

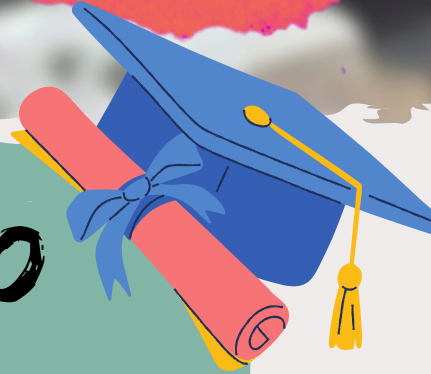
Introduction to Manufacturing System



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eNotes



INTRODUCTION TO MANUFACTURING SYSTEM



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eNotes - Introduction to Manufacturing System

2021 Edition

eNotes - Introduction to Manufacturing system is as general references and readings especially to lecturers and students of polytechnics and colleges Malaysian community to apply best practices in method implementation online teaching and learning

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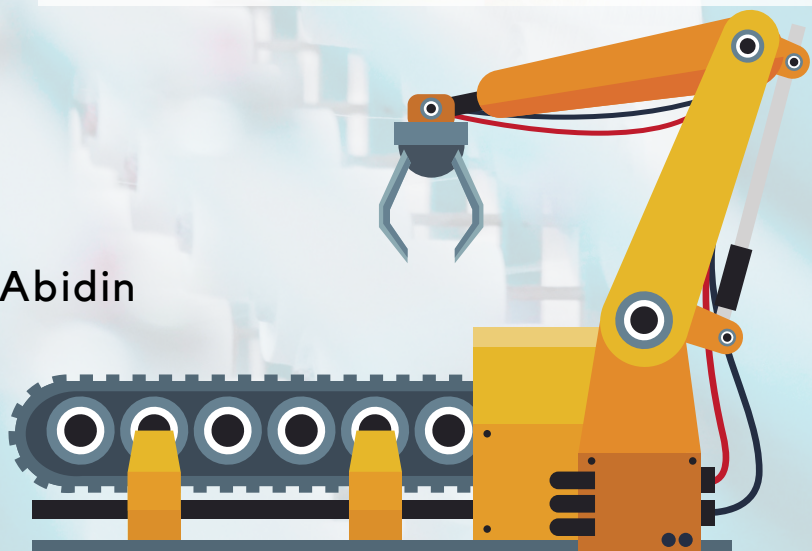
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ABSTRACT

Enotes - Introduction Manufacturing Systems provides an overview of manufacturing systems from the ground up. It is intended for students at diploma level in manufacturing engineering, lecturers and industry practicing engineers who want an overview of the production in manufacturing systems. Enotes - Introduction Manufacturing Systems has five topics that have been highlighted according to the operations of a manufacturing system. Thus, the subjects emphasized are : the definitions of manufacturing, important of manufacturing, manufacturing industries, manufacturing in production system (model in production system) and types of manufacturing system. The enotes - Introduction Manufacturing Systems attempts a compromise between theory and practice in all addressed manufacturing systems issues, covering a long spectrum of issues from traditional manufacturing processes to innovative technologies such as computer Integrated manufacturing and flexible manufacturing system. This enotes acts as general references and readings especially to lecturers and students of polytechnics and colleges Malaysian community to apply practices in method implementation online teaching and learning.

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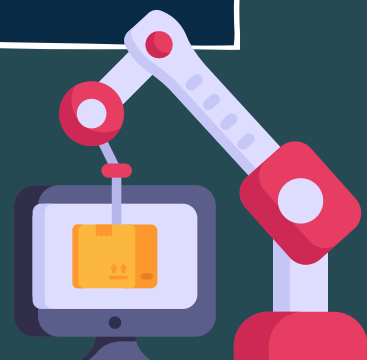
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DEFINITION

MANUFACTURING


The word "manufacture" comes from the Latin word "manus," which means "hand" and "factus" (make). In other words, "something made by hand." This term can be broadened in a modern context to include: the creation of products from raw materials using numerous processes, equipment, activities, and labour in accordance with a precise plan.

Manufacturing is a branch of industry that involves the use of tools and processes to transform raw materials into finished products. Engineering and industrial design are inextricably linked with the manufacturing sector. Some industries, such as semiconductor and steel manufacturing, prefer the term fabrication. Manufacturing encompasses all intermediate processes required for the production and assembly of a product's components.



SYSTEM

A system is a method of working, organizing, or doing something that adheres to a predetermined plan or set of rules. System also defined a collection of components that work together to complete a task in an environment and fulfil a mission. Components include drive, frame, ram, bed, and so on. They are linked in a specific way to carry out a task or function.



MANUFACTURING SYSTEM DEFINITION



Manufacturing system is a grouping or arrangement of operations and processes used to produce a desired product or component. It consists of both the actual equipment used to compose the processes and their arrangement. If a change or disturbance occurs in a manufacturing system, the system should accommodate or adjust itself to continue functioning efficiently. In most cases, the effect of a disturbance must be balanced by controllable inputs or by the system itself.

A manufacturing system, in other words, is "a collection of integrated equipment and human resources whose purpose is to perform one or more processing and/or assembly activities on a beginning raw material, part, or group of part



Figure 1 :Flow of Manufacturing System

The experiment demonstrates that the process has multiple elements, such as technical, economic, and social, all of which interact to produce the end outcome.

Manufacturing is almost always done to produce money for the company's owners. Enterprises are businesses that are set up to produce a profit. Manufacturing systems can be viewed from a technical or economic standpoint

Activity 1

Consider the following items and explain the inputs are and transformation processes are required to achieve the finished item:

- (a) a 500g butter packet
- (b) a daily newspaper

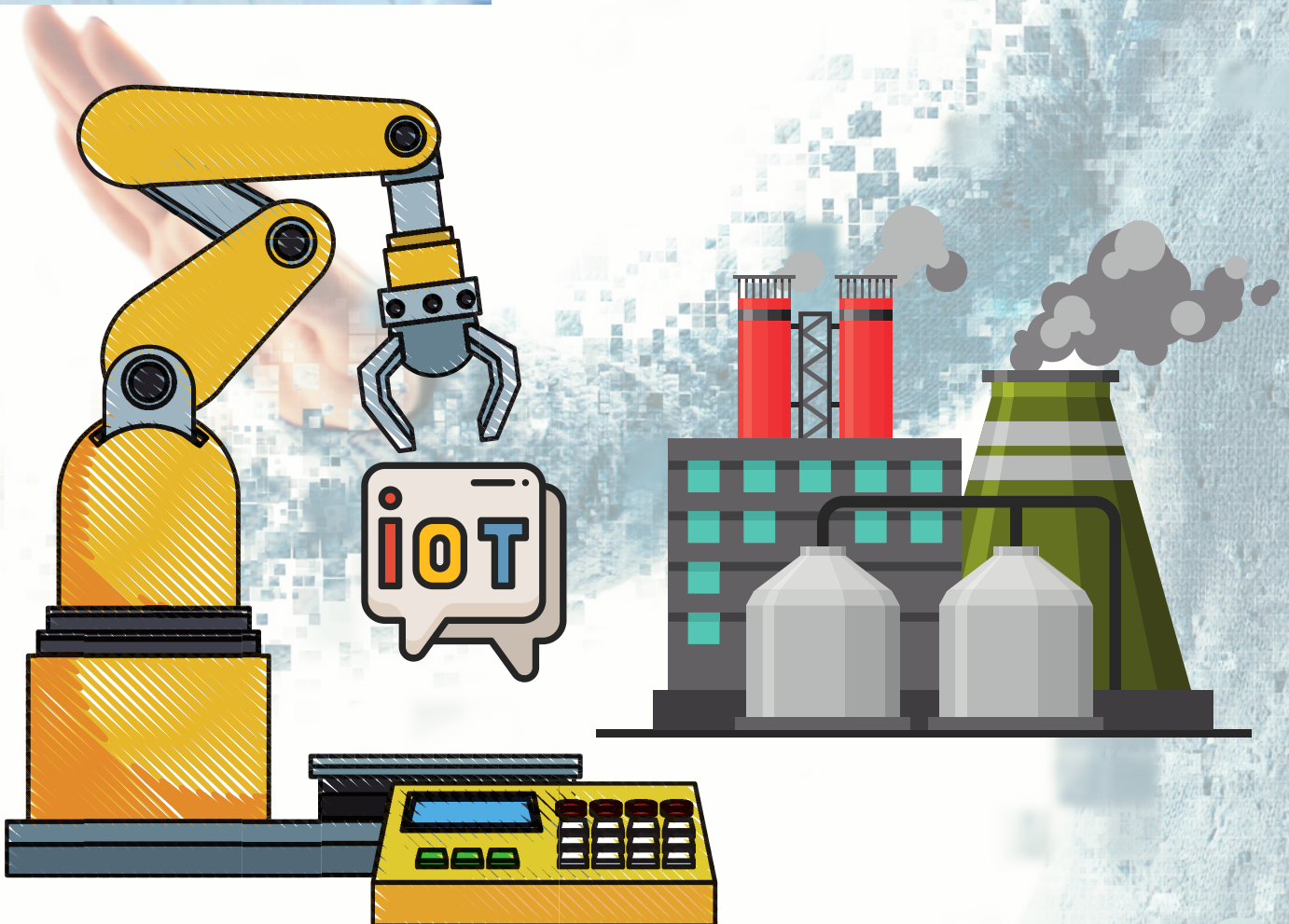
In each case, describe how the materials, labor, equipment, and management are used to create the product.



MANUFACTURING IMPORTANT

Making things has been a necessary human activity from the beginning of time. Manufacturing systems can be thought of in two ways:

- a) Technologically
- b) Economically.
- c) Historically.



1. TECHNOLOGY IMPORTANT

- The role of science is to give what people of society require and desire.
- Technology has an impact on our daily life in a variety of ways, both directly and indirectly.
- Technology creates items that improve the lives of our society's members.
- These products that have been developed are broadly applied and will not be available to the public if they cannot be manufactured.

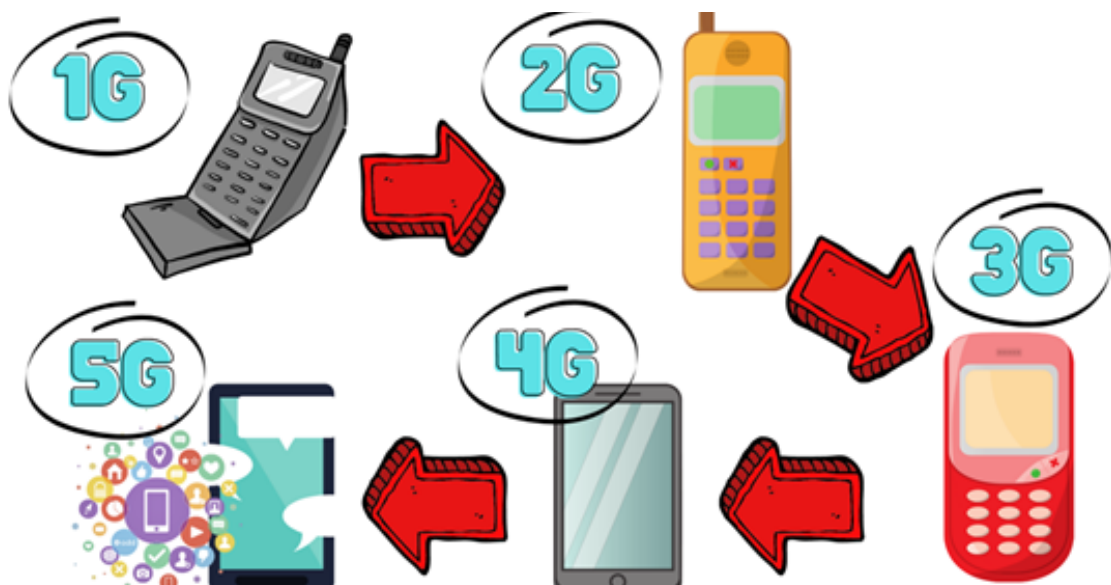


Figure 2 :Revolution in Technology

Manufacturing is the key characteristic that can generate technology. The key features of the procedure, when seen strictly in technical terms, are listed below.

Manufacturing is the process of transforming raw materials into finished goods. The manufacturing process contributes the necessary technology.

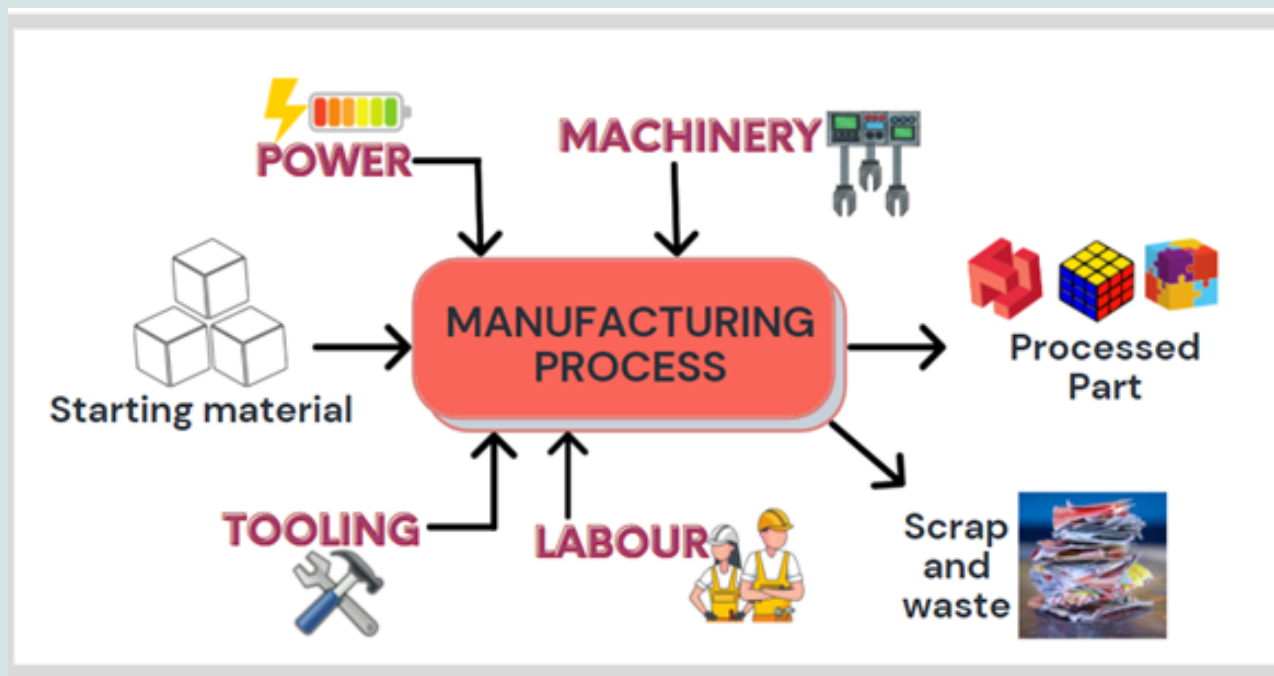
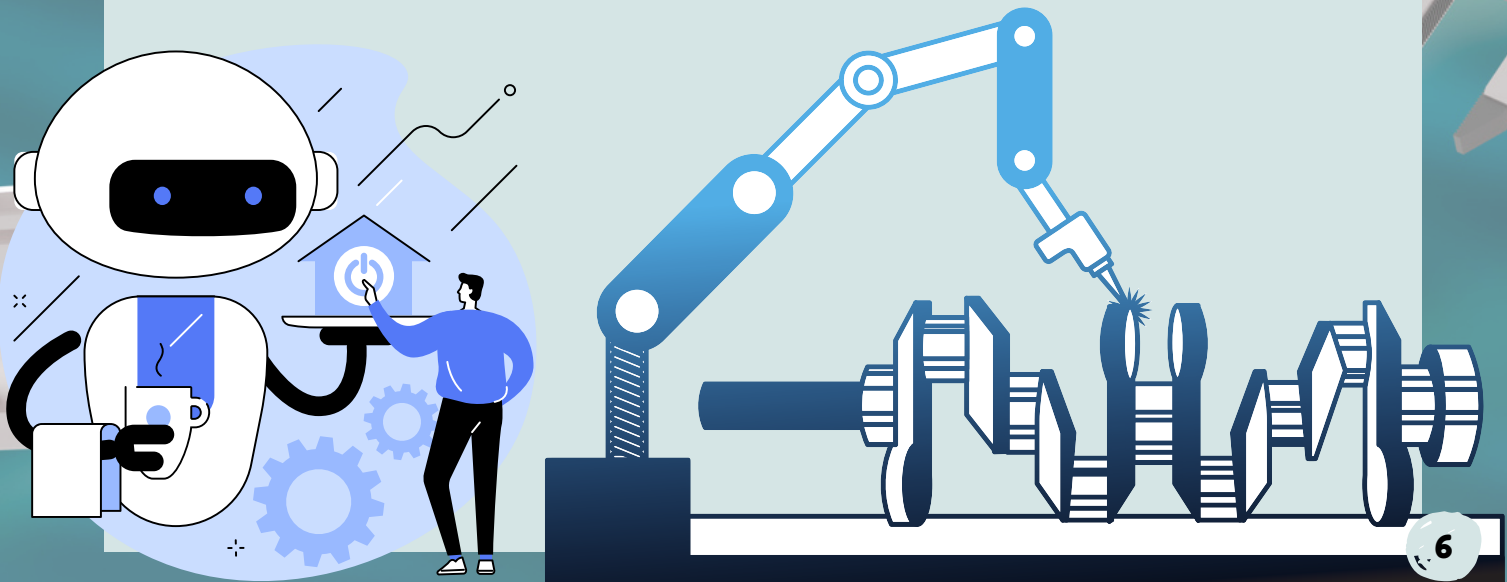


Figure 3 :Manufacturing Process Contributes the Technology



2. ECONOMY IMPORTANT

- Using one or more processing and/or assembly activities, materials are transformed into higher-value goods.
- However, when examine manufacturing from an economic standpoint, a different picture emerges. It is the value that is added to the inputs that matters in this scenario.
- A Figure 4 depicts the entire sector for KDNK achievement in Malaysia's economy.

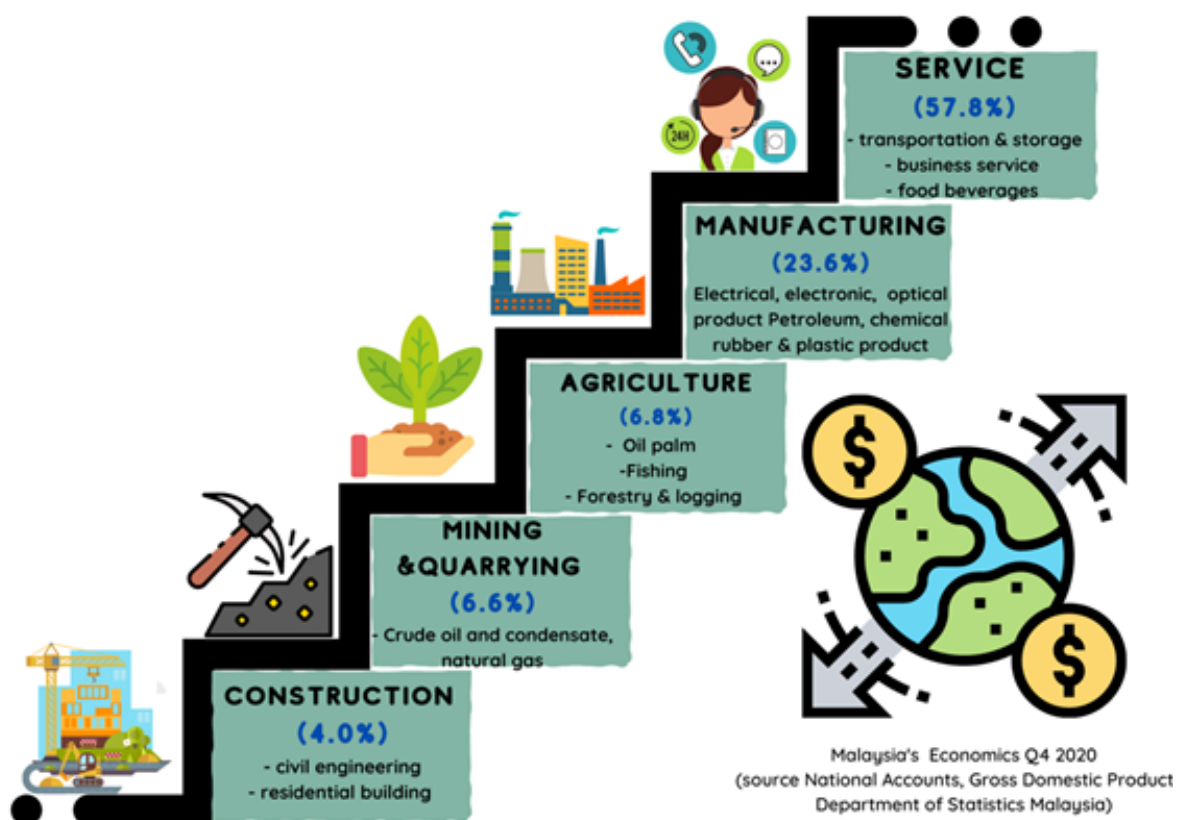


Figure 4 :Statistics in overall sector

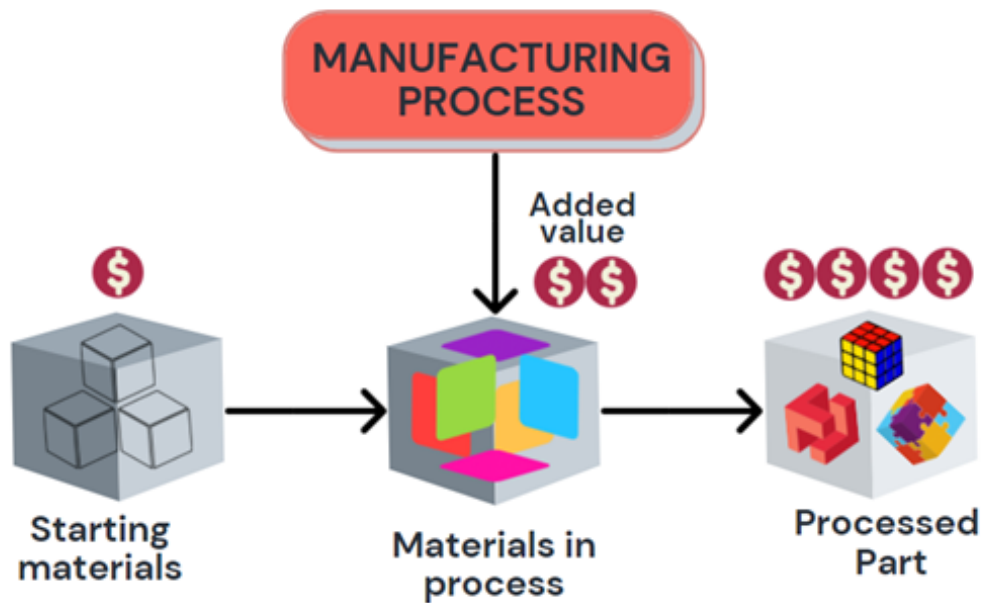
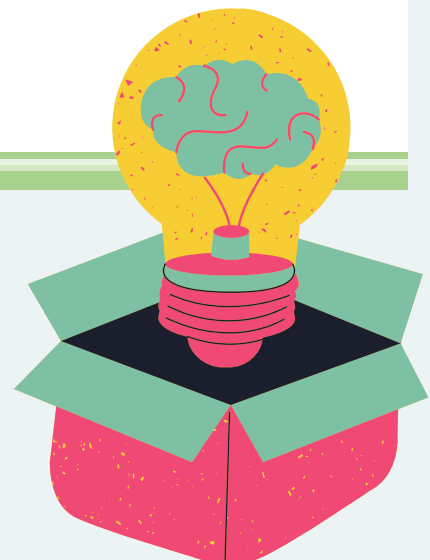
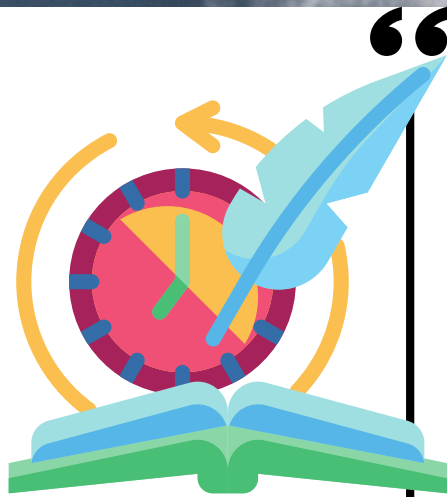


Figure 5 :Manufacturing Process Contributes the Economic

ACTIVITY 2

Consider the preceding example's two elements.
In each scenario, explain how the manufacturing process adds value to the process's raw materials (or inputs).





Manufacturing has played a significant role in the evolution of civilization. Throughout history, nations/civilizations that excelled at making/manufacturing goods have fared better.

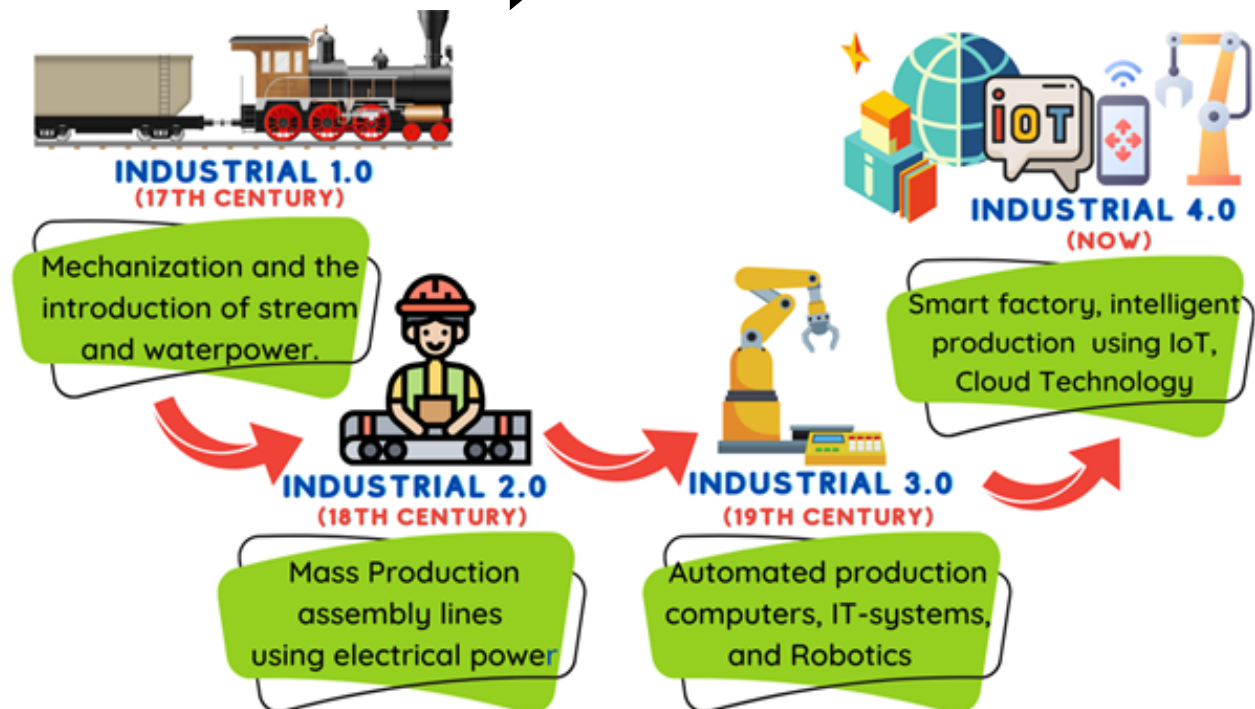


Figure 6 : The Industrial Revolution

HISTORICAL
IMPORTANT

MANUFACTURING INDUSTRIES

Industries are made up of companies and institutions that manufacture and also provide services and product. The manufacturing industrial sector is classified into three categories: primary, secondary, and tertiary. The sectors listed below are examples of several that have been grouped according to their respective categories.

01

PRIMARY

Primary industries cultivate and exploit natural resources, such as agriculture and mining.



02

SECONDARY

The secondary industry is responsible for taking products from the primary industry and transforming them into capital and consumer goods in accordance with customer demands. This sector is mostly oriented towards manufacturing, although construction is also considered.



03

TERTIARY

Tertiary industries - These sectors support the economy's service sector. Banks, for example, and insurance companies are examples of financial institutions.



INDUSTRIES SECTOR

- Manufacturing, building, and electric power generating are examples of secondary industries.
- Manufacturing encompasses a variety of businesses whose products are not addressed in this book, such as clothes, drinks, chemicals, and food processing.

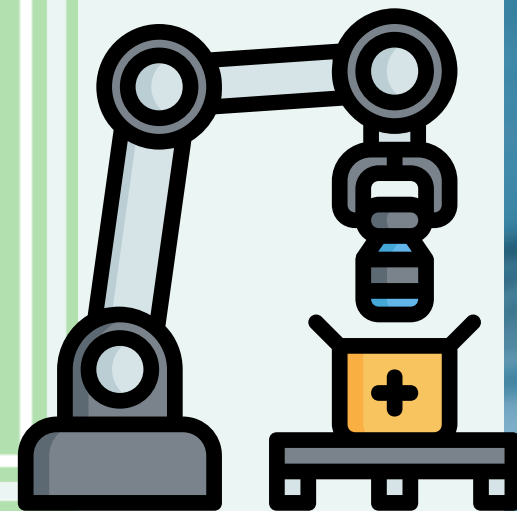
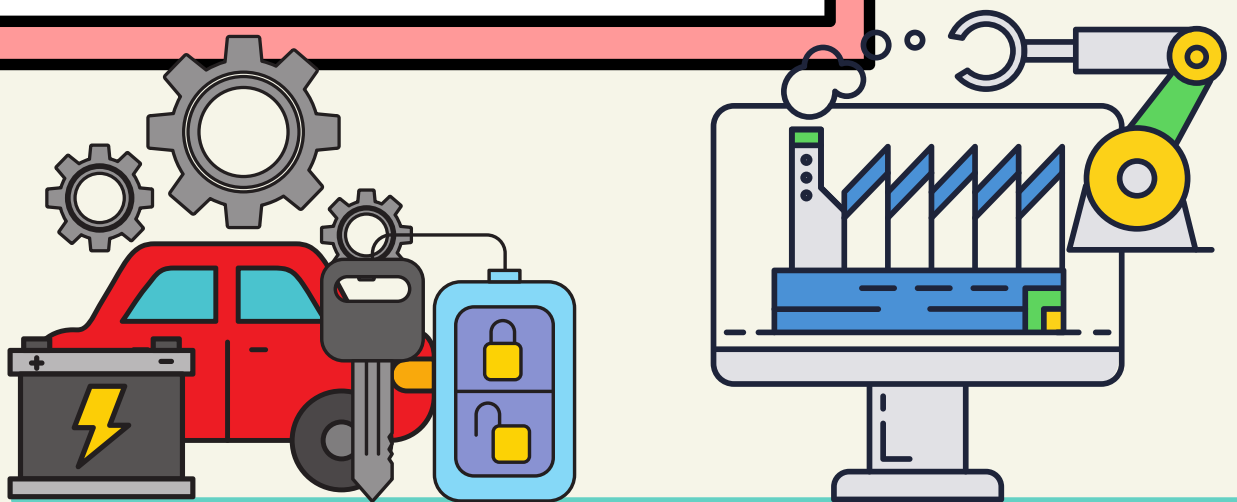


Table 1 : List of industries in the industry sector organised by category

INDUSTRY SECTOR		
PRIMARY	SECONDARY	TERTIARY
Mining Forestry Petroleum Agriculture Quarries Fishing Livestock	Automotive Textiles Food processing Electronics Consumer appliances Beverages Fabricated metal Aerospace Petroleum refining	Tire and rubber Wood & furniture Power utilities Heavy machinery Construction Building material Computer Plastics product Chemical Banking Education Communication Insurance Tourism Transportation Hotel Government Health & medical Restaurant Real state Repair & maintenance Wholesale trade Entertainment Retail trade Legal

EXAMPLE SECONDARY INDUSTRY

- Manufacturing in this context refers to the production of hardware.
- As an example, consider nuts and bolts, forgings, automobiles, aero planes, digital computers, plastic parts, and ceramic items



ACTIVITY 3

1. Choose one enterprise or business in your neighborhood.
2. Determine the inputs, transformations, and outputs. Then, Explain how it improves the inputs.




MANUFACTURING PRODUCT & SERVICE

There are two types of finished products:

1. Consumer goods are those purchased directly by customers.
(Automobiles, clothing, televisions, and Food)
2. Capital goods are items purchased by enterprises for use in the manufacturing of products and/or the supply of services.
(Airplanes, computers, communication equipment, medical equipment, vehicles, machine tools, and construction vehicles)



COMPARISON PRODUCT & SERVICE

	
PRODUCT	SERVICES
1 Durable type of items/ tangible	Disposable goods and Intangible asset
2 It's also feasible to inventory output.	It is difficult to keep track of output.
3 It takes more time to consumption.	Consumption is immediate.
4 limited level of customer interaction	High costumer's involvement.
5 a delayed response time	Response time is quick.
6 Available on a national, region, and worldwide scale market	Small marketplace
7 Large facilities are required.	Small facilities are required.
8 Capital is required	It is time consuming.



PRODUCT & SERVICE

1. Tangible Product

Manufacturing companies usually convert natural resources or tangible inputs into capital outputs (ex: aluminium, televisions, shampoo, detergents, etc.). Also, other inputs, such as operator skills, managerial abilities, and capital, are also employed. The companies use physical/chemical processes (like mixing, casting, turning, and so on) to convert raw materials into touchable goods. While service providers translate a collection of inputs into several outputs, they do not provide a physical outcome (ex: medical health, hotel service, insurance, etc.) or aid (ex: automobile, repair, pedicure & manicure, handphone repair, etc.)



2. Inventories



Durable things can be kept and delivered for a longer time in anticipation of possible needs. Therefore, by storing and smoothing out output levels, the operation manager will keep pace with demand highs and lows with durable items. Service, on the other hand, cannot be manufactured in advance. For example, in the case of eating fast food inside a fast food restaurant, receiving medical treatment at a hospital, and so on.

3. Useful Output

Products (goods) often have a longer lifespan; for example, a refrigerator, television, vehicle, and so on can be utilized for at least 10 years. In addition, the output of a service-based business (i.e., service) is consumed quickly. For example, students in a classroom, Fast food consumption and enjoyment of train/airplane/taxi/bus travel with an entertainment package



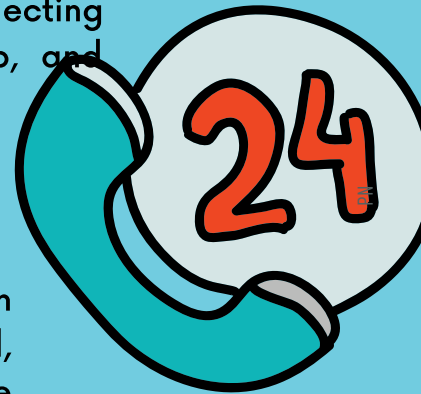
4. Contact with customer



The majority of customers appear to have less interaction with the manufacturing system/organization. However, having customers are directly involved in many service delivery organizations. for example students and patients in hospitals are more directly involved.

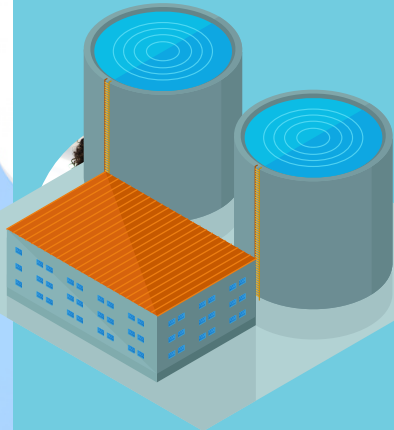
5 Time to respond to a customer's request

Manufacturers often require a few time is required (the amount of time it takes from making the purchase to delivering the products) in days or weeks In contrast, the services are delivered within a few minutes after the customer's arrival. Bank service, collecting passport tickets, buying food out of a department shop, and getting examined by a specialist are just a few examples.



6 Availability

Because to the availability of transportation and distribution infrastructure, products may be obtained from regional, national, or worldwide markets, whereas services cannot be shipped to distant areas. As a result, service organizations that require direct consumer interaction must be located quite close to the clients.



7 Liabilities/facilities

Manufacturing units/organizations that produce products often need larger infrastructure, greater automation, and greater financial investment than providers.

8. Capital/labour priority

A manufacturing company that produces goods/products often requires more capital than a service company. A car company, for example, takes more money than a post office or a nursing facility.




MANUFACTURING IN PRODUCTION SYSTEM

A production system is a system that consumes resources and production processes to transform input into desired output. Thus, a production system is comprised of four major components, such as inputs, available resources, production processes, and outputs or outcomes.

To manufacture efficiently, a manufacturing company must have processes and procedures in place. People, equipment, and procedures are employed in the materials and processes that make up a company's manufacturing business.



Figure 7: Basic block diagram in Production system

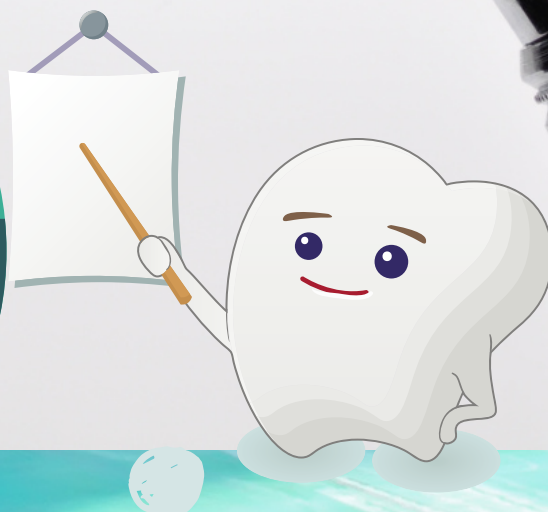


A production system is a manufacturing subsystem that includes all of the tasks involved in developing, designing, producing, distributing, and supporting produced goods. The basic purpose of this system is to continuously generate goods and/or services and/or cluster, whether for profit or not.

Production is the fundamental activity of all organisations, and everything else revolves around that. Manufacturing results in the creation of products and services that fulfil the needs of customers. In certain organisations, the product is a tangible (material) good. Hence, it is a product (like refrigerators, automobiles, televisions, badminton racket, and so on) rather than a service (medical care, banking, and education).

More businesses (even non-profits) classify their production systems. The organisation is responsible for converting a collection of inputs (such as materials, labour, equipment, and energy) into one or more valued outputs or outcomes. Products are widely used to identify the output of a manufacturing system. These goods might include:

- i. Tangible items - steels, chemicals, and so on
- ii. Intangible services such as teaching and health care
- iii. Combination of (a) and (b) - Hotel services, Restaurants etc.)

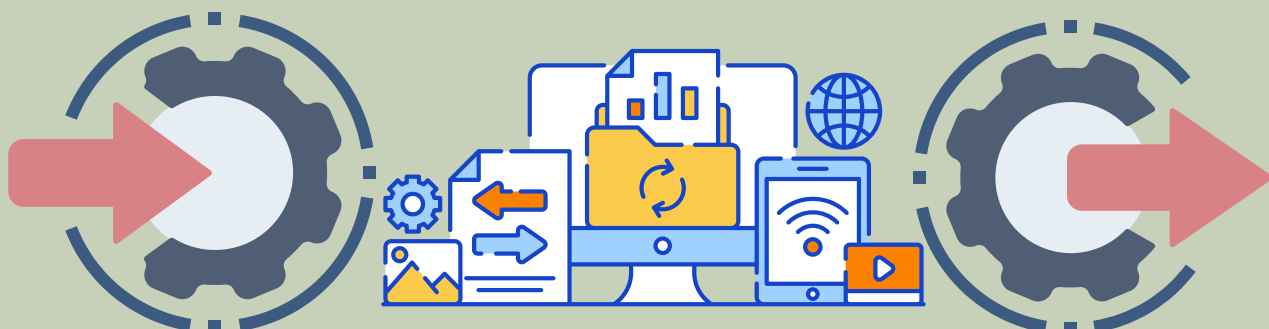


The characteristics of the production system are as follows:

- Due to the orderly production activities, the production system has a goal.
- Systems convert different inputs (materials, people, data, energy, and variable cost) into valuable outputs such as services and/or products.
- A system of production is not independent of other organizational systems such as marketing, finance, insurance and so on.
- There is feedback regarding the activities, which is necessary for controlling and improving system performance.

Table 2 : Example of Transformation Process in Manufacturing System

INPUT	PROCESS FOR TRANSFORMATION	OUTPUT
Materials	Machine/tool	Products/goods
Energy	Skill	Services
Variable Cost	Fixed cost	Revenue
Data	Interpretation	Knowledge
Element	Transformation	Useful Product



PRODUCTION SYSTEM COMPONENT

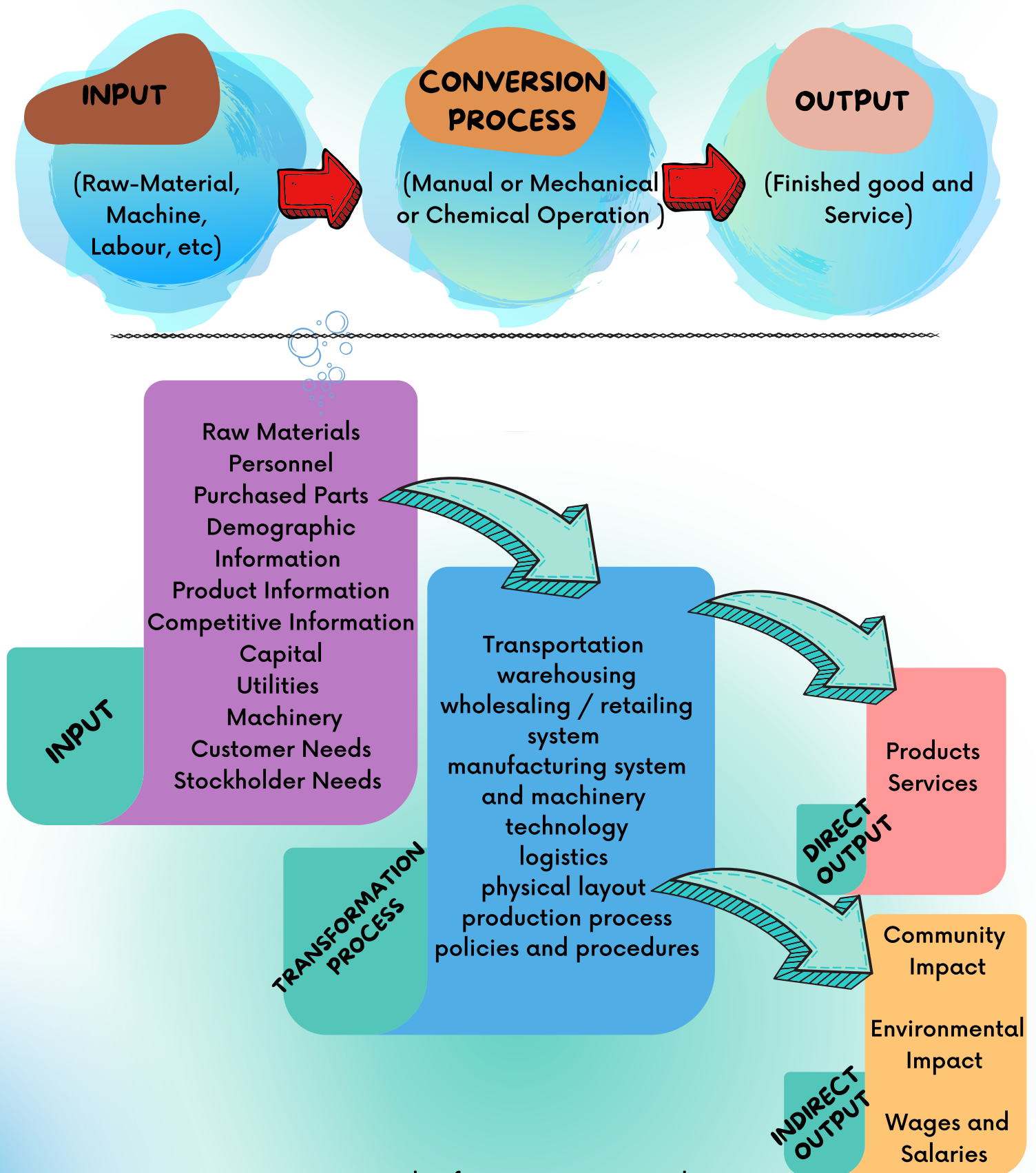


Figure 8 : Example of Components in Production system

MODEL OF PRODUCTION SYSTEM

Many activities and operations are required to transition inputs to outputs throughout the transformation process. Examples of activities and operations involved include inspection and control, mechanical, material handling, chemical and others. . Two types of production systems exist:

- a) Manufacturing facilities
- b) Manufacturing assistance/support systems

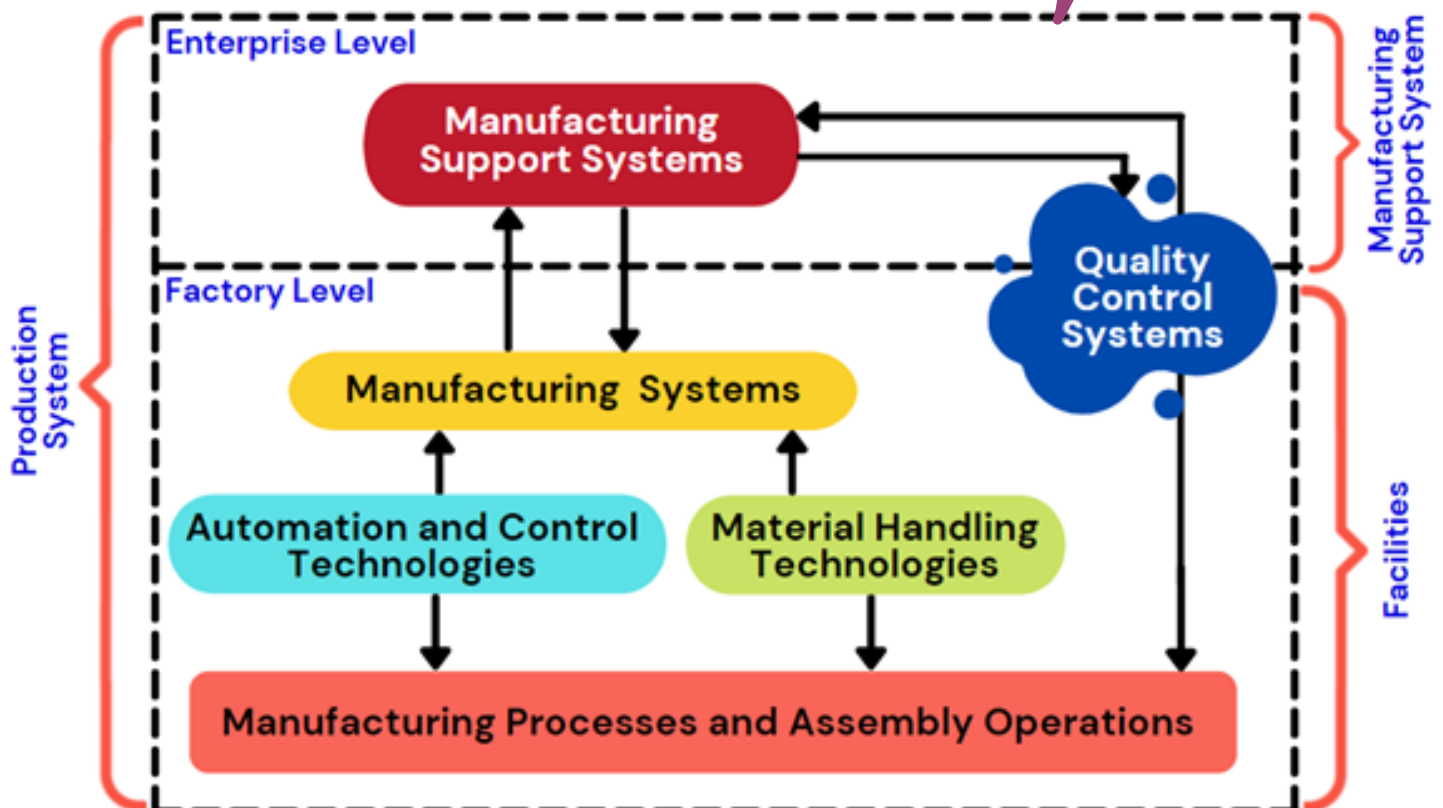


Figure 9 : Categories of Production System

MANUFACTURING FACILITIES

Examples of production system facilities are such as well -organized factories and equipment, material handling systems, layouts and so on.



MANUFACTURING SUPPORT SYSTEM

The set of procedures used by a company to manage production and solve technical and logistical problems is a reference to the manufacturing support system. For example, ordering materials and supplies, transferring work in the factory, and inspection and testing to ensure products meet quality standards.



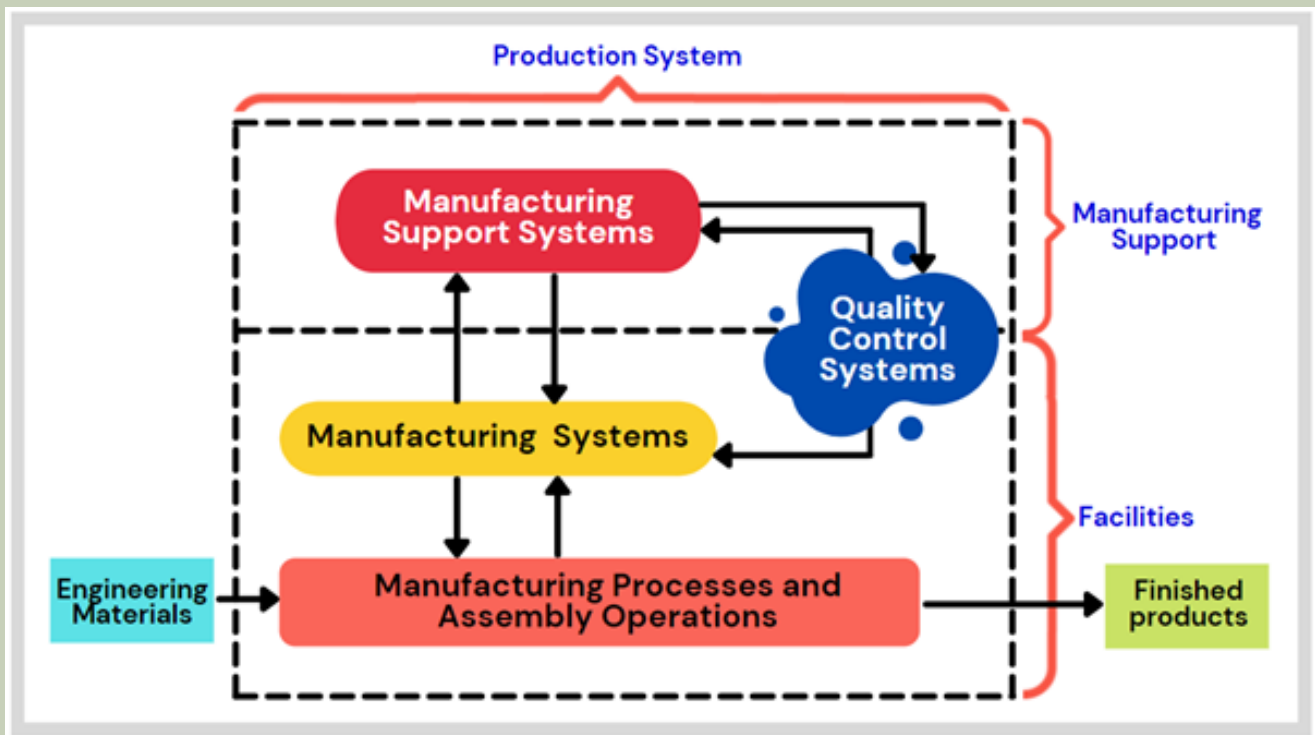
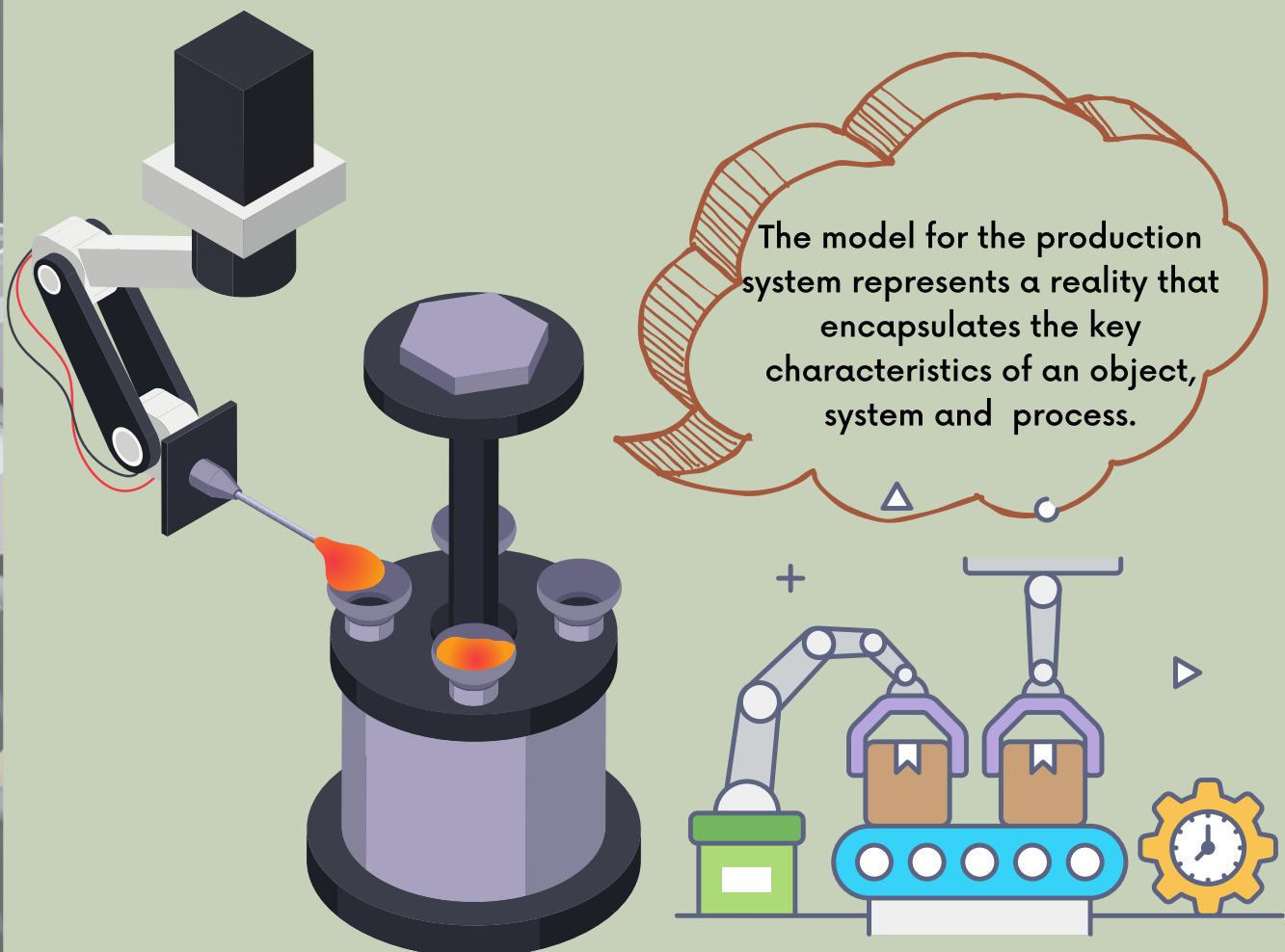
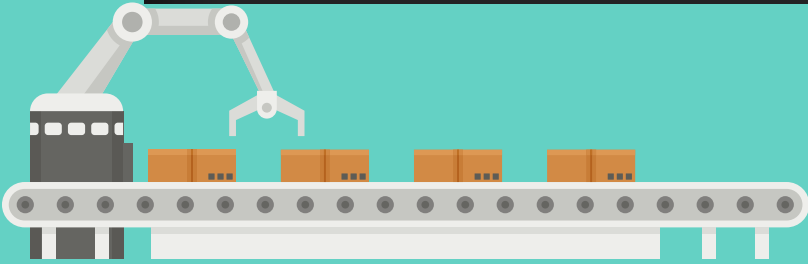


Figure 10 : Position manufacturing system in larger production



TYPE OF MANUFACTURING SYSTEM



1 Assembly Line



2 Batch Production

3 Computer Integrated Manufacturing



ASSEMBLY LINE

- A manufacturing process is a production line (also known as a progressive assembly) in which pieces (typically interchangeable components) are also placed as semi-finished guides on the way from one workstation to another workstation area in which the components have been provided successively till the complete assembly is developed. Process technology that's also ideal for mass production of such a limited number of standardised items.

- Consecutive units of output are subjected to the same series of operations, which are typically performed on specialised equipment located along a production line.

- The made in the following is fixed here. For example, television set assembly, automobile assembly, computer keyboard assembly, and cold drinks manufacturing. etc.

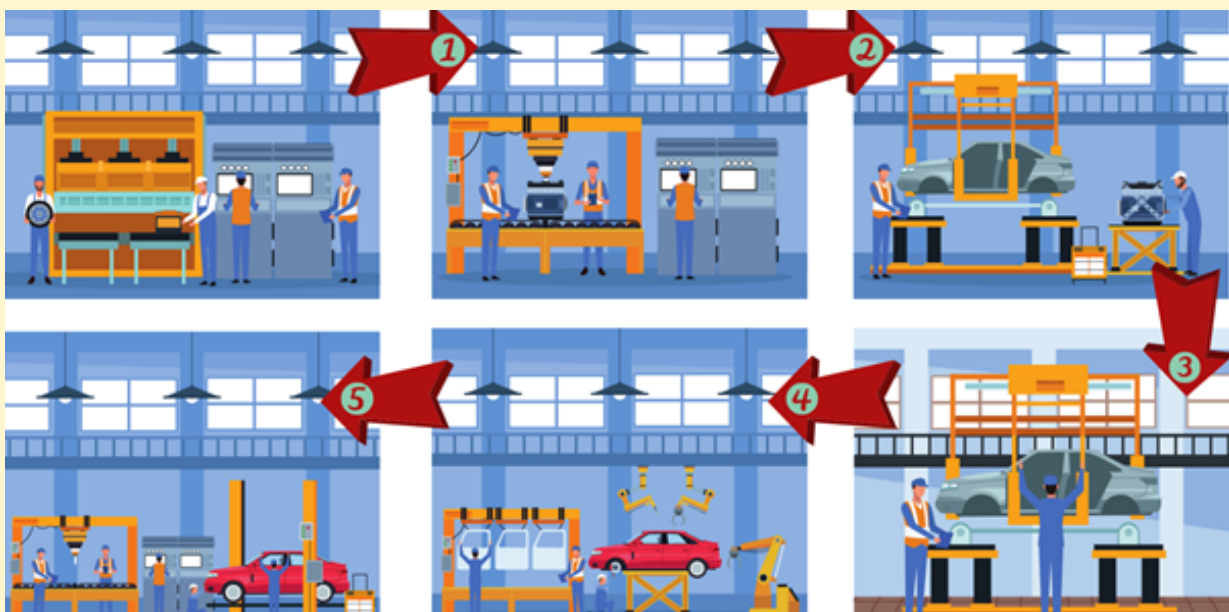
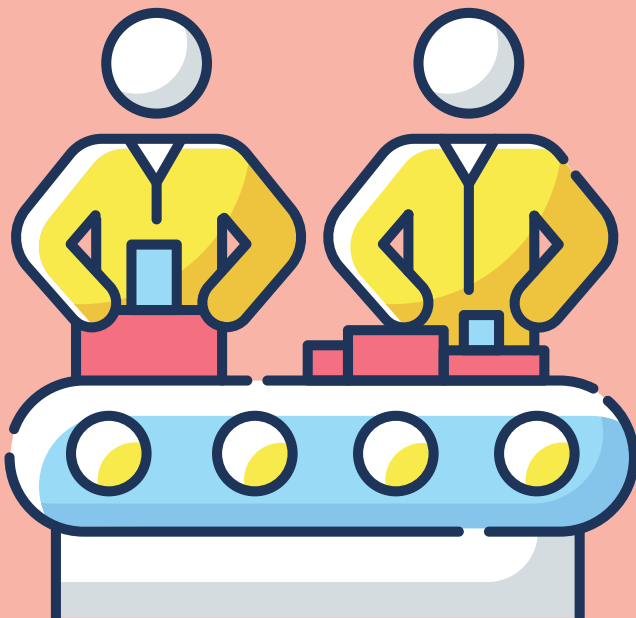


Figure 11 : Example of Assembly line

ADVANTAGES & DISADVANTAGES ASSEMBLY LINE

ADVANTAGES

1. Economies of scale can be achieved as cost per unit will be low
2. Automated assembly lines save time and money
3. Quality systems can be built into the production at each stage



DISADVANTAGES

1. Standardized product produced
2. High initial set-up costs of automated assembly lines
3. Workers find work repetitive and boring



BATCH PRODUCTION

Batch production is a manufacturing approach in which the thing in question is generated stage by stage across a sequence of workstations and batches of products. Process technique that is suited for a diverse array of products in varying quantities.

- In this situation, a limited product variability is fixed for a small collection of items.
- Several items in the facility are requested regularly and in big volume, for example, in a pharmacy or bakery.
- When there is a large variety of products in a wide variety of volumes, this type of manufacturing system should be implemented.

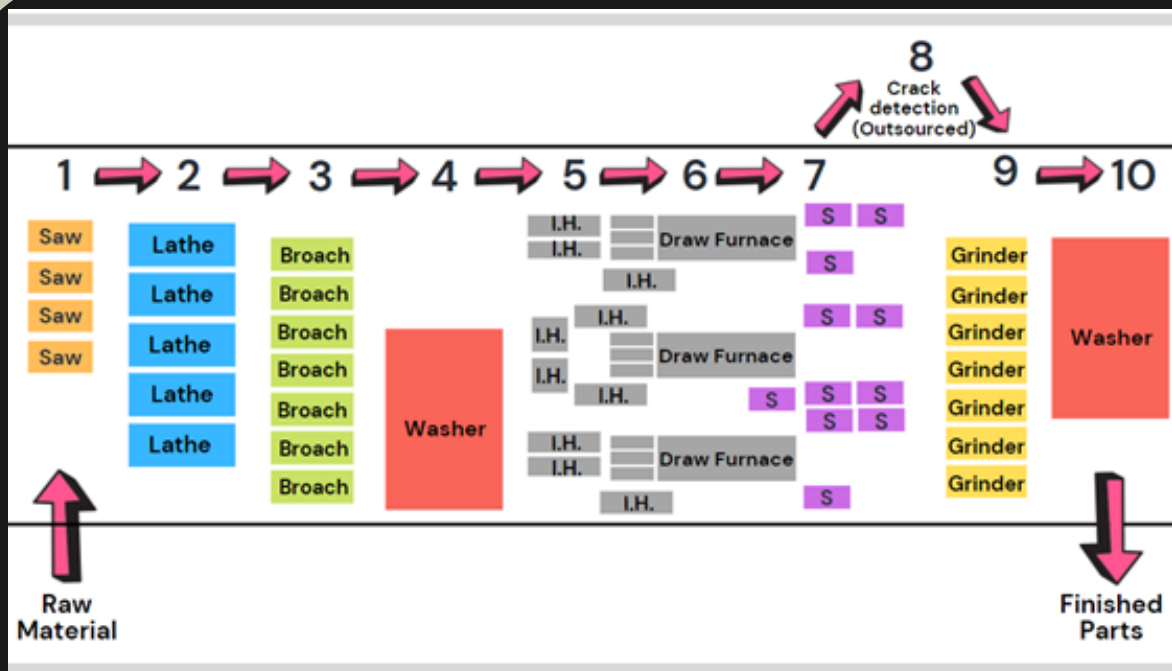
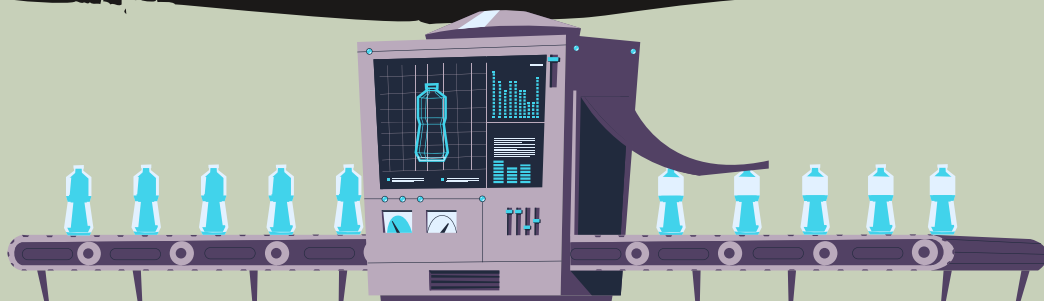


Figure 12 : Example of Batch production on manufacturing system



In medium-sized firms, the batch manufacturing system is often employed. Batch production is a stage between mass production and job-shop production. This approach produces two or more types of things in lots or batches at regular intervals, thus the phrase "batch production system." It has the following features:

1

When the rest interval expires, batch production transforms into flow production.

2

The batch production is more extensive than job shop but less comprehensive than mass- production.

3

Robots can be used to automate material handling, as in CNC machining centres, This technique produces medium-sized quantities (5 to 50) of the same things.

4

Lot may be created once in a time or on a recurring basis to suit ongoing consumer requests.

5

Capacity of the plant is frequently more than needs.



ADVANTAGES & DISADVANTAGES BATCH PRODUCTION

ADVANTAGES

1

Allows flexible production

2

Inventories of part-finished goods can be stored and completed later

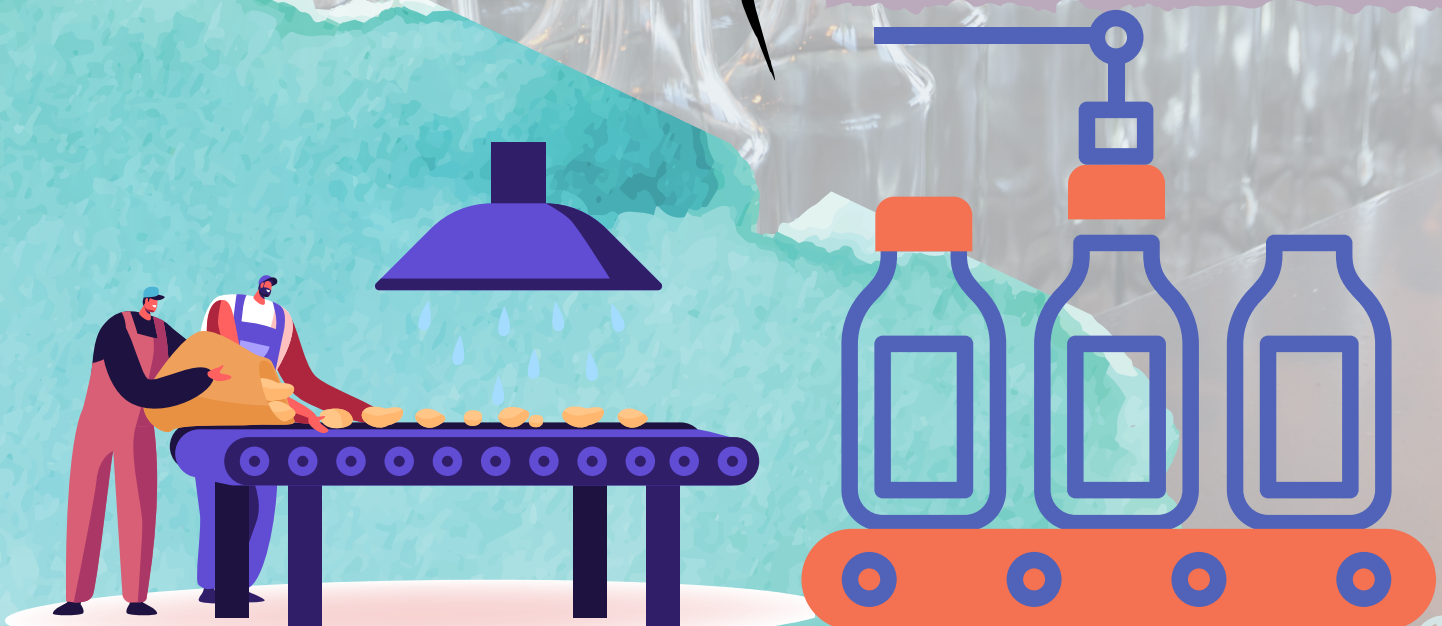
DISADVANTAGES

1

Making many small batches can be expensive

2

If production runs are different there may be additional costs and delays in preparing equipment



COMPUTER INTEGRATED MANUFACTURING

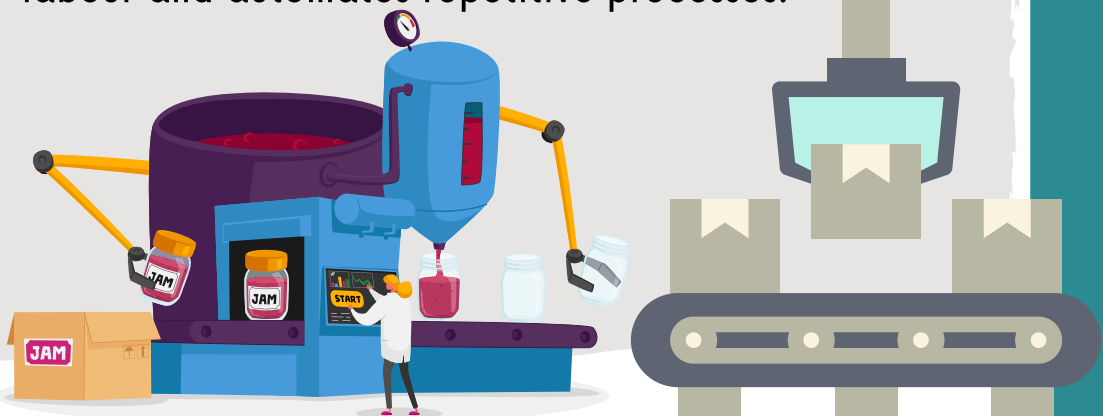
CIM, or computer integrated system, is a manufacturing method that controls, using a computer, the whole process of manufacturing. This connection enables individual processes to share information and begin actions with one another.

Because of computer integration, production can be faster and have fewer failures, but the largest benefit is the ability to build automated manufacturing processes.

Closed-loop control methods based on real-time sensor data are frequently used in CIM. This is also known as manufacturing and flexibility design

The use of computer-controlled machinery and automation systems in the manufacture of commodities is referred to as CIM.

CIM is a technology that integrates several technologies, such as computer-aided manufacturing (CAM) and computer-aided design (CAD) to create an error-free production process that removes human labour and automates repetitive processes.



CONCEPT COMPUTER INTEGRATED MANUFACTURING

A concept CIM refers to both a manufacturing process as well as the term for a computer-automated system that organizes a manufacturing firm's diverse marketing, production, support operations, and engineering. Computer-connected relevant aspects like planning, designing, analyzing, purchasing, accounting systems, distribution, and stock management are connected with production line duties like management and materials handling and management in a CIM system, offering monitoring and control, including all processes

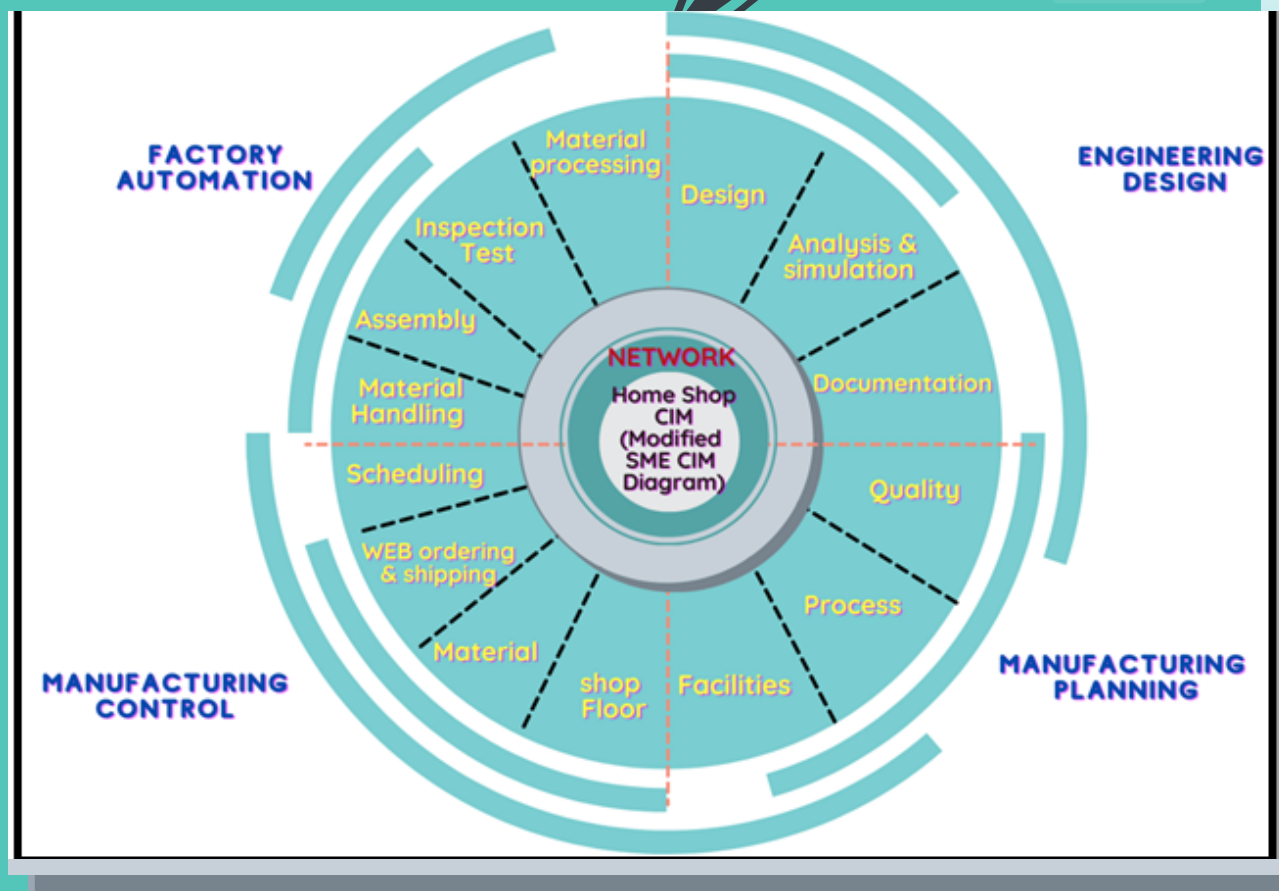


Figure 13 : CIM system

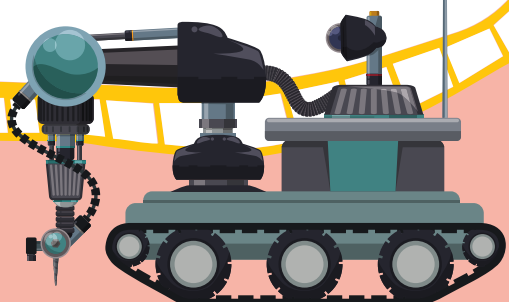
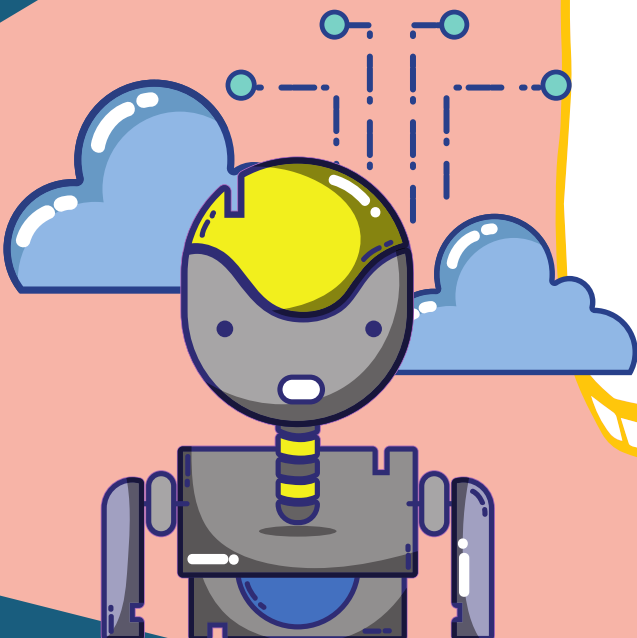
A Computer Manufacturing integrated system is divided into the following fundamental components:

- 1 Material Handling System
- 2 Computer Control System
- 3 Equipment/Machine Tool
- 4 Labour/ human resources



In a production system, CIM that consists of:

- 1 A collection of NC machines linked together by
- 2 A material handling system that is computer controlled
- 3 Computer Control Operating



BENEFIT COMPUTER INTEGRATED MANUFACTURING

Benefit from CIM Integration of technologies

Faster
responses to
data—changes
for
manufacturing
flexibility

Improved
quality of the
products.

Reduction of
lead times
which
generates a
competitive
advantage.

Control of data—
flow among
various units
and maintenance
of user—library
for system—wide
data

Creation of a
truly interactive
system that
enables
manufacturing
functions to
communicate
easily with other
relevant
functional units

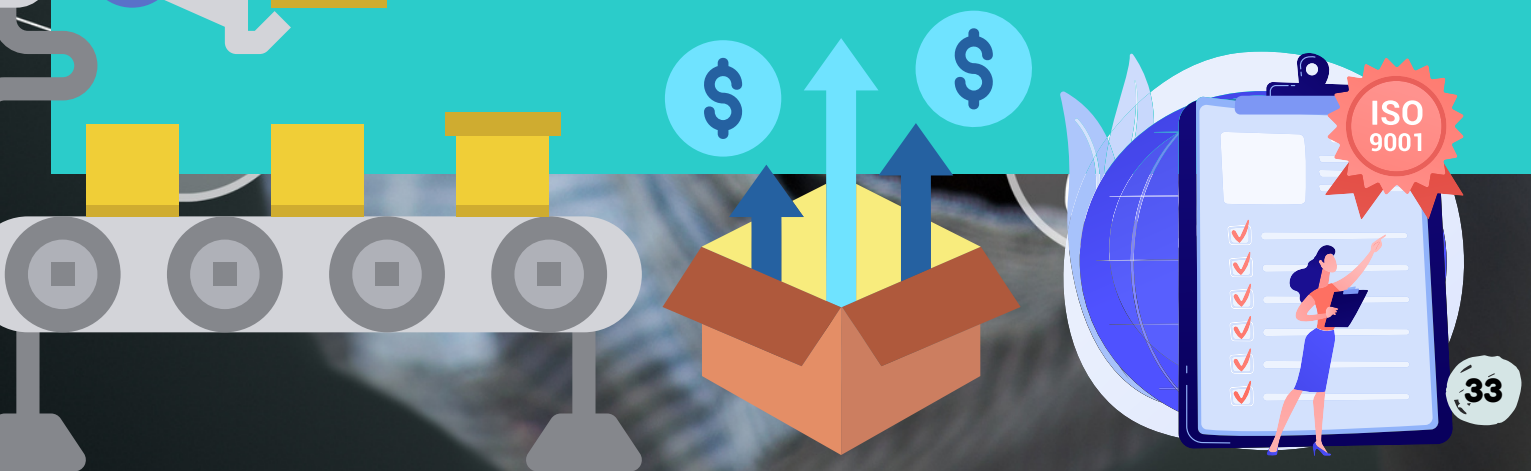
Accurate data
transferability
among
manufacturing
plant or
subcontracting
facilities at
implant or
diverse
locations

Increased
flexibility
towards
introduction of
new product

Improved accuracy
and quality in the
manufacturing
process

Easier training
and re—training
facilities

Figure 14 : Benefits CIM integration of Technology



EXERCISE :

1. Define the term below :
 - a) Manufacturing
 - b) System
 - c) Manufacturing system
2. Differentiate between Batch Production and Computerized-Integrated System.
3. Identify and Describe THREE (3) important of manufacturing
4. The manufacturing system is where the value added work on the part or product is completed. Explain the position of manufacturing system in the larger production system with suitable diagram.
5. Explain THREE (3) types of manufacturing system
6. The term manufacturing system refers to a collection or arrangement operations and process used to make a desired product or component. Explain the flow of manufacturing system with a suitable diagram.



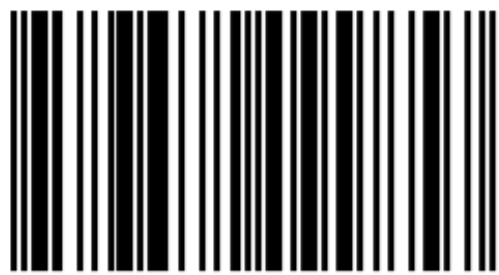
REFERENCES

1. Aswathappa, K., 2010. Production and Operations management- Manufacturing and Service operations, Himalaya publishing House.
2. Barnes, D. (2018). Operations Management: Macmillan International Higher Education.
3. Brown, S., Bessant, J., & Jia, F. (2018). Strategic operations management: Routledge.
4. Krajewski, L. J., Ritzman, L. P., & Malhotra, M. K. (2010). Operations management: Processes and supply chains: Pearson New Jersey.
5. Kumar, S. A., & Suresh, N. (2006). Production and operations management: New Age International.
6. Kumar, S. A., & Suresh, N. (2009). Operations management: New Age International.
7. Mowad, M. A. E.-L., Fathy, A., & Hafez, A. (2014). Smart home automated control system using android application and microcontroller. International Journal of Scientific & Engineering Research, 5(5), 935-939.
8. Russell, R. S., & Taylor, B. W. (2019). Operations and supply chain management: John Wiley & Sons.
9. Slack, N., & Brandon-Jones, A. (2019). Operations Management Ninth Edition. Operations Management Ninth Edition
10. Stevenson, W. J., Hojati, M., & Cao, J. (2014). Operations management: McGraw-Hill Education.





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