NATIONAL OPEN UNIVERSITY OF NIGERIA

COURSE CODE :ENT 417

COURSE TITLE:
PRODUCTION MANAGEMENT I

ENT 417

PRODUCTION MANAGEMENT I

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COURSE GUIDE

ENT 417 – PRODUCTION MANAGEMENT I

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1.0. INTRODUCTION

ENT 417 – Production Management I - is a semester course work of three credit hours. It will be available to all students taking the B.Sc. Programme in the School of Business and Human Resources Management.

The course consists of 15 units.

The Course Guide tells you what ENT 417 is all about, the material you will be using and how to make use of them.

Other information includes the Self Assessment and Tutor-Marked Assignment

2.0. COURSE CONTENT

The course content consists essentially of the principles and practices of production management.

3.0. COURSE AIMS

The aim of the course is to expose you to the principles and practices of production management.

4.0. OBJECTIVES

After going through this course, you should be able to:
(i) Explain the concept and scope of production
(ii) Identify the key principles, practices and techniques of production
(iii) State the constraints of production policy.

5.0. COURSE MATERIALS

- Course Guide
- Study units
- Textbooks
- Assignment guide

6.0. STUDY UNITS

There are 15 units in all

UNIT 1	-	The Nature and Scope of Production
UNIT 2	-	Types of Production
UNIT 3	-	Factory Location
UNIT 4	-	Plant and Equipment
UNIT 5	-	Production Planning and Control
UNIT 6	-	Work Measurement
UNIT 7	-	Method Study
UNIT 8	-	Production Engineering
UNIT 9	-	Production Function
UNIT 10	-	System Design
UNIT 11	-	System Operation
UNIT 12	-	The Production Process as a System
UNIT 13	-	Production and Productivity
UNIT 14	-	Factory and Workplace Layout
UNIT 15	-	Aggregate Production Planning

Contained in each unit are: Introduction, Objectives, Main Content, Exercise, Conclusion, Summary and References.

7.0. THE MODULES

The course is divided into three modules.

Module I - Consists of Unit 1, Unit 2, Unit 3, Unit 4, Unit 5.
Module II - Consists 7, Unit 6, Unit 7Units 8, Unit 9 and Unit 10.
Module III - Consists 9, Unit 11, Unit 12, Unit 13, Unit 14, and Unit 15.

8.0. ASSIGNMENT

Each unit will contain at least one assignment which you are expected to do carefully.

9.0. ASSESSMENT

9.1. TUTOR-MARKED ASSIGNMENT

You are expected to apply what you learnt in the content of the study units to do the assignment and send them to your tutor for grading. It forms part of your overall score.

9.2. FINAL WRITTEN EXAMINATION

This will be done at the end of the course.

10.0. SUMMARY

ENT 417 – Production Management I – will expose you to the principles and practices of production management. The course will equip you to face the challenges of production in the industries or related organizations.

UNIT 1: THE NATURE AND SCOPE OF PRODUCTION

TABLE OF CONTENT

1.0. INTRODUCTION

This Unit will take a look at the nature of production vis-à-vis the meaning, aspects and policy of production.

2.0. OBJECTIVES

At the end of this Unit, students should be able to:

(i) State the meaning of production.
(ii) Identify the various aspects of production.
(iii) State the constraints of production policy.

3.0. THE NATURE AND SCOPE OF PRODUCTION

3.1. THE MEANING OF PRODUCTION

Production is concerned with the creation of goods and services for marketing and to meet the needs of consumers.

According to Pitfield (1984), production in its strictest term, means the making of things by the conversion of materials and/or assembly of component into marketable objects.

In a wider context, Needle (1999) sees the production function operating in every department, store, restaurant, Bank, Local Government, School and hospital. The implication of this is that the production function operates in both the manufacturing and the non-manufacturing sector of the economy. When production is viewed in this wider perspective, it is referred to as operations. For instance, the school system at various levels produces graduates such as School Certificate holders, Diploma graduates, Polytechnic graduates and University graduates. The church produces converts who are then referred to as being 'born-again' with different levels of spirituality.

Production plays a central role in every organization. Such roles include:
- Design of production systems
- Operation of the production system
- Materials and resources management
- Market consideration
- Quality and quantity considerations etc, and
- Consumer satisfaction and efficient utilization of resources.

3.2. ASPECTS OF PRODUCTION

In broad terms, production embraces so many meanings. It is an all embracing process which is embedded in the operations of every organization, profit, non-profit, manufacturing and non-manufacturing alike.
The key aspects of production which will be considered here are:
- Market consideration,
- Production to order,
- Design and technical problems,
- Availability of resources,
- Purchasing and marketing, and
- Assimilation into existing production.

3.2.1. MARKET CONSIDERATION

The Market is a critical factor to be considered before goods and services are produced.
With the exception of commissioned products, the quantity and quality of goods to be produces must be estimated based on the knowledge of the supply-gap that exist in the market. Answers must be sought to the questions:

- Is there a supply gap?
- What is the degree of sales of existing products?
- Is there need for a new product?
- What will be the potential sales of a new product?
- What will the quantity and the quality of the product to be produced.
- At what price?

Answers to these questions can be obtained through market research or market survey.

3.2.2. PRODUCTION TO ORDER

Here, production is made in response to an order. In this case, a customer place order for a given quantity and quality of goods at a given price. The goods may be branded or customized.

3.2.3. DESIGN AND TECHNICAL PROBLEMS

Product design and method of production have mutual influences on each other. It is therefore imperative that there must be co-operation between the designer and the production engineers.

3.2.4. AVAILABILITY OF RESOURCES

The three Ms of management, - Money, Material and Machinery - as well as the necessary number of workers of various skills must be available

3.2.5. PURCHASING AND MARKETING

Materials must be purchased and stored. Products sent to the market. Adequate arrangement must be made for mobility.

3.2.6. ASSIMILATION INTO EXISTING PRODUCTION

In a situation where there is a new production, arrangement must be made to merge the new production into the existing one.

3.3. PRODUCTION POLICY

Every organization must have a guideline/policy on what to produce, the quality and quantities as well as the method of production.

The major constraints of production policy are:

(a) **Limitation of Range**

The range of product must be established, and the degree of specialization established.

(b) **Availability of Resources**

The resources to be made available include:

- The premises
- The plant and machineries
- Labour or human skill
- Finances etc.

(c) **Level of Production**

The level or production should be determined by the level of demand and the unit cost. Care should be taken not to produce at a unit price that will be unprofitable.

(d) **Cost and Price**

A good relationship exists between cost and price. Change in demand or decrease in purchasing power may reduce price. Increase in cost will ultimately lead to increase in price. The cost may be affected by labour demand for high wages, government policy, energy and raw materials availability.

(e) **Finance**

Money is required to finance a business until the point of profitability is reached.

(f) **Managerial Expertise**

Management must ensure that it has the necessary ability and capacity to cope with new challenges. Adequate techniques and equipment must be made available.

3.4. SELF ASSESSMENT QUESTION

Identify the key aspects of production and briefly explain them.

3.5. SELF ASSESSMENT ANSWER

The key aspects of production are:

- Consideration of the market
- Production to order
- Design and technical problem
- Availability of resources
- Purchasing and marketing
- Assimilation into existing production

4.0. CONCLUSION

Production in its strictest term is limited to manufacturing but in broader perspectives, production exists in all organizations.

5.0. SUMMARY

Production is a central function in all organizations. It has a viable relationship with its environment. Key aspects of production include:

- Market consideration
- Design and technical problems
- Availability of resources etc.

A good production policy is desirable for efficient utilization of resources.

6.0. TUTOR MARKED ASSIGNMENT

Identify and explain the main constraints of production

6.1. TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

Main constraints of production policy are:

- Limitation of range
- Availability of resources
- Level of production
- Cost and price
- Finance
- Managerial expertise

MARKING SCHEME

2 marks for each constraint identified

2 marks for each explanation

[Total – 20 marks]

7.0. REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Books

2. Needle, David (1999): Business in Context, (London),

UNIT 2: TYPES OF PRODUCTION

TABLE OF CONTENT

1.0 INTRODUCTION

This unit will take a look at the types of production vis-à-vis:

- Jobbing
- Batch Production
- Flow Production

2.0. OBJECTIVES

At the end of the unit, students should be able to:
(i) Mention the types of production
(ii) Differentiate between Jobbing and Batch Production
(iii) Explain Flow Production

3.0. TYPES OF PRODUCTION

3.1. JOB PRODUCTION

This relates to the production of one or small number of identical products to the specification of the buyer. It may mean the supply of one component to larger manufacturers, the provision of one area of production to a larger one or the making of special equipment of material.

It is a short-run production and, thus, does not have the benefits of larger scale. If subjects the producer to "peaks and troughs" activities, resulting in insufficient use of labour and equipment. This makes scientific assessment of cost difficult.

Jobbing is largely carried out by small firms in the form of sub-contracting. It is an arrangement that suit a particular situation at a time.

3.2. BATCH PRODUCTION

Batch production is a non-continuous and repetitive production. It is used in the production of goods, the quantity of which is known in advance. It be in response to a specific order or for stock-pilling. Batch production in mostly used where trade is seasonal, either as regard supply or demand.

Batches of products are sometimes produced in lots that will minimize both carrying and set-up costs of machines. Batch production has the tendency to lead to a higher in-process inventory.

A series of batches of different products may with careful planning constitute what is effectively continuous production.

3.3. FLOW PRODUCTION

Flow production is commonly referred to as line or continuous production. It is production on large scale to provide continuous supply.

Flow production may also be referred to as product layout system since it lay more emphasis on products. It is used for single product or batch of products that follow the same sequence of operation e.g. a vehicle assembly plant. Flow production is characterized by the "flow" of units from one operation point to another throughout the whole process.

A single-purpose machine or series of machines may be used. The prime objective is to have a regular, continuously moving flow.

Flow productions are usually typical by the assembly line or conveyor-belt system

3.4. SELF ASSESSMENT QUESTION

Differentiate between Jobbing and Batch Production

3.5. SELF ASSESSMENT ANSWER

- Both are non-continuous processes
- Jobbing is ‘short-run’ production while Batch is ‘long-run’
- Jobbing subjects produces to ‘peaks and troughs’ while Batch Production does not.
- Jobbing is carried out by small firms, while Batch may be carried out by large firms etc.

4.0. CONCLUSION

The types and methods used in the production of goods depend on the product and the quantity produced.

5.0. SUMMARY

The method of production adopted by producers of goods depends on the product and the quantity produced. There are three main types of production:

- Job Production
- Batch Production
- Flow Production

6.0. TUTOR MARKED ASSIGNMENT

State three (3) types of production. Identify and explain the key features of each of them.

6.1. TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

Types of production are:

- Job Production
- Batch Production
- Flow Production

MARKING SCHEME

3 marks for each type of production identified

3 marks for each type correctly explained.

[Total – 20 marks]

7.0. REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Books.

2. Needle, David (1999): Business in Context, (London), Thomson Business Press

UNIT 3: FACTORY LOCATION

TABLE OF CONTENT

1.0. INTRODUCTION

This unit will take a cursory look at factory location, with special reference to site, building and positioning of departments.

2.0. OBJECTIVES

At the end of this unit students should be able to:
(i) Identify the factors that influence the choice of a factory site.
(ii) Mention different types of building.
(iii) State the principles relevant to the positioning of departments.

3.0. FACTORY LOCATION

3.1. SITE LOCATION

According to the Oxford English Minidictionary, the word *site* means the place where something is, was or is to be located or to locate.

Site location is influenced by many factors which include:

(a) **Effective Cost**

Since building or rent cost vary from place to place it is important that one takes a critical look at the proposed site vis-à-vis the level of local rates, government grants etc, before making a choice.

(b) **Labour Availability of the Required Types**

The producer must ensure that the types of labour require are available in the area.

(c) **Labour Cost**

Producers must take cognizance of the local wage rates for skill and unskilled labour or for the type of labour required.

(d) **Transport Facilities**

Factors to be considered are access to motorway, and proximity to port.

(e) **Local By-Laws**

By-laws concerning building restriction, waste disposal etc

(f) **Housing and Social Facilities**

Availability of social and housing facilities must be considered as shortage will affect labour supply.

(g) **Possibility of Expansion**

There may be need to expand the site in near future. This must be taken into consideration.

(h) **Proximity of Commercial Services**

This will equally affect labour supply.

3.2. TYPES OF BUILDING

There exist different types of factory building. The common ones are:

(a) **Custom-Built Factory**

This type is designed to suit production requirement essential features will be adequate lighting, heating and ventilation.

(b) **Single-Storey Building**

This idea for accommodating heavy machinery and for the movement of materials. It is easier to alter them multi-storey building. They simple in construction and cheaper to build.

(c) **Multi-Storey Building**

This will require artificial lighting, cheaper to heat as a result of less heat- loss through the roof. To ensure easy traffic flow, gravity chute and lift must be provided. Otherwise traffic is continued to separate the floors.

3.3. POSITIONING DEPARTMENTS

Major processing stage should be positioned at the largest open space while other departments should be positioned in a logical proximity to it and to each other. The relevant principles to be applied are:

- The first processing section should be near the store for raw materials.
- The final inspection department should be near the production terminal
- Intermediate inspection should be built into the production line near the work stage to be inspected.
- Finished-products store should have direct access to final inspection department.

3.4. SELF ASSESSMENT QUESTIONS

Identify and explain the various types of factory building

3.5. SELF ASSESSMENT ANSWER

Examples of factory building are:

- Custom-built Factory
- Single-storey Building
- Multi-storey Building

N.B: Brief explanations required.

4.0. CONCLUSION

Factory location is a key aspect of production that requires careful consideration in order to ensure cost effectiveness.

5.0. SUMMARY

The main features of factory location are:

- Site location
- Types of Building
- Positioning of Department.

Factors and principles affecting these essential features must put into consideration before deciding to locate the factory in any chosen area.

6.0. TUTOR MARKED ASSIGNMENT

Enumerate and briefly explain the factors influencing the choice of location.

6.1. TUTOR-MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

The factors that influence site location are:

- Effective Cost
- Availability of labour of the required type
- Labour Cost
- Transport Facilities
- Local By-laws
- Housing and Social Facilities
- Possibility of expansion
- Proximity of commercial service

MARKING SCHEME

1 ½ marks for each factor identified

1 ½ marks for each brief explanation

[Total – 20 marks]

7.0. REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Books.

2. Needle, David (1999): Business in Context, (London), Thomson Business Press

UNIT 4: PLANT AND EQUIPMENT

TABLE OF CONTENT

1.0. INTRODUCTION

This unit will take a look at plant and equipment, with specific reference to maintenance, material handling and choice of equipment.

2.0. OBJECTIVES

At the end of this unit, students should be able to:
(i) Identify the factors to be considered in selecting plants and equipments.
(ii) Explain the concept of maintenance.
(iii) State the principles of material handling.

3.0. PLANT AND EQUIPMENT

3.1. THE CHOICE OF PLANT AND EQUIPMENT

The means that there exist the opportunity choose from variety. It could be goods, persons or things.

The factors to be considered when selecting plant and equipment are:

(i) **Special Purpose Machines**

These types of machine are designed to meet processing requirement. The modalities for its production and key features and functions must be agreed between the prospective users and the manufacturer.

(ii) **General Purpose Machines**

These are standardized machines and are available from stock. As the name suggest, they are not designed for function specific to the buyer.

(iii) **Effective Cost**

This will take account of the initial cost, the cost of maintenance and depreciation as well as the running cost.

(iv) **Size**

Floor area must be planned to accommodate the machines and make allowances for any giving part of the arm of a crane, operators' working position, access and passing traffic.

(v) **Maintenance and Repairs**

Maintenance officers must have easy access to the equipment for the purpose of maintenance and repairs.

(vi) **Obsolescence**

The life span of the machine should be known. There may be need for 'trade in' when larger or more efficient machines become necessary.

(vii) **Power**

One must take cognizance of the requisite power and its attendant cost.

(viii) **Labour Cost**

A simple machine will require low-paid operator. The cost of the labour replaced must be considered.

(ix) **Output**

It may be necessary to calculate the earning capacity of each machine.

3.2. MAINTENANCE

Maintenance is a continuous process and, it is handled by specialist staff whose responsibility includes:

- Regular inspection and servicing
- Repairs carried out on an emergency basis
- Supervising proper use by operatives
- Compiling records of breakdown performance etc
- Advising management about replacement.

There are different types of maintenance, these are:

- Predictive Maintenance
- Preventive Maintenance
- Corrective Maintenance.

Organizations may have maintenance policy specific to them but the general factors to be considered are:

(a) The cost of production lost through breakdown
(b) The cost and effectiveness of inspection and maintenance
(c) Principle concerning obsolescence and replacement
(d) Buying policy as effected by maintenance work

3.3. MATERIAL AND EQUIPMENT HANDLING

3.3.1. MATERIALS HANDLING

This refers to the movement of raw materials, components, finished parts and completed goods within the production stage.
The principles to be considered are:

(a) **Economy of Movement**

The transporting distance must be short and should coincide with the flow of production. There should be no 'back-tracking'

(b) **Economy of Floor Space**

Ideally, movement should be off the floor. This can be done by using overhead conveyor bolts, gantries etc.

(c) **Traffic Ways**

This should be done in such a way that movement does not interfere with other works.

(d) **Combining Movement with Processing**

For instance, a unit may be spray painted while it is on a production conveyor.

3.3.2. EQUIPMENT HANDLING

Equipment handling also deserved special attention. Suction pipes and vacuum tube can be used to move back materials while conveyors can be used to move goods overhead. Light packages can be shipped manually along roller, belts.

Gravity chutes, hoists, lifts etc are used for vertical movement, whilst Trucks are used for:

- Holding and discharging bulk or collection of items of dumper trucks.
- Picking up and transporting standard pallets on a platform made up into 'unit loads' as pallet trucks.

3.4. SELF ASSESSMENT QUESTION

List the various classification of handling equipment.

3.5. SELF ASSESSMENT ANSWER

Handling equipment are classified into:

(a) **Bulk Materials**

Moved with the aid of suction pipes and vacuum tube.

(b) **Conveyors**

Which mechanically motivated light packaging, shipped manually along rollers belts, whilst heavy materials or goods are moved overhead by conveyors which lift and lower.

(c) **Trucks** such as:

(i) **Dumber Trucks**

For holding and discharging bulk or collection of items.

(ii) **Forklift**

Trucks which pick up and carry a load and then stack it.

(iii) **Pallet Truck**

Which picks up and transport standard pallets on a platform, made up into 'unit loads'

(iv) Gravity chutes, hoists, lifts etc are used for vertical movement.

4.0. CONCLUSION

Plants and equipment are key aspect of the production section that requires careful planning with adequate movement space for equipment and materials.

5.0. SUMMARY

Management must take some factors into consideration before selecting plant and equipment. Maintenance policy must be well drawn out and allowance made for the movement of equipment and material at the outset.

6.0. TUTOR MARKED ASSIGNMENT

What are the factors to be considered in the selection of plant and equipment? Briefly explain them.

6.1. TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

The factors to be considered are:

(a) Special purpose machines

(b) General purpose machines

(c) Effective cost

(d) Size

(e) Maintenance and repairs

(f) Obsolescence

(g) Power

(h) Labour cost

(i) Output

MARKING SCHEME

1 point for each factor named

1 point for each brief explanation

[Total – 20 marks]

7.0. REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Books.

2. Needle, David (1999): Business in Context, (London), Thomson Book Press

UNIT 5: PRODUCTION PLANNING AND CONTROL

TABLE OF CONTENT

1.0. INTRODUCTION

This unit will take a cursory look at Production Planning and Control with special emphasis on progress control and inspection.

2.0. OBJECTIVES

At the end of this unit, students should be able to:
(i) Identify the objectives of Planning and Control.
(ii) Identify the features of Progress Control.
(iii) State the purpose of Inspection.

3.0. PRODUCTION PLANNING AND CONTROL

3.1. PLANNING AND CONTROL

Planning in this respect refers to the concept of deciding the method of production to be adopted. It usually follows the pre-planning stage where the type of product has been decided upon and designed output agreed in conjunction with the scale unit and all matters of cost, price and delivery times have been settled.

Control on the other hand implies the setting of standards and objectives, the coordinator of the various stages and the variation of plans as circumstances dictate.

The responsibility for these two functions rest with one department.

The objectives of Planning and Control are:
- To coordinate labour and machine in the most effective and economic ways
- To establish targets, check them against performance and take necessary action.
- To achieve smooth continuous production with the elimination of bottle necks and under-employed resources.

The prime responsibilities of the Planning and Control department are:
- To liaise with the marketing and purchasing department and to adjust the production rate or product mix where necessary
- To determine the allocation of labour and machine.
- To establish time schedules for various stages
- To establish continuous inspection
- To operate a system of cost control.

The planning programme will normally conform to the following:
- Deciding the process to be adopted
- Schedule the sequence of operation.
- Establish time schedule for the completion of each
- Allocate work to machines and work groups.
- Ensure material availability.

3.2. PROGRESS CONTROL

This is meant to ensure that production performance is in accordance with the time schedules. It is a system of checking and taking necessary action. It is commonly referred to as progress chasing.

The need for progress control arises as a result of:

- Failure of materials to be delivered
- Machine or power breakdown
- Industrial action
- Delay at an earlier point on the production line
- Staff absenteeism
- Errors of design, planning or human activity

The main tasks of progress control are:

- To check progress continuously
- To determine the cause of any deviation
- To resolve the difficulty
- To adjust material delivery and to advice the sale.

Control can be assisted through:

- The use of flow chart which shows the planned sequence of operations
- The use of production schedule such as grant charts
- The use of automatic control to give a continuous feed back of information by computer.
- The use of machine loading charts
- Inspection schedules
- Material list which specify the type and quantities of materials and components for each product.

3.3. INSPECTION

Inspection is carried out to ensure that finished products reach a required standard and to reduce the amount of 'scrap' and wasted labour.
The prime objects of inspection are:

- To establish standards
- To ensure conformity with standards
- To identify contributory factors to deviations
- To determine permitted deviations
- To ensure that periodic checks are continuous (i.e. schedule inspections)
- To provide management data about costs of deviation.

Inspection assumes the following forms:

- Inspection of raw materials
- Inspection of work in progress
- Process control
- Running test
- Quality control
- Statistical quality control

3.3.1. METHODS OF INSPECTION

Methods of inspection include:

(a) **Centralized Inspection**

This requires that work be sent to the inspection department before proceeding to the next stage.

The main features are:

- It allows for easier supervising
- Inspection records are centralized
- The shop floor is kept clear for operatives.

(b) **Floor Inspection**

This required inspectors carry out their examination at the work point. The main advantage of this method is that:

- Less time is lost in handling and transportation
- Fault-finding is immediate and may be remedied without delay.

3.4. SELF ASSESSMENT QUESTION

What are the standard methods or aids available to management in respect of control?

3.5. SELF ASSESSMENT ANSWER

The aids to control available to management are:

- Flow charts
- Production schedules, e.g. Gantt charts
- Automatic control
- Machine loading charts
- Inspection schedules
- Material lists etc.

4.0. CONCLUSION

Failure to plan is planning to fail. Management must take advantage of the object of planning and control for increased productivity.

5.0. SUMMARY

The prime objects of planning and control are:

- To co-educate labour and machines in the most effective and economic way
- To establish targets, check them against performance and to take necessary actions
- To achieve smooth continuous production.

These aims are achieved through a well planned programme of action.

6.0. TUTOR MARKED ASSIGNMENT

State the objectives of an inspection system.

6.1. TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

The prime objectives of inspection are:

- To establish standards
- To ensure conformity with standards
- To identify contributory facts to deviation
- Schedule inspections
- Provide management data about costs of deviations, the on delivery etc.

MARKING SCHEME

4 marks for each objective correctly stated

[Total – 20 marks]

7.0. REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Books

2. Needle, David (1999): Business in Context, (London), Thomson Book Press

UNIT 6: WORK MEASUREMENT

TABLE OF CONTENT

1.0 INTRODUCTION

This unit will expose us to the objectives, procedure and technique of work study.

2.0 OBJECTIVES

At the end of this unit, students should be able to:
(i) State the objectives of work measurement.
(ii) Identify the techniques of work measurement.
(iii) Enumerate the problems associated with work study.

3.0 WORK MEASUREMENT

3.1 THE CONCEPT AND OBJECTIVES OF WORK MEASUREMENT

Work measurement is an aspect of work study. It is primarily concerned with the study of time and effort required to perform a task with a view at increasing efficiency. Its primary aim is to use time study to

- establish standard time for completion of specific task;
- check performances with standards
- measure machine output;
- facilitate costing
- provide a fair basis for incentive scheme.

Once the standard time for the completion of a task is established, it becomes easier to check performances with standard and to design an effective productivity incentive scheme or what is commonly referred to as payment by result pay system.

3.2 WORK MEASUREMENT PROCEDURE AND MEASUREMENT TECHNIQUES

The steps used in work measurement are similar to those of method study but with emphasis on quantification.

- The Unit is Time, though it can be a "work unit"
- Calculation by stop-watch
- Allowances are made for fatigue, variations between operations, unavoidable delays etc
- The standard time is based on day-long average time

3.2.1 WORK MEASUREMENT TECHNIQUES

The techniques of work measurement are:

(i) **Direct Time Study**

This is used in repetive tasks, it involves recording the time taken to perform a specific part of a task. The measurements are taken at different time.

(ii) **Predetermined Motion Time System**

Set time is established for completing certain tasks taken from the observations of a number of operatives on varying occasions.

(iii) **Analytical Estimating**

Used in non-repetitive jobs, such as maintenance. As the job vary in size and complexity, a standard is set for the time taken for an average job. It is also used for non-repetitive element in a repetitive operation.

(iv) **Activity Sampling**

This involves making observations and recording what is happening on an agreed number of visits in a period at random. Idle time of a machine is calculated by noting at the random sampling, if the machine is working.

3.3 ATTITUDES TO WORK STUDY

The human problems associated with work study are:

- Resentment of being watched
- Effect of Incentives – Too high a standard would affect workers' earnings.
- Reliability of the Standard: - Workers could decide to go slow in order to get a lower standard.
- Fear of redundancies: - Improved method may lead to a reduction of labour content and consequently down-sizing of labour force.

3.4 SELF ASSESSMENT QUESTION

Identify the human problems associated with work study.

3.5 SELF ASSESSMENT ANSWER

The problems suspicious are:

- Fear of redundancy
- Reliability of the standard
- Effect on incentives
- Resentment of being watched.

4.0 CONCLUSION

You have now successfully completed the study on one of the techniques of work study which will help you to improve on your task performance efficiency.

5.0 SUMMARY

Work measurement is one of the techniques of work study. The procedure is similar to that of method study but with emphasis on quantifications. It provides a basis for designing an effective incentive scheme and to check performance with standards.

6.0 TUTOR MARKED ASSIGNMENT

State and explain the techniques of work measurement.

6.1 TUTOR MARKED ASSIGNMENT (QUESTIONS AND ANSWER)

The techniques of work measurement are:

- Direct time study
- Predetermined motion time system
- Analytical estimating
- Activity Sampling

MARKING SCHEME

3 marks for each technique named

2 marks for each explanation

[Total – 20 marks]

7.0 REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Handbooks

UNIT 7: METHOD STUDY

TABLE OF CONTENT

1.0 INTRODUCTION

This unit will take a cursory look at method study vis-à-vis the objectives and procedures.

2.0 OBJECTIVES

At the end of this unit, students should be able to:
(i) State the objectives of method study.
(ii) Enumerate the procedures of method study.
(iii) State the meaning of method study.

3.0 METHOD STUDY

3.1 CONCEPT AND MEANING OF METHOD STUDY

Method Study is one of the techniques used in Work Study. It is a scientific analysis of operations and the way in which are co-ordinate including the contribution of machines to labour.
Method Study studies the way work is done, criticizes it where necessary and devises a better approach that leads to work efficiency.

3.2 OBJECTIVES OF METHOD STUDY

The objectives of Work Study are:
- Improved individual processes
- Improved the inter-relationship of processes
- Making more efficient the use of manpower, machine and materials
- Improved working conditions
- Economize in human effort and reduce fatigue.

3.3 METHOD STUDY PERFORMANCE

The procedures of Method Study are:

(a) Determine the work to be studied and define the objectives

(b) Record the facts which are established by means of:
- Process charts and flow diagrams
- Multiple activity charts
- Motion charts which shows the movement of an operatives
- Simo-charts record the simultaneous movements of an operative's hand or other part of the body.
- Layout models and templates
- String diagrams work-positions are marked with pens and connecting length of string indicate the paths course of his work.
- Films and still cameras to record some operations

(c) Analyze the records and quantity where appropriate with a view at making some improvement through:
- eliminating an operation or part of it.
- combining one or more operations
- devising different physical movement
- altering machine tools

- altering the sequence of operations.

(d) Design a new method
(e) Record the new method and produce mathematical comparison with the old.
(f) Install the new method and provide instruction for its use.
Record the new method in operation and adjust where appropriate.

3.4 SELF ASSESSMENT QUESTION

What are the devices used in recording facts in Method Study?

3.5 SELF ASSESSMENT ANSWER

The devices used are:

- Process charts and flow diagrams
- Multiple activity charts
- Motion charts
- Simo-charts
- Layout models and templates
- String diagrams
- Films and still cameras.

4.0 CONCLUSION

With the knowledge you have acquired in this unit, you are now in a position to carry out a Method Study of any organization.

5.0 SUMMARY

Method Study is the scientific analysis of operations and the way in which all operations are co-ordinated with a view at devising better approaches. It is one of the methods of work study.

6.0 TUTOR MARKED ASSIGNMENT

State and explain the general procedures of method study.

6.1 TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

Method Study procedures are:

- Analyze the record and quantity where appropriate
- Design a new method
- Record the new method and produce a mathematical comparison with the old.
- Install the new method and provide instruction for its use.
- Record the new method in operation and adjust where appropriate.

MARKING SCHEME

2 marks for each procedure stated

1 mark for each correct explanation

[Total – 20 marks]

7.0 REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Handbooks

UNIT 8: PRODUCTION ENGINEERING

TABLE OF CONTENT

1.0 INTRODUCTION

This unit will introduce you to the concept of standardization and simplification as well as specialization and diversification.

2.0 OBJECTIVES

At the end of this unit, students should be able to:

(i) State the merits and demerits of standardization and simplification.
(ii) Explain the concept of diversification.
(iii) Explain specialization.

3.0 PRODUCTION ENGINEERING

3.1 THE CONCEPT OF SIMPLIFICATION AND STANDARDIZATION

Production engineering refers to the organization of the production process as a whole. It embraces the period from the design and layout of production facilities to final inspection of the product.
It is concerned with every stage and every aspect with the production span and includes the establishment of standards, the design of tools and equipment, as well as the measurement of performance and the working within cost limits.

Simplification is the process whereby the range of components and/or final products are reduced. It entails producing more of any one type to gain the advantage of large-scale production.

Standardization is referred to the interchangeability of standard components and between different end-products. For instance, three models of product can be basically the same but can be marketed as different models by varying some of the components.

3.1.1 ADVANTAGES OF SIMPLIFICATION AND STANDARDIZATION

- Reduction of unit cost
- Easier inspection
- Reduced cost at the design stage
- Reduced variety of skill required
- Lower tooling cost
- More efficient customer
- Service for spares and repairs
- Simpler organization
- Less complex purchasing and storage.

3.1.2 DISADVANTAGES OF SIMPLIFICATION AND STANDARDIZATION

- A mistake in the choice of product or design will be more costly to correct because of the commitment to a narrow range.
- The buyer desire for something different may present opportunities for competitors.
- Introduction may mean losses on existing stocks material and plant.

3.2 SPECIALIZATION

This is the case, when an organization decides to concentrate on a narrow range of products. It enables the manufacturer to remain in the areas where he is most

experienced and have a well-established production process, labour and technical skill required and a sound knowledge of the market.

The demerits of product specialization are:

- over-dependence on one market
- may be overtaken by a new technology
- inflexibility.

On the other hand, specialization of labour will entail reducing the range of skill required of each worker so that efficiency is improved by concentration of efforts.

3.3 DIVERSIFICATION

This entails venturing into new areas of production. It is the direct opposite of specialization. Organizations embark on diversification for the following reasons:

- To reduce risk of over dependent on one product.
- To utilize spare capacity
- To offer a wider range within the same market
- To put by-products to profitable use
- As a result of integration.

3.4 SELF ASSESSMENT QUESTION

Is diversification justifiable? If yes, give your reasons.

3.5 SELF ASSESSMENT ANSWER

Diversification is justifiable. The reason(s) for diversification are:

- It reduces risk of being over dependent on one product

- It utilizes spare capacity
- It offers wider range within the same market
- It puts by-products to profitable use
- It is a result of integration.

4.0 CONCLUSION

Now that you gone through this unit, you are better placed to appreciate the merits and demerits of simplification and standardization, specialization and diversification.

5.0 SUMMARY

Production engineering embraces the totality of the production processes in an organization vis-à-vis,:

- Implementation of production policy
- Production span
- Establishment of standards
- Design of tools and equipments
- Measurement of performance
- Working within cost limits.

6.0 TUTOR MARKED ASSIGNMENT

State the merits and demerits of simplification and standardization.

6.1 TUTOR MARKED ASSIGNMENT (ANSWERS AND MARKING SCHEME)

The merit of simplification and standardization are:

- Reduction of unit costs
- Easier inspection
- Reduced cost of design stage
- Reduced variety of skill required
- Lower tooling cost
- More efficient customer service for spares and repairs
- Simpler organization
- Less complex purchasing

MARKING SCHEME

3 marks for each merit correctly stated

[Total – 20 marks]

7.0 REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Handbooks

UNIT 9: THE PRODUCTION FUNCTION

TABLE OF CONTENT

1.0 INTRODUCTION

This unit will consider the production function as a universal concept.

2.0 OBJECTIVES

At the end of this unit, students should be able to:
(i) Identify the production function.
(ii) Differentiate between the manufacturing and non-manufacturing industries.

(iii) Explain the universality of production.

3.0 THE PRODUCTION FUNCTION

3.1 THE UNIVERSALITY OF PRODUCTION

According to Needle (1999), the production function exists in all types of industry as well as manufacturing. It transforms inputs such as information, people, material and finance into a variety of outputs such as goods, services, customer and employee satisfaction. When viewed from the above perspective, all organization can be said to have a productive system irrespective of their primary objective.

Production function is a central function that has a significant impact on organization structure. It forms the bulk of a firm's assets, expenditure and people. It is pivotal to the success of a firm by providing what the customer need at a profit or with budget in profit and non-profit organization respectively. It is concerned with issues such as quantity, quality, availability and price as well as issues of productivity and cost. Production problems occur in every organization. For instance in Airports, there is the problem of:

- Take-off and safe landing of planes on time;
- Coordination of air traffic control, ground crews bagging, passport and customs, aircraft cleaning, refueling and catering.

Similarly in hospitals, there is the problem of operation timing and schedule, patients' transfer to and from wards, equipment preparation and the support systems.

Modern methods and techniques of production have elevated production to a key position such that management strategy is incomplete without the production strategy.

3.2 DIFFERENCES BETWEEN MANUFACTURING AND NON-MANUFACTURING

Manufacturing and non-manufacturing sectors are concerned with the production of goods and services. There are, however, some differences between different types of organization operating in the same sector. For instance, a cottage textile industry would be classified as manufacturing alongside a large Textile Industry like Nichemtex. In like manner, a small car hire service centre would be a classified alongside First Bank Plc as non-manufacturing.

The major differences are:

- In non- manufacturing, the customers play an active part in the process while in manufacturing; the customers play a less active role.
- In non- manufacturing, there is a high level of interaction with customer, which makes the process unpredictable. The converse is the case with manufacturing.
- It is more difficult to control production in non-manufacturing sector. The converse is the case with manufacturing.
- The degree of contact with customers can affect the efficiency of the operation.
- Productivity in non-manufacturing is difficult to measure and quality a matter of subjective assessment.

3.3 IDENTIFYING THE PRODUCTION FUNCTION

The primary function of production is to convert inputs into different kinds of outputs. This view of production function is commonly referred to as the system view of production.
It entails:

(a) **The Input** such as:

- Raw materials
- People
- Energy
- Machines
- Fixed assets
- Method of working
- Information.

(b) **The Process** such as:

- The conversion of inputs by combining them to produce outputs.
- The support functions that control the feedback mechanisms to improve the input mix and the conversion process.

(c) **The Output** such as those desired for:

- Customers
- The firm
- The employee and
- The community.

3.4 SELF ASSESSMENT QUESTION

Identify the function of production

3.5 SELF ASSESSMENT ANSWER

The principal function of production is to transform input into different kinds of output. This is referred to as the system view of production. It embraces the input, process and output.

4.0 CONCLUSION

A form of production takes place in every organization, whether manufacturing or non-manufacturing hence the concept “universality of production”

5.0 SUMMARY

The function of production is universal. It takes place in every organization whether profit or non-profit, manufacturing or non-manufacturing. The key function of production is to convert input into output.

6.0 TUTOR MARKED ASSIGNMENT

Explain the concept "universality of production"

6.1 TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

Key points

- The production function exists in every organization
- It transforms input such information, people, material and feviance into the desired output.
- Is a key aspect of management strategy
- Is pivotal to organizations' success
- It represents the bulk of a firm's assets, expenditure and people.

MARKING SCHEME

4 marks for every concept named and explained

[Total – 20 marks]

7.0 REFERENCES

1. Needle, David (1999): Business in Context, (London), Thomson Business Press

2. Hill, .S. (1991): Production and Operation Management: Text and Cases, (London), Prentice Hall

UNIT 10: SYSTEM DESIGN

TABLE OF CONTENT

1.0 INTRODUCTION

This unit will take a look at system design vis-à-vis capacity planning Equipment design, work design and location decision.

2.0 OBJECTIVES

At the end of this unit, students should be able to:

(i) Identify the strategies used by companies to reduce difficulties imposed by capacity planning.
(ii) State the types of decision relevant in work design.
(iii) State the factors that determine the choice of location.

3.0 SYSTEM DESIGN

3.1 FORECASTING DEMAND AND CAPACITY PLANNING

Decisions central to the production process are based on forecasting demand and capacity planning. They determined the direction for the entire operation and the resources to the acquired and how they are to be deplored.

To carry out an effective forecast, accurate information concerning the market and accurate prediction of demand is required. Getting this information is particularly difficult in a highly volatile market of changing demand and high levels of competition.

In a situation where forecasting made with some degree of accuracy capacity planning may still not be straight forward. It is sensitive to product and process innovation and is affected by decision on the type of technology used, organization size and structure and the extent to which subcontracting as well as other policies in delivery service industries are faced with many challenges. This necessitates the need for capacity planning. The strategy adopted may include:

- Operating a fixed schedule
- Insisting that passengers or customers buy tickets before hand
- Creating extra capacity particularly during times of high demand
- Operating a delayed delivery system to control demand and plan capacity
- Introducing overtime to cater for overbooking
- Using demand and capacity as a marketing strategy where a product develops a rarity value and cult status

3.2 Equipment and Work Design

The key decision here is the selection of the type of equipment to be used, how much of it is to be produced in-house and how much is to be brought, and the equipment replacement strategy to be adopted. Equipment design is closely related to product design, capacity planning, nature and skill of the labour force and accounting procedure. Work design on the other hand is concerned with:

- Physical layout of the production
- Design of individual jobs.

The principal considerations are economic, technical and behavioural. Variation in these factors often results in different types of production system.
Work design is a method used by management to satisfy conflicting demands such as customer satisfaction versus efficient utilization of resources.
Management is also concerned with cost minimization; this is achieved by means of:

- Method study
- Work measurement

which are collectively referred to as Work Study. While work measures apply techniques designed to establish the time for a qualified worker to carry out a task at a defined level of performance. This technique is commonly referred to as Time Study. Method Study on the other hand is the systematic and critical examination of the ways of doing things in order to make improvement (British Standard 3138).

3.3 LOCATION DECISION

The production systems in a manufacturing concern are usually located based on the following factors:

- Proximity to raw materials and power supply
- Transport system for supply and distribution
- Labour market possessing the required skill
- Level of the local rates and taxes
- Availability of government grants
- Relative cost of labour.

Location is also a key consideration in the setting of service industries.

3.4 SELF ASSESSMENT QUESTION

(1) What factors are closely related to equipment design?
(2) Identify the key decisions to be made in equipment design.

3.5 SELF ASSESSMENT ANSWER

(1) The factors are:

- product design
- capacity planning
- skill of the labour force
- accounting procedure.

(2) The key decisions are:

- selection of the type of equipment to be used
- how much of it is to be produced in-house
- how much of it should be brought
- what should be equipment replacement strategy.

4.0 CONCLUSION

System design embraces product design, forecasting demand, capacity planning, equipment design and work design which are key factors in management production strategy.

5.0 SUMMARY

The key factors in system design are:

- Forecasting demand
- Capacity planning
- Equipment design
- Work design
- Location decision.

Managements require adequate and accurate information to make the necessary strategic decisions.

6.0 TUTOR MARKED ASSIGNMENT

Enumerate the strategies used by service industries to reduce the difficulties imposed by capacity planning.

6.1 TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

The strategies are:

- Operation of a fixed schedule
- Insisting that passengers or customers buy tickets before hand
- Create extra capacity particularly during times of high demand
- Operate a delayed delivery system to control demand and plan capacity
- Introduce over-time to cater for overbooking
- Use demand and capacity as a marketing strategy where products develop a rarity value or cult status.

MARKING SCHEME

3 points for each strategy enumerated and explained

[Total – 20 marks]

7.0 REFERENCES

1. Wild, R. (1985): Essentials of Production and Operation Management, (London), Holt Rinehart and Winston

2. Hill, T, (1993): The Strategic Management of the Manufacturing Function, 2nd edition, (London), MacMillan

3. Needle, David (1999): Business in Context, (London), Thomson Business Press

UNIT 11: SYSTEM OPERATION

TABLE OF CONTENT

1.0 INTRODUCTION

The unit will consider production system operation vis-à-vis operations planning operations control and scheduling.

2.0 OBJECTIVES

At the end of the unit, students should be able to:
(i) Explain operations planning.
(ii) State the aims of scheduling.
(iii) Identify various types of operations control.

3.0 SYSTEM OPERATION

3.1 OPERATIONS PLANNING

The primary aim of operation planning is to ensure that sufficient goods or services are produced to meet demand. Management must decide whether goods are to be produced to stock or to order. A vehicle company could decide as a matter of policy that all vehicles are ordered by manufacture or produce various models of vehicle and sell them. Whatever the system that is adopted, some elements of flexibility must be introduced, such that can enhance greater operating efficiency.
Operations planning necessarily overlaps with issues of capacity planning. Where an organization provides standardized or customized items, then the need to produce to stock or order is vital. The problem of producing to order may be more pronounced in service industries such as fast food outlets. If the policy is to produce to order, then the management must brace up for a possible delay in meeting the customer's needs at the same time.
Where goods are produced to stock, the food items such as meat pie and hamburger that are not sold must be discarded after some time.

3.2 OPERATIONS CONTROL

Five types of control are identified. The forms of control identified overlap. As with any type of control system, the managers of the system must determine the standards that are to operate.

(1) **Quantity Control:** This is sometimes referred to as production control or progress chasing. It ensures that the through put of goods and services goes according to the planned schedule.

(2) **Quality Control:** This ensures that the quality of the furnished product or service meets the standards set in the design stage and meet with approval of customer.

(3) **Technology Control:** This pertains to the maintenance of plants and equipment. It is applicable in all types of organization. The major challenge here is to decide when an equipment is in need of service. Maintenance should not be haphazard, it should be ordered.

(4) **Labour Cost:** The prime focus here are, what should be the extent and style of supervision and the type of incentive to be used to generate the right response and co-operation from the labour force?

(5) **Cost Control:** This is essentially an accounting function. It entails the collection and analysis of data on material, operating equipment and labour cost and comparisons made with previously determined standard costing.

3.3 SCHEDULING

The primary aim of scheduling is to balance the costs of production against demands for goods and services to ensure that demand is met in the most efficient way possible.

A key strategic consideration here is load-levelling which ensure that work is distributed as evenly as possible throughout the workforce, over the entire year and making efficient use of available equipment. Techniques or themes preferred to ensure optimal solution to the problems of production planning and scheduling includes:

- Queuing theory
- Linear programming
- Operation research.

3.4 SELF ASSESSMENT QUESTION

Mention and explain the techniques used to ensure optimal solution to the problem of scheduling.

3.5 SELF ASSESSMENT ANSWER

The techniques are:

- Queuing theory
- Linear programming
- Operation research.

NB: Brief explanations required.

4.0 CONCLUSION

System operation is a key aspect of the production system. It consists of operation planning, operation control and scheduling.

5.0 SUMMARY

The key aspects system operations are:

(i) Operation, planning which is primarily concerned with ensuring that sufficient goods or services are produced to meet demand.

(ii) Operation control, which consists of:

- Quantity control
- Quality control
- Technology control
- Labour cost
- Cost control.

(iii) Scheduling, which is aimed at balancing the cost of production against demand for goods and services.

6.0 TUTOR MARKED ASSIGNMENT

State and explain the various types of operations control.

6.1 TUTOR MARKED ASSIGNMENT (ANSWERS AND MARKING SCHEME)

The types of operations control are:

- Quantity control
- Quality control
- Technology control
- Labour cost
- Cost control.

MARKING SCHEME

2 marks for each type named

2 marks for each explanation

[Total – 20 marks]

7.0 REFERENCES

1. Needle, David (1999): Business in Context, (London),
Thomson Business Press

2. Hill, T., (1993): The Strategic Management of the Manufacturing Function,
Manufacturing Strategy:
2nd edition, (London), Macmillan

UNIT 12: THE PRODUCTION PROCESS AS A SYSTEM

TABLE OF CONTENT

1.0 INTRODUCTION

The unit will consider the process of transforming inputs into outputs.

2.0 OBJECTIVES

At the end of this unit, students should be able to:
(i) Identify the input of production.
(ii) Explain the process of converting input into output.
(iii) Identify the output of production.

3.0 THE PRODUCTION PROCESS AS A SYSTEM

3.1 INPUT OF PRODUCTION

Input are classified into three:

(a) **Environment Input**

This is informational in character and tends to provide operations manager with knowledge about conditions outside of the production system

(i) **Legal or Political Input:** establishes constraints within which the system must operate.

(ii) **Social and Economic Input:** This allows managers to identify the trends that may affect the production system in future.

(iii) **Technological Input:** This can be obtained from trade journals, government bulletins, trade associations, News letters, suppliers etc. They provide information concerning break through on technology that may affect machinery, tools or process.

(b) **Market Input:**

This also tends to be informational in character. It provides information concerning competitions product design customer desires etc.

(c) **Primary Resources:**

They directly support the production and delivery of goods and services. The resources are materials and suppliers, personnel, capital and capital goods and utilities such as gas, water, oil, coal and electricity.
Needle (1999) classified input as raw materials, people, energy, machine, fixed assets, methods of working and information.

3.2 PROCESS OF PRODUCTION

Production processes can be seen from two perspectives:

- The conversion of inputs by combining them to produce outputs.
- The support function that control the feedback mechanism to improve the input mix and conversion process.

To effectively actualize the above, it is necessary to choose an effective production processing system that best suits the organization.
Production processing systems are classified into:

- Product-focused system

- Process-focused system.

The Product-focused System groups together all of the machines, tools and workers needed to perform all of the tasks required to finish a product.
It is designed to produce a few standardized products in high quantity at low cost.
The Process-focused Systems are designed to produce many unique product designs in relatively low volumes. Here, the production department is designed to perform only one kind of task to a group of products being produced on batch production system.

3.3 OUTPUT OF PRODUCTION

Information gain during production process solves as feedback to the system and hence it can be considered as input to the system.
Needle (1999) classifies output as desired and undesired.

(a) **For the customer:**

Goods and services at an acceptable quality and price determined as required.

(b) **For the firm:**

- Profit
- Information
- Meeting costs
- Achieving objectives.

(c) **For the employee:**

- Wages
- Job satisfaction
- Security.

(d) **For the community:**

- Jobs
- Prosperity
- Support for other firms acting as subcontractors.

Undesirable output may include:

- Customer dissatisfaction
- Employee dissatisfaction
- Labour turn-over
- Financial losses
- Unacceptable waste
- Pollution.

3.4 SELF ASSESSMENT QUESTION

What are the undesirable output of production?

3.5 SELF ASSESSMENT ANSWER

The undesirable output are:

- Customer dissatisfaction
- Employee dissatisfaction
- Labour turn-over
- Financial losses
- Unacceptable waste
- Pollution.

4.0 CONCLUSION

The production system is a transformation process. It converts input into desirable output.

5.0 SUMMARY

The production system consists of input, process and output. Key input are raw materials, people, energy, machines, fixed assets, method of working and information while process refers to the conversion of input in combination to produce desirable output. Output are either desirable or undesirable.

6.0 TUTOR MARKED ASSIGNMENT

What are the input of production?

6.1 TUTOR MARKED ASSIGNMENT (ANSWERS AND MARKING SCHEME)

Needle (1999) identifies the input of production as raw materials, people, energy, machines, fixed assets, method of working and information. These can be broadly classified into:

- Environmental input
- Market input
- Primary Resources.

MARKING SCHEME

2 marks for each correctly named and explained.

[Total – 20 marks]

7.0 REFERENCES

1. Needle, David (1999): Business in Context, (London), Thomson Business Press

2. Asiegbu, B.C. (1999): Operation Management, (MBA course text; an unpublished work)

UNIT 13: PRODUCTION AND PRODUCTIVITY

TABLE OF CONTENT

1.0. INTRODUCTION

The unit will consider the concept of production and productivity with specific reference to capacity measurement and performance indices.

2.0. OBJECTIVES

At the end of this unit, students should be able to:
(i) Explain the concept of production and productivity.
(ii) Explain capacity measurement.
(iii) Discuss cycle time and labour requirement.

3.0. PRODUCTION AND PRODUCTIVITY

3.1. CONCEPT AND SCOPE

The words production and productivity are sometimes used interchangeably. Though they both lead to increase in output, there is a fundamental difference between them. While production increase can be obtained by increasing resources, productivity indicates how well the resources are used in production which may also lead to increase in production without necessarily increasing the level of resources.
When input resources are increased with a view at increasing the output, the outcome may be at the expense of productivity.
In like manner, production is a transformation process; it converts input into desirable output while productivity is the ration of output produced per unit of resources (worker/hour or machine/hour of services, quantity of materials or energy units) consumed by the process and activity of production/distribution which fulfill what most people desire or need [Chen et al (1982)].
It has direct impact on economic and social level growth pattern, living standard, balance of payment position, inflation and leisure level, with consequent effect on wage level, cost price, relationship and capital utilization.

3.2 CAPACITY MEASUREMENT

Planned capacity is based on some units of measurement that are common to the mix of the products.
Tonnes, Metres, and Standard Hours are sometimes used. Tonne is a weight measurement commonly used in the industry, while Metre is a unit for length measurement. Industries are either vertically or horizontally designed for single products either in sections or a whole plant. Standard hours are used in batch manufacturing industries because some operations sometimes involve many components which are normally carried out using the same facility.
Standard hours give a measure of how long it takes a process or workpiece to pass through each operation. This depends on working parameters such as speed and feed rate.
Capacity utilization is expressed in terms of installed capacity based on any of the above units to determine how efficiently the productive resources are utilized.

3.3 CYCLE TIME AND LABOUR REQUIREMENT

Processing systems are either automatic, semi-automatic or batch. In automatic systems, operations are required to load and set the machine running. They are also required to unload, clean and carry out minor adjustments to enhance efficient operation. The number of operatives required depends on the number of machines an operator can tend to at a time. Since all the machines cannot develop faults, at the same time, the operator is free to attend to the one demanding his attention while other machines are running. A perfect balance is, however, difficult to attain in the assignment process. Lockyer (1983) assumes that work to carry out in different machines should be identical in terms of cycle time, that is the actual processing time, unloading and allowance for personnel and other needs. In addition to machine capability, there is the need to consider the workers' performance in tending to machines in capacity assessment Using Time Study, the time to perform a particular task is derived and converted to basic time, using the rating factors. Relaxation and other contingency allowances are added to get what is known as Standard Time.

This is refers to the total time in which a job is to be completed at standard performance. A higher standard performance means that the job will be completed at less time than assigned, hence a reduction in Cycle Time.

If on the average the performance is higher than the standard, performance is assumed to be 100%, and then there will be an increase in capacity availability.

3.4 SELF ASSESSMENT QUESTION

What is the relationship between Cycle Time and Labour Requirement?

3.5 SELF ASSESSMENT ANSWER

Cycle Time refers to the actual processing time plus unloading and other allowances for personnel and other needs while standard performance is standard time required to perform a task. Where the standard performance is higher, then the job will completed in less than the assigned time and hence a reduction in cycle time and consequently less labour required.

4.0 CONCLUSION

Machine productivity is enhanced by labour productivity.

5.0 SUMMARY

Productivity study is primarily aimed at the best way to improve production at a reduced cost. Capacity measurement should take cognizance of workers' performance through the use of time study. Our knowledge of standard and actual performance will help us not only to capacity availability but also labour requirement.

6.0 TUTOR MARKED ASSIGNMENT

What is production?

6.1 TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

According to Chen et al (1982), Productivity is the ratio of output produced per unit of resources worker/hour machine/hour of service; quantity of materials or energy units) consumed by the process and activities of production/distribution which fulfill what most people desire or need. Productivity has direct impact on economic and social level, growth pattern, living standard, balance of payment position. Inflation or leisure level with consequent effects on wage levels, cost price, relationship, capital investment needs and capital utilization.

MARKING SCHEME

2 points for each element of productivity correctly named and briefly explained

[Total – 20 marks]

7.0 REFERENCES

1. Needle, David (1999): Business in Context, (London), Thomson Business Press

2. Asiegbu, B.C. (1999): Operation Management, (MBA course text; an unpublished work)

UNIT 14: FACTORY AND WORK PLACE LAYOUT

TABLE OF CONTENT

1.0 INTRODUCTION

The unit will address the concept and scope of factory and work place layout.

2.0 OBJECTIVES

At the end of this unit, students should be able to:
(i) Explain the meaning of Factory Layout.
(ii) State the advantages of Process Layout.
(iii) State the merits of Product Layout.

3.0 FACTORY AND WORK PLACE LAYOUT

3.1 THE CONCEPT AND SCOPE OF FACTORY LAYOUT

Factory Layout is the arrangement of machines, offices, equipments, light and electrical outlets, store rooms and all other facilities in the plant or office. A good layout permits the efficient flow of materials through the work areas, makes maximum use of the available space and minimize handling, clerical, transportation and inventory.

Most factories engage in re-layout of existing facilities rather than design an arrangement for new equipment in the new building. Starting from scratch and conceiving a layout of equipment around which a building will be constructed is a challenge, but a re-layout of existing facilities is perhaps more challenging.

In an ideal factory, the new material may come in at one end, pass through all the processes of manufacture and emerge as the finished product for dispatch at the other end.

In like manner, raw materials may come in at one door, pass right round the factory, undergoing various operations and go out at the same time.

The principles of straight line flow are still valid, even where there several parts going into the finished products, although it may necessary to introduce converging lines, of flow with components or parts stored at various points on the production line.

The various recording techniques used in the study of factory layout and work flow are:

- Process charts
- Flow diagrams
- String diagrams
- Multiple activity charts.

3.2. PROCESS LAYOUT

In process layout, similar equipment, that is machine that perform similar functions, are grouped together. It is also referred to as functional layout. Each department consists of groups of similar machine or people doing similar jobs such as carding, drawing, spinning etc. All these activities are collectively referred to as spinning process or operations in textile industries.

3.3. PRODUCT LAYOUT

A product layout groups equipment so that all the various kinds of equipment necessary to make a single product or product line are located close together. When departments are created in this fashion, such department. For instance, a hypothetical electronic firm may have such departments as television, radio, GSM phones, computers etc. In textile mills, product layouts are typified with such labels as testing room, carding room etc.

3.3.1. ADVANTAGES OF PROCESS AND PRODUCT LAYOUT

The advantages of product layout are:

- Lower material handling cost
- Materials are moved mechanically from one work station to another and the stations are grouped close together
- Less time is required to manufacture the product
- There is less work in process
- Lower skills are required by workers.

The main advantage of process layout is its flexibility. A wide variety of processes may involve the same type of equipment but in different sequences.

3.4. SELF ASSESSMENT QUESTION

State the advantages of Product Layout.

3.5. SELF ASSESSMENT ANSWER

The advantages are:

- Lower material handling cost
- Less time is required to manufacture the product
- There is less work in process
- Lower skills are required by workers.

4.0. CONCLUSION

For easy mobility, a good factory layout is required. A good factory layout will facilitate free-flow movement of personnel and materials.

5.0. SUMMARY

Factory Layout is the arrangement of machines, offices, equipment, light electrical outlets, store room and all other facilities in the plant or office.

The prime object of Factory Layout is to permit the efficient flow of people and materials.

6.0. TUTOR MARKED ASSIGNMENT

What are Factory and Work Place Layout?

6.1. TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

Factory Layout is the arrangement of different departments, machines, equipment, store etc to minimize excessive handling of materials and workers. Where the converse is the case (that is bad layout), it adds to the cost of the final product without adding any value. A good layout ensures efficient flow of material through the work areas and makes maximum use of available space. There are two types of layout. These are:

- Product Layout
- Process Layout.

MARKING SCHEME

2 marks for every accurate identification and brief explanation of Factory and Work-place Layout

[Total – 20 marks]

7.0. REFERENCES

1. Pitfield, R. Ronald (1984): Business Organization, (London), M & E Handbooks

2. Needle, David (1999): Business in Context, (London), Thomson Business Press

UNIT 15: AGGREGATE PRODUCTION PLANNING

TABLE OF CONTENT

1.0. INTRODUCTION

This unit will consider one of the methodologies of production planning and control

2.0. OBJECTIVES

At the end of this unit, students should be able to:
(i) Explain the concept of Aggregate Production Planning.
(ii) Identify the factors that will enable managements to decide whether to produce-to-order or produce-to-stock.
(iii) Identify the problems inherent in Aggregate Plans for services.

3.0. AGGREGATE PRODUCTION PLANNING

3.1. CONCEPT AND SCOPE

Aggregate planning entails devising a plan for providing production capacity for the next six to eighteen months given nine forecast of demand for products.

The plan will spell out the amount of straight time and over-time labour, amount of subcontracting and other sources of capacity to the used.

Aggregate plans are aimed at the accomplishment of two goals.
- Provide enough production capacity to satisfy market demand
- Keep production cost low.

The process of planning the quantity and timing of output from a manufacturing or service system over the medium term is usually achieved by adjusting the production ratio, inventory level and other controllable variables.

It derives its information from product demand forecast, customer order, inventory level and factory capacity level.

The process makes use of such planning models as:
- Linear programming
- Fixed cost model
- Feed back control model
- Quailing theory model
- Heuristic decision rules
- Search decision rules
- Simulation models.

3.1.1. STEPS OF AGGREGATE PRODUCTION PLANNING

The steps are:
- Begin with a sale forecast for each product that indicates the quantity to be sold in each time period.
- Total all the individual products or services forecast into one aggregate demand for a factory.

- Transform the aggregate demand for each time period into workers, materials, machines and other elements of production capacity required to satisfy aggregate demand.
- Develop alternative resources schemes of supplying the necessary production capacity to support the cumulative aggregate demand.
- Select the capacity plan for among the alternative.

3.2. AGGREGATE PLANS FOR PRODUCE-TO-STOCK VERSUS PRODUCE-TO-ORDER

	PRODUCE-TO-STOCK	PRODUCE-TO-ORDER
1.	Finished products inventory buffers the difference between the level of production capacity and the variable quantity demand.	The firm begins production only when orders are received; the purpose of buffering growth cannot be achieved.
2.	Finished product storage serves the same purpose as backlog in produce-to-order.	There is backlog because demand exceeds production capacity.
3.	No difficulty is encountered in forecasting demand.	Encounters difficulty of forecasting the levels of production capacity due to lack of production standardization.

3.2.1. FACTORS THAT DETERMINE THE CHOICE BETWEEN THE PLANS

Which management decision to adopt the produce to stock or produce to order plan is determined by the following factors:

- The cost
- Positive management-union relations
- Fatigue, reduced morale and increased cost could eventually result from working too much over-time on a continual basis
- Product quality might be better with the time plan because all production would be in-house and under direct control of the plant.
- The flexibility of increasing or decreasing production level.

3.3. AGGREGATE PLANS FOR SERVICES

Aggregate planning is simpler in a service system that supplies standard services to customers than in a system that produces products. Common examples of service system are fast food outlets, eateries etc.

Where a service system supplies, customized services to customers, difficulty will rise in course of specifying the nature and extent of service, and hence aggregate planning becomes difficult. Examples of such systems are hospitals, computer service centres, automobile body repair shops etc.

Key problems associated with aggregate plan for service are:

- In customized service, the customer is an integral part of the production system.
- The absence of finished product storage as a buffer of the difference between system capacity and customer demand
- Scaling of production capacity up and down may alter the perceived quality of the delivered services.

Techniques designed to solve these problems are:

- The use of appointment schedules
- The use of after-hours window service
- Creating extra capacity
- Using demand and capacity as a marketing strategy where a product develops a rarity value and cult status.

3.4. SELF ASSESSMENT QUESTION

Identify the problems associated with aggregate plan for service.

3.5. SELF ASSESSMENT ANSWER

- The customer is an integral part of the production system which makes the process unpredictable
- The absence of finished product storage as a buffer of the difference between system capacity and customer demand.
- Scaling of production capacity up and down may alter the perceived quality of delivered service.

4.0. CONCLUSION

Now that you have gone through this unit, you can clearly show that aggregate plan is aimed at providing enough production capacity to satisfy market demand at the lowest possible cost.

5.0. SUMMARY

Aggregate plan involves devising a plan for production capacity for a period not less than six months. The primary aim is to ensure enough production capacity to meet market demand and lowest cost possible.

Aggregate planning requires information. The choice between production-to-order and production-to-stock is determined by certain factors.

6.0. TUTOR MARKED ASSIGNMENT

Itemize the necessary steps in Aggregate Planning

6.1. TUTOR MARKED ASSIGNMENT (ANSWER AND MARKING SCHEME)

The steps in Aggregate Planning are:

- Begin with a sale forecast for each product that indicates the quantity to be sold in each time period.
- Total all the individual products or services forecast into one aggregate demand for a factory.
- Transform the aggregate demand for each time period into workers, materials, machines and other elements of production capacity required to satisfy aggregate demand.
- Develop alternative resources scheme to supplying the necessary production capacity to support the cumulative aggregate demand
- Select the capacity plan from among the alternatives.

MARKING SCHEME

4 marks for each step correctly named and explained

[Total – 20 marks]

7.0. REFERENCES

1. Needle, David (1999): Business in Context, (London), Thompson Business Press

2. Asiegbu B.C (1999): Operation Management (MBA course text; an unpublished work)