Operation Management

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Introduction

- **The management of the conversion processes which transforms inputs such as raw material, labour etc. into outputs in the form of finished goods and services is termed as Operations Management (OM).**

- **OM is the business function that is responsible for managing and coordinating the resources required to produce a company's products and services.**

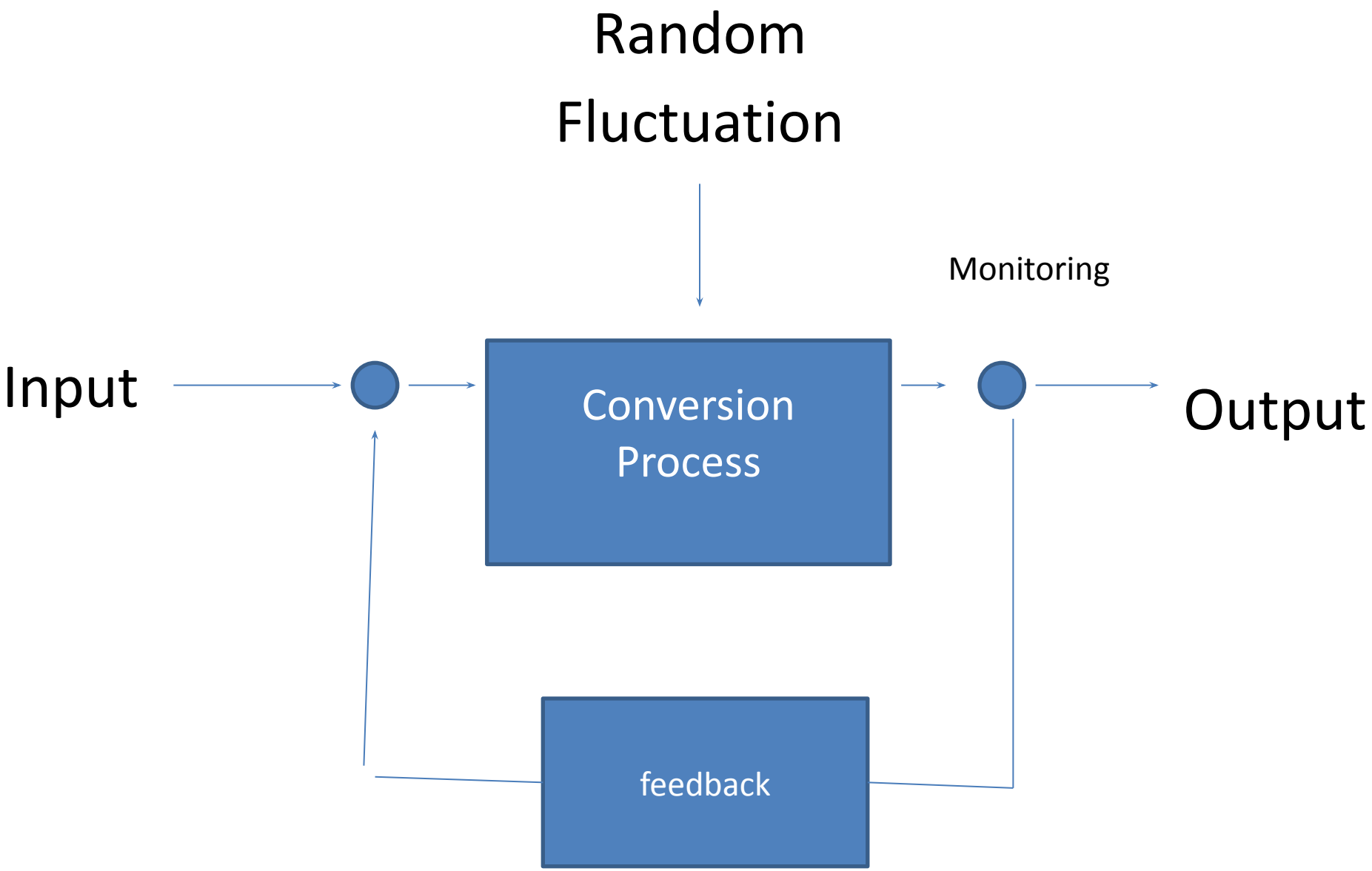
- **The role of OM is to transform organizational inputs into company's products or services outputs. OM is responsible for a wide range of decisions, ranging from strategic to tactical.**

System concept

- A system is an arrangement of components designed to achieve a particular objective (or objectives) according to plan.

- The components may be either physical or conceptual or both, but they all share a unique relationship with each other and with the overall objective of the system.

- A systems approach to operations management problems places strong emphasis upon the integrative nature of management responsibilities, recognizing both the interdependence and the hierarchical nature of subsystems.


Random
Fluctuation
Monitoring
Input
Conversion
Process
Output
feedback

Inputs	Transformation	Outputs
Energy, Raw vegetables	Cleaning	Clean vegetables
Energy, Metal sheets	Cutting/Rolling/Welding	Cans
Energy, Vegetables	Cutting/Chopping	Cut vegetables
Energy, Water, Vegetables	Cooking	Boiled vegetables
Energy, Cans, Boiled vegetables	Placing	Can food

Types of production systems

- **Mass production(Continuous and Assembly line)**
- **Batch production**
- **Job shop**

Plant location

- Plant location means the establishment of an industry at a particular place.
- The location of the plant can have a critical influence on the profitability of a project, and the scope for future expansion.
- It is challenging to set down rules whereby the problem of facilities location can be programmed but there are a number of factors which should be considered when selecting a suitable site.
- The essential purpose of location investigation is to maximize the profits by minimizing the total cost of production linked with the production process.

Critical Success Factors of Location Decisions:

A. Country Decision

- Political risks, government rules, attitudes, incentives
- Cultural and economic issues
- Location of markets
- Labor talent, attitudes, productivity, costs
- Availability of supplies, communications, energy
- Exchange rates and currency risks

B. Region/ Community Decision

- Attractiveness of region
- Corporate desires
- Costs and availability of utilities
- Environmental regulations
- Government incentives and fiscal policies
- Labor availability, costs, attitudes towards unions
- Land/construction costs
- Proximity to raw materials and customers

C. Site Decision

- Site size and cost
- Air, rail, highway, and waterway systems
- Zoning restrictions
- Proximity of services/ supplies needed
- Environmental impact issues

Plant location strategy

- Minimum handling of material
- Minimum damage and spoilage of materials
- Reduced congestion of materials, machinery and man
- Flexibility with regards to changing production conditions

Plant layout

- It is the physical preparation of equipment and facilities within a plant. Optimizing the layout of a plant can improve productivity, safety and quality of products. The basic objective is to ensure a smooth flow of work, material, people and information. It must facilitate the production process, minimize material handling time and cost.

- A perfect plant layout must emphasis on –

  - Minimizing the operational cost and maximizing the productivity of the manufacturing unit
  - Allow flexibility of operations
  - Ease of production flow
  - Economic use of the building
  - Promote effective utilization of manpower
  - Provide for employees' convenience
  - Safety & comfort at work and maximum exposure to natural light

Basic objectives of plant layout

A plant layout must achieve the following objectives:

- **Enhance productivity**
- **Maximize production capacity**
- **Avoid delays in production activities**
- **Efficient utilization of available floor space**
- **Minimize material handling costs**
- **Enhance labour efficiency**
- **Improve employee morale**
- **Ensure ease of supervision & control**
- **Allow optimum utilization of machinery & equipment**
- **Provide for flexibility in production volume**
- **Help easy maintenance**
- **Support employee health & safety**
- **Minimize hazards to employees**
- **Mitigate accident risks**

Inputs to the Plant layout decision

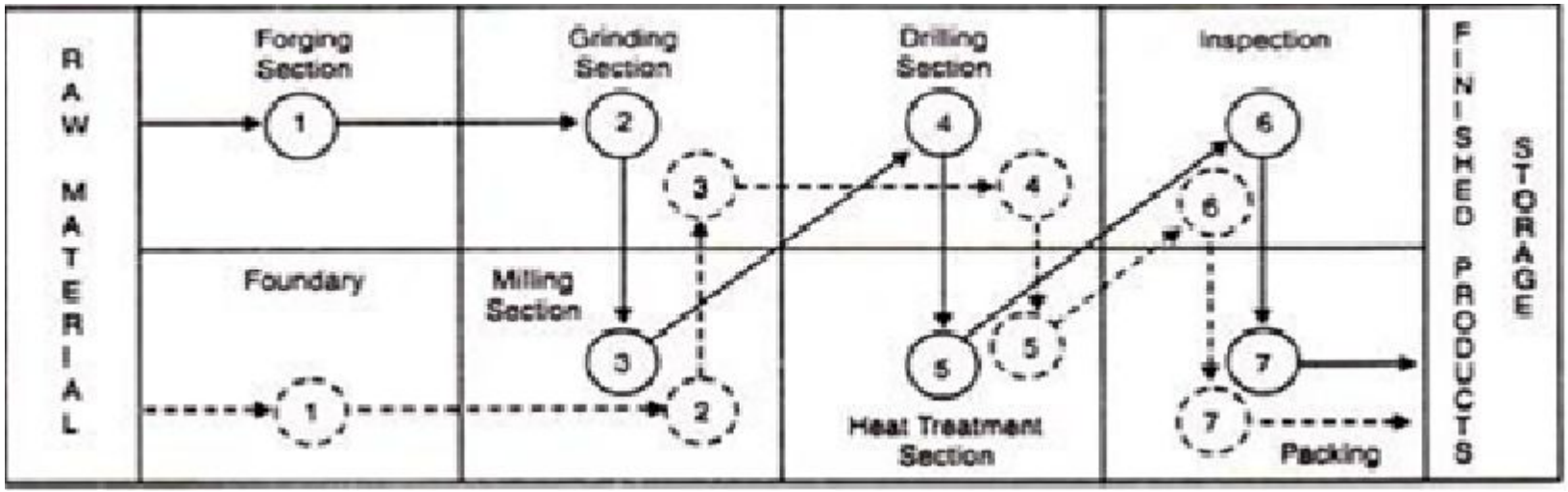
- Specification of objectives of the system in terms of output and flexibility
- Estimation of product or service demand on the system
- Processing requirements in terms of number of operations and amount of flow between departments and work centres
- Space requirements for the elements in the layout
- Space availability within the facility itself

Advantages of a good layout:

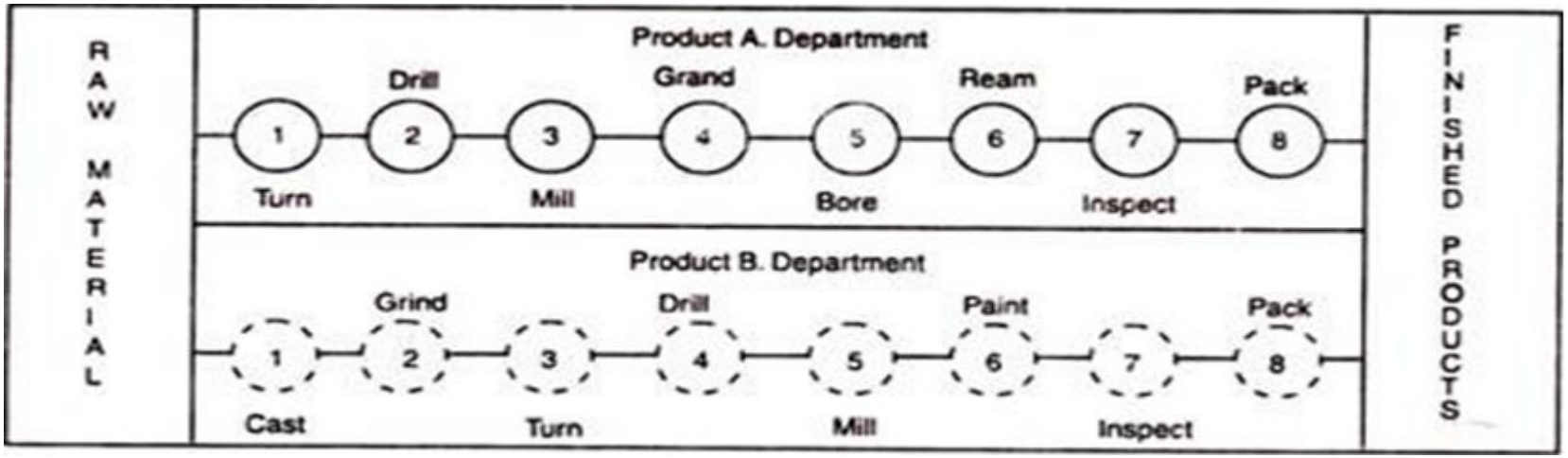
- The overall process time and cost will be minimized by reducing unnecessary handling and movement.
- Supervision and control will be simplified by the elimination of ‘hidden corners’
- Changes in the programmers will be most readily accommodated.
- Total output from a given facility will be as high as possible by making the maximum effective use of available space and resources.
- A feeling of unity among employees will be encouraged by avoiding unnecessary segregation.
- Quality of the products or service will be sustained by safer and more effective methods of operation.

Types of Plant layout:

Process layout or Functional layout - Process layout is applicable where similar equipment, machinery & task tools are grouped together, also known as a functional layout useful for low volume & high variety production jobs.



Product layout or Line layout - Product layouts are used to achieve a smooth and rapid flow of large volumes of products or customers through a system. They achieve a high degree of labour and equipment utilization.



- **Fixed position layout** – In this layout the material / job remains in a fixed position, but machinery, tools, workmen etc. are brought to the material – Project layout.
- **Cellular layout** – It is a type of layout in which machines are grouped into what is referred to as a cell. It provides faster processing time, less material handling, less work-in-process inventory, and reduced setup time.
- **Combination layout** - Sometimes, every manufacturing unit requires a customized plant layout wherein a combination of plant layout types may be employed which is known as a combination layout. A company may opt to prepare a combination layout in order avail the benefits from one or more plant layout type.

Material handling

- **The primary objective of using a Material Handling System is to confirm that the material in the right amount is safely delivered to the chosen destination at the right time and at minimum cost.**

- **The Material Handling System is properly designed not only to ensure the minimum cost and compatibility with other manufacturing equipment but also to meet safety concerns.**

- **Material Handling simply means loading, moving and unloading of material.**

- **Material Handling is defined by the Materials Handling Institute (MHI), as the movement, storage, control, and protection of materials and products throughout the process of their manufacture, distribution, consumption, and disposal.**

- **The five commonly recognized aspects of Material Handling are motion, time, place, quantity, space.**

Classification of Material Handling:

- Holding, feeding, metering
- Transferring, positioning
- Lifting, hoisting, elevating
- Dragging, pulling, pushing
- Loading, carrying, excavating
- Conveyor moving and handling
- Automatic guided vehicle transporting
- Robot manipulating
- Identifying, sorting, controlling
- Storing, warehousing
- Order picking, packing
- Loading, shipping

Importance of Materials Handling:

- By ensuring the right quantity of materials delivered at the right place at the right time most economically, it improves efficiency of a production system.
- Indirect labour cost is cut down.
- During storage and movement reduces damage of materials.
- Maximize space utilization by proper storage of materials and thereby reduce storage and handling cost.
- Proper materials handling minimises accident.
- By improving materials handling overall cost reduces.
- Improve customer services by supplying materials in a manner convenient for handlings.
- Increase efficiency and sale ability of plant and equipment with integral materials handling features.

Principles of Material Handlings:

- **Planning principle** - A plan is a recommended sequence of action that is defined in advance of implementation. In its simplest form a material handing plan defines the material (what) and the moves (when and where); together they define the method (how and who).
- **Standardization principle** - Standardization means less variety and customization in the methods and equipment employed.
- **Work principle** - The measure of work is material handling flow (volume, weight or count per unit of time) multiplied by the distance moved.
- **Orientation principle** - Study the system relationships carefully prior to initial planning in order to classify current approaches and problems, physical and economic constraints, and to establish future necessities and objectives.
- **Unit load principle** - Handle product in as large a unit load as practical.

- **Ergonomic Principle** - Recognize human capabilities and boundaries.
- **Space utilization principle** - Space in material handling is three dimensional and therefore is counted as cubic space.
- **System flow princ**iple - Integrate data flow with the physical material flow in handling and storage.
- **Automation Principle** - All items expected to be handled automatically must have features that accommodate mechanized and automated handling.
- **Ecology principle** - Minimize adverse effects on the environment when selecting MH equipment and procedures.
- **Life Cycle Cost Principle** - Life cycle costs include all cash flows that will occur between the time the first rupee is spent to plan or procure a new piece of equipment, or to put in place a new method, until that method and/or equipment is totally replaced.

Factors to be Considered while Selecting a Material Handling Equipment:

- Material to be moved
- Plant buildings and layout
- Type of production machines
- Type of material flow pattern
- Type of production
- Cost of material handling equipment
- Handling cost
- Life of equipment
- Amount of care and maintenance required for the material handling equipment

Equipment of Material Handling:

- Industrial trucks include hand trucks such as two-wheeled, four-wheeled, hand lift, and forklift and powered trucks such as forklift, tractor-trailer trains, industrial crane trucks, and side loaders
- Conveyors such as belt, chute, roller, wheel, slat, chain, bucket, trolley, tow, screw, vibrating, and pneumatic
- Monorails, hoists, and cranes such as bridge, gantry, tower, and stacker
- Automated guided vehicle systems such as unit load carriers, towing, pallet trucks, fork trucks, and assembly line
- Automated storage and retrieval systems (AS/RS) such as unit load, mini-load, person-on-board, deep lane, and storage carousel systems

Inventory management

Meaning of Inventories:

Inventory consists of items which are finished and held in sales or are in the process of production or the items which are kept as raw material.

a) **Raw materials** are those basic fabricated materials which are yet to go through any conversion.

b) **Finish parts** which may either be bought-out-parts (produced by suppliers) or piece parts (made in own company).

c) **Work-in-process Inventories**: these items are partially completed state. These items are can be found on the conveyers, trucks, pallets, in and around the machines and in store section waiting for assemble.

d) **Finish Goods** are the products or goods which are ready to be shipped.

e) **Tools** comprises standard and hand tools.

f) **Supplies** are materials in running the plant or in making companies product but do not go into the product.

g) **Machinery spares** include consumable spares and replacement spares

Major Reasons for Keeping the Inventories:

a) To economies on buying or manufacturing cost
b) To keep pace with changing market conditions
c) To satisfy demand during period of replenishment
d) To take care contingencies (i.e. prevent stock-outs)
e) To stabilize production
f) To prevent loss of sale
g) To satisfy other business constraints

Objectives of Scientific Inventory Control System:

a) Continuity of productive operations
b) Effective use of capital
c) Reduction of administrative workload
d) Service of customers
e) Economy in purchasing
f) Reduction of risk in loss
g) Practical system
h) Administrative simplicity

Classifications of Inventory :

- **ABC analysis**:
  ABC analysis work on a very important principle “vital few : trivial many”. Statistical data reveals that only a few items account for the maximum annual expenditure on materials. These few items called ‘A’ items, therefore, hold the key to business. The other items, known as ‘B’ and ‘C’ items, are numerous in number but their contribution is less significant.
- **HML analysis**:
  HML analysis is similar to ABC analysis except for the difference that instead of usage value, price criteria is used. The items under this are categorized into three types such as high, medium and low. The cut of lines of the items are fixed by the management.
- **VED analysis**:
  VED analysis categorizes the items according to their criticality. The items are classified as vital, essential and desirable. Vital category includes those items, which are very essential to running the production. Essential group includes items which have high stock out costs. And desirable group comprises of items which do not cause any immediate loss of production.
- **SDE analysis**:
  SDE analysis classifies the items in to three groups called scarce, difficult and easy. Scare group consist of items which are in short supply imported or canalized through government agencies. Difficult group consist of items which are available indigenously but are not easy procure. Easy group consist of items which are readily available.

- **G-NG-LF analysis/GOLF analysis**:
  The analysis classifies items into four groups namely G-NG-L and F. G group covers items procured from Government suppliers such as the STC, the MMTC and the public sector undertakings. NG group comprises of items procured from non-government suppliers. L group consist items bought from “local suppliers”. F group contains items which are purchased from foreign suppliers.
- **S-OS analysis**:
  S-OS analysis is based on seasonality of the items and it classifies the items into two groups S (seasonal) and OS (i.e. off seasonal). The analysis identifies items which are available only limited period, available through the year.
- **F-S-N analysis:**
  F-S-N analysis is based on consumption figures of items. The items are classified in to three categories. F fast moving items, requires to be viewed regularly. S low moving items, these items having higher stock than their rate of consumption. N non-moving, the items which are not being consumed.
- **X-Y-Z analysis:**
  X-Y-Z analysis is based on value of the stocks on hand. The items whose inventory values are high are called X items while those whose inventory values are low are called Z items. And Y items are those which have moderate inventory stocks.

Purchasing and store system

- **Purchasing:**

  Purchasing may be defined as that function of a business undertaking which is responsible for the procurement of materials, tools, implements, machinery and service required to produce certain goods and services.
- **Procurement:**

  Procurement means acquisition of materials by any method whatsoever and is a part of Material Management.
- **Objectives of Purchasing Department:**
  - To procure right material
  - To procure material in right quantities
  - To procure materials in right quality
  - To procure material from right and reliable source or vendor
  - To procure material economically, i.e. at right or reasonable price
  - To receive and deliver materials at right place and at right time

Principles of Scientific Purchasing:

There are six R's wise or scientific purchasing. These are

- Right Quality
- Right Quantity
- Right Price
- Right Time of Delivery
- Right Price of Delivery
- Right Source of Supply

Methods of Purchasing:

a) Purchasing by requirement-undertaking Purchase only when necessary
b) Purchasing for specified future period- goods regularly used by the organizations but in small quantity
c) Purchasing from the favourable market- using the correct forecast of market conditions
d) Speculative purchasing- Purchase is made in speculation of rise in prices
e) Contract purchasing- Buying goods under forward buying contracts
f) Purchasing small items in group- Purchase various items in small quantities
g) Scheduled purchasing- estimate of purchasing being made in the future in accordance with production schedules for future period

Standard Purchase Procedure for a Large Scale Organization:

a) Recognition of the need
b) Selection of source of supply
c) Inviting quotations
d) Processing the quotations
e) Placing the order and follow up
f) Receipt and inspection
g) Approval of Payment

Thank You

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