Production Planning & Control

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Introduction

- Planning and control are basic managerial functions which are essential to every organized activity.
- Proper planning and control of manufacturing activities or the production system is equally essential for efficient and economical production.
- Economy and productivity are to a large extent directly proportional to the thoroughness with which the planning and control functions are performed.
- In a modem industrial enterprise, production is a complex system and steps must be taken to ensure that goods are produced in the right quantity and quality, at the right time and place and by the most efficient methods possible.
- This is the task of production planning and control.

Production Planning

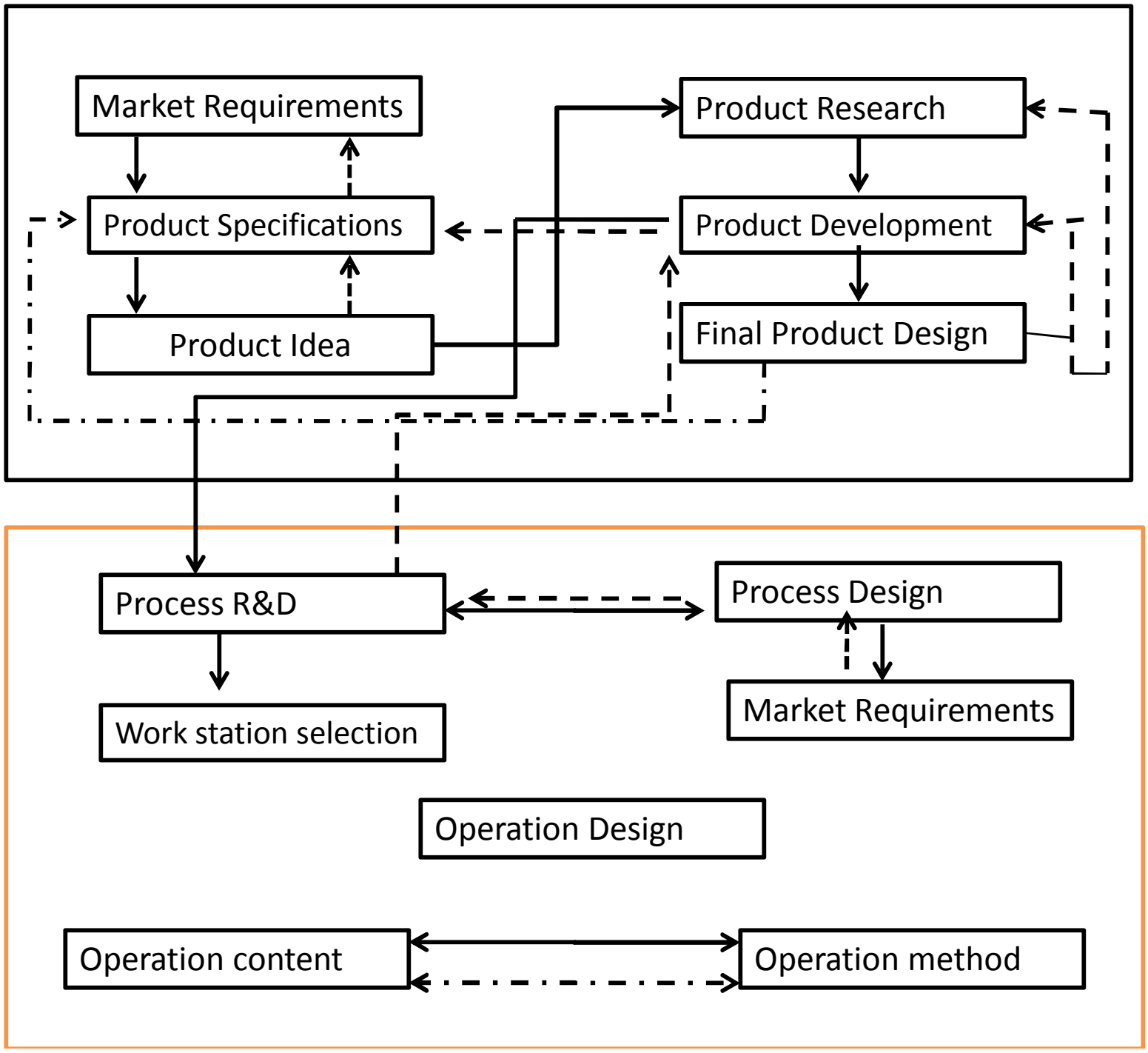
- Production planning is concerned with deciding in advance what is to be produced, when to be produced, where to be produced and how to be produced.
- It involves foreseeing every step in the process of production so as to avoid all difficulties and inefficiency in the operation of the plant.
- Production planning has been defined as the technique of forecasting or picturing ahead every step in a long series of separate operations, each step to be taken in the right place, of the right degree, and at the right time, and each operation to be done at maximum efficiency.
- In other words, production planning involves looking ahead, anticipating bottlenecks and identifying the steps necessary to ensure smooth and uninterrupted flow of production.
- It determines the requirements for materials, machinery and man-power; establishes the exact sequence of operations for each individual item and lays down the time schedule for its completion.

Objectives of Production Planning

- On the basis of the sales forecast and its engineering analysis, to estimate the kind of the resources like men, materials, machines, methods etc. in proper quantities and qualities. It also estimates when and where these resources will be required so that the production of the desired goods is made most economically.
- It also aims to make all necessary arrangement so that the production targets as set in the production budget and master schedules are reached. While attaining these targets, adjustments are made for the fluctuations in the demand.

Factors affecting production planning procedures

- Volume of production
- Nature of Production Processes - job shop- planning may be informal and development methods is left to the skilled worker where as in high volume production many product designers, equipment designers, process engineers, method engineers are involved in the planning process
- Nature of operations – Detailed planning is required for repetitive processes

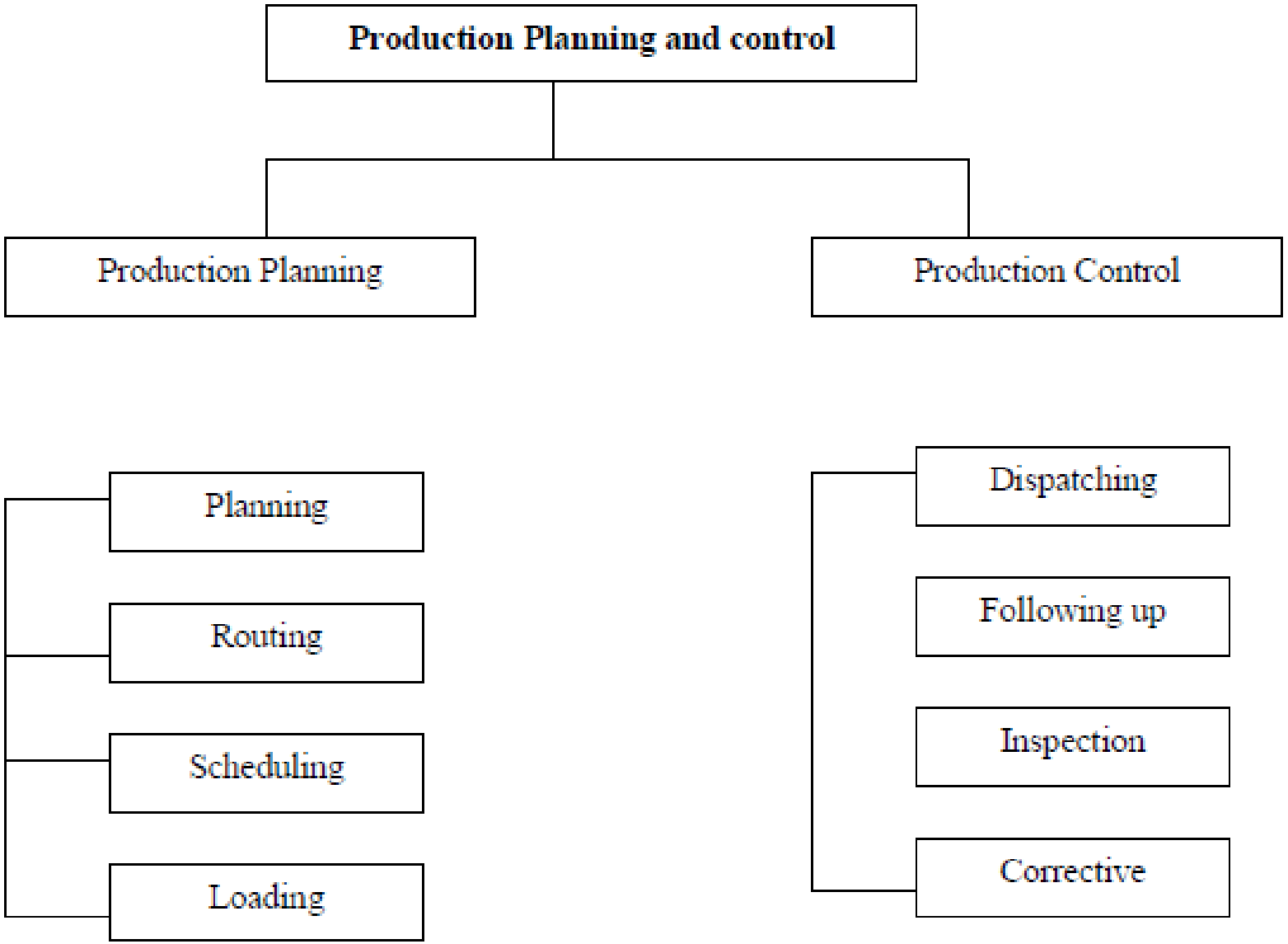

Market Requirements
Product Research
Product Specifications
Product Development
Product Idea
Final Product Design
Process R&D
Process Design
Work station selection
Market Requirements
Operation Design
Operation content
Operation method

Levels of Production Planning

- Strategic Planning – It is a process of thinking through the organization's current mission and environment and then setting forth a guide for future decisions and results. For Eg:- Technology forecasting and choice of appropriate technology for the long range and short range planning.
- They are generally long range plans. It focuses on product lines, divisions, factories etc.
- Objectives are
  - Production levels (No. of units produced)
  - Operating capacities
  - Inventory policies
  - Levels of manufacturing costs

Levels of Production Planning

- Tactical Planning – over an intermediate term. These plans focus on aggregate products rather a specific product. They specify the employment plans, machinery and utility plans, material supply plans, facility modification/expansion plans
- Operational planning – it is done over a short period of time. It focuses on current customer orders, priorities, material availability, absenteeism, proper utilization of resources


Production Planning and control
Production Planning
Production Control
Planning
Routing
Scheduling
Loading
Dispatching
Following up
Inspection
Corrective

Production Planning functions

- Estimating – Involves deciding the quantity of products to be produced and cost involved in it on the basis of sales forecast. Estimating manpower, machine capacity to meet the planned production targets are the key activities before budgeting the resources
- Routing – The process of determining the sequence of operations to be performed in the production process. Routing determines what work needs to be done, where and how? Routing information is provided by the product or process engineering function and it is useful to prepare machine loading charts and schedules.

- Routing has the following objectives:

  1. It determines the sequence of manufacturing operations.
  2. It ensures the strict adherence to the sequence so determined.
  3. It strives for the best possible & cheapest sequence of operations.
  4. It influences the design & layout of the factory building with a view to get quick & better production results.
  5. It also influences the installation of plants & factory for better results.

- Scheduling – Involves fixing priorities for each job and determining the starting time and finishing time for each operation. Scheduling lays down a timetable for production indicating the total time required for the manufacture of the product. It prevents unbalanced amount of time in work centers.

Types of Schedules

- **Production schedule**: The main aim is to schedule that amount of work which can easily be handled by plant and equipment without interference. Its not independent decision as it takes into account following factors.

  (1) Physical plant facilities of the type required to process the material being scheduled.

  (2) Personnel who possess the desired skills and experience to operate the equipment and perform the type of work involved.

  (3) Necessary materials and purchased parts.

- **Master Schedule**: Scheduling usually starts with preparation of master schedule which is weekly or monthly break-down of the production requirement for each product for a definite time period, by having this as a running record of total production requirements the entrepreneur is in better position to shift the production from one product to another as per the changed production requirements. This forms a base for all subsequent scheduling acclivities. A master schedule is followed by operator schedule which fixes total time required to do a piece of work with a given machine or which shows the time required to do each detailed operation of a given job with a given machine or process.

- **Manufacturing schedule**: It is prepared on the basis of type of manufacturing process involved. It is very useful where single or few products are manufactured repeatedly at regular intervals. Thus it would show the required quality of each product and sequence in which the same to be operated
- **Scheduling of Job order manufacturing**: Scheduling acquires greater importance in job order manufacturing. This will enable the speedy execution of job at each center point.

- Uses of scheduling:

  1. Scheduling is certainly a necessity in a large setup which produces a variety of products with numerous components. The time within which products must be manufactured forms an important element in production control.

  2. Scheduling also determines the total time required to perform a given piece of work or assembly.

  3. Time & motion study helps standardization of methods of work after a careful analysis of all the vital factors surrounding the manufacturing processes.

- Loading - Once the route has been established, the work can be loaded against the selected machine. Loading deals with the amount of work assigned to a machine or a worker. It deals with the record of work-load of different shops. The total time required to perform the operations is computed by multiplying the unit operation time given on the standard process sheet by the number of parts to be processed. The total time is then added to the work already planned for the work station. The process results in a tabulated list or chart showing the planned utilization of machines or work stations in the plant

Production control

- All organizations irrespective of size, use production control to some degree. In small organizations, the production control may be performed by one person; but in large complex industries the production control department is normally well-organized and highly specialized.
- Production control presupposes the existence of production plans, and it involves the use of various
- control techniques to ensure production performance as per plans. Coordinating men and materials and machines are the task of production control

Definition

- Production control may be defined as “the process of planning production in advance of operations; establishing the exact route of each individual item, part of assembly; setting, starting and finishing dates for each important item, assembly, and the finished products, and releasing the necessary orders as well as initiating the required follow-up to effectivate the smooth functioning of the enterprise.”
- According to Henry Fayol, “production control is the art and science of ensuring that all which occurs is in accordance with the rules established and the instructions issued”. Thus, production control regulates the orderly flow of materials in the manufacturing process from the raw material stage to the finished product.
- Production control aims at achieving production targets, optimum use of available resources, increased profits through productivity, better and more economic goods and services etc. An effective production control system requires reliable information, sound organization structure, a high degree of standardization and trained personnel for its successful operation

Objectives of Production Control

- (i) Provision of raw material, equipment, machines and labour.
- (ii) To organize production schedule in conformity with the demand forecasts.
- (iii) The resources are used in the best possible manner in such a way that the cost of production is minimised and delivery date is maintained.
- (iv) Determination of economic production runs with a view to reduce setup costs.
- (v) Proper co-ordination of the operations of various sections/ departments responsible for production.
- (vi) To ensure regular and timely supply of raw material at the desired place and of prescribed quality and quantity to avoid delays in production.
- (vii) To perform inspection of semi-finished and finished goods and use quality control techniques to ascertain that the produced items are of required specifications.
- (viii) It is also responsible for product design and development.

Production Control Functions

- **Dispatching** – It is defines as setting production activities in motion through the release of orders (work order, shop order) and instructions in accordance to the previously planned time schedules and routings. Dispatch provides official authorization and information for
- (i) Movement of materials to different work stations,
- (ii) movement of tools and fixtures necessary for each operation,
- (iii) beginning of work on each operation,
- (iv) recording of beginning and completion time,
- (v) movement of work in accordance with a routing schedule,
- (vi) control of progress of all operations and making of necessary adjustments in the release of operations

Expediting/Follow Up

- Expediting or follow up is the last step in production planning and control.
- It involves determination of the progress of work, removing bottlenecks in the flow of work and ensuring that the productive operations are taking place in accordance with the plans.
- Follow up or expediting is that branch of production control procedure which regulates the progress of materials and parts through the production process. It spots delays or deviations from the production plans It helps to reveal defects in routing and scheduling, misunderstanding of orders and instructions under loading or overloading of work etc.
- All problems and deviations are investigated and remedial measures are undertaken to ensure the completion of work by the planned date.

Inspection and Corrective Action

- **Inspection**: This is mainly to ensure the quality of goods. It can be required as effective agency of production control.
- **Corrective Action** - Corrective action is needed to make effective the system of production planning and control. By resorting to corrective measures, the production manager maintains full control over the production activities. For instance, routing may be defective and the schedules may be unrealistic and rigid. The production manager should try to rectify the routes and lay down realistic and flexible schedules.
- Workload of machines and workers should also be determined scientifically. If schedules are not being met, the causes should be fully investigated. It should also be ensured that there is optimum utilization of the plant capacity.

Benefits of PC

- Improvement in Profit through
  - Maintenance of balanced inventory of materials, parts, WIP etc.
  - Balanced and Stabilized production
  - Minimum investment in inventory
  - Reduction in indirect costs
  - Reduction in set up costs
  - Reduction in scrap and rework costs

- Competitive advantage
  - Reliable delivery to customers
  - Shortened delivery schedules to customers
  - Lower production cost and greater pricing flexibility
  - Orderly planning and marketing of new and improved products

Principles of PPC

- Type of production determines the kind of production planning and the control system needed
- Number of parts involved in the product effects expenses of operating PPC department
- Complexity of PPC function varies with the number of assemblies involved
- Time is a common denominator of all scheduling activities
- PPC permits management by exception
- Cost control should be a by-product of PPC

Phases of PPC

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1. **Planning phase**: It has two categories of planning ,
a. Prior planning is pre-production planning &
b. Active planning is actual production planning.

Prior planning refers to all the planning efforts that take place prior to active planning. The modules of prior planning are: product development & design, forecasting, aggregate planning, master scheduling etc. Active planning includes various activities directly related to the production. The modules of active planning are: process planning & routing, material planning, tools planning, loading, scheduling etc.

2. **Action phase**: Action phase directly deals with dispatching. Dispatching is the transition from planning phase to action phase. The employee is ordered to start manufacturing the product. The tasks that are included in dispatching are: job order, store issue order, tool order, time ticket, inspection order, move order etc.

3. **Control phase**: Control phase includes (a) progress reporting & (b) corrective action. Progress reporting helps to make comparison with the present level of performance. Corrective action makes provisions for an unexpected event e.g., capacity modifications, schedule modifications etc.

Functions / Importance / Needs / Significance /Advantages of

Production Planning and Control

1. Utilizes resource effectively.
2. Makes flow of production steady.
3. Estimates production resources.
4. Maintains necessary stock levels.
5. Coordinates departmental activities.
6. Minimizes wastage of resources.
7. Improves labour efficiency.
8. Help to face competition.
9. Provides better work environment.
10. Facilitates quality improvement.
11. Customer satisfaction.
12. Reduces production cost.

Importance of PPC

- **Better Service to Customers : Production planning and control,** through proper scheduling and expediting of work, helps in providing better services to customers in terms of better quality of goods at reasonable prices as per promised delivery dates. Delivery in time and proper quality, both help in winning the confidence of customers, improving relations with customers and promoting profitable repeat orders.
- **Fewer Rush Orders : In an organization, where there is effective system** of production planning and control, production operations move smoothly as per original planning and matching with the promised delivery dates. Consequently, there will be fewer rush orders in the plant and less overtime than, in the same industry, without adequate production planning and control.
- **Better Control of Inventory : A sound system of production planning** and control helps in maintaining inventory at proper levels and, thereby, minimizing investment in inventory. It requires lower inventory of work-in-progress and less finished stock to give efficient service to customers. It also helps in exercising better control over raw-material inventory, which contributes to more effective purchasing

- **More Effective Use of Equipment : An efficient system of production** planning and control makes for the most effective use of equipment. It provides information to the management on regular basis pertaining to the present position of all orders in process, equipment and personnel requirements for next few weeks. The workers can be communicated well in advance if any retrenchment, lay-offs, transfer, etc. is likely to come about. Also, unnecessary purchases of equipment and materials can be avoided. Thus, it is possible to ensure proper utilization of equipment and other resources
- **Reduced Idle Time : Production planning and control helps in reducing** idle time i.e. loss of time by workers waiting for materials and other facilities; because it ensures that materials and other facilities are available to the workers in time as per the production schedule. Consequently, less man-hours are lost, which has a positive impact on the cost of production.
- **(vi) Improved Plant Morale : An effective system of production planning** and control co-ordinates the activities of all the departments involved in the production activity. It ensures even flow of work and avoids rush orders. It avoids 'speeding up' of workers and maintains healthy working conditions in the plant. Thus, there is improved plant morale as a byproduct.

- **Good Public Image : A proper system of production planning and** control is helpful in keeping systematized operations in an organization. Such an organization is in a position to meet its orders in time to the satisfaction of its customers. Customers satisfaction leads to increased sales, increased profits, industrial harmony and, ultimately, good public image of the enterprise.
- **Lower Capital Requirements : Under a sound system of production** planning and control, everything relating to production is planned well in advance of operations. Where, when and what is required in the form of input is known before the actual production process starts. Inputs are made available as per schedule which ensures even flow of production without any bottlenecks. Facilities are used more effectively and inventory levels are kept as per schedule neither more nor less. Thus, production planning and control helps, in minimizing capital investment in equipment and inventories.

Limitations of PPC

- **(i) Lack of Sound Basis : Production planning and control is based on** certain assumptions or forecasts about availability of inputs like materials, power, equipment etc. and customers orders. In case these assumptions and forecasts do not go right, the system of production planning and control will become ineffective.
- **(ii) Rigidity in Plant's Working : Production planning and control may** be responsible for creating rigidity in the working of the plant. Once the production planning has been completed, any subsequent change may be resisted by the employees.
- **(iii) Time consuming Process : Production planning is a time consuming** process. Therefore, under emergencies it may not be possible to go through the process of production planning.

- **(iv) Costly Device : Production planning and control is not only a time** consuming process but is a costly process also. Its effective implementation requires services of specialists for performing functions of routing, scheduling, loading, despatching and expediting. Small firms cannot afford to employ specialists for the efficient performance of these functions.
- **(v) External Limitations : The effectiveness of production planning and** control is sometimes limited because of external factors which are beyond the control of production manager, Sudden break-out of war, government control, natural calamities, change in fashion, change in technology, etc. are factors which have a negative impact on the implementation of production planning and control.

Functions/scope of production planning & control

1. **Materials**: Materials should be made available at the right quality, right quantity, right price & right price. Inventory control & regular supply of materials should be guaranteed.
2. **Manpower**: It is important to carry out manpower planning to maintain operational & managerial staff possessing requisite skills & expertise.
3. **Methods**: It is always desirable to consider all the available alternatives & select the best method of processing. Simultaneously, to plan for tooling, jigs & fixtures & to determine the best sequence of operations.
4. **Machines & equipments**: The choices of manufacturing methods depend on available production facilities & utilization of plant, machines equipments.
5. **Routing**: The routing function specifies what work is to be done where & when it is to be performed.
6. **Estimating**: it involves establishing performance standard of each work after duly analyzing operation sheets. These sheets indicate feeds, speeds, depth of cuts, use of special attachments & methods.

7. **Loading & scheduling**: Loading & scheduling machines have to be made as per the production requirements. Machine loading generates accurate information on work standard, scrap allowances, machine-time requirements & machine capacities. Scheduling is a time-table for performing the job on the available machines so that delivery dates are maintained.
8. **Dispatching**: Dispatching is the release of orders & instructions to start production as per the route sheets & schedule charts.
9. Expediting: It refers to follow-up which is done after the dispatching function.
10. **Inspection**: It is related to maintenance of quality in production & processes, methods labour so that improvements can be made to achieve the quality standards.
11. **Evaluating**: It provides a feedback mechanism on a long term basis so that past experience can be used to improve upon use of methods, facilities & resources in future period.
12. **Cost control**: In manufacturing products, costs can be kept within control through wastage reduction, value analysis, inventory control & efficient use of resources.

Organization of Production planning & control

- Activities in Production planning section includes:

1. Production budget office: In this office, incoming orders are recorded in order book. Budget allocation is done to execute each order. In case the customer gives a required date of delivery, the date is noted for further action.
2. Material Requirement planning: No sooner the planning engineer receives the product to be produced, the production planning department prepares material requirement plan. Material can be applied either internally from the store or ordered from outside.
3. Methods planning office: The responsibility of this office is to assess the potentialities of available methods & to select the best method for producing components.
4. Capacity planning office: This office checks the status of each of the facility & allocates them as per requirement of jobs.

- 5. Tool & jig design office: The planner tries to provide simple & cost effective tools & jigs for performing the operation. The selection of suitable tool & jig is advised by industrial engineers.
  6. Operation layout & routing office: The responsibility of this office is to prepare several forms & documents so that the production people can work with ease.
  7. Scheduling office: The planner is excepted to prepare a time table of machine allocation for different jobs. Individual capacity of the machine indicates to the planner that with the existing number of machines how much work can be cleared & time taken to complete the work.

- Activities of Production Control section:

  1. Dispatching office: This office releases production orders & instructions to those who are expected to carry out production activities.
  2. Expediting centre: This centre implements the plan. The centre maintains an effective communication with help from expeditor, between shop floor & the scheduling office.
  3. Transportation office: It looks after movement of men & materials within the factory premises.
  4. Stores & inspection section: This section assumes the materials management & control functions.