CHAPTER 1

OVERVIEW OF OPERATIONS MANAGEMENT

Operations Management is the design, operation and improvement of the production systems that create the firms primary products and services" or "OperationsManagement deals with the design, planning, organizing, and controlling of resources, to provide goods and services so as to meet customer wants and organizational goals" Operations (or production) is the process and activities for transforming resources into finished services and goods for customers.

The operations function creates four kinds of utility – **time utility**, **place utility**; **possess utility**, and **form utility** – to meet customer needs.

Performing a service is different from manufacturing a good in several key ways: the raw material for service production includes the people who are seeking the service. In addition, most services are intangible, customized, and cannot be stored. Because of these characteristics, service providers generally focus on the customer service, often acknowledging the customer as part of the operations process. Operations planning for both goods and services involve the analysis of five key factors:

- Capacity planning requires determining how much of a product a firm must be able to produce.
- Location planning involves choosing among potential facility sites.
- Layout planning entails designing an effective, efficient facility.
- Quality planning ensures that products meet a firm's quality standards. Methods planning involve identifying specific production steps and methods for performing them.
- Total quality management (TQM) includes any activity designed to get high quality products to the marketplace. Important TQM tools include statistical process control, quality/cost studies, getting closer to the customer, business process reengineering, IS 9000, and outsourcing. The concept behind supply chain management is that members of the supply chain – the stream of all activities and companies that create a product – can gain competitive advantage by working together as a coordinated system of LESSONs. Managing the chain as a whole has yielded better service and lower prices, leading customers to prefer the products produced by the supply chain, which, in turn, benefits all of its members.

Why study Operations Management (OM)?

Operations' is the core functions of the org and continuously manages the flow of resources thru it. (The output of operations is the bundle of goods and serviceswhich is consumed by society .any org that does not continuously satisfy the needsof customers fails. All orgs have an operation s activity. Om is mgt in that it offersthe challenge, the complexity and responsibility which are part of managerial role.

• Operations management activities at the core of all business organizations

• 35% or more of all jobs are in OM related areas (customer service, quality assurance, production planning and control, scheduling, job design, inventorymanagement, etc.

• Activities in all other areas of business organizations (finance, accounting, marketing, human resource, etc.) are interrelated with OM

• POM is all about management – all managers need to possess the knowledge and skill in the content areas in OM – learn and understand the variety ofdecision making tools in the decision making process

• A course that will prepare students in developing business plans (BA 499 –Business Planning is the capstone course for ALL business majors)

Historical evolution of operations management

For over two century's operations and production management has been recognized as an important factor in a country's economic growth.

The traditional view of manufacturing management began in eighteenth century when **Adam Smith** recognised the economic benefits of specialization of labour. He recommended breaking of jobs down into subtasks and recognises workers to specialized tasks in which they would become highly skilled and efficient. In the early twentieth century, F.W. Taylor implemented Smith's theories and developed scientific management. From then till 1930, many techniques were developed prevailing the traditional view. Brief information about the contributions to manufacturing management

Production Management becomes the acceptable term from 1930s to 1950s. As F.W. Taylor's works become more widely known, managers developed techniques that focused on economic efficiency in manufacturing. Workers were studied in great detail to eliminate wasteful efforts and achieve greater efficiency. At the same time, psychologists, socialists and other social scientists began to study people and human behaviour in the working environment. In addition, economists, mathematicians, and computer socialists contributed newer, more sophisticated analytical approaches.

With the 1970s emerge two distinct changes in our views. The most obvious of these, reflected in the new name **Operations Management** was a shift in the service and manufacturing sectors of the economy. As service sector became more prominent, the change from 'production' to 'operations' emphasized the broadening of our field to service organizations. The second, more suitable change was the beginning of an emphasis on synthesis, rather than just analysis, in management practices.

Historical summary of evolution of operations management

DATE	CONTRIBUTION	CONTRIBUTOR
1776	Specialization of labour in manufacturing	Adam Smith
1799	Interchangeable parts, cost accounting	Eli Whitney & others
1832	Division of labour by skill; assignment of jobs by Skill; basics of time study	Charles Babbage
1900	Scientific management time study and work study Developed; dividing planning and doing of work	Frederick Taylor
1900	Motion of study of jobs	Frank B. Gilbreth
1901	Scheduling techniques for employees, machines Jobs in manufacturing	Henry L. Gantt
1915	Economic lot sizes for inventory control	F.W. Harris
1927	Human relations; the Hawthorne studies	Elton Mayo
1931	Statistical inference applied to product quality: quality control charts	W.A. Shewart
1935	Statistical Sampling applied to quality control: sampling plans	H.F.Dodge& H.G.Roming
1940	Operations research applications in world war II	P.M.Blacker & others
1946	Digital Computer	John Mauchlly and J.P.Eckert
1947	Linear Programming	G.B.Dantzig, Williams & others
1950	Mathematical programming, on-linear and stochastic processes	A.Charnes, W.W.Cooper & others
1960	Organisational behaviour: continued study of people at work	L.Cummings, L.Porter
1970	Integrating operations into overall strategy and policy Computer applications to manufacturing, scheduling, and control, Material Requirement Planning (MRP)	W.Skinner J.Orlicky & G. Wright
1980	Quality and productivity applications from Japan: roboticsCAD-CAM	W.E. Deming & J.Juran

Summarized evolution

- Industrial revolution (1770's)
- Scientific management (1911)
    - Mass production
    - Interchangeable parts
    - Division of labor
- Human relations movement (1920-60)
    - Unemployment insurance
    - Pension plans
- Decision models (1915, 1960-70's)
- Influence of Japanese manufacturers (1970-1990)

Key Elements of Operations Management

a) **Product selection and design**: The right kind of products and good designs of the products are crucial for the success of an organizing. A wrong selection of the product and/or poor design of the products can render the company's operation ineffective and non-competitive. Products/services, therefore, must be chosen after detailed evaluation of the product/services alternatives in conformity with the organization's objectives. Techniques like value engineering may be employed in creating alternate designs, which are free from unnecessary features and meet the intended functions at the lowest cost.

b) **Process selection and planning**: Selection of the optimal "conversion system" is as important as choice of products/services and their design. Process selection decisions include decisions concerning choice of technology, equipment, machines, material handling systems, mechanization and automation. Process planning involves detailing of processes if resource conversion required and their sequence.

c) **Facilities (Plant) location**: Plant location decisions are strategic decisions and once plant is set up at a location, it is comparatively immobile and can be shifted later only

at a considerable cost and interruption of production. Although problem of location choice does not fall within preview the production function and it occurs infrequently, yet it is of crucial importance because of its major effect on the performance of every department including production. Therefore, it is important to choose the right location, which will minimize total "delivered customer" cost (Production and distribution cost). Locational decisions involve evaluation of locational alternatives against multiplicity of relevant factors considering their relative importance to the organization and selecting those, which are operationally advantageous to the organization.

d) **Facilities (Plant) layout and materials handling**: Plant layout is concerned with relative location of one department (Work centre) with another in order to facilitate material flow and processing of a product in the most efficient manner through the shortest possible time. A good layout reduces material handling cost, eliminates delays and congestion, improves co-ordination, provide good housekeeping etc. while a poor layout results in congestion, waste, frustration, inefficiency and loss of profit

e) **Capacity Planning**: Capacity planning concerns determination and acquisition of productive resource to ensure that their availability matches the demand. Capacity decisions have a direct influence on performance of production system in respect of both resource productivity and customer service (i.e. delivery performance). Excess capacity results in low resource productivity while inadequate capacity leads to poor customer service. Capacity planning decisions can be short-term decisions. Long-term capacity planning decisions concern expansion/contraction of major facilities required in the conversion process, economics of multiple shift operation, development of vendors for major components etc. Short-term capacity planning decisions concern issues like overtime working, sub-contracting, shift adjustments etc. Break-even analysis is a valuable tool for capacity planning.

f) **Production Planning and Control (PPC):** Production planning is the system for specifying the production procedure to obtain the desired output in a given time at optimum cost in conformance with specified standard of quality, and control is essential to ensure that manufacturing takes place in the manner stated in the plan.

g) **Inventory control**: Inventory control deals with determination of optimal inventory levels of raw materials, components, parts, tools; finished goods, spares and supplies to ensure their availability with minimum capital lock up. Material requirement planning (MRP) and just in time (JIT) are the latest techniques that can help the firm to reduce inventory.

h) **Quality assurance and control**: Quality is an important aspect of production system and it must ensure that services and products produced by the company conform to the declared quality standards at the minimum cost. A total quality assurance system includes such aspects as setting standards of quality, inspection of purchased and sub-contracted parts, control of quality during manufacture and inspection of finished product including performance testing etc.

i) **Work-study and job design**: Work-study, also called time and motion study, is concerned with improvement of productivity in the existing jobs and the maximization of productivity in the design of new jobs. Two principal component of work-study are: Method study and Work measurement.Method study has been defined as the systematic recording and critical examination of the existing and proposed ways of doing work, as a means of developing and applying easier andmore effective methods and reducing costs. Method study when applied to production methods yields one or more of the following benefits:

- ✓ Improved work environment
- ✓ Improved facility layout
- ✓ Better utilization of facilities
- ✓ Greater safety
- ✓ Lesser materials handling
- ✓ Smooth production flow
- ✓ Lower work-in-process
- ✓ Higher earnings for the workmen

j) **Maintenance and replacement**: Maintenance and replacement involve selection of optimal maintenance (preventive and/or breakdown) policy to ensure higher equipment availability at minimum maintenance and repair cost. Preventive maintenance, which includes preventive inspection, planned lubrication, periodic

cleaning and upkeep, planned replacement of parts, condition monitoring of the equipment and machines, etc. Is most appropriate for critical machines.

k) **Cost reduction and cost control**: Effective production management must ensure minimum cost of production and in this context cost reduction and cost control acquires significant importance. There are large numbers of tools and techniques available that can help to make a heavy dent on the production cost.

Objectives of Operations management may be amplified as under:

- Producing the right kind of goods and services that satisfy customers' needs (effectiveness objective).
- Maximizing output of goods and services with minimum resource inputs (efficiency objective).
- Ensuring that goods and services produced conform to pre-set quality specifications (quality objective).
- Minimizing throughput-time- the time that elapses in the conversion process- by reducing delays, waiting time and idle time (lead time objective).
- Maximizing utilization of manpower, machines, etc. (Capacity utilization objective).
- Minimizing cost of producing goods or rendering a service (Cost objective).

In general, Operations management is concerned with the achievement of both satisfactory **customer service** and **resource utilisation**.

Product versus Service Operations

The differences between products and service operations fall into the eight categories.

The first distinction arises from the physical nature of the product: manufactured goods are physical, durable products. Services on the other hand are intangible, perishable.Product-they are usually ideas, concept, or information.

The second area of difference also relates to the physical nature of the product. For instance, manufactured goods are outputs that can be produced, stored, and transported in anticipation of future demand. This way, creating inventories allows manager to cope with fluctuations in demand by smoothing output level. On the other hand, services can't be pre-produced. To this end, service operations do not have the luxury of using finished goods inventories as a cushion against erratic customer demand.

Customer contract is the third distinction between manufacturing and service operations.

Most customers for manufactured products have little or no contact with the production system. The primary customer contract is normally left to distributors and retailers. However, in the case of service firms, the customers themselves are inputs, and thus, are active participant in the process.

Another distinction is response time to customer demand. For instance, manufacturers generally have days or even weeks to meet customer demand. However, many services must be offered within minutes of customer arrival. The purchaser of a generator may be willing to wait for four weeks for delivery. By contrast, a grocery store customer may grow inpatient after waiting five minutes in a checkout line. Since customers for services usually arrive at times convenient to them, service operations may have difficulty matching capacity with demand. In addition, arrival patterns may vary daily or hourly, thus creating even more short-termdemand uncertainty.

There are two distinctions with respect to location and size of an operation. Manufacturing facilities usually serve regional, national, or even international markets. Therefore, they generally require larger facilities, more automation, and greater capital investments than for service facilities. On the other hand, services cannot be moved to distant locations. Hence, service organisation requiring direct customer contact must locate relatively near the customer.

The final distinction between manufacturing and service operations relates to the measurement of quality. Since manufacturing systems tend to have tangible products and less customer contact, quality is relatively easy to measure. However, the quality of service systems, which generally produce intangibles, is often very difficult to measure. Coupled with this, the subjective nature of individual preferences further makes the measurement of services difficult.

Summary of differences between products and Services

	PRODUCT	SERVICE
1	Physical, durable product	Intangible, perishable product
2	Output can be inventoried	Output cannot be inventoried
3	Low customer contact	High customer contact
4	Long response time	Short response time
5	Large facilities	Small facilities
6	Capital intensive	Labour intensive
7	Quality easily measured	Quality not easily measured
8	Regional, national, or	Local markets International markets.

Similarities between products and Service Operations

In spite of the differences already discussed there are compelling similarities between manufacturing and service operation:

Firstly both have processes that must be designed and managed effectively.

Secondly, some type of technology be it manual or computerized must be used in each process.

Thirdly, both of them are usually concerned about quality, productivity and the timely response to customers.

Fourthly they must make choices about capacity, location, and layout of their facilities.

Fifthly, both deal with suppliers of outside services and materials, as well as scheduling problems.

Sixthly, matching staffing levels and capacities with forecasteddemand is a universal problem.

Frameworks for analysing Operations

i. Value Chain

Value chain is an interconnected set of linkages among suppliers of materials and services that spansthe transformation process that converts ideas and raw materials into finished goods and services for a firm's customers.

A value chain is a high-level model developed by Michael Porter used to describe the process by which businesses receive raw materials, add value to the raw materials through various processes to create a finished product, and then sell that end product to customers. Companies conduct value-chain analysis by looking at every production step required to create a product and identifying ways to increase the efficiency of the chain. The overall goal is to deliver maximum value for the least possible total cost and create a competitive advantage.

Primary Activities of the Value Chain

All five primary activities are essential in adding value and creating a competitive advantage. The first activity in the value chain is **inbound logistics**, which includes all receiving, warehousing and inventory management of raw materials ready for production.

The second activity is **operations** and encompasses all efforts needed to convert raw materials into a finished product or service.

Outbound logistics is the third activity in the value chain and occurs after all operations are completed and the end product is ready for the customer. Activities required to deliver a product to the end user are considered part of outbound logistics.

Marketing and sales are the fourth part of the value chain and include all strategies used to get potential customers to purchase a product, such as channel selection, advertising and pricing.

Service is the fifth and final step in a company's value chain and describes all activities that create better consumer experiences, such as customer service and repair services.

Companies can harness a competitive advantage at any one of the five activities in the value chain. Creating outbound logistics that are highly efficient, for example, cuts down on a company's shipping costs and allows it to either realize more profits or pass the savings through to the consumer, lowering the price point.

Support Activities of the Value Chain

Support activities facilitate the efficiency of the primary activities in a value chain.

The four support activities are **procurement,technological development**, **human resource management** and **company infrastructure**. Increasing the efficiency of any of the four support activities increases the benefit to at least one of the five primary activities. These support activities are normally denoted as overhead costs on a company's income statement.

ii. Systems Approach

System approach emphasizes interrelations among subsystems. It is essential whenever something is being designed, redesigned, implemented, or improved. It is important to take into account the impact on all parts of the system. Example: A new feature is added to a product.

A systematic approach involves understanding the nature of issues and problems to be studied, collecting relevant data, and developing effective as well as efficient solutions to the problem

Designer must take into account how customers will view the change, instruction for using new feature, the cost, training of workers, production schedule, quality standard, advertising must be informed about the new feature.

CHAPTER 2

VALUE ANALYSIS IN SUPPLY CHAIN

Value engineering or value analysis had its birth during the World War II Lawrence D. Miles was responsible for developing the technique and naming it. Value analysis is defined as "an organized creative approach which has its objective, the efficient identification of unnecessary cost-cost which provides neither quality nor use nor life nor appearance nor customer features." Value analysis focuses engineering, manufacturing and purchasing attention to one objective-equivalent performance at a lower cost.

Value analysis is concerned with the costs added due to inefficient or unnecessary specifications and features. It makes its contribution in the last stage of product cycle, namely, the maturity stage.

At this stage, research and development no longer make positive contributions in terms of improving the efficiency of the functions of the product or adding new functions to it.

Value is not inherent in a product, it is a relative term, and value can change with time and place.

It can be measured only by comparison with other products which perform the same function. Value is the relationship between what someone wants and what he is willing to pay for it. In fact, the heart of value analysis technique is the functional approach. It relates to cost of function whereas others relate cost to product. It is denoted by the ratio between function and cost.

Steps in Value Analysis

1. **Identifying the function:** Any useful product has some primary function which must be identified—a bulb to give light, a refrigerator to preserve food, etc. In addition it may have secondary functions such as withstanding shock, etc. These two must be identified.

2. **Evaluation of the function by comparison**: Value being a relative term, the comparison approach must be used to evaluate functions. The basic question is, 'Does the function accomplish reliability at the best cost' and can be answered only comparison.

3. **Develop alternatives**: Realistic situations must be faced, objections should overcome and effective engineering manufacturing and other alternatives must be developed. In order to

develop effective alternatives and identify unnecessary cost the following thirteen value analysis principles must be used:

- Avoid generalities.
- Get all available costs.
- Use information only from the best source.
- Brain-storming sessions.
- Blast, create and refine: In the blast stage, alternative productive products, materials, processes or ideas are generated. In the 'create' stage the ideas generated in the blast stage are used to generate alternatives which accomplish the function almost totally. In the refining stage the alternatives generated are sifted and refined so as to arrive at the final alternative to be implemented.
- Identify and overcome road blocks.
- Use industry specialists to extend specialised knowledge.
- Key tolerance not to be too light
- Utilise the pay for vendors' skills techniques.
- Utilise vendors' available functional products.
- Utilise speciality processes.
- Utilise applicable standards.
- Use the criterion 'Would I spend my money this way

Value Analysis Process

Value Analysis process is based on the application of a systematic work plan that may be divided into 7 steps as mentioned below:

- ✓ Selection & Orientation,
- ✓ Analysis,
- ✓ Recording Ideas,
- ✓ Innovation/Creativity,
- ✓ Evaluation,
- ✓ Recommendations, and
- ✓ Implementation and monitoring.

The application of VA process needs to make use of basic techniques such as **Matrices,Pareto chart**, **PERT technique** and **Gantt diagrams**, etc., in most of the VA stages.

#	Stage	Description
1.	**SELECTION & ORIENTATION**	➢ To select those critical areas where a potential for cost reductions is expected. ➢ Use the common **Pareto's ABC** analysis. ➢ General scope, restrictions and aims of the study is defined.
2.	**ANALYSIS**	➢ Examine the data at a **VA** group/team meeting. ➢ Record the minutes of each brainstorming session. ➢ Apply the Tests for **Value**. ➢ Propose further action.
3.	**RECORDING IDEAS**	➢ Write down the minutes of analyses meetings and circulate them to group/team members for further queries. ➢ It includes the agenda for the next meeting.
4.	**INNOVATION/ CREATIVITY**	➢ Arrange team meetings in order to discuss the ideas analyzed and any new information obtained. ➢ Think upon practical measures for reducing costs and increasing value.

#	Stage	Description
5.	**EVALUATION**	➢ Investigate suggestions for reducing costs and to make them practical and acceptable to client management. ➢ Obtain definite prices and costs in order to estimate cost reductions accurately.
6.	**RECOMMENDATIONS**	➢ Recommend cost reductions to client management. ➢ Present the recommendations in a comprehensive report. ➢ Recommend a member to act as an implementation consultant for **VA** recommendations.
7.	**IMPLEMENTATION & MONITORING**	➢ Implement the recommendations accepted by the company management. Monitor the results as suggested in **VA** report. ➢ Jot down the feedback of the management upon completion of **VA** assignment.