# Indian Institute of Management Visakhapatnam


# Prakriya – Operations club

Prakríya

Operations Club, IIM VISHAKAPATANAM

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# Operations Management

Operations management is a field of management that focuses on the design, planning, execution, and control of business operations to create goods or services efficiently and effectively. It involves managing the resources and processes required to deliver products and services to customers while maximizing value and minimizing waste. Its main goal is to ensure that an organization's operations are efficient, effective, and aligned with its overall business strategy. Operations management plays a crucial role in various industries, including manufacturing, services, healthcare, logistics, and more.

## What does operations management involve?

In the context of distribution, production, or service supply, operations management is primarily concerned with planning, coordination, and oversight. As a result, it is delivery-oriented, guaranteeing that an organization efficiently and effectively translates inputs to outputs. Materials, equipment, technology, and human resources such as employees or workers could all be considered inputs.

Procurement (obtaining goods or services from outside sources), managing relationships with individuals involved in processes, and enhancing a company's sustainability in terms of resource consumption are only a few examples of the types of activities or specialized jobs this involves.

Supply chain and logistics management are two major terms that can assist answer the question of what is more accurate in operations management. Operations Management has strong foundations in both fields. In order to meet consumer demand, it is also necessary to consider global advances in supply chain management. In an era where resources are often in short supply, and consumer expectations have risen, the careful and deliberate use of resources, as well as cost-effectiveness, has become increasingly vital in logistics.

## Skills required of an operations manager

There are obvious parallels between the abilities required for successful operations management and those needed for supply chain management in both logistics and supply chain management. To effectively maximize performance and drive productivity as an operations manager, one must have outstanding management skills.

To make them run well, one must be able to comprehend a company's succession of procedures, and this duty is closely tied to supply chain management. Meanwhile, the logistics needed to put these processes in place reflect planning; being a great operations manager requires a combination of knowing and managing an organization's work.

# What are the key aspects of an operations field?

**Capacity Planning**: This involves determining the capacity needed to meet the demand for products or services. It includes decisions about the size of production facilities, equipment, and workforce.

**Process Design and Improvement**: This encompasses designing efficient production or service processes and continuously improving them. Techniques like Lean Six Sigma are often used to identify and eliminate inefficiencies and defects.

**Quality Management**: Ensuring that products or services meet or exceed customer expectations. Quality control and quality assurance processes are implemented to maintain consistency and excellence.

**Inventory Management**: Managing inventory levels to ensure products are available when needed while minimizing carrying costs and stockouts.

**Supply Chain Management**: Overseeing the entire supply chain, from suppliers to manufacturers to distributors, to ensure smooth flow of materials and information.

**Logistics**: Managing the movement of goods, services, and information within an organization or between organizations. This includes transportation, warehousing, and distribution.

**Forecasting**: Predicting future demand for products or services to make informed decisions about production and resource allocation.

**Risk Management**: Identifying potential risks that could impact operations and developing strategies to mitigate or respond to them.

**Continuous Improvement**: Embracing a culture of ongoing improvement, often through methodologies like Kaizen, to enhance processes and systems over time.

**Technology and Automation**: Leveraging technology and automation to increase efficiency, accuracy, and speed in operations. This could include robotics, AI, and software solutions.

**Environmental Sustainability:** Incorporating practices that minimize the environmental impact of operations, such as reducing waste and energy consumption.

**Project Management:** Planning, organizing, and executing projects to achieve specific objectives within defined constraints such as time, cost, and scope.

**Mass customization:** The ability of a company's operations management division to highly personalize its goods and services at large quantities.

**Operations management (OM):** OM used to be known as production and operations management (P&OM) or just production. It is a corporate function that refers to the transformation process of converting raw materials into finished goods and services. As the field expanded from being mostly tactical (e.g., making inventory and scheduling decisions

on the manufacturing floor) to strategic (today, many CEOs coming from the OM field), the terminology began to refer to operations rather than just production.

**Reengineering:** The process of restructuring a company's processes in order to improve efficiency, quality and cut costs. Many businesses follow a set of procedures that have been passed down through the generations. In a company's reengineering initiatives, operations management is a critical component.

**Scheduling:** The process of agreeing on the scheduling and utilization of resources inside a business; it answers questions like who will work on what schedule and in what order jobs will be processed.

Overall, operations management aims to optimize processes, resources, and systems to achieve business goals and meet customer demands. It requires a multidisciplinary approach, involving elements of engineering, economics, human resources, and more. Effective operations management can lead to increased profitability, customer satisfaction, and competitive advantage.

# Key Terms and Jargon

**KPI (Key Performance Indicator)**: Metrics used to evaluate the performance and success of a specific aspect of operations, such as production efficiency, quality, or delivery times.

**Lean Manufacturing**: A methodology focused on minimizing waste in production processes, resulting in increased efficiency and reduced costs.

**Six Sigma**: A data-driven approach to quality improvement that aims to achieve near-perfect results by minimizing defects and variations in processes.

**Just-In-Time (JIT)**: A strategy that involves producing and delivering products or services just in time to meet customer demand, thereby minimizing inventory costs.

**Kaizen**: A Japanese term meaning "continuous improvement," referring to the practice of making small, incremental improvements to processes over time.

**Supply Chain**: The network of organizations, people, activities, information, and resources involved in moving products or services from suppliers to customers.

**Value Stream Mapping**: A visual representation of the steps involved in delivering a product or service, highlighting areas of waste and inefficiency.

**Bottleneck**: A point in a process where the capacity is limited, causing a slowdown in overall production.

**Capacity Utilization:** The extent to which a company's production capacity is being used to produce goods or services.

**Lead Time**: The time it takes to complete a process from start to finish, including waiting time, processing time, and transportation time.

**Kanban:** A visual system used to manage and control production flow by signalling when to produce or replenish items based on actual demand.

**Lean Operations:** An approach that focuses on minimizing waste, reducing inefficiencies, and improving processes to enhance value and quality while reducing costs.

**Efficiency:** The ability to accomplish tasks with minimal waste, including time, resources, and effort.

**Batch Processing:** A method of processing tasks or orders in groups (batches) rather than individually, often used to improve efficiency in manufacturing.

**Critical Path:** In project management, the sequence of activities that determines the shortest time needed to complete a project.

**Quality Control:** The process of ensuring that products or services meet specified quality standards through inspections, testing, and corrective actions.

**Root Cause Analysis:** A systematic approach to identifying the underlying causes of problems or issues in operations to prevent recurrence.

**Workflow:** The sequence of tasks and activities that are necessary to complete a process or achieve a specific outcome.

# Roles and opportunities available in the Operations domain

**Operations Manager:** Responsible for overseeing the day-to-day operations of a business. This includes managing resources, optimizing processes, and ensuring production meets quality and efficiency standards.

**Production Supervisor**: In charge of supervising the production process, ensuring that products are manufactured efficiently, on time, and according to quality standards.

**Supply Chain Manager**: Manages the entire supply chain, from sourcing raw materials to distributing finished products, to ensure smooth and efficient flow of goods and information.

**Quality Control Inspector**: Monitors and tests products or services to ensure they meet established quality standards and specifications.

**Logistics Coordinator**: Coordinates the movement of goods, manages transportation and warehousing, and ensures timely delivery to customers.

**Inventory Manager**: Manages inventory levels, tracks stock movements, and optimizes inventory turnover to balance supply and demand.

**Process Improvement Specialist**: Analyzes existing processes, identifies inefficiencies, and implements improvements using methodologies like Lean or Six Sigma.

**Operations Analyst**: Analyzes operational data and trends to provide insights that inform decision-making and drive operational improvements.

**Procurement Officer:** Responsible for sourcing and acquiring the necessary materials, goods, and services for the organization's operations.

**Demand Planner**: Analyzes historical sales data and market trends to forecast future demand, helping the organization plan production and inventory levels.

**Production Manager**: Oversees the production process, ensuring that products are manufactured efficiently, on schedule, and according to quality standards. This role involves managing production teams, optimizing processes, and troubleshooting issues.

**Quality Assurance Manager**: Ensures that products and services meet or exceed quality standards. This role involves designing and implementing quality control processes, conducting audits, and continuously improving quality management systems.

**Logistics Manager**: Manages the movement, storage, and distribution of goods. This role involves optimizing transportation routes, managing warehouses, coordinating with suppliers and customers, and ensuring timely deliveries.

**Process Improvement Specialist/Engineer**: Focuses on identifying and eliminating inefficiencies in processes. Using methodologies like Lean, Six Sigma, and process mapping, these professionals streamline operations for better efficiency and effectiveness.

**Procurement Specialist/Manager**: Focuses on sourcing and acquiring the necessary materials, goods, and services for a business. This role involves supplier selection, negotiation, and ensuring a reliable supply chain.

**Continuous Improvement Manager**: Leads efforts to establish a culture of continuous improvement within an organization. This involves implementing strategies like Kaizen and driving initiatives to enhance processes and systems.

**Facilities Manager**: Manages the physical assets of a business, including buildings, equipment, and maintenance. This role ensures that facilities are optimized for efficient operations.

**E-commerce Operations Manager**: Manages the operations of online businesses, including order fulfillment, customer service, and optimizing the online shopping experience.

**Service Operations Manager**: Focuses on managing the operations of service-based industries such as healthcare, hospitality, and financial services, ensuring efficient service delivery and customer satisfaction.

**Project Manager**: Manages specific projects within operations, overseeing resources, timelines, and budgets to successfully deliver projects that improve processes or implement new technologies.

These roles can be found in industries such as manufacturing, retail, healthcare, technology, logistics, finance, and more. With the increasing emphasis on efficiency, customer satisfaction, and sustainability, the demand for skilled operations management professionals continues to grow, offering diverse and rewarding career paths

# Key areas to focus

Operations management is a vital field of management that focuses on designing, planning, executing, and controlling the processes and resources involved in producing goods and services. It aims to optimize efficiency, quality, and customer satisfaction while minimizing waste. Key terms and concepts include KPIs, Lean manufacturing, Six Sigma, supply chain management, value stream mapping, and more. Various roles within operations management include operations managers, supply chain managers, production managers, quality assurance managers, and logistics managers. Opportunities span industries like manufacturing, retail, healthcare, and technology, offering a range of careers centred around optimizing processes, managing resources, and ensuring the effective delivery of products and services.

1. **Supply Chain Management:** This is one of the core areas in operations which deals with the strategic coordination and integration of various processes, activities, and stakeholders involved in the creation, movement, and distribution of goods and services from raw materials to delivery of finished goods to the customer. The primary goal of supply chain management is to optimize efficiency, cost-effectiveness, and customer satisfaction throughout the entire supply chain network. Key Components include **Bullwhip Effect, Bottleneck, Supplier Relationship Management (SRM), Collaborative Planning, Forecasting, and Replenishment (CPFR), Risk Management, Total Cost of Ownership (TCO**)

2. **Lean Management:** Developed by Toyota Production System (TPS), it is also known as Lean Manufacturing or Lean Production, which mainly focuses on maximizing value by reducing or eliminating activities and practices that do not add value to the final product or service, thereby enhancing efficiency, reducing costs, and improving overall quality. Lean management involves different methodologies that streamline an agile operational environment that responds effectively to customer needs and market changes. Some of the main principles are **JIT(Just-In-Time), 5S Methodology, Kaizen, and Pull System. Etc**.

   a. **Plan Do Check Act - PDCA Cycle**

   The Plan Do Check Act Cycle was suggested by Eduard Deming as a well-formed approach for quality systems, problem-solving, and kaizen initiatives. The PDCA cycle is a shortened version of the PDCA cycle. The PDCA cycle is an essential component of lean manufacturing and continuous improvement projects. It's especially useful when dealing with problems that are difficult to diagnose, have several core causes, and necessitate a concentrated effort in performance management and long-term sustainability. The PDCA cycle consists, as its name suggests, of the following stages or steps:

   **Plan:** The issue statement, objectives, data collection, and project scope specification are all part of the planning process.

   **Do:** Define the issue, problem, or quality concern with a process, product, or plant in the do stage. Other problem-solving concepts and techniques, like fishbone diagrams, Pareto charts, and root cause analysis, are frequently employed in the Do stage to establish the most likely source of the problem, issue, or lack of performance.

**Check:** The validity of the possible causes of the issue or problem, as well as the outcomes of the activities and modifications proposed above, is examined at this step.
**Act:** This is the stage in which steps and activities are put in place to permanently address the problem, issue, or improve the process or plant.
After the Actions have been implemented, they are reviewed for efficacy and, if applicable, performance improvement. If the results are not satisfactory, the PDCA cycle is repeated; in most circumstances, the process will back to the Do stage; however, starting from the planning stage may be more feasible.

### b. Just in time - JIT and Kanban systems

Just in time, or JIT, is a production system that aims to increase output without maintaining a big inventory at any point in the supply chain or manufacturing process. It seeks to produce and fulfill all customer orders on time and in full only when they are placed on demand by the customer, rather than producing/purchasing parts and finished goods in bulk. It's an important part of any lean or lean manufacturing operation. The accumulation of raw materials, work, or resources utilized in a process is referred to as inventory. When keeping a particular amount of stock/inventory, there are costs that must be considered. Handling, breakage, depreciation, taxes, storage facilities, insurance, and pilferage, and obsolescence are all included in inventory costs. All of these costs may be decreased and are considered waste; however, they are caused by having large inventories, which is where the JIT approach can help to significantly reduce costs.
It is a manufacturing approach that tries to accomplish high-volume production while keeping inventories to a minimum. The key to this strategy is to supply parts inventory to each workstation at precisely the right time. Combining the JIT mindset with TQM (total quality management), which constantly monitors for the causes of defects and eliminates them all at once, is a good idea. JIT (just-in-time) delivery is a pull system delivery because products are only delivered when an order or Kanban signal is received.

### c. Kaizen and continuous improvement

Kaizen is a Japanese concept that refers to continuous improvement in a business, operations, or manufacturing process. Kaizen is a Japanese concept that aims for continual improvement in all parts of a manufacturing process, from raw material procurement to production procedures. The term "Kaizen" is most often used to describe focal projects or efforts aimed at addressing and improving process concerns. It is one of the most significant phrases in lean manufacturing and operations management, and it should be at the top of most corporate leaders' and managers' priority lists if they want to maintain a competitive advantage in their market and become industry leaders.
Kaizen aims for continual improvement in all aspects of the business and operations, not only in plant OEE performance or profitability. Kaizen aims to incorporate varied teams of people who may contribute their experiences and knowledge to find solutions to challenges that are always improving. Process operators and supervisors who operate in the manufacturing process should be included in teams since they can give vital insights and ideas for developing meaningful solutions.

**Kaizens focus areas**

The following are some of the areas where kaizen activities and programs are more regularly used and can be very beneficial:

- Performance of individual plants and machines, including throughput and dependability
- Entire production lines, including bottlenecks, production rates, changeovers, etc
- Raw material procurement and utilization Labour utilization
- Communication, including Andon systems
- Quality
- Production processes and tasks
- Housekeeping and 5S
- Inventory management and control
- Inventory costs and warehousing
- Supply chain management

Kaizen employs a variety of lean manufacturing and problem-solving tools, techniques, communication, and interaction methods, including Kaizen boards, data collection and analysis, root cause analysis, process flow charts, Pareto charts, fishbone diagrams, and the 5 whys, among others, to achieve long-term improvements and efficiencies with the same or fewer inputs into the production process.

Kaizen, like many other lean approaches, is not restricted to manufacturing or production processes. It can be used in any process in any business. The principles may be used across industries because the end goal is to make better use of inputs to produce better, more efficient outputs through a focused team approach.

**Kaizen initiatives and framework**

There are numerous approaches to fostering a continuous improvement culture and emphasis among employees and management. It is highly dependent on the industry, staff experience, resource availability, manager preferences, and drive to develop for everyone. There is no one-size-fits-all approach to organizing a kaizen activity, plan, or program; what matters is that there is a clear framework that the entire team knows and can readily follow in order to produce long-term results.

Some general Kaizen general frameworks can include:

- Individual-specific projects run by team leaders or managers.
- Focused initiatives run by managers in conjunction with team members.
- Team member-initiated kaizen initiatives supported by managers.
- Kaizen blitzes in specific areas.
- Larger scale kaizen projects involving all staff.

External resources, such as operations or lean consultants, can help organize initiatives and assist personnel with documentation, coaching, and execution of new improvement strategies. Management must fully support any form of kaizen activity,

just like any other program or project, and take the time to integrate it into the company's culture.

**d. Kanban System in Just-in-Time Production**

Kanban or a Kanban is a sort of signalling system that is used in a process and/or an EOQ system to manage WIP and/or inventory between processes or tasks. The signalling system can be cards, containers, or squares to denote where supplies are stored. When the containers or squares are empty, the cards or the container itself can be utilized to signal to the operators that an additional product is needed.

3. **Quality Management:** This area deals with the systematic processes, practices, and strategies which are implemented to ensure that products, services, and processes consistently meet or exceed established quality standards and customer expectations. Its main aim is to enhance customer satisfaction by delivering products and services that are reliable, defect-free, and consistent in meeting specified requirements It is a crucial component for maintaining competitiveness, building a positive reputation, and minimizing costs associated with defects and rework. Some of the Key elements in Quality Management are **Quality Control (QC), Quality Assurance (QA), Total Quality Management (TQM), and Statistical Process Control (SPC).**

**a. Total Quality Management:**

TQM stands for Total Quality Management, which refers to the process of controlling an organization's whole supply chain to satisfy both internal and external consumers. It aspires to be the best in all elements of its operations and to give clients exactly what they want. It is a component of the value. No index entries were found. Stream's continuous improvement process, quality culture and should be ingrained in the company's culture, involving all employees from executives to shop floor workers. TQM acquired a lot of traction in the 1980s when the quality of American-made items was inferior to Japanese-made products in several industries.

TQM aspires for quality at the source of production and puts the responsibility for one's own work and the production process on the person. It strives to decrease quality flaws through statistical quality control, internal quality audits, teamwork, quality standards, and partnership with suppliers and consumers to ensure that the final product meets all requirements. Total quality management is a road that requires thorough data collection, process checks, analysis, resources, and dedication from everyone in the organization to attain the ultimate aim of satisfying and exceeding the expectations of customers.

4. **Logistics and transportation:** These two play a critical role in operations by ensuring an efficient and effective flow of products from suppliers to consumers. These components involve planning, execution, and control of the movement, storage, and distribution of goods, materials, and information throughout the supply chain. Learning in Deep Logistics is a process of managing the flow of goods, services, and information from the point of origin to the point of consumption which involves **inventory management, warehousing, order processing, packaging, and distribution.** Whereas Transportation is nothing but the physical movement of goods and materials from one

location to another by various means such as road, rail, air, sea, and even emerging technologies like drones. It is mainly used in the supply chain. Effective management of these functions contributes to improved coordination, reduced costs, and enhanced service levels throughout the entire product lifecycle.

**5. Green Operations and Sustainability:** It refers to the practice of integrating environmentally responsible and socially conscious principles into various aspects of business operations to minimize negative impacts on the environment, society, and economic well-being. Its main aim is to minimize waste generation, reduce carbon emissions and contribute to the long-term health of the planet and communities. The main key concepts of green operations are **Carbon Footprint Reduction, Innovation and Technology, Green Marketing, and Regulatory Compliance.**

**6. Data Analytics and Technology Integration:** By combining data analytics and technology integration, organizations can gain a competitive edge by making more informed decisions, improving resource allocation, reducing operational costs, enhancing customer experiences, and driving innovation across their operations. In operations management, data analytics focuses on using historical and real-time data from various sources to gain a deeper understanding of processes, identify areas for improvement, and make informed decisions. Key aspects of data analytics involve **Descriptive Analytics, Predictive Analytics, Prescriptive Analytics, Real-time Monitoring, and Key Performance Indicators (KPIs).** Technology integration involves the seamless incorporation of various technological solutions, such as software, hardware, sensors, and automation, into existing operational processes to enhance efficiency and effectiveness**. Key technologies include the Internet of Things (IoT), Cloud Computing, Big Data, Artificial Intelligence (AI).**

**7. Production Planning and Scheduling:** Production planning is the process of determining what products to produce, in what quantities, and over what timeframe to meet customer demand while considering available resources and capacity. It involves making decisions about production levels, inventory management, and resource allocation. Key aspects of production planning involve **Demand Forecasting, Master Production Schedule (MPS), and Materials Requirement Planning (MRP)** Whereas Production scheduling is the process of creating a detailed timetable for carrying out production activities based on the production plan. It involves determining the order and timing of specific tasks and activities to ensure that production runs smoothly and efficiently. **Job Sequencing, Machine Scheduling, Lead Time Management.**

**8. Supply chain management**

**a. Introduction**

Supply Chain Management can be described as the control of the flow of goods and services from the point of manufacture to the point of consumption. It also includes

the transportation and storage of raw materials used in work-in-progress, inventories, and fully furnished goods.

Supply chain management's major goal is to keep track of and connect the production, distribution, and shipment of goods and services. Companies having a good and tight grip over internal inventory, production, distribution, internal productions, and sales can do this.

The flow of commodities, services, and information from the producer to the consumer is depicted in the diagram above. The illustration demonstrates the flow of a product from the producer to the manufacturer, who then sends it to the distributor for distribution. The distributor then sends it to the wholesaler or retailer, who then distributes the items to various stores where customers can easily obtain them.

Supply chain management essentially combines demand and supply management. It employs a variety of tactics and methodologies to examine the complete chain and perform efficiently at each and every phase. Every unit involved in the process should strive to reduce expenses and assist organizations in improving their long-term performance while also adding value to their stakeholders and consumers. This method can help reduce rates by eliminating superfluous costs, moves, and handling.

It's important to understand that supply chain management and supply chain event management are not the same things. Supply Chain Event Management addresses the reasons that could disrupt an efficient supply chain's flow; various situations are evaluated, and remedies are designed appropriately.

### b. Advantages

Supply chain management is critical in this era of globalization, as organizations compete to give the greatest quality products to clients and meet all of their requests. All businesses rely heavily on a well-functioning supply network.

Let's take a look at some of the primary benefits of supply chain management. The following are the main advantages of supply chain management:

- Improves client service and relationships.
- Develops more efficient distribution mechanisms for in-demand items and services
- Enhances efficiency and business processes
- Lowers the cost of storage and transportation
- Reduces both direct and indirect expenditures
- Assists in the timely delivery of the correct products to the correct location.
- Supports the successful execution of just-in-time stock models by improving inventory management
- Assists businesses in adjusting to globalization, economic turmoil, rising consumer demands, and other differences
- Assists businesses in reducing waste, lowering costs, and increasing efficiencies throughout the supply chain

These are just a few of the many benefits of supply chain management. Let's have a look at the major goals of supply chain management after we've looked at the concept

and benefits of supply chain management.

### c. Goals

Every company attempts to match supply and demand as quickly as possible while making the most efficient use of resources. The following are some of the essential objectives of supply chain management:

- Supply chain partners collaborate at many levels to increase resource productivity, standardize processes, eliminate duplication of effort, and reduce inventory levels.
- Minimizing supply chain costs is critical, especially when organizations are facing economic uncertainty and want to save money.
- While cost-effective and low-cost items are vital, supply chain managers must focus on creating value for their consumers.
- The best way to satisfy customers is to consistently exceed their expectations.
- Client expectations for more product variety, customized goods, off-season inventory availability, and quick fulfilment at a price equal to in-store options should be met.
- To achieve customer expectations, retailers must see inventory as a shared resource and use distributed order management systems to fulfil orders at the most efficient node in the supply chain.

Finally, supply chain management attempts to contribute to an organization's financial performance. It aims at leading organizations leveraging the supply chain to improve differentiation, grow sales, and reach new markets, in addition to all of the points mentioned above. The goal is to increase competitive advantage and shareholder value.

### d. Process

Companies employ supply chain management to guarantee that their supply chains are efficient and cost-effective. A supply chain is the series of procedures taken by a corporation to convert raw materials into finished goods. The following are the five basic components of supply chain management

**Plan:** The planning stage is the first step in the supply chain process. In order to address how the products and services will satisfy the expectations and necessities of the customers, we must design a plan or strategy. At this point, the planning should primarily focus on devising a profit-maximizing approach.

Companies must develop a strategy to manage all of the resources required for designing products and offering services. The main focus of supply chain management is on planning and generating a set of measurements.

**Develop (Source):** The planning stage is the first step in the supply chain process. In order to address how the products and services will satisfy the expectations and necessities of the customers, we must design a plan or strategy. At this point, the planning should primarily focus on devising a profit-maximizing approach.

Companies must develop a strategy to manage all of the resources required for designing products and offering services. The main focus of supply chain management is on planning and generating a set of measurements.

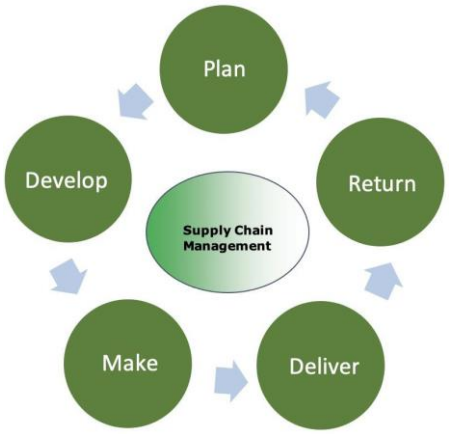
**Make:** The production or making of customer-demanded products is the third step in the supply chain management process. The products are created, manufactured, tested,

packaged, and synchronized for delivery at this step. The supply chain manager's job is to schedule all of the tasks required for manufacturing, testing, packaging, and delivery preparation. This segment of the supply chain is the most metric-intensive, with enterprises able to assess quality levels, production output, and labour productivity.

**Deliver:** The delivery stage is the fourth stage. The provider delivers the merchandise to the customer at the specified location. This is essentially the logistics stage, where consumer orders are approved and goods delivery is scheduled. The logistics stage, where organizations collaborate to collect orders from clients, construct a network of warehouses, select carriers to deliver products to customers, and set up an invoicing system to receive payments, is often referred to as the delivery stage.

**Return:** The return is the final and most important stage of supply chain management. The customer returns defective or damaged items to the provider at this step. Companies must deal with client inquiries and concerns, among other things

For many businesses, this stage of the supply chain is a source of frustration. Supply chain planners must devise a responsive and adaptable network for receiving damaged, faulty, and additional products from customers, as well as expediting the return procedure for customers who have concerns with delivered products.




### e. Warehousing

Warehousing is an important part of the supply chain. The demands and expectations of customers are changing dramatically in today's economy. We want everything to be just outside our door and at a reasonable price. We can state that warehousing function management necessitates a distinct fusion of engineering, IT, human resources, and supply chain expertise. Accepting supplies in an immediately storable conveyance, such as a pallet, case, or box, is great for neutralizing the efficiency of inbound functions. The types and quantities of orders processed are required for labelling the structure, tool selection, and business process. In addition, the quantity of stock-keeping units (SKUs) in the distribution centre is an important factor to consider.

The Warehouse Management System (WMS) directs the products to the appropriate storage location. Following that, the necessary functionality for the completion and

optimization of receiving, storing, and shipping functions are provided.

### f. Performance Measures:

A supply chain performance metric is a method for evaluating the efficiency of a supply chain system. There are two basic categories of supply chain performance indicators:

- Qualitative indicators: Customer happiness and product quality, for example.
- Quantitative measures: order-to-delivery lead time, supply chain reaction time, flexibility, resource usage, and delivery performance are just a few examples.

Only quantitative performance measures will be considered here. A multidimensional approach, which addresses how the organization needs to provide services to varied consumer expectations, can improve the performance of a supply chain.

### g. Networks:

The physical organization, design, structural architecture, and infrastructure of the supply chain are all determined by the network design. The number, location, and size of production plants and warehouses, as well as the assignment of retail outlets to warehouses, are all key considerations to be taken here. Other key sourcing decisions are also made at this stage.
Many significant decisions affecting the long-term location, capacity, technology, and supplier selection must be made while taking into account the potential for market expansion to be fraught with uncertainty, as well as changing economic and regulatory situations.

The development of multi-stage stochastic optimization methods necessary for decision support under demand, freight rate, and exchange rate uncertainty is the focus of network design in the supply chain. We will cover numerous ways of studying uncertainty and scenario modelling in this section.

- Warehouse location: When a company expands its branches to new sites, it often needs new storage facilities. The corporation is having trouble finding a warehouse facility. Within the range of possible locations, the one that has the lowest fixed and operational costs while meeting the demand is picked.\

- Traffic network design: Cities are becoming more congested as the population grows. Because of the increased demand for transportation, traffic networks must also be expanded. Because the cash available is frequently limited, the main challenge is deciding which projects should be built to improve traffic flow inside a network.

- Reshoring: This tendency has just lately emerged as a result of growing costs and other factors. It is the process of returning outsourced items and services to the point of origin from where they were originally supplied. It explains how to return some or all of the production to its original location.

## h. Inventory Management

One of the main aims of supply chain management, as stated under the major objectives of supply chain management, is to ensure that all operations and functions

within and across the firm are managed efficiently.

There are times when inventory efficiencies, or more precisely, maintaining inventory reduction efficiency, can assure supply chain efficiency. Despite the fact that inventory is viewed as a liability in supply chain management, supply chain managers recognize the importance of inventory. The unspoken guideline, however, is to maintain inventories to a bare minimum.

Many solutions are being developed with the goal of reducing inventory investment and simplifying stocks beyond the supply chain. Because of inventory investment, supply chain managers try to keep stocks as low as possible. Owning inventories has a high cost or investment associated with it. These expenses include the monetary expenditure for purchasing inventory, the costs of acquiring inventory (the cost of investing in inventory rather than something else), and the costs of inventory management.

### i. Supply chain management terms

Although the word "supply chain" may appear to be complicated, it simply refers to a system that permits a manufactured product to reach a consumer in one or more phases. A raw materials supplier, a manufacturer, a distributor, a retailer, and a consumer make up a typical supply chain network for a product. You will very certainly have an upstream (your suppliers, which might be production lines or simply the individuals you purchase from) and a downstream (your consumers, who are the people you sell to or your disposal mechanisms depending on who you are and where you are in the chain.

It's critical to understand the following concepts in order to construct an effective corporate supply chain:

- **Back Ordering**: It is the process of sending a purchase order to a supplier for a product that is temporarily out of stock in your warehouse but has already been requested by your customers. Backorders are commonly used in high-demand situations and for slow-moving products that experience a sudden surge in demand.
- **Bill of Lading:** A shipping document that specifies the type of goods, amount, and destination address. Whenever commodities are moved from one location to another, whether by land, sea, or air, it is required. This document also serves as a legal payment receipt, and all parties engaged in the shipping must sign it: the seller/shipper, the carrier, and the customer.
- **Blanket Order:** A method in which the customer agrees to acquire a particular number of one or more things over a specified time (which might range from a few days to many months) without specifying their exact shipment dates at the time of purchase. Within this time frame, the vendor can dispatch the products in pieces and on any dates that are convenient for him.
- **Bonded Warehouse:** A facility where you can store taxable items and imports subject to tariffs for commercial purposes that are overseen by the customs agency or government authority. Taxes must be paid only when the products are removed from the warehouse. This is especially beneficial for shops that import a large number of items into the country, as it allows them to spread out their tax load by deferring it **Carnet:** A legal document that allows you to temporarily export things to another country and reimport them into the US without paying import duties

within a year. Except for consumables (such as food, oils, and other liquids), agricultural products, mail, explosives, and disposables, this document is acceptable in over 80 nations.

- **Consignment:** It has multiple meanings. Most commonly, it refers to the act of entrusting your goods to a third-party warehouse owner (known as the consignee) for the purpose of maintaining them for a charge. The consignee may, in addition to keeping the items, sell or ship them to clients on your behalf for a charge. Individual shipments made to the consignee might also be referred to as consignments.
- **Cross-docking:** When a business owner receives items from vendors, he or she can send them to clients with little to no storage time. This system often employs a single dock or platform with the best access to both cargo loading and unloading zones, allowing items unloaded from a single set of trucks to be inspected, sorted, and divided into groups based on destination.
- **Drop shipment:** When one of your vendor's ships goods directly to your clients on your behalf, this is known as a drop shipment. The customer will not recognize your vendor and will make all payments to you, while you will pay your vendor and still earn. This is excellent for selling slow-moving commodities with a long shelf life without having to worry about storage or maintenance.
- **Electronic Data Interface (EDI):** It is a means of transmitting transactions from one computer system to another by transforming the data into a standard that all systems can understand. It is most employed in situations where two or more parties communicate information on paper. It could be utilized in situations when a seller sends the third party printed copies of invoices or orders.
- **Groupage:** Itis a means of combining many shipments from various sellers (each with their own bill of lading) into a single container. When individual shipments are less than the container load or when they are not large enough to fill a full container, this is done. The freight costs are divided between various sellers in this way.
- **The Harmonized Set of Codes (HS)**: It is a set of internationally recognized codes that assist businesses and government agencies in identifying things when buying or selling them around the world. Depending on where they are used, these codes usually include four to ten digits.
- **Hitchment**: This is the practice of connecting two or more shipments into a single shipment that is identified by a single bill of lading, even though they did not originate from the same location. Only if two conditions are met can this be done:
- All individual shipments have the same sender and receiver. It has been approved by the authorities in charge of shipping tariffs.
- **The International Maritime Dangerous Goods Code (IMDG):** It was established in 1960 as part of the SOLAS (Safety of Life at Sea) convention. It establishes recommendations for the safe handling of combustible, explosive, corrosive, or radioactive items and aids in the prevention of hazardous accidents and pollution that may occur during their transportation.
- **Just-in-time (JIT):** It is a method of inventory optimization in which each batch of items arrives “just in time” to meet the needs of the following stage, which could be a shipment or a production cycle.
- **Knocked Down**: An item that has been deconstructed into two or more components to make transportation easier. Before delivery, these components will be fitted together.

- **Landed Cost:** The overall cost of ownership of an item is known as the landed cost. This includes the purchase price, delivery costs, customs duties, taxes, and any additional fees the buyer was responsible for
- **PADAG:** "Please authorize my delivery against guarantee" is a document that is used when a consignee is unable to provide the shipper with necessary shipping documentation (such as the bill of lading). In exchange for releasing the items in their care, the shipper receives a personal or financial guarantee from the consignee.
- **Waybill:** A document prepared by the seller on behalf of the carrier that defines the shipment's origin, the transacting parties (buyer and seller) information, the route, and the destination address

## 9. 5S Methodology

5S is a system for organizing workspaces so that work may be done quickly, efficiently, and safely. This technique emphasizes putting things back where they belong and keeping the workplace clean, making it easier for individuals to complete their tasks without wasting time or causing damage

The term 5S comes from five Japanese words:

- Seiri (Sort)
- Seiton (Set in Order)
- Seiso (Shine)
- Seiketsu (Standardize)
- Shitsuke (Sustain)


## 10. Six Sigma:

Six Sigma is a quality-control methodology developed in 1986 by Motorola, Inc. It was originally developed as a management method to work faster with fewer mistakes. It has now become an industry standard with certifications offered to practitioners. Six Sigma emphasizes cycle-time improvement while at the same time reducing manufacturing defects to a level of no more than 3.4 occurrences per million units or events.

Six Sigma projects follow two project methodologies, each with five phases.

- DMAIC is used for projects aimed at improving an existing business process.

- DMADV is used for projects aimed at creating a new product or process designs

**DMAIC:**

- **Define** the system, the voice of the customer and their requirements, and the project goals,
- **Control** the future state process to ensure that any deviations from the target are corrected before they result in defects. Implement control systems specifically.
- **Measure** key aspects of the current process and collect relevant data; calculate the "as-is" process capability
- **Analyse** the data to investigate and verify cause and effect. Determine what the relationships are in an attempt to ensure that all factors have been considered. Seek out the root cause of the defect under investigation.
- **Improve** or optimize the current process based upon data analysis using techniques such as the design of experiment, poke yoke or mistake proofing, and standard work to create a new, future state process. Set up pilot runs to process capability
- **Contro**l the future state process to ensure that any deviations from the target are corrected before they result in defects. Implement control systems such as statistical control processes, production boards, visual workplaces, and continuously monitor the process. This process is repeated until the desired quality level is obtained.

**DMDV:**

- **Define** design goals that are consistent with customer demands and the enterprise strategy.
- **Measure** and identify CTQs (characteristics that are **C**ritical **to Q**uality), measure product capabilities, production process capability, and measure risks.
- **Analyse** to develop and design alternatives
- **Design** an improved alternative, best suited per analysis in the previous step
- **Verify** the design, set up pilot runs, implement the production process and hand it over to the process owner(s).

Six Sigma employs a variety of well-established quality-management methods inside the different phases of a DMAIC or DMADV project.

- 5 Whys
- Cause & effects diagram (also known as fishbone or Ishikawa diagram)
- Control chart/Control plan (also known as a swim lane map)/Run chart
- Cost-benefit analysis
- Pick chart/Process capability/Rolled throughput yield
- Quality Function Deployment (QFD)
- Root cause analysis
- SIPOC analysis (Suppliers, Inputs, Process, Outputs, Customers)
- COPIS analysis (Customer-centric version/perspective of SIPOC)
- Taguchi methods/Taguchi Loss Function

# Courses that are available online

**Coursera** - “Operations Research (1): Models and Applications” by National Taiwan University: This course provides different types of mathematical models to tackle optimization problems with business applications. You'll learn about the concepts and applications of Linear Programming, Integer Programming, and Nonlinear Programming will be delivered.

**edX** - "Supply Chain Management" by Rutgers, The State University of New Jersey: This course delves into supply chain dynamics, including procurement, logistics, distribution, and risk management. It covers strategies for efficient and effective supply chain operations.

**Future Learn** - “Enterprise Resource Planning in Operations Management” by Sentinel Academic and Corporate Education: This course will help to understand how to manage day-to-day business activities with effective enterprise resource planning (ERP).

**LinkedIn Learning** - "Operations Management Foundations" by Eddie Davila: This course explores the fundamental concepts of operations management, including process analysis, quality management, and project management. It's suitable for beginners and those looking to refresh their knowledge.

**Udemy** - "Operations Management: Supply Chain & Business Processes" by Sorin Dumitrascu: This course focuses on supply chain management and optimizing business processes. It covers areas like demand forecasting, inventory control, and lean manufacturing.

**MIT Open Courseware** - “Operation Strategy” by Massachusetts Institute of Technology: This course will help to build the concepts of Reengineering and process design, Manufacturing strategy and Supply chain design and 3-D concurrent engineering. This course emphasizes the need of integrating product strategy, manufacturing strategy, and supply chain strategy.

**Open Learn** - “Operations, technology and stakeholder value” by The Open University: This course covers various aspects of effective operations management and outlines the steps to preparing your own operations proposal. The course also introduces a transformation model of operations management, with stakeholder value as the principal output, provide models, concepts and techniques to assist in the analysis of operations systems, especially as these relate to the strategic objectives of the organization.

**Alison** - “Mastering Supply Chain and Logistics Management” by John Academy: The course introduces the basic concepts of supply chain management and covers vertical and virtual integration models. This covers many important concepts such as it lists down five supply chain drivers and outline ways to optimise them, explain how to track supply chain metrics and benchmark the related logistic data, Outline some sustainable and eco-friendly supply chain strategies etc.

# Companies visited last year

Previous academic year, the batch of PGP 2021-23 has recorded a stellar performance in the operations segment. The batch registered 8% placements in operations and manufacturing field.