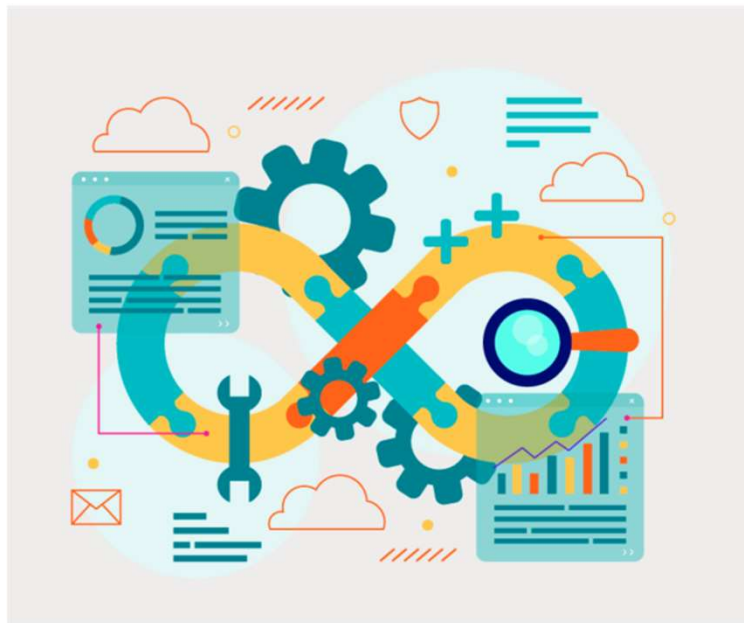




Business Management BMA 204

Erandi Thennakoon

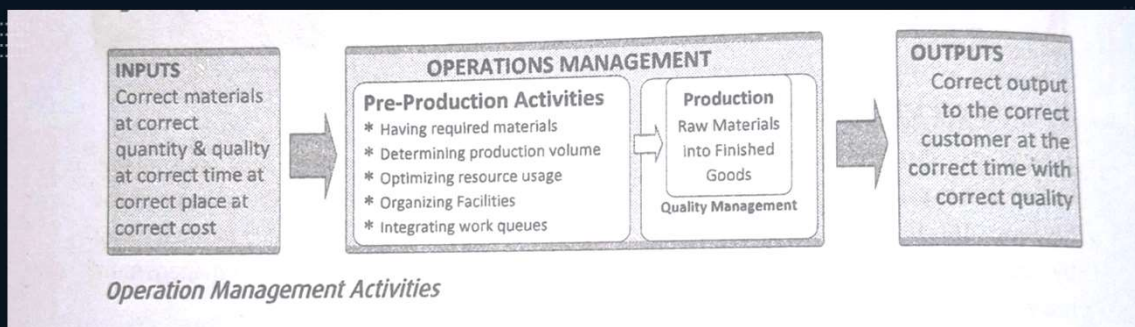
CHAPTER 03 OPERATIONS MANAGEMENT



Introduction to Operations Management

- Operations management is a critical function in any business, encompassing the processes that transform inputs into outputs
- Operations referred to as the "heart" of the business, operations management goes beyond mere production.
- While production specifically involves the creation of finished goods from raw materials, operations management includes a broader scope of activities that ensure overall efficiency and alignment with market demands.
- At its core, **operations management aims to enhance efficiency in primary activities by:**
 - Managing production facilities to be more efficient in a business
 - Maintaining the correct suppliers to maintain a continuous business process.
 - Managing the production cost in order to maintain the profitability
 - Managing the internal capabilities (labour, production know-how, production facilities such as machinery and factory, etc.)
 - Supporting the ultimate objective of the business to be stable in the market through coordinating the core processes.

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Key Functions of Operations Management

- Operations management oversees production activities to ensure they meet business goals.
- It involves converting inputs (raw materials and services) into outputs (finished goods) through a systematic approach.
- While it focuses on production, operations management also encompasses broader activities beyond just products.

Operations Management Activities

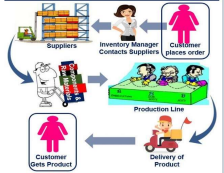
1. **Supply Chain Management:** This involves managing supplier relationships to ensure necessary materials are available in the warehouse. If materials are lacking, issues must be addressed with suppliers.
2. **Forecasting Demand:** Production volumes should align with market demand to avoid excess inventory, as produced goods often have limited durability.
3. **Capacity Planning:** Optimal use of production facilities is essential to maintain profitability, given their limited availability.
4. **Layout Designing:** The organization of the production plant should facilitate efficient use of facilities, aligned with the production schedule.
5. **Production Scheduling:** Activities must be sequenced to prevent production overlaps and ensure timely completion.
6. **Quality Management:** Quality must be monitored throughout the production process, not just at the end, to ensure that products meet required standards.

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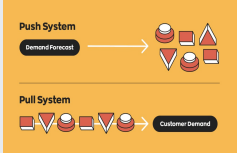
Key Production Methods

Method	Explanation
Job production 	• In this production method, goods are made specifically for individual customer orders, meaning no finished products are kept in stock. • Customers prefer customized items, so production begins only after an order is confirmed. • To reduce wait times, necessary raw materials may be stocked in advance. • This approach is ideal for industries such as carpentry, construction, and catering, where customization is key.
Batch Production 	• Batch production involves manufacturing fixed quantities of products at a time, with production machinery organized to handle a specific capacity. • If production is below this capacity, costs may increase, or machinery may be underutilized. • While items in each batch can have limited customization (e.g., design or color), they are generally similar. • Finished goods are stocked until they can be sold, making this method suitable for durable goods like plastic furniture.

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Mass Production 	- Mass production focuses on producing large quantities of standardized products, often using assembly lines or automation. - This method aims for efficient production of similar items in bulk, making it ideal for products frequently traded in large volumes, such as vehicle tires.
Just in Time Production 	- Just in Time (JIT) production emphasizes manufacturing based on current market demand, eliminating the need for inventory storage. - By avoiding overproduction and excess inventory, JIT minimizes waste. - Unlike traditional job production, JIT is a modern approach that utilizes advanced technology and is commonly adopted by franchise chains like Pizza Hut and Burger King, which prepare food only after receiving customer orders.
Lean Production 	- Lean production, originating from Japanese philosophy, focuses on maximizing customer value while minimizing resource usage. - This approach encourages businesses to listen to customer needs and streamline internal processes by reducing unnecessary inventory and waste. - By emphasizing cost-effective, valuable products, lean manufacturing helps companies maintain a competitive market presence.

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Method	Explanation
Push and Pull Production Methods 	- Push production involves manufacturing products first and then trying to sell them, which can lead to excess inventory and lower sales prices due to oversupply. - In contrast, pull production is demand-driven; products are made only after market demand is established. - This method reduces the need for finished goods inventory, lowers costs associated with unsold products, and allows businesses to respond quickly to customer demand, resulting in a more market-responsive operation.

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Role of Operations Management for Business Success

Role of the function	Explanation
Make what customers want	- The customers in the market really seek the products, not the business. - They deal with the business in the market only for the reason they have the product. - The product which is created at the operations process makes the business live in the market.
Make the brand for business	- The leading business names are well known not because of who they are, but what they make. - The business is introducing products know to the world. - The reputation or the blame is the performance of the operations.
Utilize the resources and competencies for competitive advantage.	- The secret of success of business is creating competitive advantage In the market. - The competitive advantage is the function of unique resources and core competencies utilized in the operations. - The operations management needs to perform as the heart of the business which pumps the energy to all other units and divisions in order to keep the business active.

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Role of the function	Explanation
Create the basis for profitability	Production cost management is enabled in the operations management by managing the supply chain and internal activities to keep a gap between the targeted revenue and the production cost.
Create the basis for market leadership	- Maintaining a higher market share is the competition among firms. - But the customers seek the better value via the offerings of the businesses. - The relative performance of the operations management is the life blood which determined whether firm is a leader in the market or not.

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Operations Management in the Service Sector

Features	Goods	Services
Tangibility	Can be seen with eyes and stored for consumption later. Have physical substance and identified with shape, colour, size, etc.	Cannot be seen with eyes or stored for consumption later. Do not have a physical substance such as shape, colour, etc.
Process of generating	Raw materials converted into finished goods and the production machinery and process can be seen Process takes place in factory	The skills, knowledge and competencies used to provide appropriate services Conversion process is mostly invisible and involves with a cognitive process
Separability	Can be extracted from the manufacturer and sold in the market by intermediaries	Cannot be extracted from the manufacturer and sold in the market by intermediaries, only direct sales is possible
Nature of output	Products are homogeneous when produced in the same time or same batch, as the same inputs are processed in the same process using the same material and other mix and technology	Service rendered to various customers even in the same period may be different based on case by case, determined by the level of understanding, communication process and the customer convenience.

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Challenges of Operations Management in the Service Industry

- **Difficulties in Forecasting Demand:** Accurately predicting sales in quantitative terms is challenging, which affects the level of service provided.
- **Difficulties in Determining Costs:** Since many resources are intellectual and intangible, it's hard to calculate costs precisely, especially when service times and competencies vary.
- **Difficulties in Understanding Customer Requirements:** Customers have diverse expectations for services, making it difficult for operations managers to fully grasp their needs.
- **Difficulties in Adjusting Facilities:** Limited facilities can hinder a business's ability to accommodate customer preferences regarding time, location, and other factors.
- **Difficulties in Communication:** Language barriers and specific terminologies can complicate effective communication, which is crucial in service delivery.

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Strategies for enhancing operations management in the service industry

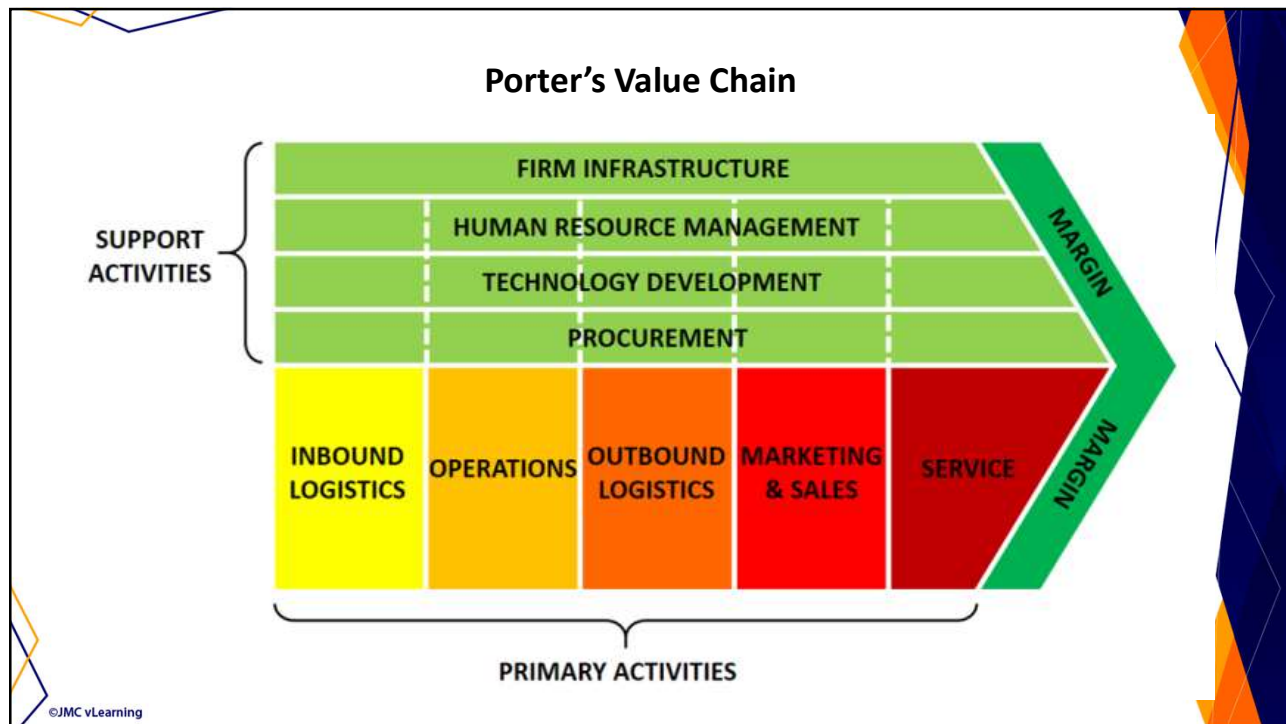
- **Integration of Marketing and Operations:** Marketing activities are closely tied to service delivery, requiring operations management to actively engage with customers during the service process.
- **Inclusion of Customer Service:** In the service sector, customer service is integral to operations, not just a post-sale activity, necessitating a focus on managing customer relationships throughout the service delivery.
- **Minimization of Warehousing and Supply Chain Activities:** With a reliance on intellectual resources, the service industry typically requires less emphasis on warehousing, allowing operations management to concentrate on service delivery.
- **Outward Focus:** Operations management must integrate market research and customer support, focusing on external market factors to align services with customer needs.
- **Integration of Skill Base:** Service industry staff need strong communication and relationship management skills, in addition to operational expertise, to effectively interact with customers.

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Porter's Value Chain

- In operations management, it's essential to consider all business activities, as they directly or indirectly impact operations and value creation.
- Porter's Value Chain concept highlights a sequence of activities that add value to products or services from the end user's perspective.
- This framework allows firms to analyze specific activities to identify opportunities for competitive advantage.
- Michael Porter identified a set of interrelated generic activities that are common across various industries, making the value chain a powerful tool for modeling and optimizing operations.

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Primary activities

To create value that exceeds the cost of providing the product service, thus generating a profit margin.

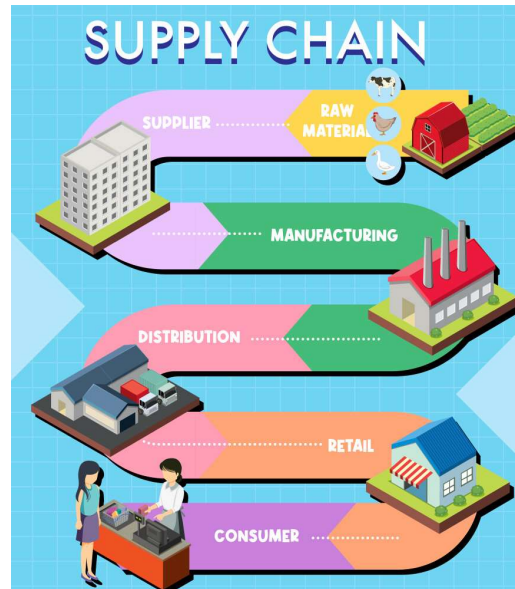
- Inbound logistics - Receiving, warehousing and inventory control of input materials
- Operations - Value creating activities that transform the inputs into the final product
- Outbound logistic – Activities to get the finished product to the customer Ex: warehousing, order fulfillment
- Marketing & sales - Activities associated with getting buyers to purchase the product. Ex: channel selection, advertising, pricing, etc
- Service – To maintain and enhance the products value. Ex: Customer support, repair service, etc.

Support activities

The primary value chain activities are facilitated by support activities.

- Procurement - The function of purchasing the raw materials and other inputs used in the value-creating activities
- Technology development-It includes research and development, process automation and other technology development used to support the value chain activities
- Human resource management-The activities associated with recruiting, development and compensation of employees
- Firm infrastructure - It includes activities such as finance, legal, quality management, etc.

Supply Chain Management



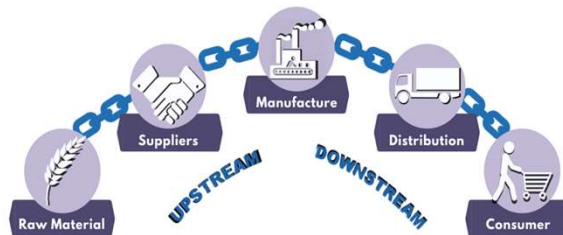
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Introduction to Supply Chain Management

- Supply Chain Management (SCM) encompasses the entire process of activities and elements involved in delivering products from suppliers to customers.
- It includes all the steps a product goes through, from sourcing raw materials to reaching the end user.
- Each component of the supply chain plays a crucial role in the overall success of a business, ensuring efficiency, quality, and customer satisfaction.
- Effective SCM is essential for optimizing operations and enhancing competitive advantage.



Two major portions of supply chain



- **Supplier side (called upstream activities)**

The portion of the whole supply chain between the supplier and the business where the business procures the raw materials and services from the suppliers.

- **Customer side (downstream activities)**

The portion of the supply chain between the business and its customer where the business sells its finished goods and services to the customers.

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Key elements of a supply chain



Integration

The supply chain is a network of interconnected elements that must work together seamlessly. Effective integration ensures that all necessary components are aligned and communicate continuously to achieve business goals.

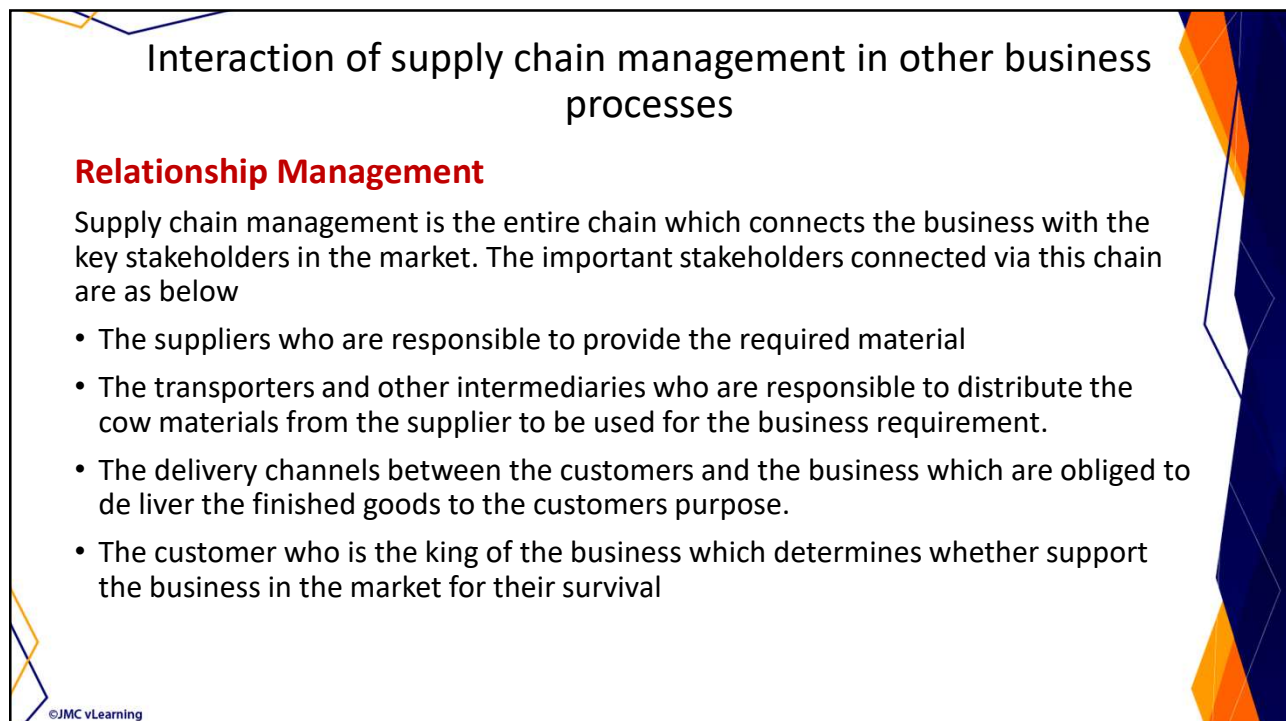
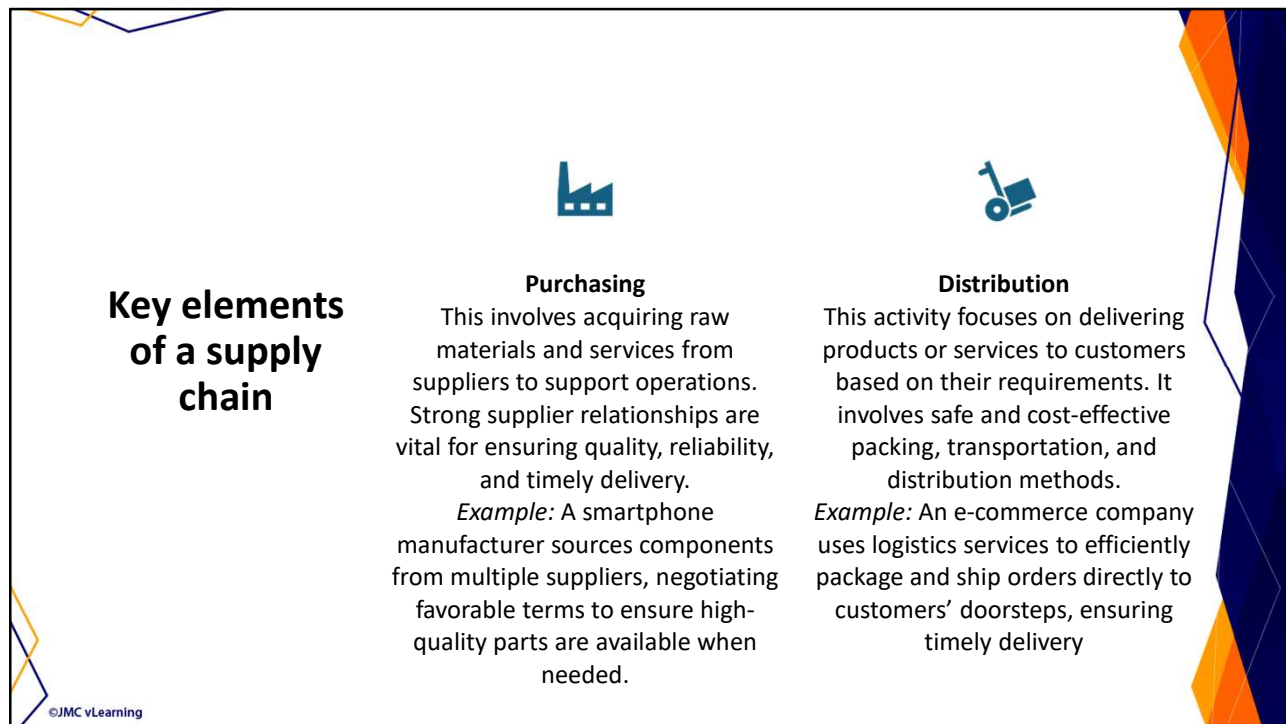
Example: A car manufacturer coordinates between suppliers, production teams, and distributors to ensure timely delivery of parts and vehicles.



Operations

This refers to the processes that create outputs to meet customer needs. In manufacturing, this is known as production, while in services, it's the rendering of services.

Example: A bakery produces fresh bread daily to satisfy customer demand, focusing on quality and timely delivery.



Interaction of supply chain management in other business processes

Functional Interactions

- **Procurement**

The supply chain ensures that the right materials are sourced from appropriate suppliers at the correct time, quantity, quality, and cost.

Example: A clothing manufacturer works closely with fabric suppliers to obtain high-quality materials at competitive prices to meet production schedules.

- **Inbound Logistics**

After procurement, materials must be stored and distributed internally until needed. Effective management of inventory holding costs, quality, and minimizing wastage is crucial.

Example: A restaurant stocks ingredients in a controlled environment, ensuring fresh produce is available when required for meal preparation.

- **Outbound Logistics**

Finished goods are stored and then dispatched to customers based on confirmed orders. This process involves ensuring the right products are delivered safely and efficiently.

Example: An online retailer organizes its warehouse to quickly pick and pack orders, ensuring timely delivery to customers using reliable shipping services.

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Functional Interactions

- **Production Functions:**

This area focuses on producing outputs that meet market demand in the right quantities and quality standards. Proper management ensures customer needs are addressed effectively.

Example: An electronics manufacturer adjusts production schedules based on demand forecasts, ensuring they produce enough smartphones to meet market needs without overstocking.

- **Marketing Channels:**

This involves the distribution channels used to transport goods to customers, balancing cost, safety, distance, and customer preferences.

Example: A furniture store chooses a delivery service that minimizes transportation costs while ensuring safe and timely delivery to customers' homes.

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Strategies to manage the supply chain

Strategy	Explanation
Demand recognition	Adopt a demand-driven planning and business operating model based on real-time demand insights and demand shaping. Example: A retail company uses real-time sales data and social media trends to adjust its inventory. By analyzing purchasing patterns and customer engagement, they can quickly shift production focus to high-demand items, such as seasonal clothing, ensuring they meet customer needs promptly.
Total Cost of Ownership	Focus on total cost of ownership (TCO) not price. Supply chain costing should not only consider about the selling price but the value it can bring to various stakeholders. Example: A manufacturing firm evaluates a new supplier not just on the price of raw materials but also on the total cost of ownership. They consider factors like delivery reliability, quality control, and after-sales service, ultimately selecting a slightly higher-priced supplier that offers better quality and reliability, reducing overall costs and risks over time.

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Understand the value and risks of technology	The supply chain should recognize the importance of Technology and the most appropriate use of it. Also, it needs to be mindful that technology brings risks as well as benefits. A better understanding of both sides is an essential requirement to be successful. Example: A logistics company implements an advanced tracking system using IoT devices. While this technology improves shipment visibility and reduces delays, they also assess the cybersecurity risks associated with data breaches. By investing in robust security measures, they balance the benefits of enhanced tracking with the need for risk management.
Optimize product designs and product management	Optimize product designs and product management for supply, manufacturing, and sustainability to accelerate profitable innovation. The design and contents of the product should be acceptable not only to the customer but also for the other stakeholders as well. Example: An automotive manufacturer redesigns its vehicles to be more fuel-efficient and environmentally friendly, responding to consumer demand and regulatory pressures. They collaborate with suppliers early in the design process to ensure that the materials used are sustainable and cost-effective, aligning with both customer expectations and stakeholder values.

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Integrate supply chain with business goals.

Align your supply chain with business goals by integrating sales and operations planning with corporate business planning. Supply chain activity should not be an isolated process. But it's a made connecting factor which integrates the entire business functions.

Example: A food and beverage company integrates its supply chain strategy with its corporate sustainability goals. They align sales and operations planning by ensuring that production schedules reflect not only sales forecasts but also sustainability targets, such as reducing carbon footprints. This alignment fosters collaboration between departments, enhancing overall efficiency and accountability.

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Forecasting Demand

- Demand, in economic terms, represents the quantity of a product that customers are willing and able to purchase.
- Businesses base their production decisions on this market demand to effectively capitalize on opportunities and avoid imbalances of excess demand or surplus supply.
- **Forecasting demand** is the process of estimating future market demand for specific goods and supplies, providing a critical foundation for making informed production decisions regarding the appropriate outputs and volumes.
- Accurate demand forecasting enables businesses to align their operations with customer needs and optimize resource utilization.



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Key Factors Influencing Accurate Market Demand Prediction

- **Past Experiences**
Historical sales data can help predict future demand patterns.
Example: A toy company analyzes past holiday sales to forecast demand for the upcoming season.
- **Government Legislation and Regulations**
New laws can impact consumer behavior and demand for certain products.
Example: Increased taxes on sugary drinks may lead to a decline in soda sales.
- **Changes in Customer Priorities and Tastes**
Shifts in consumer preferences can alter demand significantly.
Example: Growing health consciousness may increase demand for organic food products.
- **Introduction of Substitute Products**
The availability of alternatives can affect demand for existing products.
Example: The rise of electric scooters may reduce demand for traditional bicycles.
- **Changes in Fashion and Technology**
Trends can rapidly influence consumer choices and demand.
Example: The popularity of smartwatches has increased demand for wearable technology.
- **Market Expectations**
Consumer expectations about future prices or product availability can drive demand.
Example: Anticipation of a price increase may lead consumers to buy a product sooner than planned.

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Importance of Demand Forecasting

- **Enhancing the process efficiency** - It allows businesses to more efficiently optimize inventory, increasing inventory turnover rates and reducing holding costs.
- **Better planning** - It provides an insight into upcoming cash flow. Businesses can more accurately budget to pay suppliers and other operational costs, and invest in the growth of the business
- **Resource Management** - Anticipating demand means when we have to increase staff and other resources to keep operations running smoothly during peak periods.
- **Market knowledge** - Market knowledge is considered as one of the key factors behind the competitive advantage. A business that has an accurate prediction of the market demand can optimize the opportunities in the market.

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Types of Forecasting

Based on Economy

- **Macro-level forecasting:** It deals with the general economic environment relating to the economy as measured by the index of Industrial Production(IIP), national income and general level of employment, etc.
- **Industry level forecasting:** Industry level forecasting deals with the demand for the Industry's products.
- **Firm-level forecasting:** It means forecasting the demand for a firm's product.

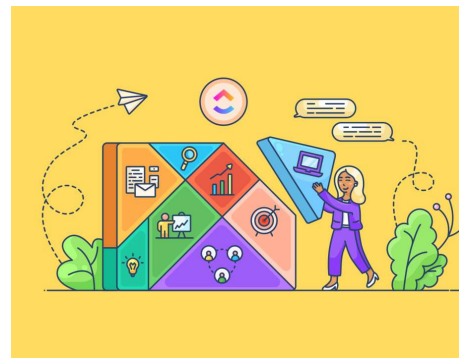
Based on the Time Period

- **Short-term forecasting:** It covers a short period of time, depending upon the nature of the industry. It is done generally for six months or less than one year
- **Long-term forecasting casting:** Long-term forecasts are for a longer period that is two to five years or more. It gives Information for major strategic decisions of the firm.

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Capacity planning

- Capacity planning is essential for managing production activities, which are often subject to constraints such as bottlenecks and limiting factors.
- Given the limited supply of resources and skills, it's crucial to forecast requirements and ensure availability when needed.
- Effective capacity planning helps avoid the disadvantages of undercapacity and overcapacity.
 - **Overcapacity** means resources available for production are not fully utilized.
 - **Under capacity** means more production is being demanded than produced



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Capacity Planning Methods

Capacity leads demand model

It can provide capacity ahead of the forecast so that it is ready to respond immediately.

Example: A hotel expands its facilities in anticipation of a large upcoming event, ensuring enough rooms are available for guests.

Capacity matches demand model

Matching is a strategy that involve monitoring the market for demand increases and decreases on a regular basis.

Example: A clothing retailer tracks sales trends and adjusts inventory levels to align with seasonal demand fluctuations, ensuring they have enough stock without overproducing.

Capacity lags demand strategy model

It can wait to see what demand is and then respond after it is confirmed.

Example: A new restaurant operates at a smaller scale initially and only expands its seating and staff after experiencing consistent customer traffic and confirmed demand.

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Benefits of Capacity Management

Budgeting

Capacity planning outlines the labour and other resource requirements needed for the planned operation.

Scalability

It is the process of planning for the level of activities, and an extension if needed.

Growth

Capacity planning also plans for the growth of the business based on the future projections in order to utilize the market opportunities.

Dynamic Change

The process of capacity planning collects a significant amount of data on how the company currently operates and the change needed in order to survive long.

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Results of Inappropriate Capacity Management

Acquiring equipment before the plan is ready and hence overused equipment is likely to break down

Staff may suffer from low morale since they are not guided with a proper plan. This will lead to job stress or laziness, employee turnover

The quality of operations may drop

Reworks and rejects in manufacturing new products to meet a customers' expectation will cost high.

Expectations (quality, time, price, etc.) could damage the reputation and cause to lose not only current customers, but potential new customers

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Capacity Management Strategies

1. Fixed Level Capacity

This strategy maintains **a constant production capacity regardless of demand fluctuations**. When demand is high, the business operates at the same level and may sell out, while during low demand, it produces and stockpiles inventory.

Example: A bakery might produce 100 loaves of bread daily, regardless of whether it's a busy holiday season or a slow weekday. During high demand, they may sell out quickly, but when demand drops, they'll have unsold stock.

2. Chase Demand

This model involves **adjusting production capacity to match demand**. When demand spikes, the business increases production (e.g., adding shifts), and when demand dips, it reduces output, which may lead to idle resources.

Example: A toy manufacturer may increase production during the holiday season by adding extra shifts to meet demand. Conversely, after the holidays, they might cut back on production and have some workers temporarily laid off or work fewer hours until demand picks up again.

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Capacity Management Strategies

3. Demand Management

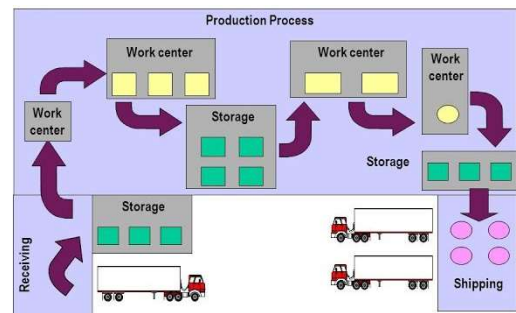
In this approach, the business **actively seeks to influence market demand through promotions and special offers during off-peak periods**, ensuring that production capacity is utilized more effectively.

Example: A hotel might offer discounted rates or special packages during the off-peak season to attract guests. This way, they can fill rooms and maintain steady revenue, rather than having a high number of empty rooms.

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Facility Layout Designing

- Facility layout refers to the strategic arrangement of various elements within a manufacturing environment to optimize production outcomes.
- Key considerations include available space, the final product, user safety, and operational convenience.
- An effective layout promotes a smooth flow of materials, equipment, and personnel, minimizing costs while maximizing efficiency.
- The primary goal of facility layout planning is to enhance workflow, thereby increasing the productivity of both equipment and workers.



Benefits of better facility layout design

To promote order in production towards a single objective

To reduce movement of workers, raw material and equipment

To promote safety of plant as well as its workers

To facilitate extension or change in the layout to accommodate new product line or technology upgradation

To Increase production capacity of the organization

Requirements for a better layout function

An organization can achieve the above-mentioned objective by ensuring the following:

Better training of the workers and supervisors.

Creating awareness about health hazard and safety standards

Optimum utilization of workforce and equipment

Encouraging empowerment and reducing administrative and other indirect work

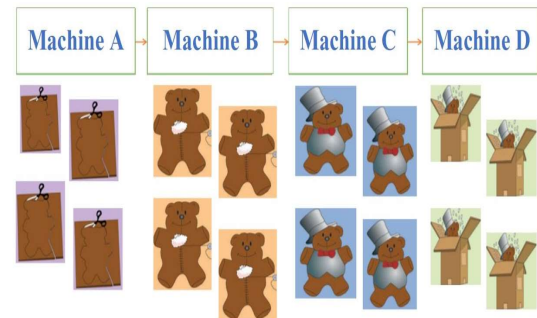
Different layout models

Process layout

- A process layout organizes facilities based on different functions or processes, allowing for flexibility in handling various tasks.
- This setup is ideal for businesses that need to accommodate a range of services or products.

Example:

In a hospital, different departments (like emergency, surgery, and maternity) are arranged according to their specific functions. This layout allows the hospital to efficiently manage diverse patient needs while adapting to varying service demands.



Advantages of process layouts

Flexibility - The firm would be able to handle a variety of processing requirements.

Cost - The general-purpose equipment utilized may be less costly to purchase and less costly and easier to maintain than specialized equipment.

Motivation - Employees in this type of layout will probably be able to perform a variety of tasks on multiple machines.

Protection from system failure - Since there are multiple machines available, process lay-outs are not particularly vulnerable to equipment failures.

Disadvantages of process layouts

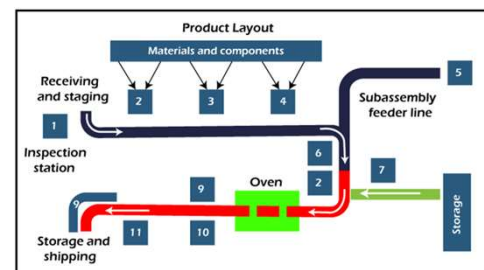
Lesser equipment utilization - Equipment utilization rates in process layout are frequently very low, because machine usage is dependent upon a variety of output requirements, but the number of equipment they have may be high.

Leading for Confusion - Changing schedules and routines make juggling process requirements more difficult.

Different layout models

Product layout

- In a product layout, **resources are organized sequentially based on the product's routing**, creating a straight-line flow that can be dedicated to a single product or version.
- This arrangement ensures smooth utilization of labor and equipment throughout the operation.
- To enhance efficiency, line balancing is employed, which involves assigning tasks to workstations so that each has approximately equal time requirements.
- This minimizes idle time at workstations, reducing delays from waiting for parts or preventing inventory buildup.
- Advantageous for sectors that produce in large quantities or on a continuous basis, such as automobile assembling, cement manufacturing, and oil refining.



advantages of product layouts



Output - Product layouts can generate a large volume of products in a short time.



Cost - Unit cost is low as a result of the high volume.

Labor specialization results in reduced training time and cost.

A wider span of supervision also reduces labor costs.

Accounting, purchasing, and inventory control are routine.

Because routing is fixed, less attention is required.



Utilization - There is a high degree of labor and equipment utilization.

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Disadvantages of product layouts



Lack of Motivation - The system's inherent division of labor can result in dull, repetitive jobs that can prove to be quite stressful



Lack of Flexibility - Product layouts are inflexible and cannot easily respond to required system changes-especially changes in product or process design



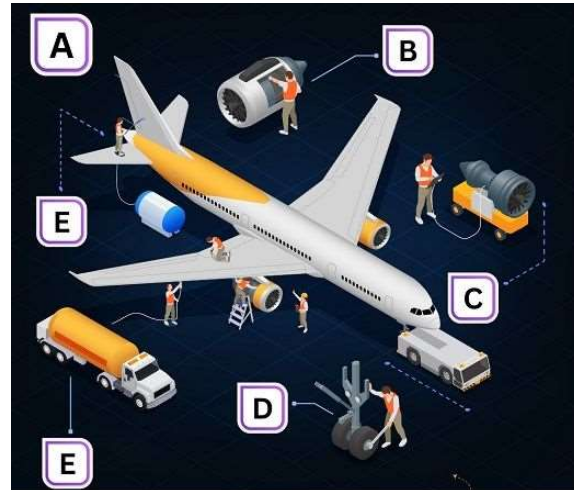
Lack of System protection - The system is at risk from equipment breakdown, absenteeism, and downtime due to preventive maintenance.

Different layout models

Fixed-position layout

- The fixed-position layout method involves keeping the layout constant over time without adjustments to accommodate changing requirements.
- For this approach to be effective, resources must be portable to facilitate "on the spot" performance.
- This method is typically used when the nature of the product limits flexibility.

Example: Building a ship is a classic instance of a fixed-position layout, where the ship remains in one location while workers and materials are brought to it as needed.



A = Workstation, B,C,D,E = Jobs or Processes

Advantages Fixed-position layout

Beneficial for stable environment - When the environmental factors are free from fluctuation, this model will help the business for smooth operations.

Lack of uncertainty and surprises - when the system is kept fixed, the cost escalations, sudden volume changes, etc. may not be possible

Customization of products and processes is easy.

Material handling and mobilization are also easy.

Disadvantages Fixed-position layout

Limited Space - The work area may be crowded so that little storage space is available and material handling problems may occur

Administrative burden - The span of control can be narrow, and coordination difficult.

Higher risky in contingencies - The environment is continuously changing. Keeping a fixed system may cause limitations and losses of opportunities

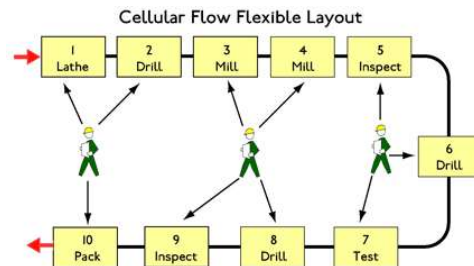
Different layout models

Cellular layout

- Cellular manufacturing is a layout method where machines are organized into groups, or "cells," based on the processing needs of similar items (part families).
- This layout facilitates efficient production by allowing workers to be cross-trained to operate all equipment within a cell, enabling them to manage the output effectively.

Examples:

- Toyota:** Toyota employs cellular layouts in its assembly lines to enhance efficiency and reduce waste.
- Dell:** Uses cellular manufacturing in its production of computers, allowing for flexible assembly processes tailored to specific customer orders.
- Boeing:** In certain assembly plants, Boeing organizes workstations into cells for manufacturing components of aircraft, facilitating streamlined workflows.



Advantages of cellular layout

Low Cost of Operations: It reduces costs through faster processing, less material handling, lower work-in-process inventory, and shorter setup times.

Flexibility: Cellular manufacturing enables the production of small batches, increasing flexibility to adapt to changes.

Motivation: Cross-training workers to operate all machines in a cell reduces boredom and increases job ownership, leading to higher motivation and engagement.

Disadvantages of cellular layout

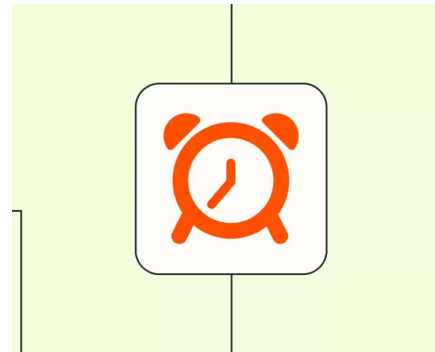
Increased Labor Cost: Cross-training employees raises training expenses, and skilled workers may demand higher wages.

Increased Pressure: Employees face multi-tasking demands, leading to fatigue and potential overload during operational hours.

Inter-Group Conflicts: Management prioritizing one group over others can create internal conflicts, negatively affecting employee morale.

Scheduling of work

- Planning and organizing tasks to optimize resource use, meet production deadlines, and balance workloads.
- Effective scheduling maximizes efficiency, addresses unforeseen delays, and adapts to changing demand.



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Operations scheduling

- Operations scheduling and workplace planning are crucial for efficiently transforming inputs into outputs.
- Scheduling focuses on producing the necessary quantity of products within specific timeframes, while workplace planning involves resource allocation, prioritizing tasks based on delivery dates.
- This planning is part of short-term strategies, ensuring that jobs are assigned to the right machines before production begins.
- Ultimately, scheduling serves as a production timetable, outlining job sequences, timings, and resource allocations to support effective cash flow management.
- **Three main objectives** of production scheduling:
 - Due importance to delivery date and avoiding delays in completion
 - Reducing time of job on machines
 - Proper utilization of work centers
- **Two approaches** of operational scheduling
 - **Forward scheduling** - The planner considers order received date as the starting point for forward planning of all the activities.
 - **Backward scheduling** - The planner considers the order delivery date as the starting point and does backward planning of all activities.

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Example - A Custom Furniture Workshop

Forward Scheduling:

- **Order Received:** A customer places an order for a custom dining table on October
- **Planning:** The workshop plans to start work immediately and schedules tasks:
 - **October 2-3:** Cut wood.
 - **October 4-5:** Assemble the table.
 - **October 6:** Finish and deliver.

Backward Scheduling:

- **Delivery Date:** The customer requests delivery by October 10.
- **Planning:** The workshop plans backward from the delivery date:
 - **October 9:** Final inspection and packing.
 - **October 8:** Finish assembly.
 - **October 7:** Start cutting wood.

In both approaches, the workshop ensures that tasks are organized efficiently to meet the customer's deadline while optimizing the use of resources

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Maintenance scheduling

- The maintenance department is responsible with planning and scheduling of maintenance in line with the requirement and expectation of the organization.
- Planning and scheduling need to ensure that business as usual is not disturbed.
- **Key areas to plan maintenance:**
 - Identify the equipment for maintenance and technique for maintenance.
 - Categorize maintenance into **routine, priority and emergency**.
 - Plan maintenance considering cost, time, space etc.
 - Material planning for maintenance requirements.
 - Budget time and money requirements.
- **The importance of schedule maintenance**
 - To optimize usage of plant, machinery and tools.
 - To optimize usage of manpower in maintenance.
 - To ensure smooth production flow.

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Example - In a small bakery

- **Identifying Equipment:** The maintenance team identifies key equipment like ovens and mixers that require regular checks.
- **Categorization:**
 - **Routine Maintenance:** Daily cleaning and weekly checks of oven temperatures.
 - **Priority Maintenance:** Monthly inspection of the mixer for wear and tear.
 - **Emergency Maintenance:** Immediate repairs for any equipment breakdown.
- **Planning:** The bakery schedules routine maintenance during early morning hours before opening, ensuring that operations are not interrupted.
- **Execution:** For example, every Monday at 6 AM, the maintenance staff conducts a routine check of the ovens. This helps avoid unexpected breakdowns during busy hours, ensuring the bakery can operate smoothly throughout the week.

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Quality Management

- Quality reflects how customers perceive a product and is a measure of customer satisfaction, though it can't be quantified.
- Quality is understood through various definitions and cannot be determined by a single element of a product.
- For some products (e.g., medical drugs, food), quality must meet **legal standards** to be sold.
- In other products (e.g., clothing, electronics), quality **relates to suitability for conditions, fashion, or technology**
- **Definition** - the features of a product that provide value to users, including attributes like color, ingredients, durability, appearance, performance, and value for money.
- While **primarily associated with customers**, the concept of **users** can extend beyond them.
- **Importance of Quality** - Quality is essential for customer loyalty; low-quality goods tend to fall out of the market quickly.



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Quality management costs

Prevention cost

These are arrangements to prevent defective items or reduce the number of defectives.

Inspection and testing costs

These are the costs of inspecting and testing output, to identify defective items or batches.

Internal failure costs

These are the costs of correcting defective items that are found by inspection and testing.

External failure costs

These are the costs of dealing with complaints from customers about defective items that have escaped detection in the inspection process and that have been sold to customers.

Quality Circles

- The system of quality circle requires to form **small group of employees (referred as "circle")** in the same area working under same process and provide the responsibilities for them to identify and resolve quality related issues.
- A Japanese quality management techniques.
- This group will be shared by a person. called **leader**
- The leader of the quality circle will be responsible for the following tasks:
 - Assume the responsibility of guiding the members.
 - Make his members sure about what is going on.
 - Channelize the discussions.
 - Allowing every member equal opportunity.
 - Assigning specific task to each member.
 - Work in coordination with facilitator.



Characteristics of effective quality circles:

The atmosphere should be informal, comfortable and relaxed. The members should feel involved and interested.

Everyone should participate.

The objectives should be clear to the members.

The members should listen to each other.

The group should feel comfortable even when there are disagreements.

The decisions should generally be taken by a kind of consensus and voting should be minimum.

When an action is required to be taken, clear assignments should be made and accepted by all the members.

The leader should not dominate the group. The main idea should not be as to who controls but how to get the job done.

Until a final solution is found and results are attained feedback is necessary

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Objectives of quality circles



To improve quality, productivity, safety and cost reduction.



To give chance to the employees to use their wisdom and creativity.



To encourage team spirit, cohesive culture among different levels and sections of the employees.



To promote self and mutual development including leadership quality,



To fulfill the self-esteem and motivational needs of employees.

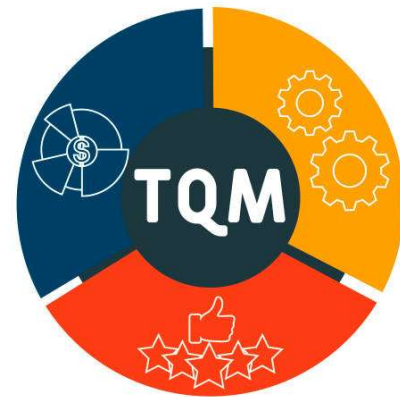


To improve the quality of work-life of employees.

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Total Quality Management (TQM)

- TQM is a structured approach to overall organizational management.
- The focus of the process is to improve the quality of an organization's outputs, including goods and services, through continual improvement of internal practices.
- The objective of TQM is doing things right the first time repeatedly.
- This saves the organization the time that is needed to correct poor work and failed product and service implementations (such as warranty repairs)



TOTAL QUALITY MANAGEMENT

Principles of total quality management



Process



Focus on the customer



Have a strategic approach to improvement



Improve continuously



Integrated system



Employee involvement



Communication



Decision making based on facts

Advantages of total quality management

Strengthened competitive position

Adaptability to changing

Higher productivity

Enhanced market image

Elimination of defects and waste

Reduced costs and better cost management

Higher profitability

Improved customer focus and satisfaction

Increased customer loyalty and retention

Increased job security

Improved employee morale

Enhanced shareholder and stakeholder value

Improved and innovative processes

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Disadvantages of Total Quality Management

Cultural Change Required

TQM demands a shift in organizational culture towards continuous improvement and customer satisfaction, which can be difficult to achieve.

Time and Resource Intensive

Implementing a TQM system requires significant planning, time, and long-term resource commitment

High Costs

TQM can be expensive due to training, team development, infrastructure improvements, and ongoing investments in quality management

Delayed Results

TQM is a long-term strategy that may take years to yield noticeable results, leading some organizations to abandon it without seeing quick benefits.

Stifles Creativity

The emphasis on standardization and consistency can discourage creativity and innovation, limiting new ideas that could enhance productivity.

Not a Quick Fix

Excessive focus on quality can lead to financial losses, and many companies adopting TQM do not see significant performance improvements or increased customer satisfaction.

5S Approach for quality

- The 5S Method is a standardized process that when properly implemented creates and maintains an organized, safe, clean and efficient workplace.
- Improved visual controls are implemented as part of 5S to make any process non-conformance's obvious and easily detectable.
- 5S is often one element of a larger Lean initiative and promotes continuous improvement.
- **5S refers to:**
 - **Seiri/Sort:** Separating of the essential from the nonessential items
 - **Seiton/Straighten:** Organizing the essential materials where everything has its place
 - **Seiso/Shine:** Cleaning the work area.
 - **Seiketsu/Standardize:** Establishing a system to maintain and make 5S a habit
 - **Shitsuke/Sustain:** Establishing a safe and sanitary work environment (Safety)



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VIDEO ON 5S METHOD

<https://www.youtube.com/watch?v=52qJ-AcdkdA>

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Kaizen Approach for Quality Management

- One effective method for continuous improvement is *kaizen*, a Japanese term that means "change for the good."
- This change can be significant or occur gradually through smaller, consistent steps.
- There's always room for small, continuous improvements.
- After implementing a major change, it's important to recognize that improvements won't last without ongoing efforts.
- If businesses take a "set it and forget it" approach, they may see benefits decline over time due to inefficiencies.
- This approach emphasizes making small, ongoing improvements to enhance processes and quality consistently.



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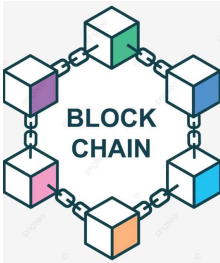
VIDEO ON KAIZEN METHOD

<https://www.youtube.com/watch?v=NFrwxzUhfNA>

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Operations management concepts in the modern technology

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Computer-Aided Design (CAD)

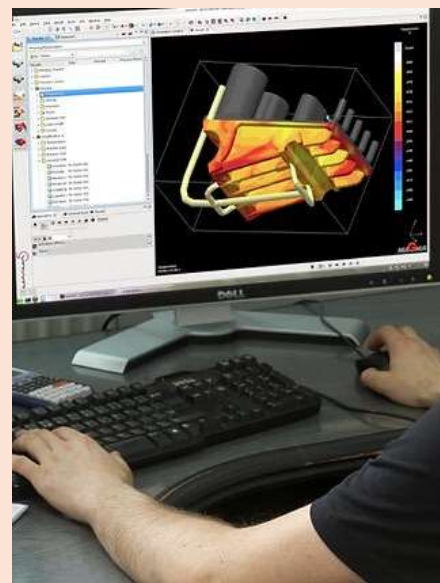
CAD is a computer technology used to design products and document the design process.

It creates detailed diagrams and can generate both 2D and 3D models.

CAD is used as follows:

- To produce detailed engineering designs through 3-D and 2-D drawings of the physical components of manufactured products.
- To create conceptual design, product layout, strength and dynamic analysis of assembly and the manufacturing processes themselves.
- To prepare environmental impact reports, in which computer-aided designs are used in photographs to produce a rendering of the appearance when the new structures are built.

Examples: AutoCAD, SolidWorks



Computer-Aided Manufacturing (CAM)

- CAM uses computer software and machinery **to automate manufacturing processes**, often working in conjunction with CAD systems.
- Depending on enterprise solution and manufacturer, **CAM may present inadequacies in the following areas:**
 - Manufacturing process and usage complexity
 - Product Lifecycle Management (PLM) and modern enterprise integration
 - Machine process automation

Examples: Mastercam, Fusion 360

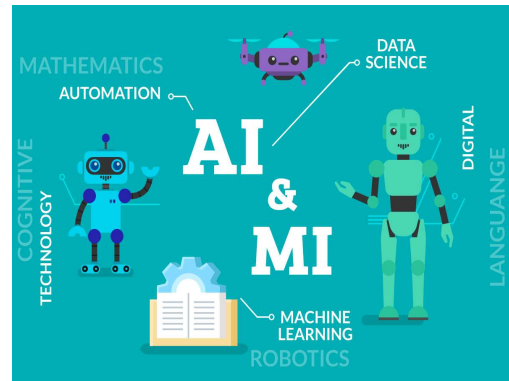


Computer-Integrated Manufacturing (CIM)

- CIM combines CAD and CAM with computer-controlled machinery to automate the manufacturing process and reduce manual labor.
- It is widely used in the **automotive, aviation, space and ship-building industries**.
- **Examples: Siemens Digital Industries Software, Rockwell Automation**
- All the operations are controlled by computers and have a common storage and distribution.
- The **various processes involved in a CIM** are:
 - Computer-aided design
 - Prototype manufacture
 - Determining the efficient method for manufacturing (costs, production methods, volume, storage and distribution)
 - Ordering of the necessary materials needed for the manufacturing process
 - Computer-aided manufacturing of the products with the help of computer numerical controllers
 - Quality controls at each phase of the development.
 - Product assembly with the help of robots
 - Quality check and automated storage
 - Automatic distribution of products from the storage areas to awaiting lorries/trucks
 - Automatic updating of logs, financial data and bills in the computer system

Artificial Intelligence (AI) and Machine Learning (ML)

- **AI simulates human intelligence processes by machines**, especially computer systems which include **learning** (the acquisition of information and rules for using the information), **reasoning** (using rules to reach approximate or definite conclusions) and **self-correction**.
- ML focuses on the **using data and algorithms** to enable AI to imitate the way that humans learn, gradually improving its accuracy.
- Examples
 - Ore beneficiation
 - Gas processing
 - Oil refinery
 - Chemical Industry
 - Plastics industry
 - Glass manufacturing
 - Semiconductor manufacturing



Blockchain

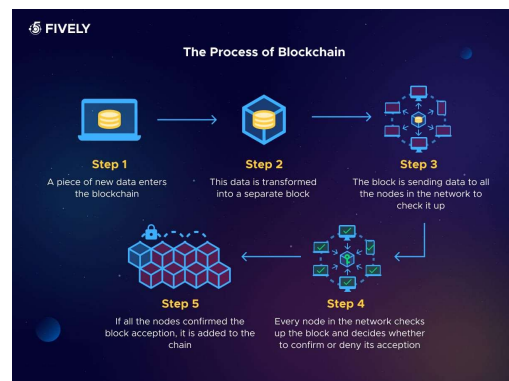
Blockchain is a decentralized technology that **enables secure transactions without intermediaries**. It records transactions in an immutable manner.

Advantages:

- Improved accuracy by removing human involvement in verification.
- Cost reductions by eliminating third-party verification.
- Decentralization makes it harder to tamper with.
- Transactions are secure, private, and efficient.
- Transparent technology.

Disadvantages:

- Significant technology cost associated with mining cryptocurrencies.
- Low transactions per second compared to traditional systems.
- History of use in illicit activities.
- Susceptibility to being hacked.



Examples: Bitcoin

