

Materials Management

Introduction

Materials Management is simply the process by which an organization is supplied with the goods and services that it needs to achieve its objectives of buying, storage and movement of materials. Materials Management is related to planning, procuring, storing and providing the appropriate material of right quality, right quantity at right place in right time so as to co-ordinate and schedule the production activity in an integrative way for an industrial undertaking. Most industries buy materials, transport them in to the plant, change the materials in to parts, assemble parts in to finished products, sell and transport the product to the customer. All these activities of purchase of materials, flow of materials, manufacture them in to the product, supply and sell the product at the market requires various types of materials to manage and control their storage, flow and supply at various places. It is only possible by efficient materials management.

The materials requirements planning, purchasing, inventory planning, storage, inventory control, materials supply, transportation and materials handling are the activities of materials management. They will be discussed in details in various chapters to follow.

About 20-25 years ago, there was no cut-throat competition in the market to sell the various consumer items manufactured by different industrial undertakings and the availability of materials to manufacture these items was not scarce. Therefore, materials management was not thought to be so important and its separate identity in the organization was not felt. But today it has become an important management activity to streamline production.

Actually before the production begins it is necessary to ensure availability of all the types of materials needed for production and its supply at the various production centers. Planning, purchasing and scheduling are the main functions of materials management. It aims at improved productivity. It is used to reduce the cost, which increases profitability and streamlines the production. Apart from management of material cost and its supply it helps in its proper utilization, transportation, storage, handling and distribution.

The market research and forecasting both for sales of company's product and purchasing of various materials required for producing the product are needed at the planning stage.

Purchasing, procurement of materials, transportation, storage, inventory control, quality control and inspection of materials and goods supplied at various production centers before production are also managed as routine work. Materials handling, packaging, warehouse

planning, accounting, scrap, surplus and obsolete materials disposal, finished goods safety and care are the activities managed by the materials management department.

Selection of personnel for marketing, purchasing, inventory control, stores management and materials handling and their training and placement is also to be seen by the materials management department

This indicates that it is very essential to have a materials management department in any organization to support the management in the production activities. It also helps in the marketing, sales promotion and control of all the types of materials for its quantity, quality and cost.

Definition

The International Federation of Purchasing and Materials Management accept the definition of materials management given below. According to it, materials management is a total concept having its definite organization to plan and control all types of materials, its supply, and its flow from raw stage to finished stage so as to deliver the product to customer as per his requirements in time. This involves materials planning, purchasing, receiving, storing, inventory control, scheduling, production, physical distribution and marketing. It also controls the materials handling and its traffic. The materials manager has to manage all these functions with proper authority and responsibility in the material management department. The historical background about the materials management is as follows.

Historical Background

The scarcity of materials, which was felt during World War I in USA to a very large extent and it, has become difficult for production managers to supply the War goods. This has created it necessary to organize the Materials Management department for managing large inventories in stores and to analyze the problems arising to control and economize inventory cost problems and shortage elimination. The materials management was included as an important function of the management.

With the development of principles of scientific management by F.W. Taylor in 20th century, the economic use of materials in all the organizations was critically felt to reduce the cost of production.

The early years of developments in the field of materials purchase and supply systematically begins from 1850. Charles Babbage's book on the economy of machinery and manufacturing published in 1832 refers to the importance of purchasing function. Babbage is also known as "Materials Man".

The growth of Rail Road industries by 1866 started in America. The Book on 'The Handling of Railway Supplies and their Purchase and Disposition' in 1887 discussed the purchasing issues. Purchasing gained importance during World War I. Howard T. Lewis was a purchasing professional from 1905 to 1945. He developed importance of sound procurement to company operation.

The concept of materials management was widely spread during World War II. Professor Howard T. Lewis of the Harvard Business School made the extensive studies in Industrial Purchasing Practice. W.N. Michelle, N.F. Harriman, L.F. Buffy, Donald G. Clark, Edward T. Gushee, Russell Forbes, Stuart F. Hewritz and George A. Reward had contributed largely to

purchasing and materials management in procuring, receiving, inventory control and supply. World War II introduced a new period in purchasing history. The emphasis on obtaining required and scarce materials influenced a growth in purchasing interest. In 1933, nine colleges offered courses related to purchasing which was increased to forty-nine colleges in 1945 in America. The membership of the National Association of Purchasing Agents increased from 3400 in 1934 to 5500 in 1940.

The post-war period saw the development of the value analysis technique, pioneered by General Electric Company in 1947 on the evaluation of which materials or changes in the specification and design would reduce over all product cost. From 1947 to 1960 were 13 years on further developments in materials management. Firms initiated dramatic growth of the materials management during 1960-1970. The Vietnam War resulted in upward price and materials availability pressure. During 1970 Firms experienced widespread materials problems related to 'oil shortages and embargoes'.

Widespread agreement between countries taken place with the overall objective to solve materials problems including materials planning, inventory control, purchasing, quality control, stores control, materials movement and surplus disposal. The purchasing strategies and behaviors that evolved over in 1980 gave rise to foreign global competition .

The global era of trading in between 1970 and 1999 for materials management increased. Purchasing approaches beyond 2000 reflects a changing emphasis towards the improvement of quality of materials, supplier relationship, more co-operative approach, long-term strategies of cost management and database materials management systems for materials planning and utilization in industries to bring about overall improvement in production systems, in-cost reduction through economy and increased sales. In order to serve the corporate goals and perform materials activities efficiently, a functional organization of the materials management must be established to fulfill the objectives of materials program, elimination of materials wastages and duplication of efforts to do so in every organization. Then only the above-mentioned goals of materials management can be achieved.

Objectives and Functions of Materials Management

The objectives and functions of materials management can be categorized in two ways as follows:

- (I) Primary objectives
- (II) Secondary objectives

They are discussed below:

(I) Primary objectives

Which can be classified as:

- (i) Efficient materials planning
- (ii) Buying or Purchasing
- (iii) Procuring and receiving
- (iv) Storing and inventory control
- (v) Supply and distribution of materials
- (vi) Quality assurance

- (vii) Good supplier and customer relationship
- (viii) Improved departmental efficiency

(II) Secondary objectives

There can be several secondary objectives of materials management. Some of them are given below:

- (i) Efficient production scheduling
- (ii) To take make or buy decisions
- (iii) Prepare specifications and standardization of materials
- (iv) To assist in product design and development
- (v) Forecasting demand and quantity of materials requirements
- (vi) Quality control of materials purchased
- (vii) Material handling
- (viii) Use of value analysis and value engineering
- (ix) Developing skills of workers in materials management
- (x) Smooth flow of materials in and out of the organization

To fulfill all these objectives, it is necessary to establish harmony and good co-ordination between all the employees of material management department and this department should have good co-ordination with the other departments of the organization to serve all production centers.

The basic objectives of management in an organization are:

- (1) Sales increase through sales promotion
- (2) Profit maximization
- (3) Improvement in customer services
- (4) Globalization of its product sales
- (5) Meet the technological changes
- (6) Good employer - employee relationship
- (7) Selection of alternative materials
- (8) Reduction in manufacturing and other cost.
- (9) Social objectives

In order to fulfill these basic objectives of management the objectives of materials management should be set in such a way that they should totally help to meet ultimate goals.

The functions of materials management are discussed below:

In order to fulfill the objectives of materials management as stated above to meet the basic objectives and goals, the functions of the materials management are also categorized as primary and secondary functions.

(I) Primary Functions

To meet the primary objectives, the primary functions of the materials management are given as follows:

(i) *Materials Requirements Planning (MRP)*

Planning of materials requirements in manufacturing is a necessary function in any organization, as inventory of materials involve about 60% of the total investment of the organization. The profit earned depends on the utilization of these materials and reducing the inventory of the materials.

The latest technique used is called *Just in Time (JIT)* is referred practically to no inventory. However, in the present situations in any of the organization particularly manufacturing organization, it is not absolutely possible to keep no inventory of materials required for production. The MRP is a technique used to plan the materials starting from the raw materials, finished parts, components, sub-assemblies and assemblies as per Bill of Materials (BOM) to procure or produce them to support a Master Production Schedule (MPS). It is used on computers productively by any company that uses a MPS to manufacture products that require assemblies, components and materials to produce the final products. The MPS is exploded using the bills of materials to determine requirements of lower-level assemblies, components, finished parts and raw materials. It plans orders to meet these needs.

(ii) *Purchasing*

All the organizations needs an efficient and economic purchasing and procurement of its various supplies of materials from the suppliers. The materials management department has to perform this function of purchasing and procurement of materials very efficiently. Since 50% to 60% of sales turnover is spent on the purchase of various materials, the amount of profit earned on this sales very much depends how economically the materials are purchased and utilized in the organization. The profitability depends on the efficiency by which this particular function of purchasing and procuring the requisite materials at appropriate time will be done and its availability is assured.

The function of purchasing can be stated as follows:

- (1) The requisition of material is necessary by proper authority to initiate its purchase.
- (2) To select proper supplier for the materials requisitioned, before placing an order.
- (3) To negotiate about the price of the material from the supplier and it will be purchased at the cheapest price.
- (4) The quality of material must be assured and should not be compromised with the cost of the material.
- (5) The material should be purchased of right quantity and right quality at proper time at the cheapest cost.
- (6) To set the proper purchase policy and procedure.

(iii) *Inventory Planning and Control*

The modern concept of inventory planning is that the materials should be purchased and brought in the stores just before it enters the production or sold out so that inventory cost is negligible. The zero inventories are the ideal planning. There are three types of inventories.

- (i) Raw materials
- (ii) Purchased goods
- (iii) Finished parts and components

The inventory control of these various materials lies with the materials management department, production department and sales department. Inventory at different levels is necessary to make sure about the availability of all these types of materials and goods and their proper flow from one facility to another at different levels of production centers in a manufacturing concern.

The storing of various types of materials and parts as inventory is therefore very essential before its delivery and use at different production centers. This involves inventory planning and control of materials in the stores department. Many a time, the supplier may not be in a position to supply the materials of the ordered quantity at the proper time. To maintain the continuity in production and line balance in assembly work, the various types of inventories are necessary to be maintained and kept in the stores. as shown in Figure 1 given below.

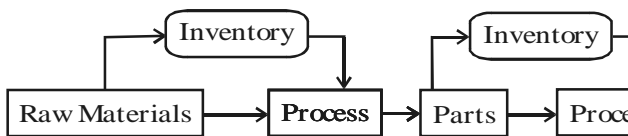


Fig. 1. Inventory of materials

The raw materials before being supplied to a production process, some of it is sent to store as inventory and rest is sent to production facility as per its requirements and in the same way, various parts manufactured and assembled as components and assemblies are also stored as finished parts inventories at the different places in the stores. The final products before being supplied to the customers are also stocked as inventory of the final products of the organization to meet the fluctuating demand and to regularize the supplies in the market. Thus, the inventory control is a very important function of the materials management department. The various types of inventory models are developed for the different materials to economise the purchase, supply, inventory control and production control to analyze and optimize the costs involved in ordering, set-up and inventory carrying of materials required in the production.

(iv) Ascertaining and Maintaining the Flow and Supply of Materials

Distribution of materials requisitioned by the various production centers and other departments must be ascertained and its flow and continuity of supply must be maintained by the materials management department. Insufficient or zero inventories many times create the situations of stock-outs and leads to stoppage of production. Failure of materials handling devices is also responsible for disruption of material supplies. Alternatives or emergency supply systems can be used for assuring production lines to continue.

Uncertainty in demand and production quantity is the main factor. As the customer requirements as per his needs and liking, are changing very fast. The management has to maintain continuity in production to meet this uncertainty in demand and control the situation by proper flow of materials supply and distribution at various production facilities and other departments as per changes in production quantity.

(v) Quality Control of Materials

The quality of the product manufactured by the organization depends upon the quality of the materials used to manufacture that product. It is a very important and necessary

function of materials management to purchase the right quality of materials. The inspection, quality control, simplification, specification, and standardization are the activities which are to be followed for the measurement of quality of the materials. The quality assurance is decided by inspection and checking. The various properties of materials as per their specifications and standard. The size and dimensional measurements within tolerance limits assures the interchangeability and reliability of components and parts.

Quality is largely determined by consumer taste and liking. The market is under buyer's control. Customer decides the quality of the product. Material quality control aims at delivering product at higher and higher quality at lower cost. The product will be specified not only by its dimensional accuracy but its quality standards, durability and dependability, high performance, reliability and aesthetic value. Each of this factor aids cost to the product. In order to achieve high quality, the materials input to the product should be of high quality, which will have higher cost. The performance decides the reliability, which is obtained through high quality production. The performance is checked by quality inspection and accuracy. This also aids cost to the product. The quality of the materials also decides the selection of vendors and the relationship between buyers and suppliers. The specifications, size and quality of materials must be referred and if possible the standard should be followed for specifications and sizes. The types of tests required for assuring the quality should be specified and conducted to establish the standards.

(vi) Departmental Efficiency

The objective of this function is to ensure the efficiency of the system adopted. If the system and procedure adopted for materials management are inefficient or faulty, none of the objectives mentioned above can be fulfilled, howsoever the procedure may be good. In order to maintain the things in proper way as per planning an efficient control is necessary in the department over each and every process. Management Information System (MIS) and feed back control at every stage of working must be adopted to control and make the management and employee work as efficiently as possible to achieve the best results.

(II) Secondary Functions

There can be number of secondary functions. Some of them are discussed below:

(i) Standardization and Simplification

The standards and specifications of various types of materials are fixed by design and technical department of the organization and they are followed by production department. Standards define the quality, reduction in sizes and variety, interchangeability of parts and products. It ensures efficient utilization of materials and reduces wastages. Standard materials are always available at reasonable cost. It also helps purchasing department in selection of materials and vendors. If less variety of items purchased and put in the stores the types of inventories will be reduced and in this way the cost of carrying the inventories in the stores will be reduced. The objective of this function will be to produce standard product reducing the overall cost of the product.

(ii) Design and Development of the Product

The variety in product and functionality are the important factors to promote the sales of a product. The new techniques of designing a product using Computer Aided Design (CAD)

has made possible to develop variety of products at faster rate. The new technological development in manufacturing using Computer Aided Manufacturing (CAM) can produce variety of products at much faster rate with all types of flexibility in the manufacturing as compared to conventional methods.

Materials management department has to act according to use of such variety of materials to produce variety of parts and ensure the supply of such materials. It should also be decided how to purchase and produce such variety of products with flexibility and economic cost.

(iii) Make and Buy Decisions

These types of decisions are the policy decisions of the management. The capacity of the organization and the various facility developed by the organization to manufacture various items is the main objective of every organization. This is the important planning activity of every undertaking. But when a company grows fast, its sales increases at rapid rate then it becomes an important matter to decide whether the company should buy the parts and components or increase and establish its facilities to cope up with the increased demand and sales. This will be greatly concern to materials management department. It will help in selecting the suppliers to buy the items at reduced cost. The material evaluation, its availability, alternative materials selection, procurement and inventory control are the functions influence the make and buy decisions.

The make and buy decisions are largely based on cost economics and cost benefit analysis made by the organization using the existing production capacity of labor, skill and machines available with the factory and how best they can be utilized.

(iv) Coding and Classification of Materials

This is an important function of the materials management to help the production and purchasing department of every organization. It uses its own methods of classification of materials used to manufacture the product or a company selling various goods. ABC analysis is one of the simple and standard method used by most of the firms for classification and storing their variety of materials.

The materials are recognized to purchase and store as an inventory by its codes and nomenclatures. The various methods of coding are used by every organization to control the variety of materials and its quantity and price rates.

(v) Forecasting and Planning

Materials requirements planning is based on correct forecasting of sales and demand of the products in the market. The market fluctuations are to be observed to control production of the organization. The various methods of forecasting are available and the materials management department can choose the one which gives the best results to the company.

Forecast of future demand of sales sets the planning of materials supply. Analytical methods are adopted for systematic forecasting and planning to procure the various materials required for production.

In case of fluctuating demands, there can be uncertainties in supply as well. This can be overcome by maintaining the proper quantity in inventory of short supply materials at proper time. The different techniques available to use correct forecasting have to be utilized by materials manager to plan the procurement, purchase, supply, managing the outside

and inside transport and storing of the materials to maintain the supply chain lines at every production facility to meet the changes in production quantity and schedule of production to meet the fluctuating demand of sales of products manufactured by the organization.

To fulfill the objectives and functions of materials management and control the activities of this department, they are thoroughly studied and analyzed. The topics for this study and analysis are given as follows:

- (1) Materials management organization
- (2) Materials requirements planning
- (3) Forecasting
- (4) Purchasing
- (5) Inventory control
- (6) Storing, warehouse planning and control
- (7) Value analysis
- (8) Materials handling
- (9) Just In Time

The main functions of materials management are summarized as follows:

- (1) Materials planning as per production requirements for quantity and time
- (2) Purchasing the required materials
- (3) Make or Buy decisions
- (4) Receipts and inspections of materials
- (5) Storage, warehousing securities and preservation
- (6) Distribution of materials
- (7) Transportation should be expedited and must be economically done
- (8) Inventory control
- (9) Disposal of over stock, surplus, scrap and salvage of materials
- (10) Developing new sources of supply at competitive way
- (11) Ancillaries industrial development
- (12) Indigenous source of supply for foreign materials
- (13) Material cost control and cost reduction
- (14) Co-ordination and co-operation with the other departments
- (15) Research and developments in materials management and their use

Scope of Materials Management

Referring to the various functions of materials management stated above the materials management co-ordinates various departments of manufacturing concern. Since the cost involved in manufacturing has maximum investment in the materials. It is about 55% to 65% of the sales value as has been investigated by the Directorate of Industrial Statistics during

1954-57 in India. As soon as materials are purchased and brought by the organization, its value goes on increasing as the other costs as required for ordering the materials, carrying the materials in inventory, its maintenance and handling charges must be assigned to the cost of materials before it enters in to a product or transformed in to some other form. In order to economize all the costs of materials management company has to adopt definite method of deciding the quantity of materials to be ordered, quantity to be stored as inventory and work in process inventory. In order to reduce the material cost and all other costs stated above, there has to be some efficient and effective materials management techniques, which must be dynamic to adjust with changing demand and production.

Integrated Materials Management Concept

Materials management concept is to manage resources in an integrative way for national economic development. This is possible with the development Management Information System (MIS), technological innovations and selection of economic and newly-developed materials for manufacture. It is the management's responsibility to develop the materials management system, which will find the ways and means for most efficient and most effective use of its resources using new technological processes, methods and ideas. The various resources to be fully utilized are men, money and materials and therefore there is importance of materials management. This will be further clear from the examples given below in the table about the expenditure incurred in the materials resource.

Materials worth Rupees 30,000 crores flow in various production channel annually in India, out of which about Rupees 15,000 crores are held up in the stock and out of which Rupees 1200 crores worth materials are inactive, obsolete and scrap.

Average Expenditure on the Materials by Various Industries

The various industries, which are spending their money on the materials to produce the products as percentage of average expenditure, are given below.

Table 1

<i>S.No.</i>	<i>Industries</i>	<i>Average expenditure on materials in percentage</i>
1.	Electrodes, rubber goods, cotton and silk yarns, electric motors, sugar, jute, motor vehicles etc.	65 % to 70 %
2.	Cotton, textiles, cables, wires and utensils	60 % to 65 %
3.	Engineering goods and non-ferrous metals	55 % to 60 %
4.	Ship building, cement, chemicals and electricity	50 % to 55 %
5.	Pharmaceuticals and medicines	45 % to 50 %
6.	Aircraft, fertilizer and steel	40 % to 45 %
7.	Other industries	40 %

Industries-wise expenditure on materials is given in the above table to show its importance. The integration of materials management functions is necessary in the following ways:

- (1) Materials management will take decisions for purchase of materials.

- (2) The centralization of authority is necessary.
- (3) It will co-ordinate all the functions.
- (4) Speedy and accurate decisions are needed.
- (5) Data analysis through Electronic Data Processing (EDP) and use of computers is necessary.
- (6) Opportunity for growth must be emphasized.

Types of Materials

The various types of materials to be managed are:

- (i) *Purchased materials*: They are raw materials, components, spare parts, oils, grease, cotton waste, consumables and tools.
- (ii) *Work in process (WIP) materials*: These are semi-finished and finished parts and components lying on the shop floor.
- (iii) *Finished goods*: These are the final products either waiting to be assembled in the assembly lines or in stores which are stocked for final delivery waiting to sell.

The various costs involved in these materials are basic price, purchasing costs, inventory carrying cost, transportation cost, materials handling cost, office cost, packing cost, marketing cost, obsolescence and wastages.

Materials Management Organization

The major resources in any organization to manage are the materials out of seven main resources required to run any organization. They are management, materials, money, man power, machines, methods and matrix or facilities which include systems, plants, location and buildings etc. The purpose of materials management organization in any industry is to plan the materials requirements for the production of goods and services. The structure of the organization must be such so as to have the efficient management of materials controlling its flow, conservation and utilization. Its objective is to use judiciously and economically. The product must be produced from the available materials purchased at the economic price and bring together under one organizational component sharing responsibilities of all the aspects affecting flow, conservation, utilization, quality and cost of materials. Materials management include inventory management, purchase management, value analysis, store keeping, maintenance and upkeep of the inventories in hand and in process.

A typical Organization Structure is given below:

Fig. 2. Structure of materials management department

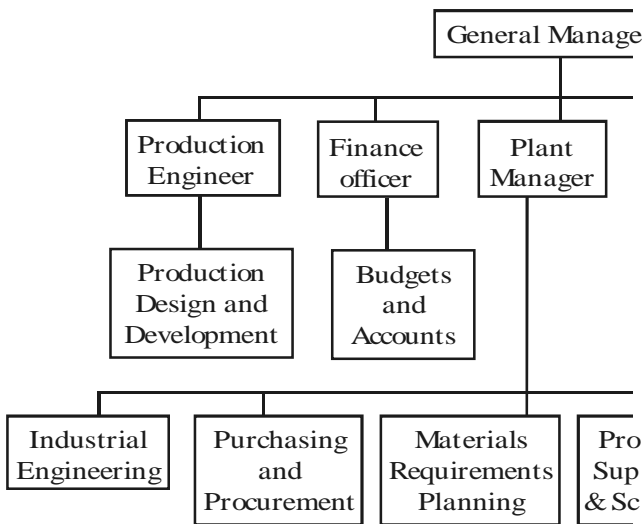


Fig. 3. Organization structure with functional activities

The organization of materials management must be such as to efficiently integrate the activities concerned with materials and regulate its use as per requirements in the production so as to have stability. The structural development and authority within the hierarchy of the system must be harmonious and integrative for proper decision making and achieving goals of the organization through proper information supply system.

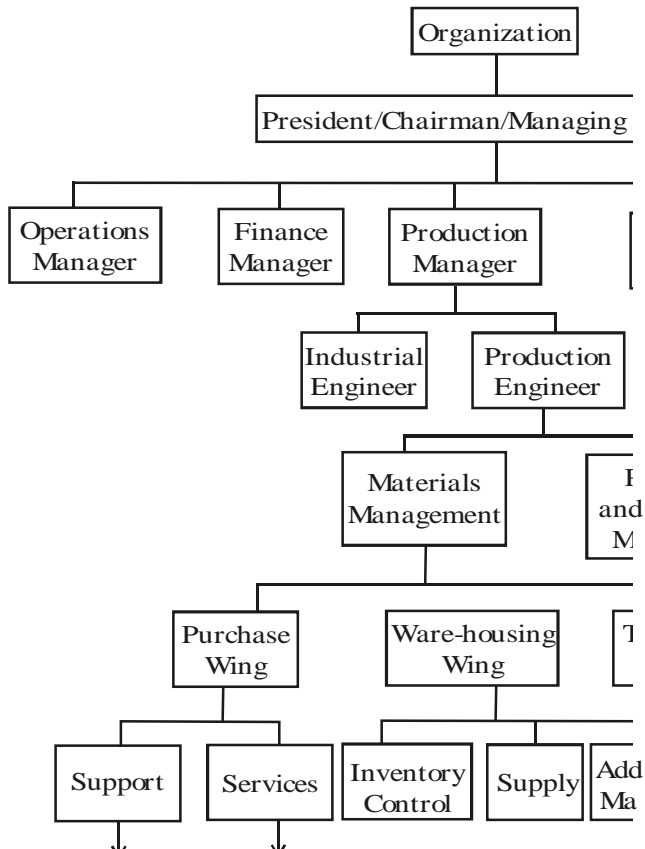


Fig. 4. Materials management activities in an organization

QUESTIONS

1. What is the importance of the materials management?
2. Explain the objectives of the materials management departments.
3. Give the various functions of the materials management and explain them.
4. What are the duties and responsibilities of the materials manager?
5. What is the scope of materials management?
6. How will you integrate the various activities of materials management?
7. Give a typical organization structure of materials management department.
8. What types of materials are to be managed?
9. What is materials requirements planning?
10. Give an organizational structure with functional activities.