CHAPTER ONE

Introduction to Production and Operations Management

Learning Objectives

After reading this chapter, you should be able to:

- Understand the nature of production.
- Define and explain the production system model.
- Bring-out the importance of production function.
- Distinguish between production and operations management.
- List characteristics of modern production and operations functions.
- Discuss organsiation of production function.

NATURE OF PRODUCTION

Production is the process by which raw materials and other inputs are converted into finished goods.

Among all the functional areas of management, production is considered to be crucial in any industrial organisation. *Production is the process by which raw materials and other inputs are converted into finished products.* The other word synonymously used with production is manufacturing. Some people try to draw distinction between the two terms: production and manufacturing. Manufacturing is understood to refer to the process of producing only tangible goods, whereas production includes creation of both tangible goods as well as intangible services. Though distinction of this type is sought to be made, we use the terms production and manufacturing synonymously in this book.

Nature of production can be better understood if we view the manufacturing function from three angles: *production as a system, production as an organisational function* and *decision making in production.*

PRODUCTION AS A SYSTEM

Production system model comprises: (i) Production system, (ii) Conversion sub-system and (iii) Control sub-system.

A **system** is understood as a whole which cannot be taken apart. It must be studied as a whole. While looking from this perspective, we may note that there are three systems:

(i) **production system,**

(ii) **conversion sub-system,** and

(iii) **control sub-system.**

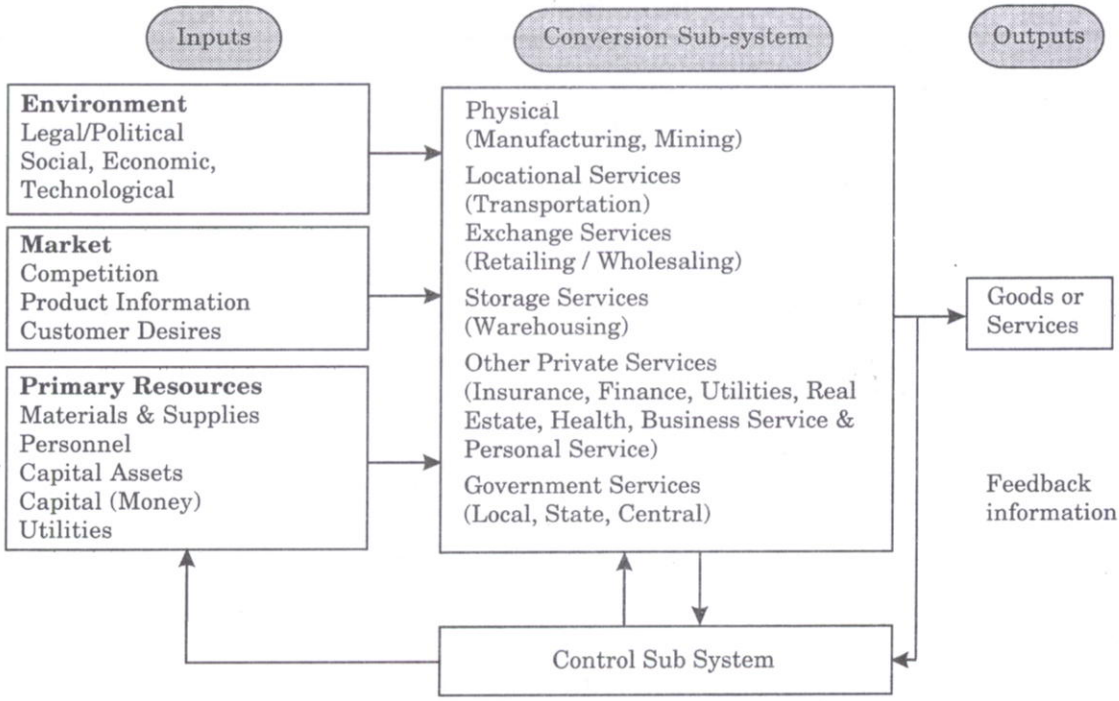
Read *Table 1.1* for definitions of the three concepts.

Table 1.1 : Production System Concepts

Concept	Definition
1. Production system	A system whose function is to convert a set of inputs into a set of desired outputs.
2. Conversion sub-system	A sub-system of the larger production system where inputs are converted into outputs.
3. Control sub-system	A sub-system of the larger production system where a portion of the output is monitored for feedback signals to provide corrective action if required.

Production system receives *inputs* in the form of materials, personnel, capital, utilities and information. These inputs are changed in a conversion *sub-system* into desired products and services, which are called the *outputs*. A portion of the output is maintained in the *control sub-system* to determine if it is acceptable in terms of quantity, cost and quality. If the output is acceptable, no changes are required in the system. If, however, the appropriate standards are not met, managerial corrective action is required. The control sub-system ensures a uniform level of system performance by providing feedback information so that corrective action may be taken by managers. *Exhibit 1.1* illustrates the production system.

Exhibit 1.1 : A Production System Model



I PRODUCTION AS AN ORGANISATIONAL FUNCTION

The core of a production system is its conversion sub-system, wherein workers, materials and machines are used to convert inputs into products and services. This process of conversion is at the heart of production function and is present in some form in all organisations. It may be stated that every organisation, irrespective of its purpose, has a production function where departments and personnel play a central role in achieving the objectives of the organisation.

Conversion sub-system is at the heart of production function.

I DECISION-MAKING IN PRODUCTION

Operation managers are required to make a series of decisions in the production function. They plan, organise, staff, direct and control all the activities in the process of converting all the inputs into finished products. At each level, operating managers are expected to make decisions and implement them too.

Strategic, operating and control decisions are the three catageries of decisions made by operations mangers.

The decisions made by operation managers about the activities of production systems tend to fall into three general categories, viz.,

I. **Strategic decisions** relating to products, processes and manufacturing facilities. These decisions are major ones having strategic importance and long-term significance for the organisation.

II. **Operating decisions** relating to planning production to meet demand. These decisions are necessary in order to ensure that the ongoing production of goods and services meets the market demand and provides reasonable profits for the organisation.

Shop floor planning and control is an operating decision.

III. **Control decisions** relating to planning and controlling operations. These decisions concern the day-to-day activities of workers, quality of products and services, production and overhead costs and maintenance of machines.

Table 1.2 lists the type of decisions and the areas of their involvement.

Table 1.2 : POM Decisions and their Applications

Type of Decisions	Area of Involvement	Nature of Activities
I. **Strategic Decisions** (Planning Products) Processes and Facilities)	1. Production Processes	Developing long range production plans including process design.
	2. Production Technology	Selecting and managing production technology.
	3. Facility Layout	Planning the arrangement of facilities.
	4. Allocating Resources to Strategic Alternatives	Planning for the optimal distribution of scarce resources among product lines or business units.
	5. Long Range Capacity Planning and Facility Location	Answering the 'how much' and 'where' questions about long range production capacity.
II. **Operating Decisions** (Planning production to meet demand)	1. Production Planning Systems	Aggregate planning and master production scheduling
	2. Independent Demand Inventory Systems	Planning and controlling finished goods inventories
	3. Resource Requirements Planning Systems	Planning materials and capacity requirements.
	4. Shop Floor Planning and Control at each work centre.	Short range decisions about what to produce and when to produce
	5. Materials Management	Managing all facets of materials system.
III. **Control Decisions** (Planning and Operations)	1. Productivity and Employees	Planning for the effective and efficient use of human resources in operations.
	2. Total Quality Control	Planning and controlling the quality of products and services.
	3. Project Planning and Control Techniques	Planning and controlling projects.
	4. Maintenance Management and Reliability	Planning for maintaining the machines and facilities of production.

IMPORTANCE OF PRODUCTION FUNCTION

Standard of living of people depands on production of goods and services

It needs no exaggeration to say that production makes significant contribution to society's well being. The standard of living of people depends on production of goods and services. More the production, higher the standard of living of the people. Alexander Solzhenitsyn in his novel *August 1914* beautifully sums up the importance of production. One of the characters in the work is Suyataslav Lakintovich Obodovsky, a former anarchist, who maintains the following position: "As for industry, anyone who has created something with his own hands knows that production is neither capitalist nor socialist but one thing only, it is what creates national wealth, the common national basis without which no country can exist."

Having reached that conclusion, Obodovsky goes on to say: "Before, I was most concerned with how to *distribute* everything that other people had created without my help. Now my main preoccupation is how to *create*. The best brains and hands in the country should

concentrate on doing that; we can safely leave distribution to the second-raters. When enough has been built and made, then even if distribution is less than perfect, no one will be left completely without his share.

Competitive advantage of companies is highly talked about these days. It is believed that a firm, strong in competitive advantage, is well poised to succeed whatever may be the constraints or restraints. Firms look to production function to achieve competitive advantage.

Production helps achieve competitive advantage.

Production function can offer competitive advantage to a firm in the following areas:

- Shorter new-product-lead time
- More inventory turns
- Shorter manufacturing lead time
- Higher quality
- Greater flexibility
- Better customer service
- Reduced wastage

Many causes that deny competitive advantages to any firm can be attributed to manufacturing function–specifically to poor quality and reliability, delayed deliveries, high production costs and lack of adequate inventory at the right time.

It has long been recognised that high productivity is one of the keys to high standard of living and is the backbone of a nation's economic progress. Japan's economic prosperity and a greater standard of living of Japanese may be attributed to high productivity. It may be stated that the production function offers vast scope for achieving productivity with effective management of materials and lead time, and with better control of cost, a firm will be able to bring out more output from a given input at reasonable cost. *Table 1.2* shows the different areas of achieving productivity.

I PRODUCTION MANAGEMENT AND OPERATIONS MANAGEMENT

Production Mnanagement refers to the application of management principles to the production function in a factory

Production management refers to the application of management principles to the production function in a factory. In other words, production management involves application of planning, organising, directing and controlling to the production process.

The application of management to the field of production has been the result of at least three developments. *First is the development of factory system of production*. Until the emergence of the concept of manufacturing, there was no such thing as management as we know it. It is true that people operated business of one type or another, but for the most part, these people were owners of business and did not regard themselves as managers as well. *The second* essentially stems from the first, namely, *the development of the large corporation* with many owners and the necessity to hire people to operate the business. *The third* reason stems from the *work of many of the pioneers of scientific management* who were able to demonstrate the value, from a performance and profit point of view, of some of the techniques they were developing.

Operations Management

Operations management is often used along with production management in literature on the subject. It is therefore, useful to understand the nature of operations management. Operations are purposeful actions or activities which are done methodically as part of a plan of work by a process that is designed to achieve the pre-decided objectives. It indicates that operations management consists of tactics such as scheduling work, assigning resources

Operations management is the process in which resorurces/inputs are converted into more useful products

including people, equipment, managing inventories, assessing quality standards, process type decisions and the sequence for making individual items is a product mix set, put it simple. Operations management is understood as the process whereby resources or inputs are converted into more useful products.

Distinction between Production and Operations Management

Production management and operations management are differntiated based on tangibilities of finished goods/ services

A second reading of the last sentence in the above para reveals that there is hardly any difference between the terms production management and operations management. But there are atleast two points of distinction between production management and operations management. First, the term production management is more used for a system where tangible goods are produced. Whereas, operations management is more frequently used where various inputs are transformed into intangible services. Viewed from this perspective, operations management will cover such service organisations as banks, airlines, utilities, pollution control agencies, super bazaars, educational institutions, libraries, consultancy firms and police departments, in addition, of course, to manufacturing enterprises. The second distinction relates to the evolution of the subject. Operations management is the term that is used nowadays. Production management precedes operations management in the historical growth of the subject.

The two distinctions not with standing, the terms production management and operations management are used interchangeably. We also allow the same approach in this book.

Box 1.1 : Production Function - Areas of Productivity

1. Improving volume of production
2. Reducing rejection rate
3. Minimising rework rate
4. Maintaining delivery schedules
5. Controlling idle machine and manpower hours
6. Establishing/updating/improving/setting industrial engineering norms
7. Updating processes and procedures
8. Maintaining accuracy and timeliness of Management Information System
9. Decreasing machine set-up time
10. Controlling overtime
11. Good house-keeping
12. Checking absenteeism, thefts/pilferage and misconduct
13. Eliminating accidents
14. Effective grievance – handling
15. Efficient training and team building
16. Minimising inventory and achieving better yields
17. Enhancing customer satisfaction
18. Total Quality Management (TQM)
19. Business Process Re-engineering (BPRE)
20. Automation

Scope of Production and Operations Management

The scope of production and operation management is indeed vast. Commencing with the selection of location, production management covers such activities as acquisition of land, constructing buildings, procuring and installing machinery, purchasing and storing raw materials and converting them into saleable products.

Added to the above are other related topics such as quality management, maintenance management, production planning and control, methods improvement and work simplification and other related areas. As subsequent pages in this book reveal, all these topics have been discussed in greater detail.

I CHARACTERISTICS OF MODERN PRODUCTION AND OPERATIONS FUNCTION

The production management of today presents certain characteristics which make it look totally different from what it was during the past. Specifically, today's production system is characterised by at least four features.

1. Manufacturing as Competitive Advantage

In the past production was considered to be like any other function in the organisation. When demand was high and production capacities were inadequate, the concern was to somehow muster all inputs and use them to produce goods which would be grabbed by market. But today's scenario is contrasting. Plants have excess capacities, competition is mounting and firms look and gain competitive advantage to survive and succeed. Interestingly, production system offers vast scope to gain competitive edge and firms intend to exploit the potential. Total Quality Management (TQM), Time-Based Competition, Business Process Re-engineering (BPRE), Just-in-Time (JIT), Focused Factory, Flexible Manufacturing Systems (FMS), Computer Integrated Manufacturing (CIM), and The Virtual Corporation are but only some techniques which the companies are employing to gain competitive advantage.

2. Services Orientation

As was stated earlier, service sector is gaining greater relevance these days. The production system, therefore, needs to be organised keeping in mind the peculiar requirements of the service component. The entire manufacturing needs to be geared to serve *(i)* intangible and perishable nature of the services, *(ii)* constant interaction with clients or customers, *(iii)* small volumes of production to serve local markets, and *(iv)* need to locate facilities to serve local markets. There is increased presence of professionals on the production, instead of technicians and engineers.

3. Disappearance of Smokestacks

Commencing from Industrial Revolution till the middle of the 20th century, production system was dominated by smokestacks. These smokestacks (the term used by Alvin Toffler in his book *Power Shift*) represented industrial establishments which ejected thick smoke polluting the environment around. Smokestacks not only disgorged reek, they produced nauseating smell, generated dust, created sound and in general were resembling ghosts. Not that they have become extinct but are disappearing gradually.

Protective labour legislation, environmental movement and gradual emergence of knowledge based organisations have brought total transformation in the production system. Today's factories are aesthetically designed and built, environment friendly – in fact, they are homes away from homes. Going to factory everyday is no more excruciating experience, it is like holidaying at a scenic spot. A visit to ABB, L & T or Smith Kline and Beecham should convince the reader about the transformation that has taken place in the wealth creation system.

4. Small has Become Beautiful

It was E.F. Schumacher who, in his famous book *Small is Beautiful*, opposed giant organisations and increased specialisation. He advocated, instead, intermediate technology based on smaller working units, community ownership, and regional workplaces utilising local labour and resources. For him, small was beautiful. Businessmen, all over the world, did not believe in Schumacher's philosophy. Inspired by economies of scale, industrialists went in for huge organisations and mass production systems.

The wheel has turned its full circle. If not for the reasons advanced by Schumacher, we find small and tiny manufacturing units sprouting everywhere. Increasing customisation, flexible manufacturing system and similar other developments have made economies of scale outdated and giant organisation irrelevant. Days are not far off when the giants of today like, HMT, and ITI will be decomposed into antiquity. These organisations are already showing signs of decay. In their place, tiny units owned and managed by family members and started just a couple of years back, are doing roaring business.

Why be Interested in Study?

Why a general reader should study production and operations management is a relevant question. The following paragraphs answer the question. Factories occupy a unique place in our country. They are the temples of modern India shouldering the stupendous task of lifting our economy from its traditional and agrarian fold to modern and industrialised one. Next to agriculture, it is the factories which are the largest employers. Thousands of families look to the plants for support and sustenance. It is the industrial establishments which produce the various goods and services for our day-to-day consumption Factories are great institutions which bring about desired changes in our socioeconomic outlook. Our incomes, living standards, wants, motives, thoughts, actions, life-styles and patterns are influenced by factories. It is desirable that one should be knowledgeable about factories – their nature and scope, and their functions and problems.

A study about factories helps us appreciate the role played by people in producing goods and services. When a product is turned out by a plant, it is the result of fusion of the efforts and services of scientists, engineers, technicians, managers, workers and janitors. Factory is not mere buildings and machines. Factory is people. The best of automation may result in the reduction of number of people working in a plant but the presence and contribution of human beings cannot be completely dispensed with. Neither factories, nor products be divested of people They are the common ingredient of all activities that take place in factories.

The total picture about factory becomes clear by a close study of the subject. Contrary to popular belief, factory is not a sinner that has annihilated the handicrafts. Factory is not a monster out to disrupt ecology. Not a satan that has destroyed the traditional values that we once held dearly. Neither factory is a scourge that resulted in migration of people from village to cities. Nor factory is a bad neighbour who disturbs our sleep early mornings by blowing sirens. Systematic study of factory management reveals its interesting psychological, social, political, technical and artistic phases all of which lend colour, character and genuine splendour to the activities which permeate an industrial enterprise.

Factory study helps in selecting a career. As was mentioned earlier, factories are potential employers. They offer attractive positions for effective executives, brilliant scientists, financial wizards, creative artists, skilled technicians and hard-working workmen. First step in selecting a career is to understand the various positions [operations executive/manager; line manager; operations planning analyst; materials manager; purchasing manager; inventory manager; production control and scheduling manager; quality manager; facility manager; project manager-internal or external etc.] available in a factory and what they demand, in terms of qualification and experience. Next step is to evaluate one's fitness in relation to the requirements of the job. Submitting applications and attending interviews will follow later.

Taking a close look at the subject by practising managers helps them in at least two ways. First, it has been recognised that high productivity has been one of the keys to the high standard of living. Productivity is the backbone of a nation's economic progress. In those countries where productivity is high, living standards are also high. Increasing productivity should be a national challenge, and it behaves all managers to do their utmost to achieve ever increasing levels.

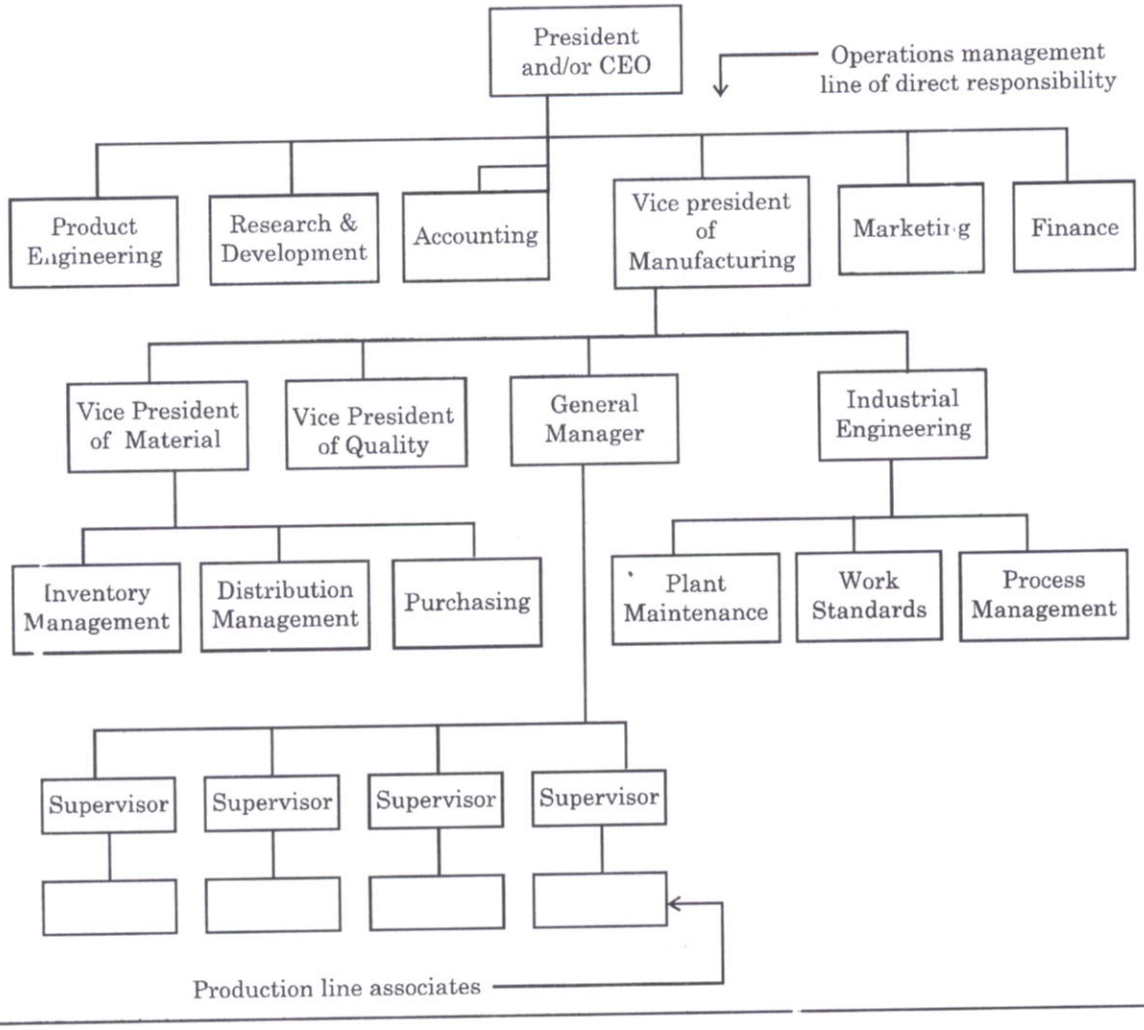
Second, the managing of a manufacturing firm today presents a greater challenge than ever before. Top managers of companies are presented with endless streams of problems that arise from continuing inflation, energy crisis, high taxes, government regulations and intense foreign competition. To get some idea of the magnitude of these problems one need but pick up a daily newspaper or news magazine and read about efforts to offset price increases, to secure plant modernisation, to increase productivity, to meet foreign competition and so forth. Knowledge about the ways of managing production and operations management is highly useful to the executives.

ORGANISATION OF PRODUCTION FUNCTION

We have read in the importance of production function section that it plays a pivotal role in achieving competitive advantage. So it is necessary to set up a sound and efficient organisation for the purpose of achieving its objectives. The following *Exhibit 1.2* details how a production function is organised.

The POM department is headed by a senior vice president of operations, who organises the department with the help of plant manager as well as staff heads, who are reporting to him/or her.

Exhibit 1.2



Duties and Responsibilities of Production Managers in Manufacturing Organisations

The following are the duties and responsibilities of production managers in manufacturing organisations:

1. Planning the geographical location of the factory.
2. Purchasing production equipments.
3. Layout of equipments within the factory.
4. Designing production processes and equipments.
5. Product design.
6. Designing production work and establishing work standards.
7. Capacity planning.
8. Production planning and scheduling.
9. Production control.
10. Inventory management.
11. Supply chain management.
12. Quality control.
13. Production equipment maintenance and repair.
14. Measurement and monitoring of productivity.
15. Industrial relations.
16. Health and safety.
17. Staff selection and liaisoning.
18. Budgeting and capacity planning.

Emerging Role of the Production and Operations Manager

Liberalisation of Indian Economy (after 1991) with privatisation and globalisation has brought about major changes in the business environment. Moving with the changes in business environment is very important for any organisation which has plans to stay back is the industry. The entry of MNCs into almost every sphere of industry has created a sense of competition in the Indian industry. Facing competition with MNCs is possible only when managers are able to accept new responsibilities. The same is the case for production and operations managers in India. The following are the new responsibilities of production and operations managers in India:

1. Take part in strategic decision making of the company.
2. Take part in the implementation and use of Enterprise Resource Planning in the company.
3. Automate processes as per the requirements of the company.
4. Enhance the Research and Development effort in developing self-relevant new technologies.
5. Reduce lag in implementation of projects [new products/services launching; expansion of facilities) due to increased competition.
6. Protect the environment by implementing environment and pollution norms established by the Government from time to time.
7. Act as a member of the concurrent engineering teams in new product design and old product development.
8. Develop long-term strategic relationship with supplies by acting as supply chain managers.

9. Give more attention to technology management, in view of joint ventures of multinational companies with domestic companies.
10. Be an internal quality auditor in quality certification programming such as ISO 9000 series and ISO 14000.

RECENT TRENDS IN PRODUCTION/OPERATIONS MANAGEMENT

Many recent trends in production/operations management relate to global competition and the impact it has on manufacturing firms. Some of the recent trends are :

1. **Global Market Place :** Globalisation of business has compelled many manufacturing firms to have operations in many countries where they have certain economic advantage. This has resulted in a steep increase in the level of competition among manufacturing firms throughout the world.
2. **Production/Operations Strategy :** More and more firms are recognising the importance of production/operations strategy for the overall success of their business and the necessity for relating it to their overall business strategy.
3. **Total Quality Management (TQM) :** TQM approach has been adopted by many firms to achieve customer satisfaction by a never-ending quest for improving the quality of goods and services.
4. **Flexibility :** The ability to adapt quickly to changes in volume of demand, in the product mix demanded, and in product design or in delivery schedules, has become a major competitive strategy and a competitive advantage to the firms. This is sometimes called as *agile manufacturing*.
5. **Time Reduction :** Reduction of manufacturing cycle time and speed to market for a new product provide competitive edge to a firm over other firms. When companies can provide products at the same price and quality, quicker delivery (short lead times) provide one firm competitive edge over the other.
6. **Technology :** Advances in technology have led to a vast array of new products, new processes and new materials and components. Automation, computerisation, information and communication technologies have revolutionised the way companies operate. Technological changes in products and processes can have great impact on competitiveness and quality, if the advanced technology is carefully integrated into the existing system.
7. **Worker Involvement :** The recent trend is to assign responsibility for decision making and problem solving to the lower levels in the organisation. This is known as employee involvement and empowerment. Examples of worker involvement are quality circles and use of work teams or quality improvement teams.
8. **Re-engineering :** This involves drastic measures or break-through improvements to improve the performance of a firm. It involves the concept of clean-slate approach or starting from scratch in redesigning the business processes.
9. **Environmental Issues :** Today's production managers are concerned more and more with pollution control and waste disposal which are key issues in protection of environment and social responsibility. There is increasing emphasis on reducing waste, recycling waste, using less-toxic chemicals and using biodegradable materials for packaging.
10. **Corporate Downsizing (or Right Sizing)** : Downsizing or right sizing has been forced on firms to shed their obesity. This has become necessary due to competition, lowering productivity, need for improved profit and for higher dividend payment to shareholders.

11. **Supply-Chain Management :** Management of supply-chain, from suppliers to final customers reduces the cost of transportation, warehousing and distribution throughout the supply chain.
12. **Lean Production :** Production systems have become lean production systems which use minimal amounts of resources to produce a high volume of high quality goods with some variety. These systems use flexible manufacturing systems and multi-skilled workforce to have advantages of both mass production and job production (or craft production).

QUESTIONS

1. What is production and operations management?
2. Discuss the nature of production.
3. Differentiate between production management and operations management.
4. Discuss the importance of production function.
5. Discuss the scope of production management.
6. Define the term 'Production System.' Name the inputs of the production system. How can they be classified?
7. Name the various subsystems used in a 'Production System.' State the importance of a 'subsystem.'
8. Define the terms 'strategic decision', 'operating decision' and 'control decision' with examples.
9. Discuss the characteristics of modern production and operations function.
10. Describe how production function is organised in a manufacturing firm with the help of an organisational chart.
11. Discuss the various POM decisions and their applications.
12. Discuss the duties and responsibilities of production managers in manufacturing organisations.
13. Discuss the emerging role of the production and operations manager in India.
14. Discuss the recent trends in production and operations management.

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