

Solution cum Scheme of Evaluation

IV/IV B.Tech(Regular) Degree Examination

ME 411 Industrial Management & Entrepreneurship Development

Mechanical Engineering

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1.

a) State the levels of Management

- Top level management.
- Middle level management
- Lower level management

b) What are the types of organization structure?

- Line organization
- Line and Staff organization
- Functional organization

c) Describe about market mix variables

1. Product

Goods manufactured by organizations for the end-users are called products. Products can be of two types - Tangible Product and Intangible Product (Services) An individual can see, touch and feel tangible products as compared to intangible products. A product in a market place is something which a seller sells to the buyers in exchange of money.

2. Price

The money which a buyer pays for a product is called as price of the product. The price of a product is indirectly proportional to its availability in the market. Lesser its availability, more would be its price and vice a versa.

Retail stores which stock unique products (not available at any other store) quote a higher price from the buyers.

3. Place

Place refers to the location where the products are available and can be sold or purchased. Buyers can purchase products either from physical markets or from virtual markets. In a physical market, buyers and sellers can physically meet and interact with each other whereas in a virtual market buyers and sellers meet through internet.

4. Promotion

Promotion refers to the various strategies and ideas implemented by the marketers to make the end - users aware of their brand. Promotion includes various techniques employed to promote and make a brand popular amongst the masses.

d) What are steps involved in Method Study

1. SELECT the work to be studied
2. RECORD all the relevant facts about the present method by direct observation
3. EXAMINE those facts critically and in an ordered sequence, using the techniques best suited to the purpose.

4. DEVELOP the most practical, economic and effective method, having due regard to all contingent circumstances
5. DEFINE the new method so that it can always be identified
6. INSTALL that method as standard practice
7. MAINTAIN that standard practice by regular routine checks.

These are the seven essential stages in the application of method study; none can be excluded. Strict adherence to their sequence, as well as to their content, is essential for the success of an investigation.

e) Define Productivity

The ratio of output produced to the input resources utilized in the production.

f) How do you calculate Standard Time?

Standard Time = Basic Time + allowances

g) State any two attribute charts with formula

C-Chart

$$LCL = \bar{c} - 3\sqrt{\bar{c}} \qquad UCL = \bar{c} + 3\sqrt{\bar{c}}$$

P-Chart

$$LCL = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \qquad UCL = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

h) Define Quality control

Quality control (QC) is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer.

i) When do you use sampling plans?

All sampling plans are devised to provide a specified producer's and consumer's risk. However, it is in the consumer's best interest to keep the average number of items inspected (ANI) to a minimum because that keeps the cost of inspection low. Sampling plans differ with respect to ANI.

j) What are Entrepreneurial characteristics?

- Self-confident
- Able to make decisions
- Determined
- Independent
- Energetic
- Able to lead
- Resourceful
- Versatile
- Achievement-oriented

- Able to take calculated risks

k) Steps involved in Plant Design

- Raw material selection.
- Block diagram of the process.
- Material and Energy balance of the process.
- Equipment selection.
- Piping drawings, instrument drawings, electrical and civil drawings.
- Layout drawings.
- Utility section equipment capacity calculation based on energy requirement found by energy balance.
- Individual equipment drawings and flow sheet.
- Blue print of complete process.
- HAZOP and safety studies (safety interlock systems).
- Redesigning of the process flow sheet.
- Construction of the civil structures.
- Equipment installation and commissioning
- Leak and pressure tests of the equipment and pipe lines.
- Instruments and controller installation, calibration.
- Trail run with water and then with air.
- Purging the process equipments.
- Validation runs are taken for stabilization of the process.

l) Discuss the need of training for enterprises

In order to motivate and assist the prospective entrepreneurs for the success of their industry, proper training is essential in production techniques, management, marketing and other aspects. Small industries service institutes and their extension centres organise training for

1. Improving technical skills of workers and employees
2. Providing acquaintance to entrepreneurs with modern and latest production and management techniques.

UNIT-I

2. a) What are the functions of management? Explain in detail

6M

FUNCTIONS OF MANAGEMENT:

1. Forecasting:

Forecasting is a pre-requisite to planning. It determines estimate of future requirement of the business in regard to products and quantities for sale, materials, manpower, machines capacity for production or any other aspect of business activities.

Forecast are of two types i) short term forecast and ii) Long-term forecast. Forecast covering periods less than one year ahead are called short term forecasts and forecasts covering periods over 1 year to 15 years(beyond 15 years future is assumed to be uncertain) are termed as long term forecasts.

Short term forecasts are made for the purpose of materials control, loading and scheduling, and budgeting while long term forecasts are made for product diversification, sales and advertising, budgeting, financial planning and investment planning.

2. Planning:

Planning is determining (identifying and listing) activities to be performed in future in order to achieve desired goals. Planning, therefore, is forward looking. Planning is important because

1. It is done ahead of the job and therefore considered key activity for achieving goals
2. It involves making decisions today which will affect future
3. It provides the basis for other steps of the management process-organising, directing and controlling
4. It gives overall idea of the work that is to be done, in advance so that we don't forget anything and run at the last minute.
5. Planning develops manager's capacity to visualize and help foresee problems before they occur.

Planning involves three steps:

1. Listing of all the activities that need to be performed
2. Arranging activities in the sequence in which they need to be performed
3. Incorporating flexibility to meet contingencies

Planning embraces every activity (function) of management. In the absence of planning, there will be confusion, haphazard working and wastage of resources.

3. Organizing:

Organizing is the next phase to planning. Planning establishes objectives and draws a plan of the activities and organizing puts the plan into action. Organising is

1. Identification and classification of various activities necessary for Achievement of objectives (task identification)
 2. Separation and grouping of activities(formation of departments)
 3. Assigning people to those activities and providing physical factors of environment (resource allocation)
 4. Delegation of authority to each individual charged with execution of each respective activity (delegation of authority)
 5. Fixation of horizontal and vertical relationships between various positions
- Organising facilitates smooth functioning of the organization, greater co-ordination of work performed by different subordinates, and effective channels of communication. Good organizing results in greater utilization of resources, clarity of responsibility and authority, reduced inter and intra departmental problems, effective decision making, and horizontal and vertical co-ordination of authority and information relationships.

4. Directing:

Directing is the process by which actual performance of the subordinates is guided towards attainment of the goals of the organization.

- Directing involves
- Guiding and helping subordinates in performing the job
- Giving instructions to the subordinates to do a job
- Supervising subordinates to ensure that job is carried out as per established plan
- Motivating them (subordinates) for better performance

Directing involves following four functions

1. Leadership
2. Communication
3. Motivation
4. Supervision

1. Leadership

Influencing subordinates and gaining their confidence and trust is critical for every manager. Subordinates must accept their bosses as leaders and latter must possess leadership qualities.

2. Communication

Managers need to give instructions and guide subordinates. Instructions to subordinates may be oral or written, but they must be clear and precise. Communication, therefore, plays an important role in getting things done through people.

3. Motivation

Motivation is inspiring people for better performance. Since, different people have different needs, every manager must carefully study the employees' needs and make sincere efforts to satisfy them by providing monetary and non-monetary rewards. Motivation, therefore, is important for directing subordinates.

4. Supervision

Supervision and directing are not separatable since a manager must supervise his subordinates to see that work is performed according to laid down plan

5. Staffing:

Management is getting things done through other people and as such staffing-the process of selecting, training, developing and placing of qualified people in the various jobs- is another important function of management. Staffing is a continuous process as people are required to fill newly created positions due to expansion of activity and to fill vacated positions on account of separation (resignations, death, termination, dismissal etc) of employees

6. Co-ordination:

Co-ordination is integrating or synchronizing the work performed by various individuals for attainment of company's objectives. Co-ordination, like communication, is required at every stage of the management process. The problems as well as importance of co-ordination increases

with size of the organization. Co-ordination improves communication between different departments (sales, production, administration, finance etc) increases productivity and morale while lack of co-ordination between different departments can cause irreparable damage to the organization. Effective co-ordination involves

- Setting procedures and systems that co-ordinate the activities (e.g. production meetings, or review meetings)
- Reviewing jointly status of the activities with the departments involved
- Regulating communications to convey decisions taken at the review meetings wherever required.

Success of co-ordination depends on effectiveness of administrative controls (procedures and systems in the organization), dynamism of the leadership, and quality of informal relationships within the organization.

7. Controlling:

Controlling is the process of measuring current performance and taking action (if required) to ensure that pre-determined goals are accomplished. Controlling involves

- Setting performance standards
- Measuring actual performance
- Comparing actual performance against pre-set standards
- Identifying gaps in performances (actual and standard performance)
- Initiating corrective and preventing actions.

Planning and controlling are closely related. The objectives set in planning process provide the basis for controlling. And findings of controlling help future planning.

Controlling is a continuous process which monitors progress of the activities on continuous basis and initiates corrective action when performance is not in conformity with the pre-determined plan.

8. Decision making:

Decision making is selecting the best course of action among the available alternatives. Decision making is required in every step of management i.e. planning, organizing, directing and controlling.

Decision making entails identifying the problem, finding out the different possible solutions, selecting the best course of action and implementing the selected alternative.

2. b) Discuss about channels of distribution in detail

CHANNELS OF DISTRIBUTION

2M

A channel of distribution or trade channel is the path or route along which goods move from producers to ultimate consumers. It is a distribution network through which a producer puts his

products in the hands of actual users. A trade or marketing channel consists of the producer, consumers or users and the various middlemen who intervene between the two. The channel serves as a connecting link between the producer and consumers. By bridging the gap between the point of production and the point of consumption, a channel creates time, place and possession utilities. A channel of distribution represents three types of flows:

- a. Goods flow from producer to consumers;
- b. Cash flow from consumers to producer as payment for goods; and
- c. Marketing information flows in both directions, from producers to consumers in the form of information on new products, new uses of existing products, etc. The flow of information from consumers to producers is the feedback of the wants, suggestions, complaints, etc.

KINDS OF DISTRIBUTION CHANNELS

4M

Every small-scale entrepreneur requires a channel that can distribute his product to the right customers at the right time and at the right cost. It consists of all the middlemen which participate in the distribution of goods and which serve as a link between the manufacturer and the consumer.

1. Manufacturer to Customer: This is also known as direct selling because no Middlemen are involved. A producer may sell directly through his own retail stores, for example, Bata. This is the simplest and the shortest channel. It is fast and economical. Small producers and producers of perishable commodities also sell directly to the local consumers. Big firms adopt direct selling in order to cut distribution cost and because they have sufficient facilities to sell directly to the consumers. The producer or the entrepreneur himself performs all the marketing activities.

2. Manufacturer to Retailer to Customer: This is one stage distribution channel having one middleman, i.e., retailer. In this channel, the producer sells to big retailers like departmental stores and chain stores who in turn sell to customer. This channel is very popular in the distribution of consumer durables such as refrigerators, T V sets, washing machines, typewriters, etc. This channel of distribution is very popular these days because of emergence of departmental stores, super markets and other big retail stores. The retailers purchase in large quantities from the producer and perform certain marketing activities in order to sell the product to the ultimate consumers.

3. Manufacturer to Wholesaler to Retailer to Customer: This is the traditional channel of distribution. There are two middlemen in this channel of distribution, namely, wholesaler and retailer. This channel is most suitable for the products with widely scattered market. It is used in the distribution of consumer products like groceries, drugs, cosmetics, etc. It is quite suitable for small scale producers whose product line is narrow and who require the expert services and promotional support of wholesalers.

3. a) Distinguish marketing and selling

6M

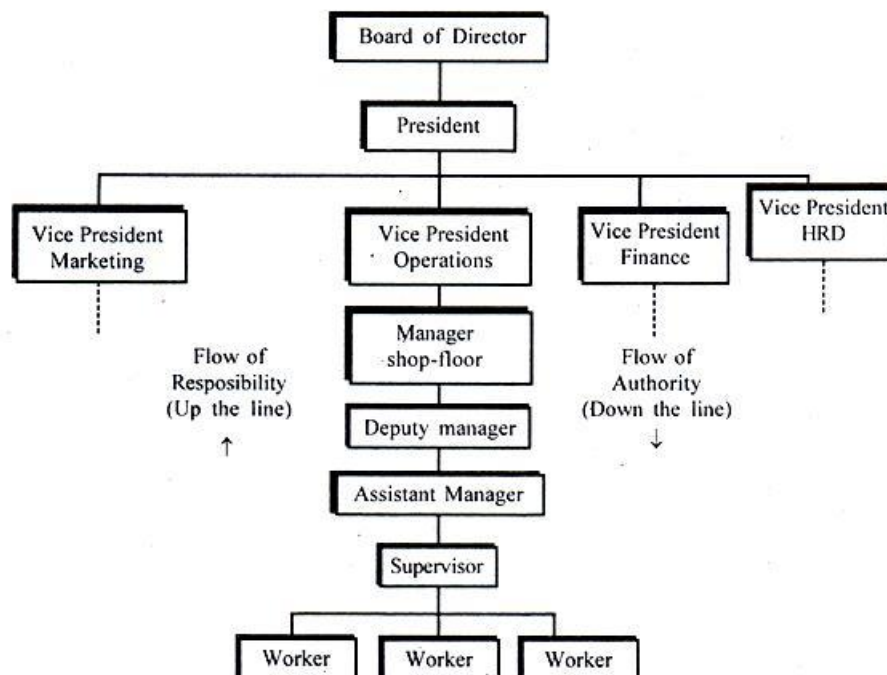
| Marketing | Selling |
|---|---|
| 1. MARKETING is a process of transferring a product or service to a buyer at a competitive price in order to satisfy his or her need” | 1. SELLING is a process of transferring a product or service to a buyer at a price regardless of his or her need” |
| 2. Focuses on the needs of the Customer | 2. Focuses on the needs of the Producer |
| 3. Marketing makes use of long-term Strategies to get sales | 3. Selling makes use of short-term tactics to get sales |
| 4. Customers enjoy supreme importance | 4. Product enjoys supreme importance |
| 5. Converts customer needs into products | 5. Converting products into cash |
| 6. Profits through customer satisfaction | 6. Profits through sales volume |

3. b) Explain about different types of organization structures

2M

Line organization

This is the oldest and most conventional type of relationship, which is also called as **scalar or military type**. This is simple and represents a military organization, where relationships are based on relative rank, authority and responsibility rather than the activity or operations that an individual performs. Immediate supervisor is the boss. Authority flows downwards while responsibility flows upwards. The relationships are more at vertical levels. No service or support units are possible in an ideal line-type structure. The principle of unit of command is strictly followed.



Advantages of Line organisation Structure

1. **Simplicity:** Line Organisation structure is easy to understand and follow by superiors and subordinates. It is simple and clear as regards authority and accountability.
2. **Prompt decisions:** Line Organisation facilitates prompt decision-making at all levels as the authority given is clear and complete.
3. **Discipline:** It brings discipline in the Organisation due to unity of command, delegation of authority and direct accountability.
4. **Economical:** Line Organisation is economical as experts are not appointed.
5. **Attraction to talented persons:** Line Organisation brings out talented workers and develops in them quality of leadership. It offers opportunities of self-development to employees.
6. **Quick communication, high efficiency, flexibility and high employee morale** are some more advantages of line Organisation structure.

Limitations of Line organisation Structure

1. **Heavy burden on line executives:** The line executives are given too many duties and responsibilities. Even the quality of the decisions of executives may suffer due to heavy burden of duties and responsibilities.
2. **Non-availability of services of experts:** There is absence of skilled experts in line organisation. Expert assistance is not available promptly when needed by line executives.
3. **Favoritism:** There is wide scope for favoritism and nepotism in the line organisation. Leadership of departmental executive is autocratic due to heavy concentration of powers. He may favour some employees at the cost of others.
4. **Too much dependence on limited executives:** In the line organisation, all powers are concentrated in the hands of a few executives. Naturally, the success and stability of the entire organisation depends on their personal skill, initiative and interest. Special difficulties arise when one executive is to be transferred/replaced/promoted.
5. **Rigidity:** There is rigidity in the working of line organisation.
6. **Delays in communication, limited freedom to employees and unsuitability to modern large business units** are some more demerits of line organisation.

LINE AND STAFF ORGANIZATION STRUCTURE

2M

Staff authority is used to support the line authority. Line authorities are more involved in the core activities of the business. They have little time to analyze all information for many decisions. They do not have expertise in all technical areas. Staffs are specialists, who help line authority in discharging their duties. For example, a production manager (a line authority) does not have enough time and experience to handle labor relation problems. Staffs (who are specialists) help them in doing so.

Line and staff organizations have both line and staff executives. Line executives are assisted by staff specialists in R & D, planning, distribution, quality, legal, audit, public relations, etc. The job of staff is mainly advisory and guidance. Line executives maintain the supervisory power and control over the execution of work.

Characteristics of Line and Staff organisation

1. Planning and execution: There are two aspects of administration in this organisation, viz., planning and execution.
2. Combining line and staff: Planning function is entrusted to staff specialists who are 'thinkers' while execution function is given to line executives who are 'doers'. The staff is supportive to line.
3. Role of authority: The line managers have authority to take decisions as they are concerned with actual production. The staff officers lack such authority.
4. Guidance from staff: The staff provides guidance and advice to line executives when asked for. Moreover, line executives may or may not act as per the guidance offered.
5. Exercising control: The staff manager has authority over subordinates working in his department.
6. Scope for specialization: There is wide scope for specialization in this organisation as planning work is given to staff and execution work is given to line executives.
7. Possibility of conflicts: Conflicts between line and staff executives are quite common in this organisation but can be minimized through special measures.
8. Suitability: Line and staff organisation structure is suitable to large-scale business activities.

Merits of Line and Staff organisation

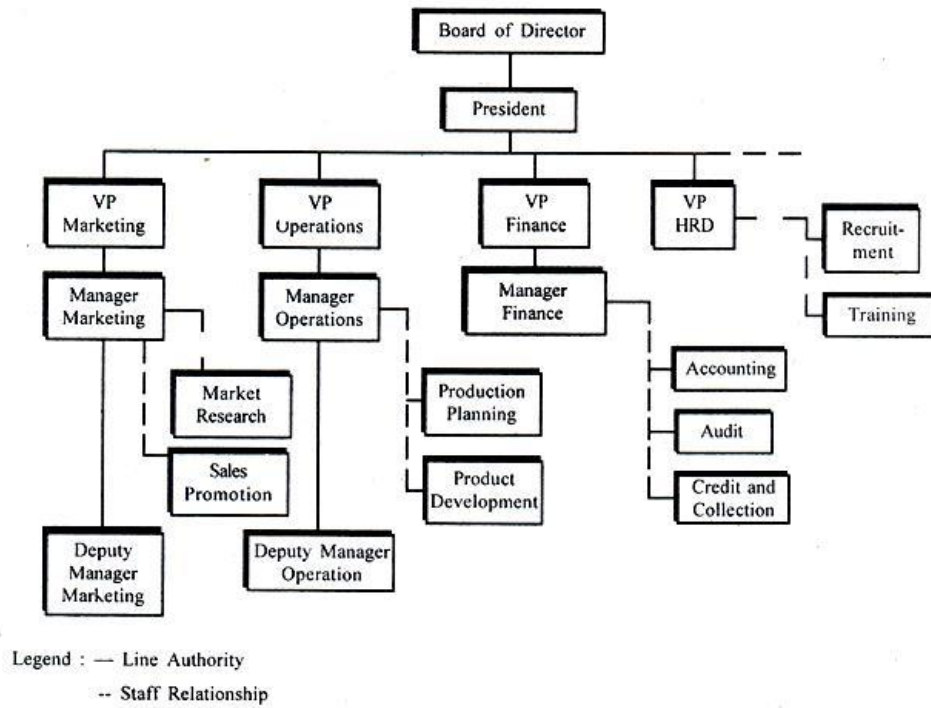
1. Less burden on executives: Line executives get the assistance of staff specialists. This reduces the burden of line executives. This raises overall efficiency and facilitates the growth and expansion of an enterprise.
2. Services of experts available: The benefits of services of experts are provided to line managers. Highly qualified experts are appointed and they offer guidance to line executives.
3. Sound decision-making: Line and staff organisation facilitates sound management decisions because of the services of experts and specialists. The decisions are also taken in a democratic method i.e. in consultation with the experts.
4. Limited tension on line managers: The pressure of work of line bosses is brought down as they are concerned only with production management.
5. Benefits of specialization: There is division of work and specialization in this organisation. Naturally, the benefits of division of work and specialization are easily available.
6. Training opportunities to employees: Better opportunities of advancement are provided to workers. The scope for learning and training for promotions are available.

Demerits of Line and Staff organisation

1. Delay in decision-making: The process of decision-making is delayed, as line executives have to consult staff experts before finalizing the decisions. The decisions of line managers are likely to be delayed due to this lengthy procedure.
2. Buck passing among executives: The line bosses are concerned with actual execution of work. However, they depend on staff experts for guidance. If something goes wrong, the

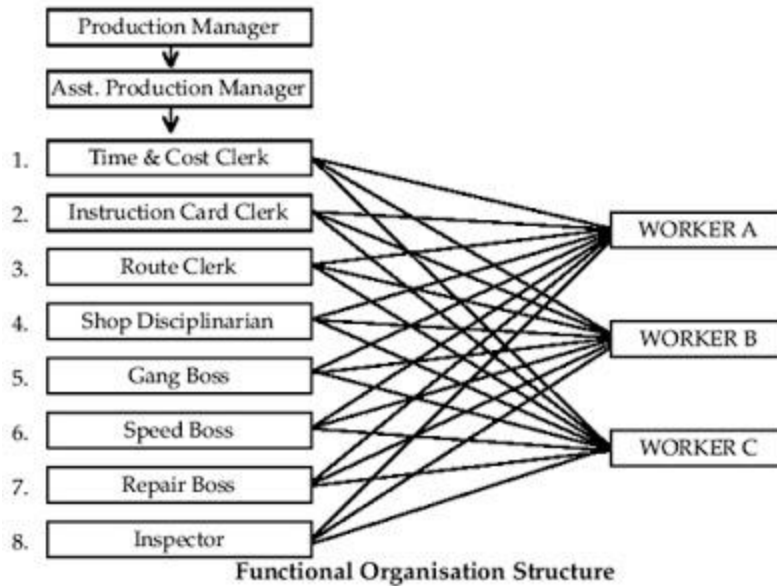
attempt is made to pass on the blame by one party to the other. Thus, there is shifting of responsibility or buck-passing.

3. Conflicts between line and staff executives: In this organisation, quarrels and conflicts between line managers and staff specialists are quite common. The line managers are generally not interested in the advice offered by experts. Secondly, specialists feel that the line bosses lack knowledge of new ideas. Such conflicts lead to bitterness.
4. Costly organisation: Line and staff organisation is a costly organisation as the line executives are supported by highly paid staff executives who are experts. All this adds to the overhead expenses and the cost of production increases.
5. Complicated operation: This organisation is too complicated in actual operation because of dual authority, division of functions and too much dependence on staff. The unity of command principle is violated.
6. Internal discipline is affected adversely: The internal discipline is likely to be affected adversely due to decentralisation and division of loyalty of subordinates.



Functional Organisation

2M



Foremen at Planning Level (Planning Dept.)

1. Time and Cost Clerk: He is concerned with preparing standard time for the completion of certain piece of work and compiling the cost of that work.
2. Instruction Card Clerk: He lays down the exact method of doing the work. He specifies the tools to be used for conducting the production and also gives other instructions on the instruction cards prepared by him.
3. Route Clerk: The route clerk lays down the exact route through which each and every piece of work should move through various stages till completion. He decides the production schedule and the sequence of steps by which the production process is to move.
4. Shop Disciplinarian: He is concerned with the discipline, insubordination, violation of rules of discipline and absenteeism. All cases relating to these matters will be managed by the shop disciplinarian.

Foremen At Shop Floor Level (Shop Floor)

1. Gang Boss: He assembles and sets up various machines; and tools for a particular piece of work. He is in-charge of assembling line of production.
2. Speed Boss: He is concerned with the speeding of machines used for production. He keeps proper speed of the machines and see that workers complete the production work as per the schedule time.
3. Repair Boss: The repair boss looks after the proper maintenance of machines, tools and equipments required during the production process.
4. Inspector: The inspector controls quality of the products by keeping adequate check/control when the production work is in progress.

Merits of Functional Organisation Structure

1. Facilitates specialization: Functional organisation structure facilitates division of work and specialization. Each boss has specialized knowledge of his functional area. He is in a better position to guide and help the workers.
2. Benefits of large-scale operations: Functional organisation offers the benefit of economy of large-scale operation. In this organisation, one administrative unit manufactures all products. The available machinery, equipment and facilities are used fully for large-scale production.
3. Facilitates effective coordination: Functional organisation facilitates effective coordination within the function. This is possible as one boss is in-charge of a particular function and he looks after all activities, which come within that function.
4. Operational flexibility: Functional organisation possesses operational flexibility. Necessary changes can be introduced easily to suit the needs of the situation without any adverse effect on the efficiency.
5. Ensures effective supervision: Functional organisation facilitates effective supervision by the functional heads and foremen. Due to specialization, they concentrate on the specific functional area and also keep effective supervision on their subordinates.

Demerits of Functional Organisation Structure

1. Absence of unity of command: Unity of command is absent in the functional organisation as each worker gets orders and instructions from several bosses.
2. Fixing responsibility is difficult: In functional organisation, responsibility is difficult to fix on a specific person. This is because the responsibility itself is divided among many.
3. Unsuitable to non-manufacturing activities: Functional organisation can be introduced in the case of manufacturing activities. However, its application to non-manufacturing activities such as marketing, etc. has not been successful.
4. Costly: Functional organisation is costly, as more specialists are required to be appointed.
5. Creates confusion among workers: Functional organisation is based on specialization as function is taken as a base for dividing the work. The authority is overlapping the responsibility is divided. This confuses workers.
6. Conflicts among foremen, delays in decision-making and limited discipline within the departments are some more demerits of functional organisation.

UNIT-II

4. a) What are measures to improve productivity

6M

MEASURES TO IMPROVE PRODUCTIVITY:

Productivity of any system can be improved either by proper use of resources or by effective utilization of system or processes. Some action plans are:

1. Machine : manual labor be replaced by machines
Reliable machines
Automation
2. Management: Motivated workforce
Better planning and coordination

- 3. Process:
 - Effective control of processes
 - computerization of system
 - Use of management information system
 - Improvement in scheduling
 - Better material flow
 - Fast and accurate retrieval of parts

- 4. Work design:
 - Improve job-design
 - Better working method
 - On-job training

- 5. Work environment:
 - Better lighting and illumination
 - Better ventilation
 - Safe work place
 - Total quality management

- 6. Program:
 - Quality circle
 - Suggestion scheme
 - Incentive schemes
 - Revise pay or policy

- 7. Technology:
 - Acquire new technology such as electro-chemical machining (ECM)
 - Acquire automation in assembly, for example, surface mounting Technology (SMT) for printed circuit board assembly unit.
 - Acquire computer controlled machines, such as CNC or DNC
 - Use automated guided vehicle (AGV) for material transportation

- 8. Manufacturing strategy:
 - Change the manufacturing system from functional to cellular Layout, if it is a batch production unit.
 - Adopt stock-less production strategy and Just-In-Time frame Work in the production unit.
 - Keep work place clean and environmentally friendly (Green Production system)
 - Go for total change in the process/ product or strategy if the System is not working properly (also known as business Process re-engineering or BPR)

- 9. External Environment:
 - Better political stability
 - Boosting economy and purchasing capacity of buyers
 - Globalization and open market economy

4. b) Distinguish between micro motion and memo motion studies

MICROMOTION STUDY

4M

- It is a technique for recording and timing an activity.

- It consists of taking motion pictures of the operation with a clock in the picture (or with a video camera running at a known speed).
- The film is a permanent record of the method and the time and is always ready to be examined when needed.

Purposes of Micro motion Study

1. To assist in finding the preferred method of doing the work.
2. To assist in training the workers to understand the meaning of motion study and to enable them to apply motion economy principles in a professional way.

Micro motion study as an Aid in Improving Methods

The procedure of making a micro motion study consists of:

1. Filming the operation to be studied.
2. Analysing the film.
3. Charting the results of the analysis.
4. Developing the improved method.

The speed of the camera used ranges from 960 to 1000 frames per minute. But faster cameras may be used to study very fast hand motions or complex operations.

The pictures should be enlarged many times to facilitate the analysis of the motions.

Micro motion study should be used when it is economical to do so (short cycle highly repetitive operations, large volume production, or operation performed by a large number of workers).

Memo motion Study

2M

In memo motion study, the camera speed is at 60 or 100 frames per minute.

In addition to its use in industrial operations, it is used to study many other operations such as check-in operations as airline counters, the manner in which customers select items in the store, traffic flow on highways, and in banks.

It costs less than micro motion study (only costs 6% of the cost of a micro motion study).

5. a) What are the different methods of performance rating? Explain

6M

1. Skill and effort rating:

Around 1916 Charles E. Bedaux introduced the Bedaux system of wage payment and labor control in this country. His plan was based on time study and his time standards were expressed in points or "Bs". A point or B was simply another name for what we now call a standard minute. His time study procedure included the rating of the operator's skill and effort and the use of a standard table of fatigue allowances. Bedaux used 60 points equal to standard performance. In another words, an operator working at a normal pace was expected to produce 60 Bs per hour, and it was expected that the average incentive pace would be around 70 to 85 points per hour.

Before Bedaux, performance rating had been done mainly by selecting stop-watch readings from the time study data. Thus, if the operator was judged to be working at a fast tempo, a watch reading considerably above average would be selected as the

representative time for the element; if the operator was judged to be working at a slow tempo, then a watch reading below average would be selected. The bedaux system was a definite improvement over this informal method of rating operator performance.

2. **Westing house system of rating:**

A four-factor system for rating operator performance was developed at Westinghouse and originally published in 1927. These four factors are i) skill ii) effort iii) conditions, and iv) consistency. A scale of numerical values for each factor was supplied in fig. and the selected time obtained from time study was normalized or leveled by applying the sum of the ratings of the four factors.

For example, if the selected time for an operation was 0.50 minute and if the ratings were as follows:

| | | |
|---------------------|--------|-------|
| Excellent skill, B2 | + 0.08 | |
| Good effort, C2 | + 0.02 | |
| Good condition, C | + 0.02 | |
| Good consistency, C | + 0.01 | |
| | | ----- |
| Total | + 0.13 | |

Then the normal time for this operation would be 0.565 minute (0.50X1.13 = 0.565)

3. **Synthetic rating:**

Synthetic rating is the name given to a method of evaluating an operator's speed from predetermined time values. The procedure is to make a time study in the usual manner, and then compare the actual time for as many elements as possible with predetermined time values for the same elements. A ratio can be established between the predetermined time value for the element and the actual time value for that element. This ratio is the performance index or rating factor for the operator in so far as that one element is concerned. The formula for computing the performance rating factor is

$$R = \frac{P}{A}$$

Where R = performance rating factor

P = predetermined time for the element, expressed in minutes

A = average actual time value (selected time) for the same element

The selected times for elements 1 and 3 were 0.12 and 0.17 minute, respectively. The time values for these two elements as determined from a table of predetermined time values were 0.13 and 0.19 minute, respectively. In the first case the rating factor was 108 percent (0.13/0.12 X 100 = 108%), and in the second case it was 112 percent (0.19/0.17X100 = 112%). The average rating factor was the average of 108 and 112, or

110 percent. The average rating factor was then applied to all elements in this study. The rating factor, of course, is applied only to manually controlled elements.

4. Objective rating:

Another method of rating performance has been given the name objective rating. First, the operators speed is rated against a single standard pace which is independent of job difficulty. The observer merely rates speed of movement or rate of activity, paying no attention to the job itself. After the pace rating is made, an allowance or a secondary adjustment is added to the pace rating to take care of the job difficulty. Job difficulty is divided into six classes, and a table or categories are 1. Amount of body used 2. Foot pedals 3. Bimanual ness 4. Eye-hand coordination 5. Handling requirements 6. weight

EXAMPLE:

If the selected time for an element is 0.26 minute, the pace rating is 95 percent, and if the sum of all secondary adjustments amounts to 20 percent, then the normal time will be 0.297 minute ($0.26 \times 0.95 \times 1.20$)

5. Performance rating

By far the most widely used system of rating in this country is that of rating a single factor –operator speed, pace, or tempo. This system is called performance rating. The rating factor may be expressed in percentage, in points per hour, or in other units. Here we shall use the percentage system, with normal performance equal to 100 percent.

5. b) Explain about work measurement techniques

TIME STUDY

3M

Time study is used to determine the time required by a qualified and well-trained person working at a normal pace to do a specified task. It should be noted that, whereas motion study is largely design, time study involves measurement. Time study is used to measure work. The result of time study is the time that a person suited to the job and fully trained in the specified method will need to perform the job if he or she works at a normal or standard tempo. This time is called the standard time for the operation.

TIME STUDY EQUIPMENT:

The equipment needed for time study work consists of a timing device and observation board. The devices most commonly used for measuring work are

1. Stop watch or electronic timer
2. Motion picture camera (with constant –speed motor drive or with a micro chronometer in the picture to indicate time)

3. Electronic data collector and computer

DECIMAL STOP WATCHES AND ELECTRONIC TIMERS:

The stop watch and the electronic timer are the most widely used timing devices for time study. The electronic timer, which performs the same function as the stop watch, is some times referred to as an electronic stop watch. The electronic data collector and the computer provide an entirely different system for making time studies.

The decimal-minute stop watch has the dial divided into 100 equal spaces, each of which represents 0.01 minute, the hand making one complete revolution per minute. A smaller dial on the watch is divided into 30 spaces, each of which represents 1 minute, the hand making one complete revolution in 30 minutes. The hands of the watch are controlled by the side A and the winding stem B. The starting and stopping of the watch are controlled by the slide. It is possible to stop the hand at any point and then start it again from that position. Pressure on the top of the stem B returns the hand to zero, but it starts off immediately upon releasing the stem. The hand may be held at zero either by holding the stem down or by pushing the slide A away from the stem.

The decimal-hour stop watch is like the decimal-minute watch in design and operation, but it has the dial divided into 100 spaces, each of which represents 0.0001 hour, the hand making 100 revolutions per hour. The small dial on the watch is divided into 30 spaces, each of which represents 0.01 hour, the hand making $3\frac{1}{3}$ revolutions per hour. The principal advantage of this watch is that the readings are made directly in fractions of an hour, which is the common unit of time measurement in industry. The chief disadvantage of the decimal-hour watch is that it is more difficult to handle four decimal places than two decimal places. This is particularly true in recording stop-watch data on the observation sheet. The split-second stop watch is not recommended and is seldom used for this work.

WORK SAMPLING

3M

Work sampling was first used by L.H.C.Tippet in the British textile industry, and it was introduced into this country under the name of “ratio delay” in 1940. Work sampling is a fact-finding tool. In many cases, needed information about men or machines can be obtained in less time and at lower cost by this method than by other means.

Work sampling has three main uses:

1.activity and delay sampling- to measure the activities and delays of workers or machines –for example, to determine the percentage of the day that a person is working and the percentage that he or she is not working

2. Performance sampling- to measure working time and non working time of a person on a manual task, and to establish a performance index or performance level for the person during his or her working time.

3. Work measurement-Under certain circumstances, to measure a manual task, that is, to establish a time standard for an operation.

Work sampling is based on the law of probability. A sample taken at random from a large group tends to have the same pattern of distribution as the large group or universe. If the sample is large enough, the characteristics of the sample will differ but little from the characteristics of the group. Sample is the term used for this small number, and population or universe is the term used for large group. Obtaining and analyzing only a part of the universe is known as sampling.

PROCEDURE:

The work sampling procedure can be divided into the following three phases:

- a) preparing for work sampling
 - i) statement of the main objective of the study
 - ii) obtain the approval of the supervisor of the department in which work sampling is to be performed
 - iii) Establish quantitative measure of activity
 - iv) Selection of training of personnel
 - v) Making a detail plan for taking observations
- b) performing work sampling
 - i) Describing and classifying the elements to be studied in details
 - ii) Design the observation form
 - iii) Determine the number of days or shifts required for the study
 - iv) Develop properly randomized times of observations
 - v) Observing activity and recording data
 - vi) Summarizing the data at the end of each day
- c) Evaluating and presenting results of work sampling
 - i) Evaluate the validity and reliability of data
 - ii) Presenting and analyzing data
 - iii) Planning for future studies

UNIT-III

6. a) What are the different methods of Merit rating

6M

Methods of merit rating

1. Ranking method
2. Paired comparison method
3. Man to man comparison
4. Checklist plan
5. Scale plan

1. Ranking method

Ranking is the oldest, simplest and most conventional method. In this method the workers are arranged in rank from best or most satisfactory to worst or least satisfactory. There is another way of ranking by classifying the jobs in a firm in terms of various level of skill or responsibility and rank the workers accordingly. This method however does not indicate points of difference between two or more of them or does not indicate specific strength and weakness. This method is used in business organizations where there are few employees.

2. Paired comparison method

This is a modified ranking method. In this method each man is compared with every other man, one at a time. Comparison is done with one trait (i.e ability to perform the job). For example A's performance is compared to that of B's, and decision is made concerning whose performance is better. Then A is compared to C, D and E in order. Next, B must be compared with all others individually. The same approach is used for other personnel. Each time a worker is considered better than the other one point is assigned to him. Once all the possible combinations are considered, points scored by each employee are totaled and he is ranked according to his aggregate score in relation to aggregate score of each other employee. The number of combinations can be worked out with the formula.

Number of comparisons = $N(N-1)/2$

Where N = total number of employees to be evaluated

This method is not suitable where number of employees is large. This method also does not indicate specific strengths and weaknesses.

3. Man to Man comparison

The plan was widely used in U.S.A in rating military officers and hence sometimes is also known as army rating scale. This is based on five basic characteristics

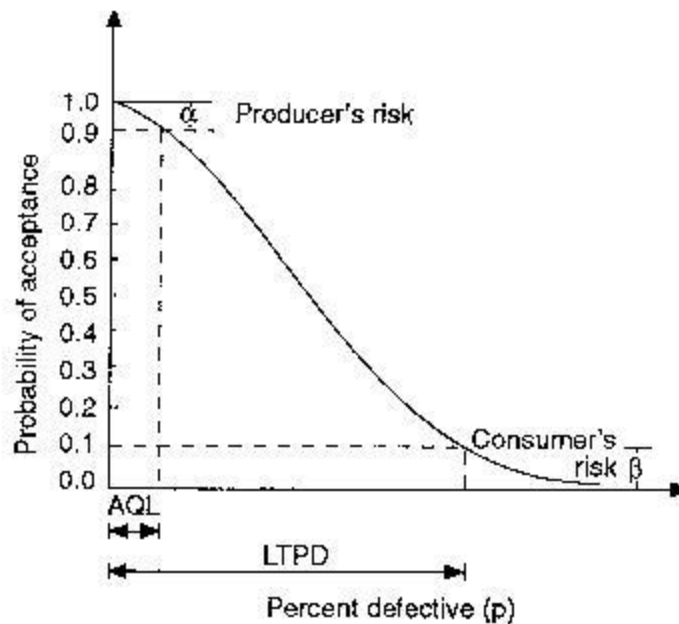
1. Physical qualities
2. Personal qualities
3. Intelligence
4. General value to the service
5. Leadership

4. Check list plan

These are the lists made up of a series of questions or statements which concern the importance of the employees performance on the job.

6. b) Explain clearly about OC curve

6M



The concepts of the two types of risk are well explained using an operating characteristic- curve. This curve will provide a basis for selecting alternate sample plans. For a given value of sample size (n), acceptance number (C), the O.C. curve is shown in Fig..

In the above figure, percent defective is shown on x-axis. The probability of accepting the lot for a given percent defective is shown on y-axis. The value for percent defective indicates the quality level of the lot inspected. AQL means acceptable quality level. LTPD means lot tolerance percent defectives. These represent quality levels of the lot submitted for inspection. If the quality level of the lot inspected is at AQL or less than AQL, then the customers are satisfied with the quality of the lot. The corresponding probability of acceptance is called $1 - \alpha$. On the other hand, if the quality level is more than or equal to LTPD, the quality of the lot is considered to be inferior from consumer's view point. The corresponding probability of acceptance of the lot is called β . The quality level in between AQL and LTPD is called indifferent zone.

So, we require α , β , AQL and LTPD to design a sample plan. Based on these, one can determine n and C for the implementation purpose of the plan.

7. a) Discuss about the different wage incentive plans

6M

Incentive means encouragement or inducement or reward to any person for putting his best efforts to achieve higher level of quality production. Permanent employees, in a well established organization, tend to lose interest in productivity. Their jobs are secured, so why should they bother for production. The production will decrease on the pretext of lost time due to minor faults in a machine/equipment/tools/materials etc. There may be minor delays due to non-coordination of feeding of raw materials or in process materials. Once a part of employee's earnings are related to his output, the employee will take initiative to overcome all these

- minor problems and will try to achieve higher level of performance by putting extra efforts & skill

1. Straight Piece Rate Plan- If the standard time for a particular job/ operation is 1 hour, the production per shift/day of eight hours will be eight pieces. Decide average earnings per day to perform the job requiring particular skill, education & experience. Say it is Rs 100. Now the piece rate for the job will be Rs. $100/8 = \text{Rs } 12.5$. If a worker has produced 9 pieces, his earning for that day will be $12.5 \times 9 = \text{Rs. } 112.5$. On the other hand, if he has produced only 7 pieces his earning will be $12.5 \times 7 = \text{Rs } 87.5$.

This scheme is very easy to follow. The increase in production is rapid. Minimum wages are not guaranteed, so it is the prime responsibility of management to provide sufficient materials, tools, power, machines & equipment.

Advantages:

1. It provides direct incentive for increased output
2. It is easy to understand and calculate

2. Taylor's differential piece rate system: This system was introduced by Taylor, the father of scientific management. This system introduced to penalize a slow worker by paying him a low piece rate for low production and to reward an efficient worker by giving him a higher piece rate for a higher production.

Thus if a worker completes the work within or less than the standard time, he is paid a higher piece rate and if he does not complete the work within the standard time, he is given a lower piece rate

Advantages:

1. The system is easy to understand
2. It provides greater incentive to efficient workers and penalizes the inefficient ones
3. The worker is not required to be paid for idle time

3. Merricks multiple piece rate: Under this method, three piece rates are applied for workers with different levels of performance. Wages are paid at ordinary piece rate to those workers whose performance is less than 83% of the standard output. 110% piece rate is given to workers whose performance is between 83% and 100% of standard. 120% of ordinary piece rate is given to those workers who produce more than 100% of the standard output.

4. Gantt task and bonus plan: This plan is based on careful time and motion study. A standard time is fixed for doing a particular job, worker's actual performance is compared with the standard time and his efficiency is determined. If a worker takes more time than the standard time to complete the job (Below 100%) he is given wages for the time taken by him and if a worker takes the standard time to perform job (100% efficiency), he is given wages for the standard time and bonus of 20% of wages earned. If the worker takes less time than the standard time his efficiency is more than 100% and he is given wages for the actual time and bonus at the rate of 20%.

5. Halsey incentive plan:

The Halsey plan was introduced by Fredrick. Halsey, an american engineer in 1891. In this system a minimum wage is guaranteed to the workers. A standard time is fixed for the performance of each job. If a worker completes his job before the standard time, he gets Guaranteed wage plus incentive bonus at fixed percentage of earnings for the time saved. The most common percentage is 50 percent.

Let hourly rate(Rs) = R

standard time (Hrs)= T_s

Time actually taken (Hrs)= T_a

Time saved (Hrs) = $T_s - T_a$

Bonus earned = $(T_s - T_a) \times 50/100 \times R = \frac{1}{2} R (T_s - T_a)$

Wages earned by the worker = $T_a \times R + \frac{1}{2} R (T_s - T_a)$

7. b) Explain about job evaluation methods

6M

Methods of job evaluation:

- a) Non-quantitative methods
 1. Ranking method
 2. Classification method
- b) Quantitative methods
 1. Factor comparison method
 2. The point rating method

1. Ranking method

This is the easiest and simplest method of job evaluation. In this method the jobs are ranked from the most important one to the least important. Each departmental head arranges the jobs in their department in the order of importance. The individual departments pass on their ranking to a central committee who groups the jobs into grades/classes.

While ranking, following points are considered:

1. Amount of work involved
2. Supervision needed
3. Extent of responsibility required
4. Difficulties involved in the work
5. Monotony of work
6. Working conditions required
7. Knowledge and experience needed

2. Classification method

In this method jobs are classified or graded in groups or levels of equal skill, difficulty, responsibility, importance and other requirements. It may be production job, a sales job or an office job, each job family can be broken into a number of grades. For example, production jobs may be classified into five grades, namely grade 1 to grade 5. Grade 1

involves simple tasks requiring less skill, precision and accuracy while grade 5 involves skilled, precise and highly accurate work.

The job evaluation by job classification involves following major steps:

1. Deciding the number of grades(five, six etc)
2. Writing grade level descriptions
3. Identifying/listing of the jobs to be evaluated
4. Preparing job descriptions
5. Comparing job descriptions with grade level descriptions and assigning jobs to grades

3. Factor comparison method

In this method detailed analysis of the jobs is carried out by employing following five main factors:

1. Skill
2. Mental effort
3. Physical effort
4. Responsibilities
5. Working conditions

The various steps involved in the factor comparison method are:

1. Identify a few key jobs in the organization which can be described accurately and assumed to be correctly paid
2. Analyse the key jobs for each of the five factors mentioned above
3. The salary paid for each key job is amongst the factors in proportion to their importance in the job
4. This provides a money rating scale for each of the factors
5. Each of the remaining jobs is evaluated for each of the factors on its money rating scale of the key jobs. The monetary value of the job is obtained by adding up the individual money values assigned to the job for each of the factors depending upon their importance in the job.

| Key job | Salary | Factors | | | | |
|---------|---------------------|---------|---------------|-----------------|----------------|--------------------|
| | | Skill | Mental effort | Physical effort | Responsibility | Working conditions |
| J1 | 1300 | 240 | 100 | 200 | 600 | 160 |
| J2 | 1640 | 500 | 100 | 600 | 200 | 240 |
| J3 | 2160 | 400 | 750 | 140 | 800 | 120 |
| J4 | 2500 | 540 | 380 | 900 | 320 | 360 |
| J5 | 3200 | 800 | 400 | 200 | 1100 | 700 |
| X | Job to be evaluated | 200 | 160 | 240 | 500 | 300 |

4. Point method

The point system a widely used method is based on dividing the jobs into a number of factors which in turn are further subdivided into grades or degrees. Certain points (weightage) is assigned to each grade.(for example, effort is one of the factors which may be subdivided in two grades-physical and mental) when such points for all the factors are added they indicate the importance of the job in the organization. The points or weightage assigned to each factor will vary from industry to industry. Point method involves the following major steps:

- a) Decide the type of jobs to be evaluated
- b) Select and define job factors which may vary from five to ten.

A few job factors commonly selected are as given below

1. Skill
 - a) Education and training
 - b) Experience
 - c) Judgement and initiative
2. Effort
 - a) Physical
 - b) Mental
3. Responsibility towards
 - a) Materials or product
 - b) Equipment or process
 - c) Safety of others
 - d) Work of others
4. Working conditions
 - a) Exposure to hazards
 - b) Dust, smoke, fumes and noise
 - c) High temperature
 - d) Glares and harmful radiations

While selecting the factors it should be noted that:

1. The factors selected must be rateable. For example, education is a rateable factor as it can be specified in varying degrees such as middle school, trade certificate, graduation, postgraduation etc
2. The number of factors should be as few as possible
3. Only important factors should be selected factors which are present to the same degree in all jobs should not be selected
4. Each factor should measure only one aspect of the job

Select and define grades or degrees to each factor. For example, education and training may have the following factors:

1. Diploma in engineering with no training
2. Diploma in engineering with 2 years apprentice training
3. Diploma in engineering with 2 years training in machine shop and certificate course in computer applications
4. Diploma in engineering A.M.I.E and 2 years experience

UNIT-IV

8. a) What are the factors affecting Entrepreneurship

6M

1. Great need for achievement
2. Urge for independence
3. Urge for power
4. Family Background
5. Flexibility
6. Creative and Innovative spirit
7. Fluency
8. Decision making capacity

8. b) Explain about the method of obtaining finance for enterprises

6M

Finance for the enterprises:

Finance is the main input for any enterprise. The entrepreneur requires capital to begin with and also needs financial assistance at every stage of the project. Project finance is needed for both short term as well as long term as follows:

Short-term finance:

When the funds are required for a period of less than one year. These are usually utilized for meeting the working capital requirements. Main sources for short term finance are bank borrowings, trade credit and customer advances.

Medium-term finance:

When the requirement period is from one year to five years, the finance is regarded as a medium-term finance. This type of finance is generally needed for permanent working capital to be used for small expansions, modifications and replacements. The sources of this type of finance are raised by issue of shares and debentures plus borrowings from banks and other financial institutions.

Long-term finance:

When the requirement period is more than 5 years the finance are regarded as long term finance. These are used for procurement of fixed assets. The important sources of long term finance are issue of shares and debentures plus loan from banks and other financial institutions.

9. a) Explain about product analysis process

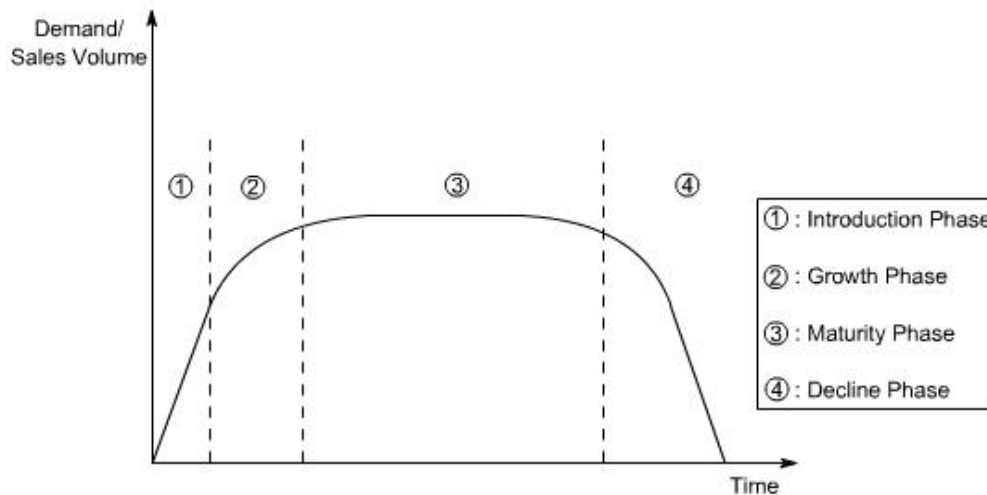
6M

Product Analysis

Several important considerations in product analysis are:

Market Potential : First of all it should be looked that product will satisfy a demand in the market and it is both desirable and acceptable. Otherwise if no consumption is envisaged or shorter product life cycle is envisaged, there is no point in producing the product. Sometimes marketing division has to make special efforts to create demand and make product acceptable to the customers through sales promotion schemes.

Product Life Cycle : Product demand in market over time follows an inverted bath tub curve. In the first two phases, its demand will increase continuously being the product new. After some time its demand will stabilize due to the saturation in market place (phase 3) and then finally will decrease gradually due to the entry of competitors or better products (phase 4). The overall time span is defined as product life cycle and its estimation is important from the view point of economic analysis. It is desirable that all investments made in product design and development, procurements of new resources etc. should be recovered from the sale of that product itself.



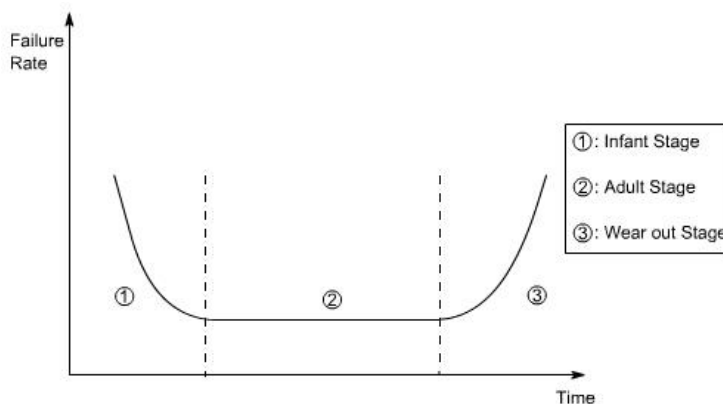
Competition : If company is entering a mature market, it has to face stiff competition from other manufacturers who are already established and in touch with the customers. Thus management has to analyze its capabilities carefully before formulating their own marketing strategy and positioning of its product. It is also important to mention that the functionality, quality and cost of the products offered by the competitors should also be analyzed.

Customer Needs : Basic aim of a product is to satisfy customer needs. As different customers have different needs (in terms of cost, functions, colors etc.), it is very difficult to satisfy all their needs in many situations. A balancing act between customer needs and product cost is utmost important particularly in a mature market.

Functional Aspect : After market research, the functional scope of the product has to be carefully analyzed and properly defined. Functions can be divided into three main categories viz., primary function, secondary functions, and tertiary functions. For a washing machine 'to wash clothing' is the primary function. Secondary and tertiary functions may include: level of automation, rinsing or drying or both, heating of water prior to washing etc. A functional analysis to see that most of the customer requirements are satisfied within their buying capacity is important during product design and development and affects the design of product, its complexity, its appearance and its price.

Operational Aspect : It is related with the ease of operation of the product. It must be easy to handle and simple to operate. Its operational efficiency should not be affected by the varying operating conditions and varying operator skills. In many situations, operational efficiency of a product can be improved by providing supporting literature in the form of operation guidelines or by providing on hand training to the first time users.

Durability and Dependability : These two factors often determine quality of a product. Durability is defined by the length of active life of the product under given working conditions. Dependability is the capability of the product to function when called upon to do its job. Both durability and dependability are related to the selection of materials and the class of workmanship. Durability of a product can be shown by a bath tub curve. It can be observed that during infant stage, product is new and may have some design or manufacturing defects leading to higher rate of failure. During adult stage, product is put under use after all necessary testing and thus the rate of failure is stabilized and is fairly low. Similarly in wear out stage, product has completed its useful life and due to wear and tear in its components, failure rate starts increasing again.



9. b) What are the Objectives of Entrepreneurial development?

6M

Objectives of Entrepreneurial development:

1. To develop and strengthen the entrepreneurial characteristics
2. To analyse industrial environment concerned with small scale industry and small business enterprises
3. To select the product to be manufactured
4. Formulate project reports
5. To analyse and understand the procedure for establishing the small enterprises
6. To provide support required for launching the enterprise
7. To acquire basic management skills needed
8. To appreciate the social responsibilities
9. To let the entrepreneur set the objectives of his business
10. To prepare the entrepreneur to accept moderate risks
11. To take strategic decisions
12. To develop communication skills