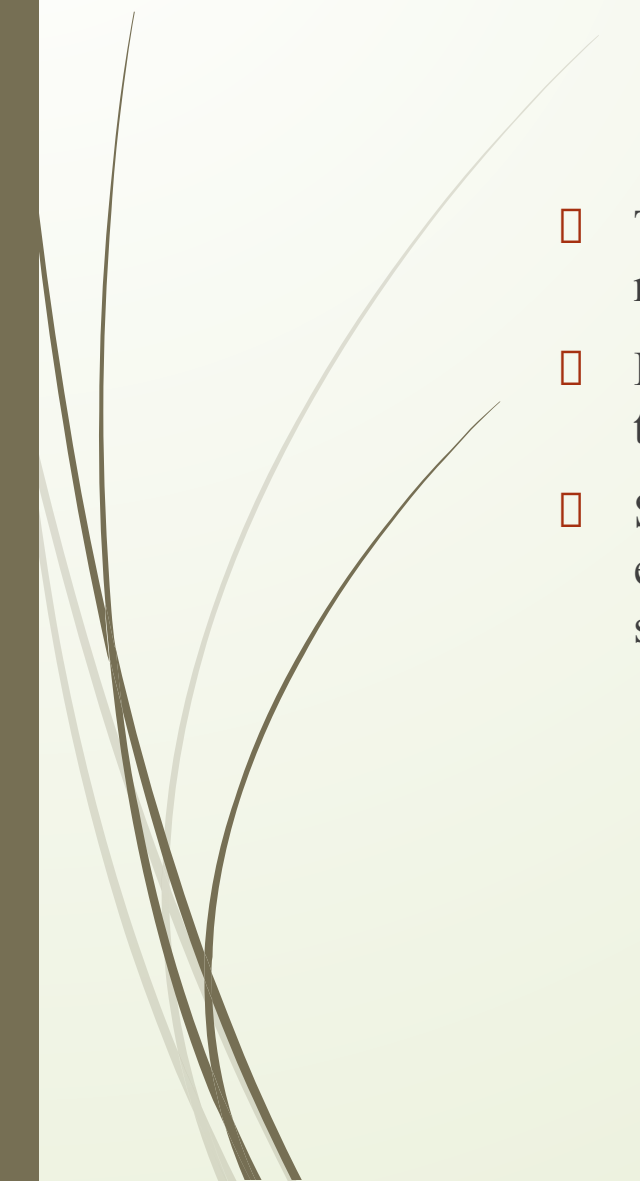


# Availability of Substitutes





# Availability of Substitutes

- The price elasticity of demand for a good or service will be greater in absolute value if many close substitutes are available for it.
  - If there are lots of substitutes for a particular good or service, then it is easy for consumers to switch to those substitutes when there is a price increase for that good or service
  - Substitute products offer consumers choices when making purchase decisions by providing equally good alternatives, thus increasing utility. However, from a company's perspective, substitute products create a rivalry.
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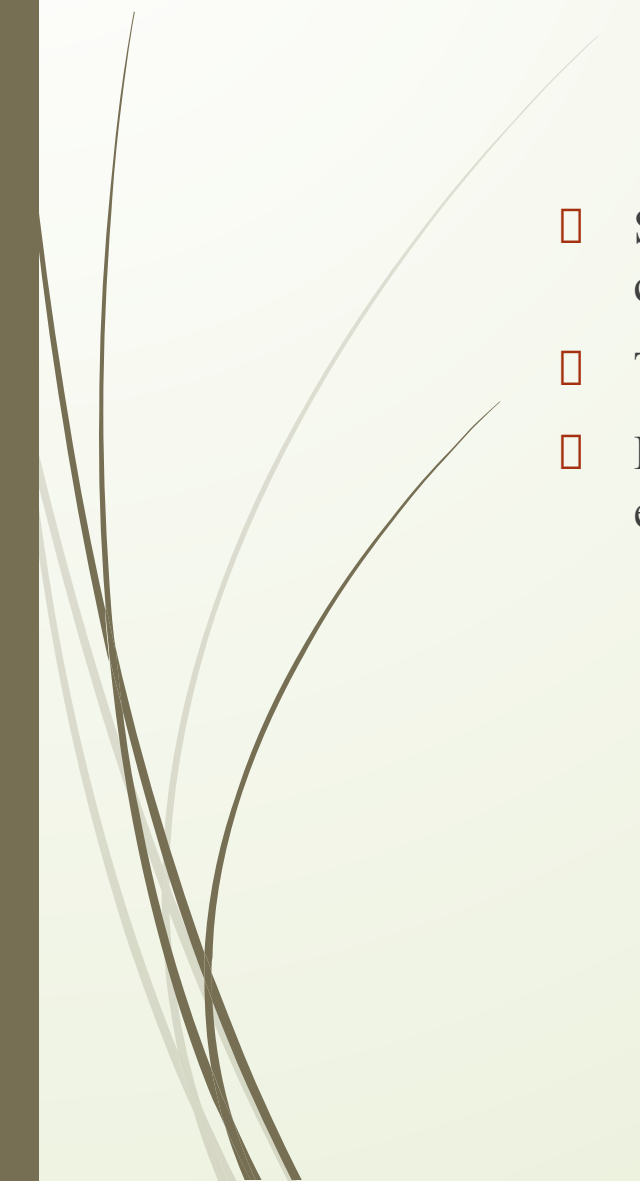
# Impact of Substitute Products

- ❑ A product with several substitutes is hard to price
- ❑ Customers are given a wide variety of products to choose from
- ❑ High competition
- ❑ Low-quality products



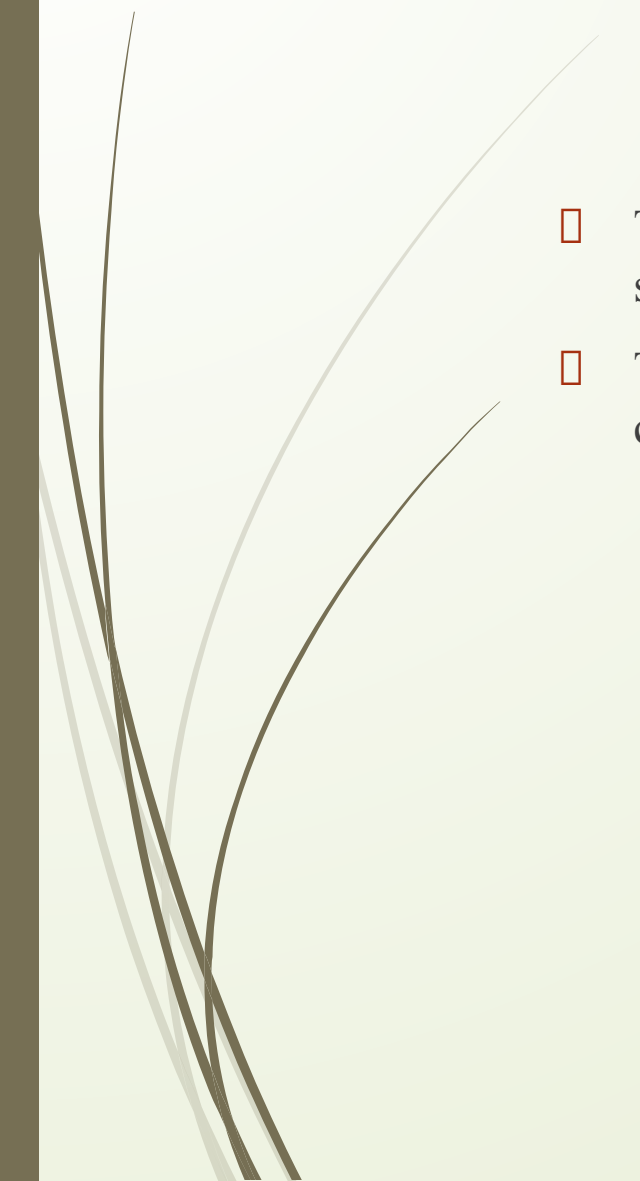


# A product with several substitutes is hard to price

- Since every producer of the substitute product is trying to sell more, the only things they can rely on are branding and pricing.
  - Thus, the prices of products with many substitutes are highly volatile.
  - In a market where there are fewer substitute products, there is a higher probability of earning greater profits.
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# Customers are given a wide variety of products to choose from

- The availability of more products can lead to a higher utility. No one single product can satisfy all consumers of a particular type.
  - Therefore, the greater the number of substitutes, the higher the probability of every consumer getting what is right for them.
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# High competition

- The greater the number of substitute products in the market, the more rivalry exists in the industry.
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# Low-quality products



- ❑ In a bid to be the lowest seller in the market, companies try to use the least amount of resources in their manufacturing process to reduce costs.
- ❑ However, this works against the welfare of the consumer, as it sometimes leads to the production of low-quality products.

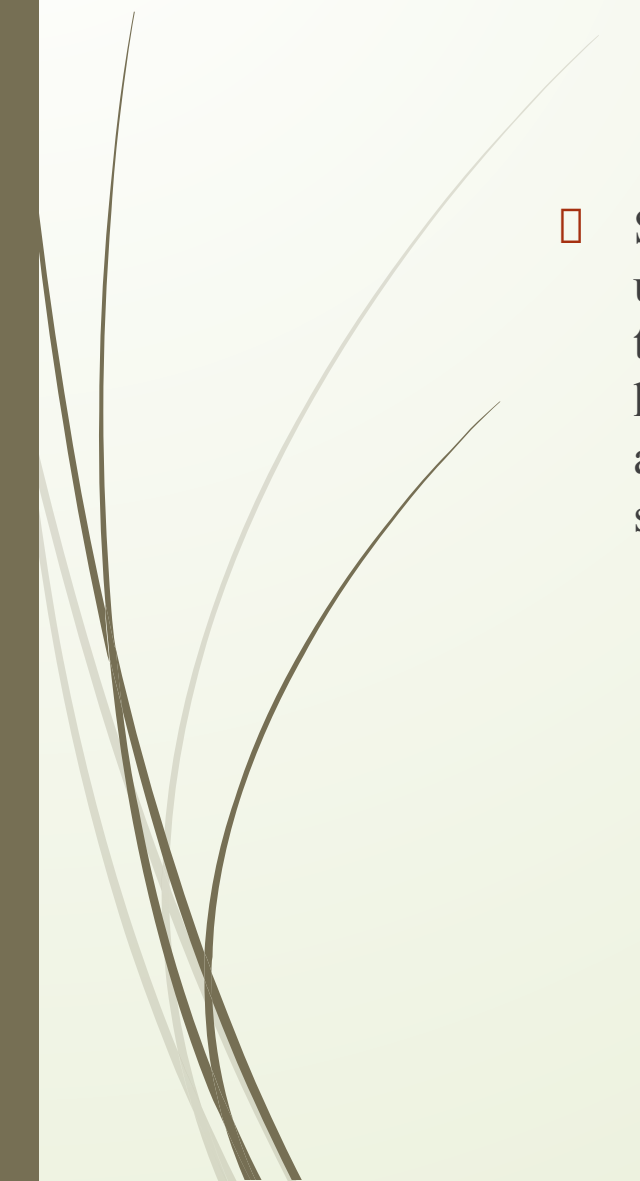
# Factors that Increase the Risk of Substitute Products

- ❑ Low switching cost
- ❑ Price of the product
- ❑ Quality of the products
- ❑ Product performance
- ❑ Availability of the substitute product






# Low switching cost

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- Switching cost is the loss or the extra cost you incur from leaving the option you were using for another. For example, if you have been taking notes with a pen but now you want to take them using a video recording device, the switching cost here is high since you will have to buy the video recording device. As a result, you are likely to stick with a notebook and a pen. On the same note, you can switch from one pen to the other easily since the switching costs are low.




# Price of the product

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- If a product is priced comparatively, for example in the case of writing pens, there is a higher risk of consumers switching from using one pen to the other unless they are loyal to the particular brand they have been using.



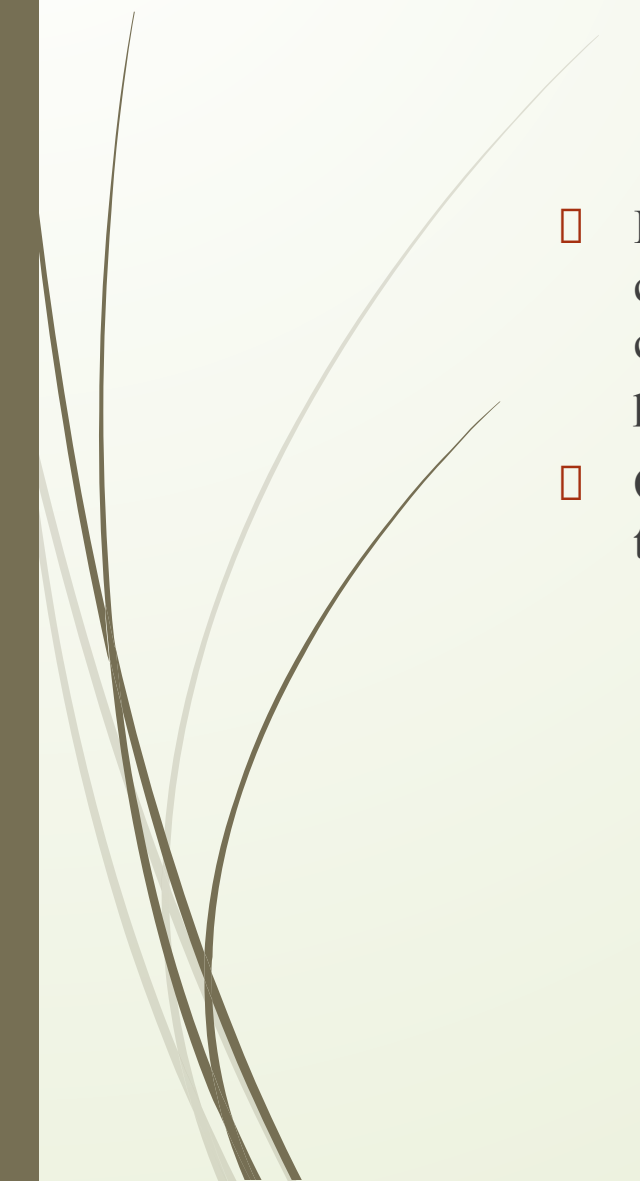


# Quality of the products

- If substitute products are highly differentiated and are of high quality, a consumer is likely to switch to a product that offers better quality. For example, users of aesthetic products like skin lightening creams are very sensitive to quality. They will discontinue using a product once they realize there is a higher quality substitute in the market.
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# Product performance

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- If two substitute products perform differently when subjected to various conditions, the customer will choose the option that is most beneficial for the particular prevailing condition. For example, in the transport sector, while traveling for shorter distances, most people prefer small vehicles.
  - On the other hand, while traveling for long distances, commuters may prefer big buses and trains. Many factors may contribute to the preference, but it is mostly due to comfort.



# Availability of the substitute product

- If substitute products are readily available in all corners of the market, there is a likelihood of consumers switching more often.
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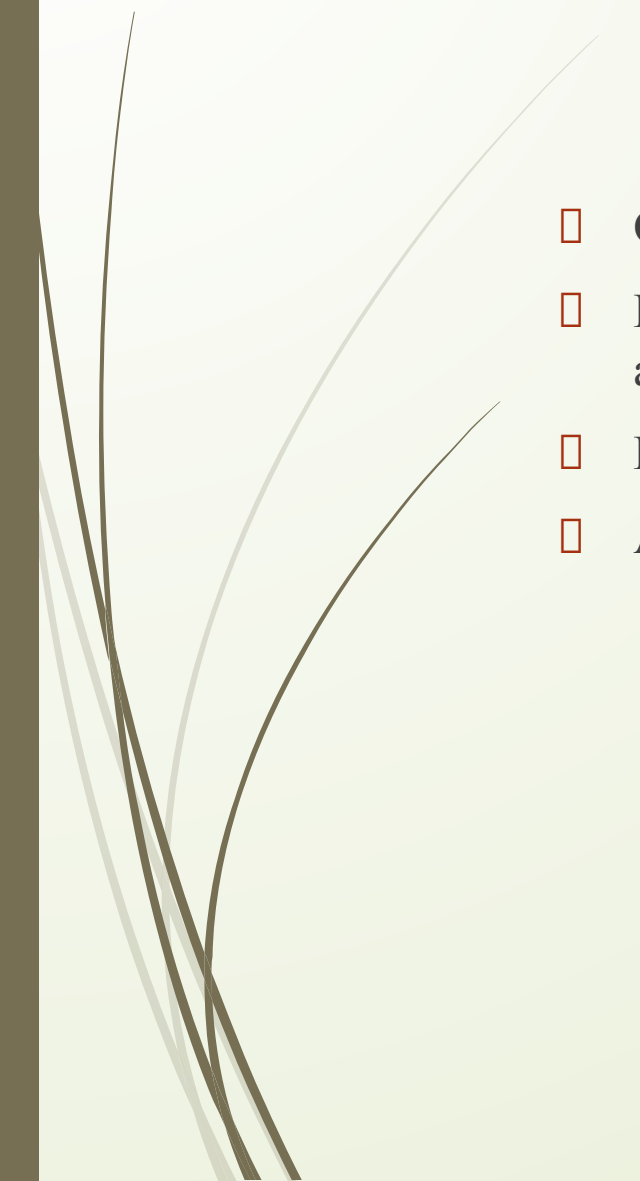
# Operating Costs



- ❑ Operating costs are associated with the maintenance and administration of a business on a day-to-day basis.
- ❑ Operating costs include direct costs of goods sold (COGS) and other operating expenses—often called selling, general, and administrative (SG&A)—which include rent, payroll, and other overhead costs, as well as raw materials and maintenance expenses.
- ❑ Operating costs exclude non-operating expenses related to financing, such as interest, investments, or foreign currency translation.



# How to Calculate Operating Costs

- ❑ Operating cost=Cost of goods sold+Operating expenses
  - ❑ From a company's income statement, take the total cost of goods sold, or COGS, which can also be called cost of sales.
  - ❑ Find total operating expenses, which should be further down the income statement.
  - ❑ Add total operating expenses and COGS to arrive at the total operating costs for the period.
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# Types of Operating Costs


While operating costs generally do not include capital outlays, they can include many components of operating expenses, such as:

- ❑ Accounting and legal fees
  - ❑ Bank charges
  - ❑ Sales and marketing costs
  - ❑ Travel expenses
  - ❑ Entertainment costs
  - ❑ Non-capitalized research and development expenses
  - ❑ Office supply costs
  - ❑ Rent
  - ❑ Repair and maintenance costs
  - ❑ Utility expenses
  - ❑ Salary and wage expenses
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# Types of Operating Costs

Operating costs will also include the cost of goods sold, which are the expenses directly tied to the production of goods and services. Some of the costs include:

- ❑ Direct material costs
  - ❑ Direct labor
  - ❑ Rent of the plant or production facility
  - ❑ Benefits and wages for the production workers
  - ❑ Repair costs of equipment
  - ❑ Utility costs and taxes of the production facilities
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# Fixed Costs


- A fixed cost is one that does not change with an increase or decrease in sales or productivity and must be paid regardless of the company's activity or performance. For example, a manufacturing company must pay rent for factory space, regardless of how much it is producing or earning. While it can downsize and reduce the cost of its rent payments, it cannot eliminate these costs, and so they are considered to be fixed. Fixed costs generally include overhead costs, insurance, security, and equipment.
- Fixed costs can help in achieving economies of scale, as when many of a company's costs are fixed, the company can make more profit per unit as it produces more units. In this system, fixed costs are spread out over the number of units produced, making production more efficient as production increases by reducing the average per-unit cost of production. Economies of scale can allow large companies to sell the same goods as smaller companies for lower prices.
- The economies of scale principle can be limited in that fixed costs generally need to increase with certain benchmarks in production growth. For example, a manufacturing company that increases its rate of production over a specified period will eventually reach a point where it needs to increase the size of its factory space in order to accommodate the increased production of its products.

# Variable Costs

- ❑ Variable costs, like the name implies, are comprised of costs that vary with production. Unlike fixed costs, variable costs increase as production increases and decrease as production decreases. Examples of variable costs include raw material costs and the cost of electricity. In order for a fast-food restaurant chain that sells french fries to increase its fry sales, for instance, it will need to increase its purchase orders of potatoes from its supplier.
- ❑ It's sometimes possible for a company to achieve a volume discount or "price break" when purchasing supplies in bulk, wherein the seller agrees to slightly reduce the per-unit cost in exchange for the buyer's agreement to regularly buy the supplies in large amounts. As a result, the agreement might diminish the correlation somewhat between an increase or decrease in production and an increase or decrease in the company's operating costs.
- ❑ For example, the fast-food company may buy its potatoes at \$0.50 per pound when it buys potatoes in amounts of less than 200 pounds. However, the potato supplier may offer the restaurant chain a price of \$0.45 per pound when it buys potatoes in bulk amounts of 200 to 500 pounds. Volume discounts generally have a small impact on the correlation between production and variable costs, and the trend otherwise remains the same.



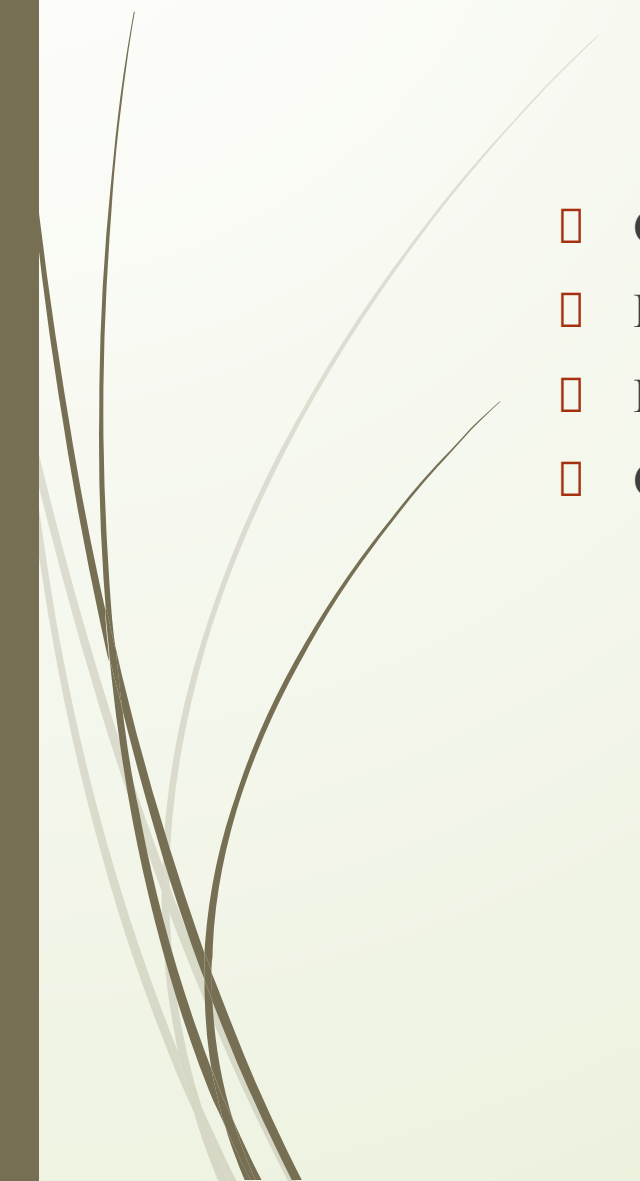
# maintenance of technology

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- The term "maintenance" refers to those **preventive, diagnostic, updating, replacement, and repair procedures that an organization undertakes to keep its technology working effectively and efficiently.**



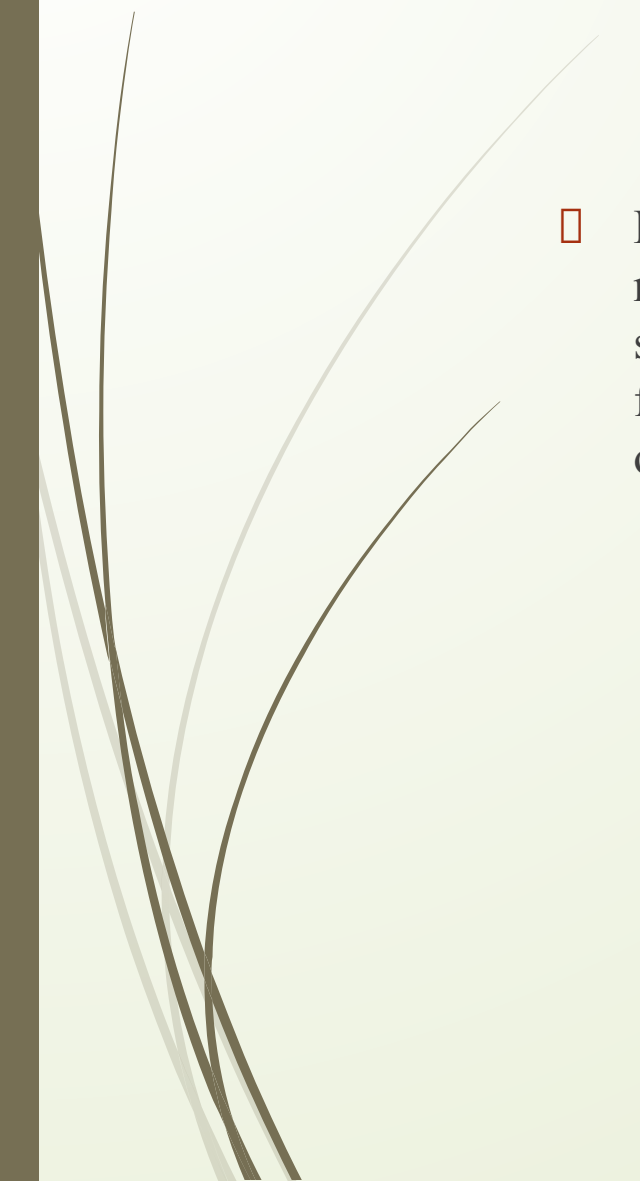


# maintenance of technology - Types

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- ❑ Corrective maintenance.
  - ❑ Preventive maintenance.
  - ❑ Risk-based maintenance.
  - ❑ Condition-based maintenance.

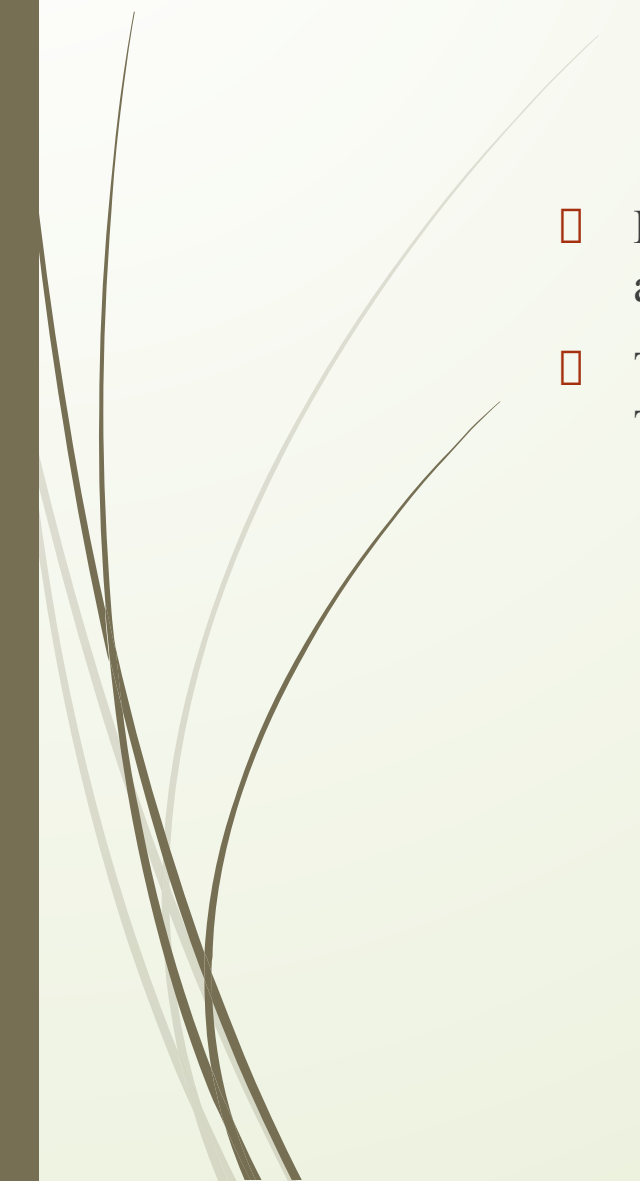


# Corrective maintenance

- Maintenance is carried out following detection of an anomaly and aimed at restoring normal operating conditions. This approach is based on the firm belief that the costs sustained for downtime and repair in case of fault are lower than the investment required for a maintenance program. This strategy may be cost-effective until catastrophic faults occur.
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# Preventive maintenance

- Maintenance carried out **at predetermined intervals** or according to **prescribed criteria**, aimed at **reducing the failure risk or performance degradation** of the equipment.
  - The maintenance cycles are planned according to the need to take the device out of service. The incidence of operating faults is reduced.
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# Risk-based maintenance



- ❑ Maintenance carried out by integrating analysis, measurement and periodic test activities to standard preventive maintenance.
- ❑ The gathered information is viewed in the context of the environmental, operation and process condition of the equipment in the system. The aim is to perform the asset condition and risk assessment and define the appropriate maintenance program.
- ❑ All equipment displaying abnormal values is refurbished or replaced. In this way it is possible to extend the useful life and guarantee over time high levels of reliability, safety and efficiency of the plant.



# Condition-based maintenance

- Maintenance based on the equipment **performance monitoring** and the **control of the corrective actions** taken as a result.
- The real actual equipment condition is continuously assessed by the on-line detection of significant working device parameters and their automatic comparison with average values and performance. Maintenance is carried out when certain indicators give the signaling that the equipment is deteriorating and the failure probability is increasing.
- This strategy, in the long term, allows reducing drastically the costs associated with maintenance, thereby minimizing the occurrence of serious faults and optimizing the available economic resources management.