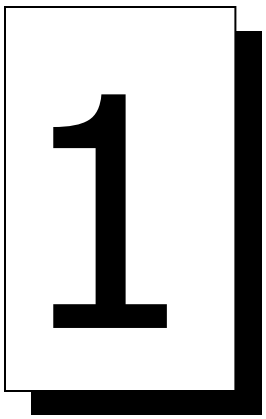
Introduction to Operations Management



Unit Introduction

Operations, as it is termed, are focused on conversion of input to output. While the managers are involved in planning, organizing and controlling, operations managers have the direct responsibility of getting the job done timely, economically and with quality. They must provide the leadership that is needed to produce the goods and services demanded by the customers. With quality, productivity, and timeliness more competitively significant than ever before, operations management has added behavioral and modeling approaches to its historical use of the classical/scientific schools of management techniques. All of these many elements come into play in the fascinating field of operations management. This unit begins by describing what the operations management in organizations means, followed by the operations functions and its environment. Next we traced operations management history to observe how operations management has evolved from simple manufacturing to achieve its current stature as a major element of competitive strategy in contemporary organizations. In the lesson two the operations objectives, the life cycle process and its operational issues are discussed and analyzed in details emphasizing the role of operations managers.

Lesson One: Introduction to Production & Operations

Lesson Objectives
After completing this lesson you will be able to:

- Understand the concept of goods and services
- Define operations management
- Explain the production system
- Justify the relationships between production system and environment
- Historical development of operations management

The Concept of Product: Goods & Services
Product is the core of operations. In this introductory chapter we begin our journey by explaining what a 'product' is because a thorough idea of product is vital to the understanding of productions and operations management. When we say an operation is converting inputs into outputs, these outputs are products or things that satisfy consumer needs. A product can be either a good (i.e., a physical object) or it may be a service (i.e., an intangible product) that offer benefits to customers in forms of financial, medical, legal or educational, etc.. In operational terms, *producing* a good is called *manufacturing* and *generating* service is *services*. The difference of the two can be drawn in term of the following characteristics (Table 1.1.1).

Goods are physical objects and services are intangible products that offer benefits to the customer.

Table 1.1.1: Characteristic differences between goods & services

Characteristics	Goods	Services
Output	Tangible	Intangible
Customer contact	Low	High
Uniformity of input	High	Low
Labor content	Low	High
Measurement of productivity	Easy	Difficult
Opportunity to correct quality problems before delivery to customer	High	Low
Input variability	Lower	Greater

While reading the above table we need to keep in mind that it represents two extreme end of the same spectrum. IN one end pure goods are tangible in nature, whereas, on the other end of the spectrum services are purely intangible. But in reality most goods and services are somewhere in between the extreme ends, as such, have features that are common to each other. For example, Airlines is a service sector endeavor, it is highly capital intensive, has very little labor content, and has low customer contact. Similarly, many goods that we use now a days come with lots of intangible features, like after sales service, etc.

Operations Management Defined
What does production and operations management mean? First the term *production* conjures up images of factories, machines, and assembly lines. To many production simply means to make products. Therefore, production

management seems the management of making products. What then, does the term *operations management* specifically mean? Operations management, a term that more closely reflects the diverse nature of activities and situations outside manufacturing, such as, health care, food service, education, recreation, banking, etc. Therefore, *Operations management is defined as the process of designing, operating, and controlling a productive system capable of transforming physical resources and human talent into needed goods and services.*

Operations Management is the process of converting inputs into desired outputs.

In simpler terms, *Operations Management* is the process of converting inputs into desired outputs. More specifically, it is the management of the conversion of land, labor, capital, technology and management inputs into desired outputs of goods or services.

The Operation System

Now let us take a look at this operation process in more details. As we have said production is the process of converting the resources available to an organization into products. In some organization production or manufacturing of goods and the creation of a service go hand in hand. Consider for example a fast food restaurant where various food items are converted into consumable products but where the speed and quality of service are also crucial factors for a successful operation. The collection of all interrelated activities and operations involved in producing goods and services is called a production system (Figure1.1.1). This figure illustrates that any production system consists of five principal components: input, conversion, output, getting feedback and generating managerial control.

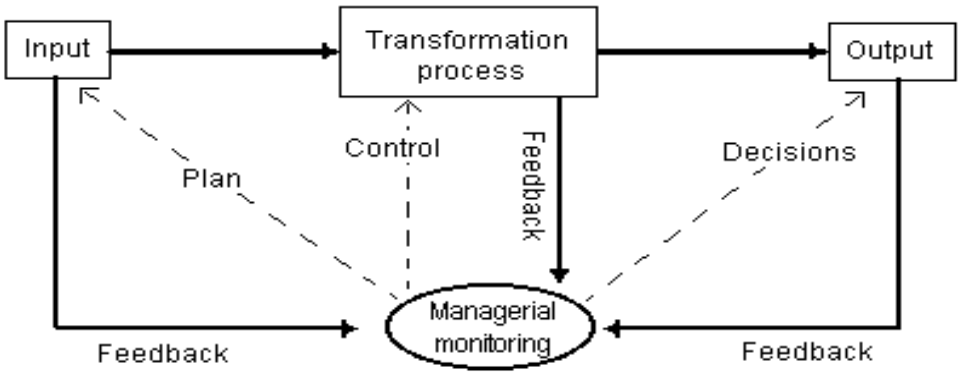


Figure 1.1.1: The production system in operations management

- **Inputs and outputs**

Inputs consist of the resources that are transformed into desired output.

Inputs of a production system consist of the resources that are transformed into the desired outputs (goods and services), as well as the resources needed to support the overall production process. In manufacturing, for example, the inputs consist of the raw materials and or the purchased parts that are transformed into finished goods as outputs. These inputs might be crude oil to convert into petrol, auto parts to assemble into a car, or fabrics to make dresses. In addition to such material inputs, machines and material handling

equipment must be purchased, workers must be hired and trained and information regarding the technology, market and competitors must have to be obtained. All these also fall in the category of inputs. In a service organization, similar inputs are needed. For example, an educational institute requires tables, chairs, chalks/markers, chalk boards/white boards, books, lighting, and skilled teachers to teach students; a restaurant requires food, chefs, waiters and waitresses. The major output of a service organization is the customer satisfaction.

- **The conversion process**

Conversion processes in production typically change the shape of raw materials or change the composition or form of the material. For example, grains are converted into food products and different parts are combined to make an automobile. Larger manufacturing systems usually employ several different conversion processes. In service organizations, conversion does not take place; rather the service is created. This creation process may consist of making the service available at specific times and locations—for example, a branch bank with a 24-hour automatic teller that is built in a shopping mall. In other service organizations, such as hospital, it is the skill and expertise of the staff that create satisfaction.

The extent to which customers participate in the conversion process is very important to understand. In service operations, managers sometimes find it useful to distinguish between output and throughput types of customer participation. Output is a generated service; throughput is an item going through the process. Following two examples illustrate the difference between throughput items going through the conversion process contrasted with outputs coming out of the conversion process. In a dental clinic the output is the medical service to the patient who, by going through the conversion process, is also the throughput (Figure 1.1.2).

Output is a generated service; throughput is an item going through the process.

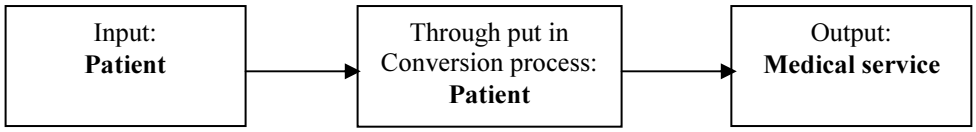


Figure 1.1.2: Input-Output in a Dental Clinic

At a restaurant, in contrast, the customer does not go through the conversion process. The outputs are prepared food items served (both goods and services), and while the throughputs are the food items as they are prepared and converted (Figure 1.1.3).

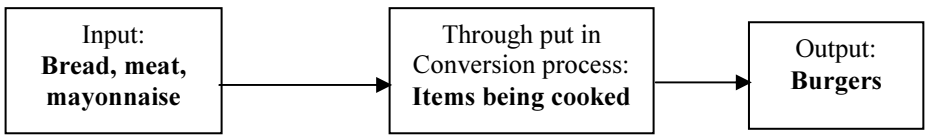


Figure 1.1.3: Input-Output in a fast-food Shop

Both the clinic and the restaurant provide services even though the outputs and throughputs differ considerably.

- **Managers**

Managers represent the most important component in a production system. In order for a production system to function effectively, skilled managers are needed to plan and make decisions. Managers must acquire the inputs, control the conversion or creation process and ensure that outputs are available at the proper time and place to satisfy demand. The selection of customer orders to process, the assignment of workers to jobs, employee motivation, cost control and quality issues are a few of the important problems that managers of production systems must face. Such problems involve both technical and behavioral skills.

- **Feedback**

Feedback is the process of monitoring the outputs of a production system and using this information to control the production process.

Feedback is the process of monitoring the outputs of a production system and using this information to control the production process. Effective feedback requires useful performance measures and enables an organization to improve the goods and services that it offers and better meet the demands of the marketplace. For example, manufacturers need to determine if finished products contain any defects. If so, then it must be determined whether the problem is a result of bad materials, poor workmanship or something else. Feedback is also an important issue for service operations. For instance, a travel agent often calls a client after his or her vacation to see if the travel arrangements were satisfactory. In case of a bad report from the client, the agent can easily understand that if this goes on, he might loose valuable customers in the future. In larger organizations, feedback provides means for top managers to determine how well their goals are being met at lower levels. While plans and decisions are fed downward, feedback on performance flows upwards, thus providing a link between hierarchical levels.

Activity: Assume that you are an operation manager. Now, how the process of feedback will help you redesign your product or ensure customer satisfaction.

The Production System and its Environment

Environment is internal and external factors that affect the overall performance of the organization.

A production system is only one of the major components of an organization. Production is affected by, and has an impact on decisions in other functional areas of the firm. These are referred to as the internal influences of the production environment. In addition, various external influences affect the overall objectives and policies of a company and have important implications for production. These relationships for a typical firm are illustrated in the Figure 1.1.4.

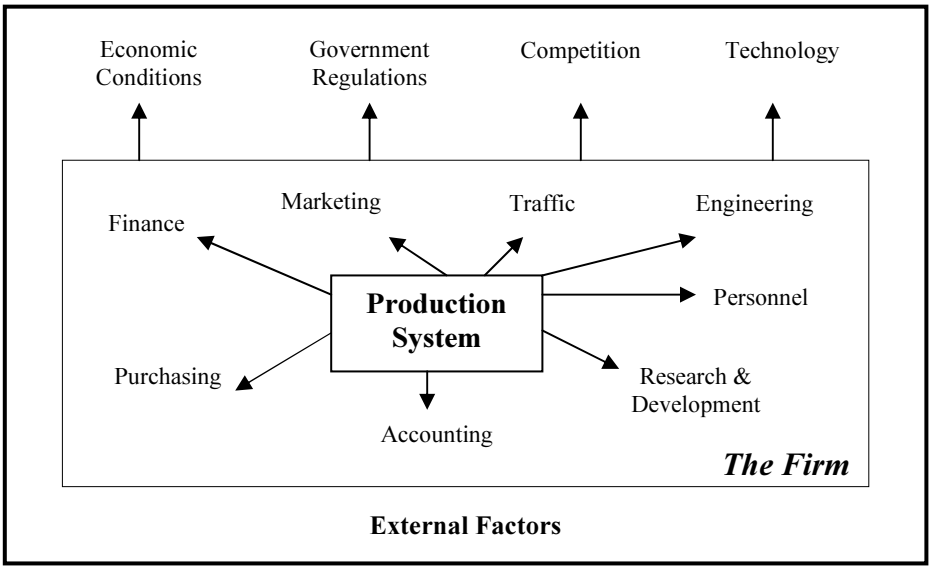


Figure1.1.4: The production system and different environment

At the outermost level, external to the firm itself, are several environmental factors that influence the overall policies and objectives of the company. The most important environmental factors are economic conditions, government regulation, competition, and technology. Economic factors include interest rates, availability of capital, general economic conditions, tax regulations, and economies of scale. For example, the sudden rise in oil prices, coupled with an increasing energy conscious American people, has had a dramatic effect on the product lines of automobile manufacturers. New product lines in America requires significant retooling and redesign of production processes in the auto industry. Compliance with governmental regulations on pollution control and environmental impact, for example, has also had an impact on production.

The nature of competition, market shares, and how the firms react to competitive strategies have a significant influence on product lines and other strategic decisions. This has been especially evident in the fast- food industry. You have undoubtedly observed that when a fast food franchise offers a new item, a variety of other similar operations almost immediately imitate such items and offer them in different preparations. This requires new consideration in food production processes and the management of food items and supplies.

New technology in manufacturing processes, equipment, or materials can drastically affect product designs and production methods. An excellent illustration of this is the development of microprocessors in the electronic industry. Manufacturers of all mechanical office equipment, cash registers, and other product were forced to incorporate the new technology in order to stay in business. Thus we see that production must react quickly to strategic changes in firm's business plan.

In the organization other functional areas such as finance, accounting, marketing etc also influences the production system.

Within an organization, other functional area influences the production system. Finance is responsible for obtaining funds, controlling their use, analyzing investment opportunities, and insuring that the firm operates on a cost-effective basis and in most cases at a profit. Financial decisions affect the choice of manufacturing equipment, use of over time, cost-control policies and price volume decision and in fact nearly all facets of the organization. Accounting keeps records on costs and prices that relate to such factors as financial decisions, purchasing, and payroll. Many of these data must be obtained from production managers. Marketing is responsible for generating and maintaining demand for the firm's products, insuring customer satisfaction and developing new markets and product potentials. Coordination of production and marketing is important in order to use demand forecast effectively, to project workloads and to ensure sufficient capacity to handle the demand and deliver finished products on time. Engineering determines guidelines for product quality, production methods and other technical specification. Personnel and labor relations recruit and train employees and are responsible for employee morale, wage administration, union negotiations and so on. Research and development investigates new ideas and their potential uses as consumer products. Finally, purchasing and traffic are responsible for the acquisition of materials and supplies necessary for production and the distribution of the finished goods to customer, respectively.

Activity: Do you think the Bangladeshi Garment Industry sector is heavily influenced by the global environment? Why or why not? Discuss.

As we have already mentioned, the random fluctuations can be due to internal problems (e.g., human error, faulty process, imperfect input, etc.) or because of external sources (e.g., natural disasters, political impacts, government interventions, etc.). Consider the cases of a department store (Figure 1.1.5) and a farm (Figure 1.1.6) for better understanding.

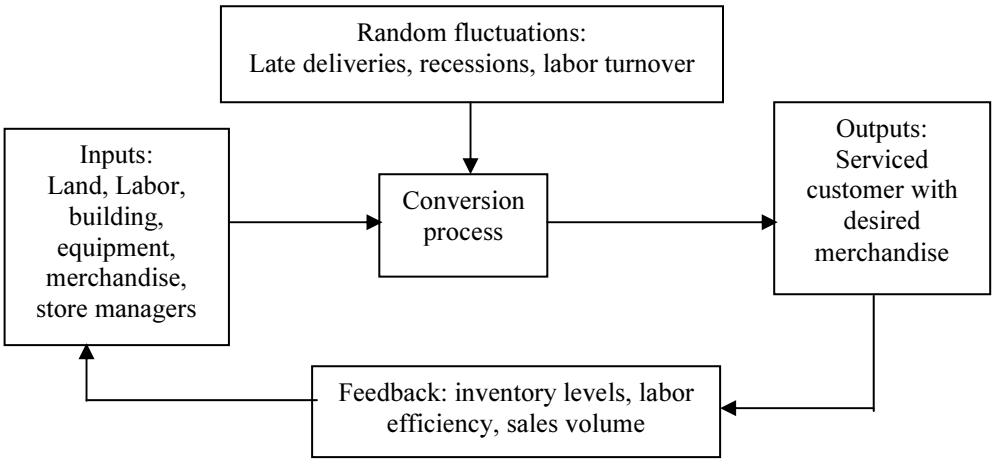


Figure 1.1.5: Operations systems for a Department store

In a department store we use land, labor, building, equipment, merchandise, store managers as inputs to get the serviced customers with desired merchandise as the outputs. In this conversion process the *random fluctuations* are late deliveries, recession, labor turnover, etc.

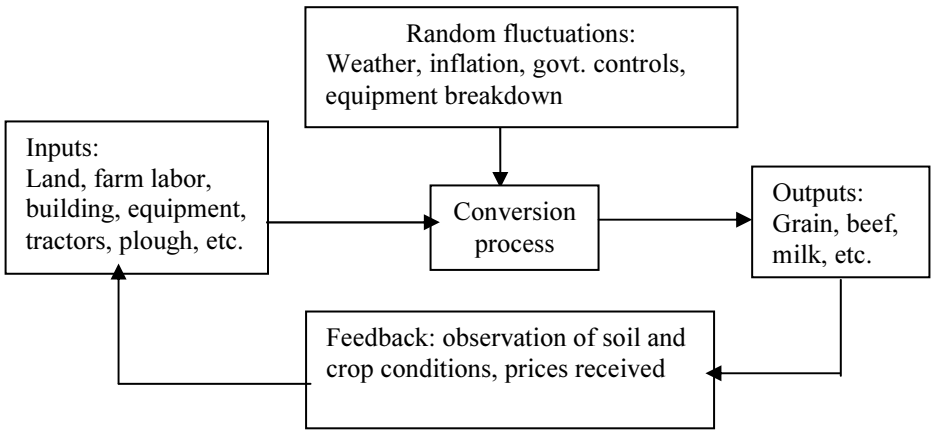


Figure 1.1.6: Operations systems for a farm

On the other hand in case of a farm we give inputs of land, farm labor, tractors, plough, buildings, skills of farmers, etc., to get the grains, beef, milk, etc. Here the random fluctuations are weather, inflation, government control, and equipment breakdown.

There is continuous *feedback* on the process to monitor and control operations. This helps to achieve desired outputs with minimum variations. The feedback loop provides key information to the managers regarding adjustments needed.

Historical Development of Operations Management

Operations Management has been playing a vital role for over two centuries for the economic development of a country (Table 1.1.2). The term Operations Management progressed through a series of names: manufacturing management, production management, production and operations management, and operations management. All these different names describe the same general discipline.

The traditional view of manufacturing management began in the eighteenth century when Adam Smith recognized the economic benefits of specialization of labor. For higher skill and efficiency, he recommended breaking down of jobs into subtasks and reassigning workers to specialized tasks. In late eighteenth century, Eli Whitney and others highlighted interchangeable parts and cost accounting. In nineteenth century, Charles Babbage came up with division of labor by skill, assigning of jobs skills and basics of time study. In the early twentieth century, Frederick W. Taylor implemented Smith's theories and voiced for scientific management throughout the vast manufacturing complex of his day. From then until about 1930, the traditional view prevailed. During this time many techniques developed that we still use today.

Traditional view of manufacturing management began in the eighteenth century when Adam Smith recognized the economic benefits of specialization of labor.

From 1930s to 1950s, *production management* becomes the more widely accepted term. As Frederick Taylor's work became more widely known, managers developed techniques that focused on economic efficiency of manufacturing. Workers were carefully scrutinized and studied in great details to eliminate wasteful efforts and achieve greater efficiency. At the same time, however, management also began discovering that workers have multiple needs, not just economic needs. Psychologists, sociologists and other social scientists began to study human behavior in the work environment. In addition, economists, mathematicians, and computer scientists contributed newer, more sophisticated analytical approaches.

There was a shift in the *service* & *manufacturing* sectors of the economy.

During 1970s, two distinct views emerged. The first view was reflected in the new name *operations management.* At that time, there was a shift in the *service* and *manufacturing* sectors of the economy. As the service sector became more prominent, the change from *production* to *operations* emphasized the broadening of the field to service organizations. The second view was an emphasis on synthesis in management practices, rather than just analysis. Previously, managers emphasized more on the analytical aspects of management practices. Accordingly, they were preoccupied with an intense analytical orientation and emphasis on marketing and finance. But the result was a failure to integrate operations activities coherently into the highest levels of policy and strategy. The synthesis approach changed their perspective and the managers began to focus on how they could combine the various elements of management practices in the most effective and efficient way to obtain the best result. Because of these new approaches, today the operations function is experiencing a renewed role as a vital strategic element. Consequently organizations' goals are better focused to meet consumer's needs throughout the globe.

Table 1.1.2: Historical summary of operations management

Year	Contribution	Contributor
1776	Specialization of labor in manufacturing	Adam Smith
1799	Interchangeable parts, cost accounting	Eli Whitney & others
1832	Division of labor by skill; assignment of jobs by skill; basics of time study	Charles Babbage
1900	Scientific management; time study and work study, dividing, planning and doing of work	Frederick W. Taylor
1900	Motion 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	Walter A. Shewart
1935	Statistical sampling applied to quality control; inspection sampling plans	H.F. Dodge & H.G. Romig
1940	Operations research applications in World War II	P.M.S. Blacket & others
1946	Digital computer	John Mauchly & J.P. Eckert

1947	Linear programming	George B. Dantzig, William Orchard-Hays, & others
1950	Mathematical programming, nonlinear and stochastic processes	A. Charnes, W.W. Cooper, H. Raiffa & others
1951	Commercial digital computer; large-scale computations available	Sperry Univac
1960	Organizational behavior; continued study of people at work	L. Cummings, L. Porter & others
1970	Integrating operations into overall strategy and policy	W. Skinner
1970	Computer applications to manufacturing, scheduling, and control, material requirements planning (MRP)	J. Orlicky & O. Wright
1980	Quality and productivity applications from Japan; robotics, computer-aided design and manufacturing (CAD/CAM)	W.E. Deming & J. Juran
1990	Time based competition and information highway	Numerous

The evolution of in the core concepts regarding operations management can be illustrated in the following Figure 1.1.7.

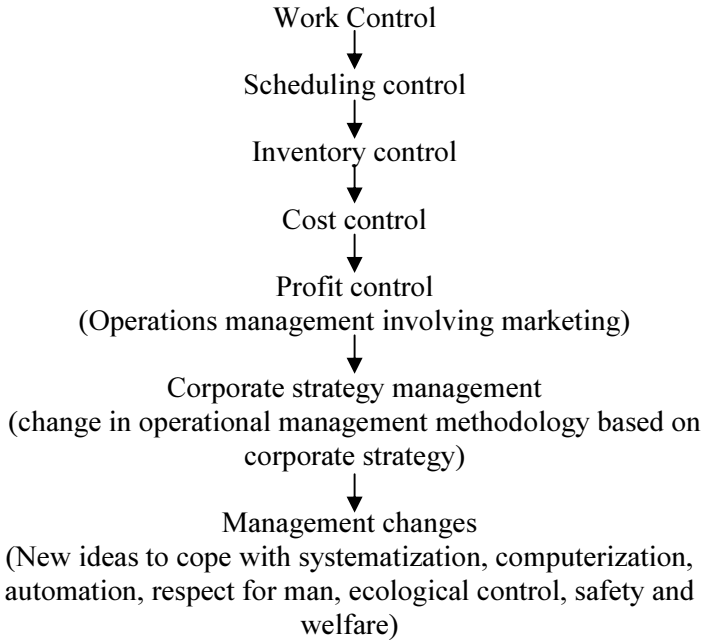


Figure 1.1.7: Evolution of Operation Management

Recent Issues of the Operations Management

In today's world production and operations management considers certain factors as vital to the success of any organization. These recent trends are:

- *Global market place:* The world economy is, "…not trade among 160 countries; it is the world moving from trade among countries to a single economy. One economy, one marketplace."
- *Operation strategy:* "..Involves fitting the operations mission into the corporate strategy, a strategy that should blend the environment and corporate resources into a corporate position statement."

- *TQM—total quality management:* A continuous attention to manufacturing details rather than attainment of a fixed quantitative quality standard.
- *Flexibility:* Capability of a manufacturing system to adapt successfully environmental conditions and process requirements.
- *Time reduction:* Increasing efficiency by reducing time taken.
- *Technology:* The level of sophistication in plant, equipment, and skills in the conversion process.
- *Worker investment:* Considering worker benefit and improving human relationship with the top management.
- *Reengineering:* Updating the complete conversion process by reprocessing the entire set of information and recreating the entire MRP (materials requirement planning).
- *Environmental issues:* Profit maximization through operational activities with the social and environmental welfare in mind.

Operation Management Today—A System Viewpoint

Production management, which originally meant the management of production lines, has today evolved into a comprehensive idea directly related to corporate strategy. The process of evolution appears to be closely related to the birth of industrial giants having complex production systems.

System is a collection of objectives of regular interaction and interdependence.

Today organizations are viewed as systems. A system is a collection of objectives of regular interaction and interdependence. A systems model of the organization identifies the subsystems or sub-components that make up the organizations. A business firm might well have finance, marketing, accounting, personnel, engineering, purchasing, and physical distribution systems in addition to the operations system. These systems are not independent, but are interrelated to one another in many vital ways.

The systems viewpoint identifies each of these functional areas of the organization as subsystems. Thus operations stand out as a very important subsystem of the 'organization' system. The significance of this approach is that operations is not viewed as an independent subsystem of any organization; it is rather considered as an interrelated subsystem that incorporates large emphasis from other subsystems. As a result the decision makers of any organization always bears in mind the operations function in times of developing the overall corporate strategies. Similarly, the operations function always adheres to the goals of the corporate bodies.

Discussion Questions

1. List five different organizations that offer both manufacturing and service operations.
2. What are the major components of a production system? Give examples of each.
3. Discuss the major environmental influences on the production system. Which are external and which are internal to the firm?
4. Choose an organization and identify the inputs, outputs, conversion process, throughputs, managers and feedback.
5. Explain the role of feedback in service industries, such as, fire department, post offices and ambulance service.

Lesson 2: Operations Objectives, Life Cycle Approach

Lesson Objectives

After completing this lesson you will be able to:

- Identify operations objectives
- Discuss the concept of new product
- Explain the life cycle and operations issues
- Identify the role of operations managers
- Explain operation management thought of the different schools

The Operations Objectives

The major objective of the operations subsystem is to provide conversion capabilities for meeting the organization's goal and strategy. The specific objectives (sub goals) of the operations subsystem are:

- To define product and service characteristics
- To define process characteristics
- To define product/service quality
- To ensure efficiency in terms of
  - (a) Effective employee relations and cost control of labor
  - (b) Cost control of material
  - (c) Cost control in facility utilization
- To provide customer service through
  - (a) Producing quantities to meet expected demand
  - (b) Meeting the required delivery date for goods & services
- To ensure adaptability for future survival

These operations sub-goals or the objectives can be attained through the decisions that are made in the various operations areas. Each decision involves important trade-off between choices about product and process vs. choices about quality, efficiency, schedule and adaptability. Again the priorities among these sub goals and their related emphasis should be direct reflection of the organization's mission. Once again the general thrust of the process is guided by competitive and markets conditions in the industry, which provide the basis for the organizations strategy.

The Product Life Cycle Approach and Operations Issues

Operational manager must remain aware at- what stage his product is.

Managerial strategies for operations should be formulated from situations at hand and not from set rules and principles. And to identify the stages and right situations, an operational manager must remain aware at what stage his product is at any moment and thus make the right decision.

Entrepreneurs frequently come up with new businesses with unique product ideas or new services. Firms ordinarily prepare to bring out new products or services as competitors infringe on the market, replicating products and services or as the useful product life diminishes. These new product ideas

come from various sources such as, top management, customers, staff, research and development (R&D), etc. Once launched even good products have limited life and to remain viable, the organization seeks a flow of new product possibilities.

The PLC- Product Life Cycle

The demand for a product – its market acceptance – generally tends to follow a predictable pattern called the product life cycle (Figure 1.2.1). A product life cycle is nothing but a graphic representation of the sequential rise and fall of a product. Any products go through a series of stages, beginning with low-demand during market development, proceeding through growth, maturity, high volume saturation, and finally decline.

A product life cycle is nothing but a graphic representation of the sequential rise and fall of a product.

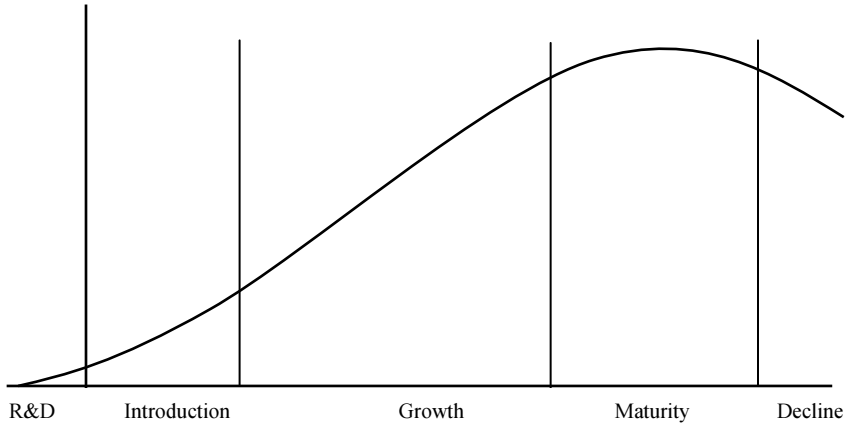


Figure 1.2.1: The Product Life Cycle

The time span of the four stages varies from industry to industry. For novelty products this time may be only few weeks or months. For other products the life cycle may span many years or decades. This life cycle is significant for operations managers. Because the operation issues that will arise are:

- Occurrence of various stages and their accommodation
- Optimization of facilities, materials, labor, management system
- Fate of existing facilities and conversion processes through various stages

Activity: Think of goods or services (any of your choice). And design the PLC of it with your understanding regarding the current situation of that product in the PLC. Also justify your arguments.

The following Table 1.2.1 summarizes the important features of different stages in the product life cycle that can provide a guideline to operations managers.

Table 1.2.1: Important features of different stages in the product life cycle

Stages	R&D	Introduction	Growth	Maturity	Decline
Basic strategies	Innovate	Infiltrate	Advance	Defend	Withdraw
Product variety	Great variety	Great variety	Increasing standardization	Emergence of a 'dominant design'	High standardization , 'commodity characteristics'
Product volume	-	Low volume	Increasing volume	High volume	High volume
Form of competition	-	Product characteristics	Product quality and availability	Price and dependability	Price
Strategic concerns	1. R&D new products and services 2. Forecast sales and key trends	1. Plan financing for negative cash flow period. 2. scale up production and marketing operations	1. R&D competitive innovations for present products 2. seek economies of scale in production	1. Cut costs in production and marketing to fight declining profit. 2. Consider extending product life cycle via reintroduction or product update.	1. scale down production and marketing 2. trim inventories

The Operations Issues

Life cycle can be reconstructed into five stages: Development, Introduction, Growth, Maturation & Decline.

From an operations management viewpoint, the life cycle can be reconstructed into five stages: Research & Development, Introduction, Growth, Maturation, and Decline of commodity. The operations strategy and conversion process have to be adaptive throughout the life cycle because of change in basic strategies, product variety, forms of competition, strategic concerns, etc in different stages of PLC. For example, in the R&D and introductory stages, design change is frequent due to differences in the demands on product design and production; whereas, in the maturity and during decline phases the product design is rather stable, as is the conversion process.

Whereas the early life cycle stages emphasize the product's unique characteristics and quality, later stages emphasize price competition and delivery capabilities. Survival in the market depends on producing a stable product with high volume in contrast to the earlier emphasis on a high quality variety, low-volume conversion process. The conversion process has changed substantially, including new types of human skills and orientations, equipment and facility revisions, and planning and control systems. To prepare for and influence these adaptations use of R & D is undertaken.

Process technologies have life cycles related to product life cycle. Over time unit manufacturing costs diminish for mature products. From product start-up to decline, manufacturing processes change in organization, throughput volume, rates of process innovation, and automation. The process technology

(Figure 1.2.2) is typically *job-shop*[1] at start-up and moves towards a *continuous flow technology*[2] if the products survive to become a commodity. Throughput volumes and automation are low at start-up and high during maturation and decline. These changes require appropriately matching up the manufacturer's product and process structures (e.g., *batch, technology*[3] and *assembly line*[4]).

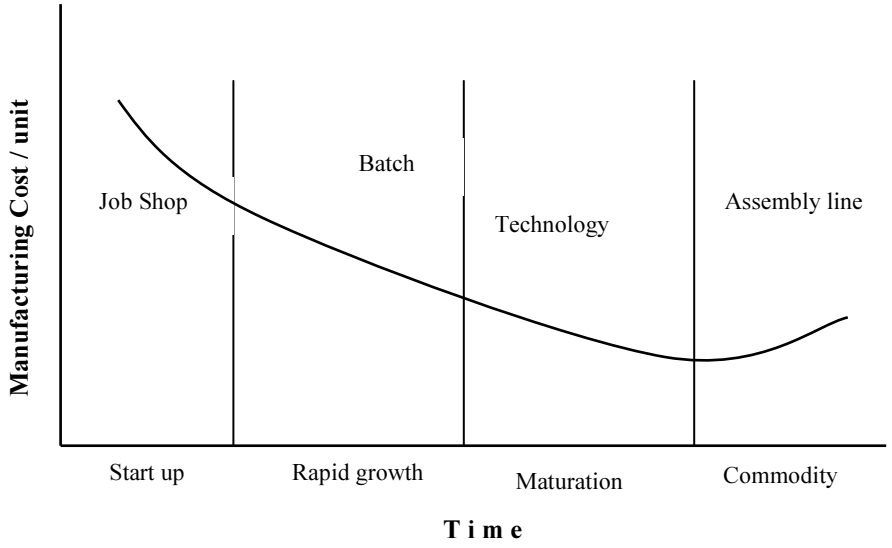


Figure 1.2.2 Process Costing

As products, market requirements, and competitions change, so must equipment procedures and human resources. If process changes are not made to accommodate the product life cycles, product and process are incompatible: the result is competitive disadvantage.

Role of Operations Manager

Operations managers like other managers must guide the efforts of other people in selecting the organization's goals and accomplishing its objectives. They may perform some of the tasks they direct, but when they are performing what are strictly management tasks, their work is to plan and direct the work of others.

Operations managers require two main types of decisions- Systems design decision, & Operation and control decision of system.

Production and operations managers require two main types of decisions - one for the design of the systems and the other related to the operation and control of the system inclusive of long-run and short-run decisions. They will have to give emphasis on the factors of cost, service and reliability of both functional and time performance that depend on the basic purposes of the whole concern and the general nature of production of goods or services to be rendered. In this way, generally, economic concerns will most emphasize cost based upon quality and delivery of goods.

[1] Job shop technology is a process technology suitable for a variety of custom-designed products in small volume.
[2] Continuous flow technology is a process technology suitable for producing a continuous flow of products.
[3] Batch technology is a process technology suitable for a variety of products in varying volumes.
[4] Assembly line is a process technology suitable for a narrow range of standardized products in high volumes.

Long run decisions base on the production design system. These will be given below:

i) *Selection of the product*: First of all the product is to be selected to the requirements of the people to fetch more appeal.

ii) *Design of the product*: Selection and design are greatly related mutually. They have interaction of strong nature with capability of the product. The design will create the appreciability of the people.

iii) *Selection of equipment and processes*: There are many equipment and processes. The equipment and processes should be such that concern can cope up within its capital limit prescribed for the equipment; and processes should be such to cope up design.

iv) *Production design of items processed*: Production cost interacts greatly with the design of arts, products, and paper work forms. Design decision mostly set the limiting characteristics of cost and processing of the system.

v) *Job design*: Total system design includes many things of which job design is an integral part. It involves the basic organization of work and the integration of human engineering data to produce designed jobs optimally.

vi) *Site of the industry and business*: The decisions about location of the system play an important part if the balance of cost factors determined by nearness to markets and material supply is critical. Location should be near to market so that the transportation expenses are not more and supply of material does not pose any great problem due to seasons.

vii) *Facility layout*: All decisions regarding design capacity, basic modes of production, shift, use of overtime and subcontracting. Besides, operations and equipment must be situated in a pattern that lessens overall material handling cost or meets the needs of some more complicated criterion. The latter need is most difficult for the complex intermittent model where routes change. Many detailed problems are connected with each other so as to specify sufficiently the layout of a production system. These include heating, lightning and other utility needs, the allocation of storing space and the design of the building to accommodate the layout.

Short-run decisions concerning the design of operation and control systems are as follows:

i) *Inventory control*: Decisions should be made regarding inventory at demand.

ii) *Production control*: Decision should be made relating to allocation of productive capacity consistent with demand and inventory policy. Feasible schedules must be worked out, and the load on men and machines and the flow of production should be in control.

iii) *Maintenance and reliability of the system*: Decisions should be made for the efforts of maintenance, recognition of the random nature of equipment breakdown and recognition that machine down-time may itself be connected with important costs or loss of sales.

iv) *Quality control*: While controlling the quality, care should be taken so that defective parts are not produced and shipped. If that is not

possible at all, it should be seen that errors are tolerable and the good parts are sent. Inspection should be done and covered in the cost against probable losses due to passing defective material or services.

v) *Labor control*: Most products need labor and it costs much for services. Production planning needs labor appraisal and so we find that much effort is wasted to develop work measurement and wage payment systems.

vi) *Cost control and improvement*: It is the duty of the production supervisors to see that daily decisions regarding the balance of labor material and overhead costs are done to the satisfaction up to minimum.

The individual production systems change these factors' importance in production management. No doubt every system faces these problems to some extent. The equipment policy may cost more where capital investment per labor is more but in some industries it may not cost more. The art of operations management includes the sense of the relative importance of the various problems in a given circumstance or situation.

Activity: As a production manager do you think that you would face any problem in taking long term production decisions? What are they? Why these problems might arise? How you can overcome all these problems? Justify.

Skills required of the operations managers

In trying to work through others to accomplish the objectives of operations and production, managers must posses a variety of skills of which two major categories are as follows.

i) *Technical competence*: Since managers make decisions about the tasks that other people are to perform, they need a basic understanding of the technology with which the production system works and they need adequate knowledge of the work they are to manage. Technical competence can be obtained through personal training and experience or through the use of staff specialists and consultants.

ii) *Behavioral competence*: People find that they can achieve more, both in work and in rewards, by working as a group, rather than by working alone. Management must consider the social as well as the physical aspects of the work and workers. Since managers work through others, their work necessarily involves a great deal of interpersonal contact. A good manager therefore should have good behavioral competence—the ability to work with other people.

Operations manager must posses a variety technical skills and have the ability to work with others.

Case Analysis

Different Schools of Thought of Operational Management

Operations Management is the process of converting inputs into desired outputs. More specifically, it is the management of the conversion of land, labor, capital, technology and management inputs into desired outputs of goods or services. In doing so managers use various approaches from the *classical*, *behavioral*, and *modeling* views of management. The following chart shows the various views under these three schools of thought.

School	Some important issues	Primary focus	General contribution to the management
Classical			
Scientific management	People motivated by economies alone Managerial rationality Organization a closed system (certainty)	Economic efficiency; Physical aspects of work environment; Scientific analysis of work tasks; Applications of techniques to work tasks	Demonstration of benefits from specialization of labor, division of labor, job analysis, separation of planning and doing work
Process orientation	Management activities separable	Management processes	Identification of management functions and principals
Behavioral			
Human relations	People complex possess multiple needs	Behavior of individual in work environment	Awareness of individualism
Behavioral science	Human beings are social creatures	Interpersonal and social aspects of works	Identification of behavioral variables that relate to organizational behavior
Social systems	Organization an open system	Interactive relationships of organization with its environment	Development of theories relating organizational behavior to human characteristics and organizational variables
Modeling			
Decision making	Decision making processes are the primary managerial Behavior	Information acquisition, utilization and choice processes	Development of guides for improving decision making
Systems theory	Organization-an open system Organization-an complex of interrelated sub-components	Identification of organization boundaries, interrelationships among subsystems, and relationships between organization and larger environment	Development of approaches for predicting and explaining system behavior
Mathematical modeling	Main elements of organizations can be abstracted interrelated, and expressed mathematically	Quantification of decision problems and systems	Development of explicit rules for management decisions Development of methods for analyzing organization systems or subsystems

Operations management elements from various schools of management thought

Classical management theories emphasize efficiency at the production core, the separation of planning and doing work, and management principles and functions. Classical management has contributed the *scientific management* and *process orientation* theories. *Scientific* management emphasizes economic efficiency at the production core through management rationality,

the economic motivation of workers, and the separation of planning and doing work. Organizational efficiency refers to a ratio of outputs to land, capital, or labor inputs.

$$\text{Efficiency (\%)} = \text{Output/Input} \times 100\%$$

Process management emphasizes management as a continuous process of planning, organizing, and controlling to influence the others' action. This is also referred to as the administrative or functional approach to management.

Behavioral management emphasizes human relations and the behavioral sciences. The phenomenon recognized by behavioral scientists noted that people are complex and have multiple needs and that the subordinate-supervisor relationship directly affects productivity are known as human relations. Behavioral science explores how human behavior leadership, motivation, communication, interpersonal relationships, and attitude change affect. Besides this, social psychologist, sociologists and cultural anthropologists have developed social systems theories of groups of people at work.

Modeling management emphasizes decision-making, systems, and mathematical modeling. These models create and use mathematical representations of management problems and organizations to predict outcomes of proposed courses of action. The decision-making orientation considers making decisions to be the central purpose of management. Systems theory stresses the importance of studying organizations from a 'total systems' point of view. Mathematical modeling, with its foundations in operations research and management science focuses on creating mathematical representations of management problems and organizations.

Case questions

1. How the classical thought of management and operations management differ from the behavioral thought? Do you think these differences are significant? Why or why not? Justify.
2. What are the difference between process management and modeling management style? Explain.

Discussion questions

1. Accomplishing an organization's goals requires that operations management accounts for the organization's industry strategy, operations policy and conversion process. How do these elements relate to one another? How they relate to accomplishing organizational goals? Justify.
2. Explain how the knowledge of product's life cycle helps an operations manager formulate operational strategies.
3. A director of materials management for a larger manufacturing company made the following statement: *All significant problems impacting manufacturing effectiveness really result from one very common problem—incomplete and inaccurate planning, monitoring and controlling regarding all aspects and phases of the business and manufacturing operations.* Logically comment on this.
4. How do inflation, energy shortages and a shorter workweek, each present a new challenge to operations management? Explain.
5. How does the operations function play a significant role in ensuring success of a company's strategy? Justify.