DEPARTMENT OF EDUCATION

GRADE 12 BUSINESS STUDIES

MODULE 2 MANAGING OPERATIONS

FODE DISTANCE LEARNING

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GRADE 12

BUSINESS STUDIES

MODULE 2

MANAGING OPERATIONS

Acknowledgements

We acknowledge the contributions of all Primary Teachers who in one way or another helped to develop this course.

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DIANA TEIT AKIS

PRINCIPAL

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SECRETARY'S MESSAGE

Achieving a better future by individuals students, their families, communities or the nation as a whole, depends on the curriculum and the way it is delivered.

This course is part and parcel of the new reformed curriculum. Its learning outcomes are student centred and written in terms that allow them to be demonstrated, assessed and measured.

It maintains the rationale, goals, aims and principles of the National Curriculum and identifies the knowledge, skills, attitudes and values that students should achieve.

This is a provision of Flexible, Open and Distance Education as an alternative pathway of formal education.

The Course promotes Papua New Guinea values and beliefs which are found in our constitution, Government policies and reports. It is developed in line with the National Education Plan (2005 – 2014) and addresses an increase in the number of school leavers which has been coupled with a limited access to secondary and higher educational institutions.

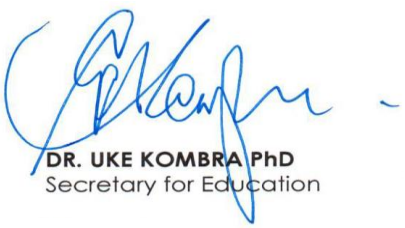
Flexible, Open and Distance Education is guided by the Department of Education's Mission which is fivefold;

- to facilitate and promote integral development of every individual
- to develop and encourage an education system which satisfies the requirements of Papua New Guinea and its people
- to establish, preserve, and improve standards of education throughout Papua New Guinea
- to make the benefits of such education available as widely as possible to all of the people
- to make education accessible to the physically, mentally and socially handicapped as well as to those who are educationally disadvantaged

The College is enhanced to provide alternative and comparable path ways for students and adults to complete their education, through one system, many path ways and same learning outcomes.

It is our vision that Papua New Guineans harness all appropriate and affordable technologies

I commend all those teachers, curriculum writers and instructional designers, who have contributed so much in developing this module.



STUDY GUIDE

Below are the steps to guide you in your course study.

Step 1: Start with Topic 12.2.1, study the first sub-topic notes and do the Learning Activities as you go along. Turn to the back of your module to correct the answers of your learning activities

Step 2: When you have completed the first sub-topic notes, then, you can move on to the next sub-topic. Continue to do the Learning Activities as you go along. Turn to the back of your module to correct the answers of your learning activities.

Step 3: If you make any mistake, go back to the notes in your module and revise the notes well and try to understand why you gave an incorrect answer.

Step 4: After completing your 12.2.1, then, complete the Topic Test in the Assessment Book.

Step 5: Go to topic 12.2.2 and repeat the same process in step 2, 3, and 4 until you complete your second topic. You will also repeat the same process until you complete your third topic.

Step 6: After you have completed your three (3) topics, do also the Module Examination in the Assessment Book.

Step 7: Check through your Assessment Book, when you are satisfied, then submit your Assessment Book to your provincial centre for marking.

Here is a Study Schedule. It will guide you to complete your module and its assessment.

WEEKS	TOPICS/SUB-TOPICS	ASSESSMENT	COMMENTS
1-3	Topic 12.2.1	Topic 12.2.1 test	
4-6	Topic 12.2.2	Topic 12.2.2 test	
7-8	Topic 12.2.3	Topic 12.2.3 test	
9		Module examination	
10	Submit your assessment Book 1 to your Provincial Centre for marking		

Remember

As you complete each lesson, tick the box on the contents' page. This shows what you have done and what you still have to do in each topic.

All the best and enjoy your studies with FODE-Business Studies.

CONTENT

MODULE 2 MANAGING OPERATIONS

INTRODUCTION

In this module, you will learn the roles of management in order to transform inputs into final production of goods and services. The production of the product or delivery of the service is the core objective of any business organization. The study of Operations Management allows you to consider the best and most responsible use of all available resources for producing a quality product or service in an environmentally friendly way.

Learning Outcomes;

On successful completion of this module, students will be able to:

- identify and describe the key elements of operations management in determining input in order to generate an environmentally responsible finished product.
- use a case study of an industry to demonstrate understanding of the need for industry to combine inputs to generate environmentally responsible finished product.

Time Frame

This module should be completed within 10 weeks.

If you set an average of 3 hours per day, you should be able to complete the module comfortably by the end of the assigned week.

Try to do all the learning activities and compare your answers with the ones provided at the end of the unit. If you do not get a particular exercise right in the first attempt, you should not get discouraged but instead, go back and attempt it again. If you still do not get it right after several attempts then you should seek help from your friend or even your tutor. Do not pass any question without solving it first.

12.2.1 Concept and Nature of Operations Management

In this section you will study the concept and nature of Operations Management. In particular the Production System, Operations Management, Roles of Operations Manager, Production of Goods, Managing Goods and Services Operations and Ethics and Social Responsibility in Operation. As you read through and study this section it will give you an insight of the importance of Managing Operations System in a business organization. The concept and nature of Operations differ according to the type of activity that is carried out in that organization.

Learning Outcomes;

On successful completion of this module, students will be able to:

- identify and describe the key elements of operations management in determining input in order to generate an environmentally responsible finished product.
- use a case study of an industry to demonstrate understanding of the need for industry to combine inputs to generate environmentally responsible finished product.

12.2.1.1 Production System

Production System

Production function is that part of an organization, which is concerned with the transformation of a range of inputs into the required outputs (products) having the requisite quality level.

Meaning of Production

Production is defined as "the step-by-step conversion of one form of material into another form through chemical or mechanical process to create or enhance the utility of the product to the user."
Thus production is a value addition process. At each stage of processing, there will be value addition.

Elwood Buffa defines production as '*a process by which goods and services are created*'.

Some examples of production are: manufacturing custom-made products like boilers with a specific capacity, constructing flats, and some structural fabrication works for selected customers, and manufacturing standardized products like cars, buses, motor cycles, radios and television sets.

Production is a method employed for making or providing essential goods and services for consumers. It is a process that puts intangible inputs like ideas, creativity, research, knowledge, and wisdom, in use or action. It is a way that transforms (converts) tangible inputs like raw-materials, semi-finished goods and unassembled goods into finished goods or commodities.

Meaning of System

System is an arrangement or assembly of inter-dependent processes (activities) that are based on some logic and function. It operates as a whole and is designed (built) with an intention to achieve (fulfill) some objectives or do some work. Huge systems are often a collection (assembly) of smaller sub-systems.

Production System

Production system may be defined as; "the methods, procedure or arrangement which includes all functions required to accumulate (gather) the inputs and deliver the marketable output (goods)".Production system utilizes materials, funds, infrastructures, and labor to produce the required output in the form of goods. Production system consists of three main components: inputs, transformation process, and output.

1. Input – includes raw- materials, machines, man-hours, components or parts, drawing instructions and other paper works.

2. Transformation/conversion process- includes operations (actual production process). Operations may be manual, mechanical or chemical. Operations transform inputs into

outputs. Transformation process also includes supporting activities, which help the process of transformation.

The supporting activities include;
Production plans and control purchase of raw materials, receipt, storage and issue of materials, inspection of parts and work-in progress, testing of products, quality control and warehousing of finished products.

3. Output- includes finished products, finished goods (parts) and services.

A production system is illustrated in this diagram.

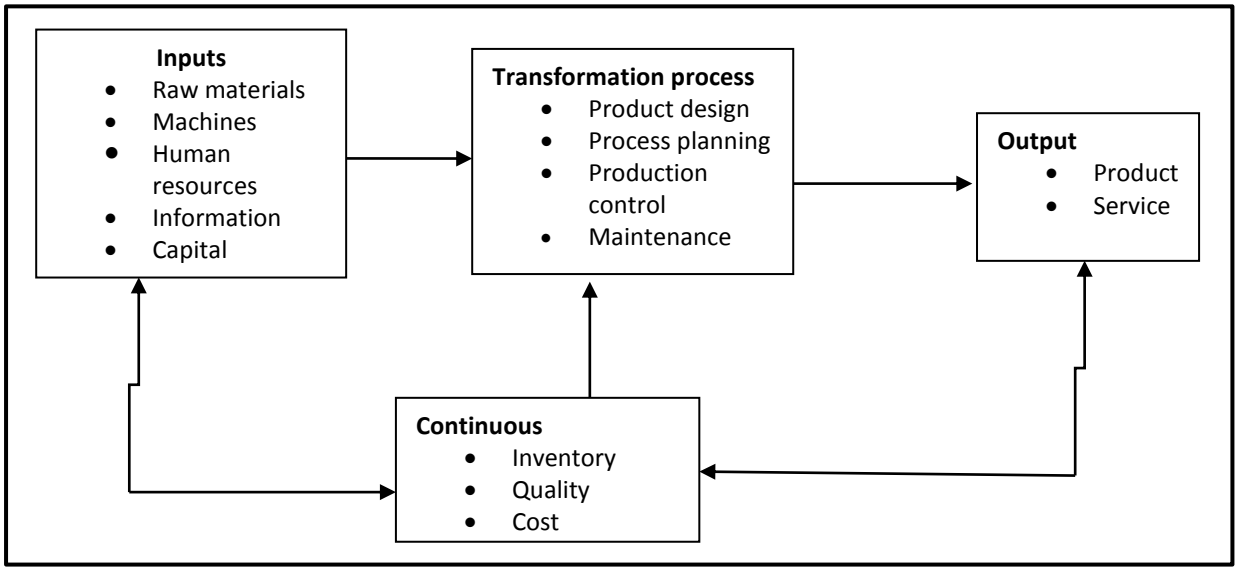


Fig. 1.1. Schematic Production System.

The production system of an organization is that part, which produces products of an organization. It is that activity whereby resources, flowing within a defined system, are combined and transformed in a controlled manner to add value in accordance with the policies communicated by management.

A simplified production system is shown above.

The production system has the following characteristics:

1. Production is an organized activity, so every production system has an objective.

2. The system transforms the various inputs to useful outputs.

3. It does not operate in isolation from the other organization system.

4. There exists a feedback about the activities, which is essential to control and improve system performance.

Classification of Production System

Production systems can be classified as Job Shop, Batch, Mass and Continuous Production systems.

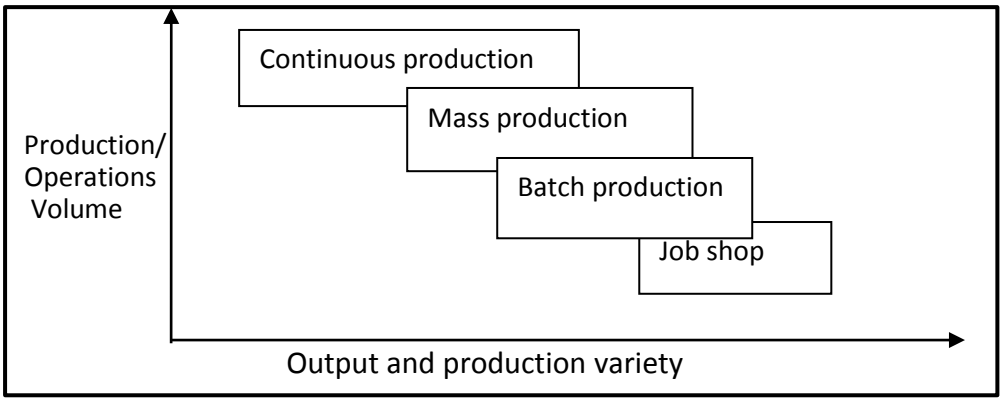


Fig. 1.2 Classification of production systems.

- **JOB SHOP PRODUCTION**

Job shop production are characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed small time and cost. The distinguishing feature of this is low volume and high variety of products. A job shop comprises of general purpose machines arranged into different departments. Each job demands unique technological requirements, demands processing on machines in a certain sequence.

Characteristics

The Job-shop production system is followed when there is:

1. High variety of products and low volume.
2. Use of general purpose machines and facilities.
3. Highly skilled operators who can take up each job as a challenge because of uniqueness.
4. Large inventory of materials, tools, parts.
5. Detailed planning is essential for sequencing the requirements of each product, capacities for each work centre and order priorities.

Advantages

Following are the advantages of job shop production:

1. Because of general purpose machines and facilities variety of products can be produced.
2. Operators will become more skilled and competent, as each job gives them learning opportunities.
3. Full potential of operators can be utilized.
4. Opportunity exists for creative methods and innovative ideas.

Limitations/Disadvantages

Following are the limitations of job shop production:

1. Higher cost due to frequent set up changes.
2. Higher level of inventory at all levels and hence higher inventory cost.
3. Complicated production planning.
4. Larger space requirements.

- **BATCH PRODUCTION**

Batch production is defined by American Production and Inventory Control Society (APICS) "as a form of manufacturing in which the job passes through the functional departments in lots or batches and each lot may have a different routing." It is characterized by the manufacture of limited number of products produced at regular intervals and stocked awaiting sales.

Characteristics

Batch production system is used under the following circumstances:

1. When there are shorter production runs
2. When plant and machinery are flexible
3. When plant and machinery set up is used for the production of items in a batch and change of set up is required for processing the next batch
4. When manufacturing lead time and cost are lower as compared to job order production.

Advantages

Following are the advantages of batch production:

1. Better utilization of plant and machinery.
2. Promotes functional specialization.
3. Lower cost per unit as compared to job order production.
4. Lower investment in plant and machinery.
5. Flexibility to accommodate and process number of products.
6. Job satisfaction exists for operators.

Limitations / Disadvantages

Following are the limitations of batch production:

1. Material handling is complex because of irregular and longer flows.
2. Production planning and control is complex.
3. Work in process inventory is higher compared to continuous production.
4. Higher set up costs due to frequent changes in set up.

- **MASS PRODUCTION**

Manufacture of discrete parts or assemblies using a continuous process is called mass production.

This production system is justified by very large volume of production. The machines are arranged in a line or product layout. Product and process standardization exists and all outputs follow the same path.

Characteristics

Mass production is used under the following circumstances:

1. standardization of product and process sequences is technically feasible.
2. there are dedicated special-purpose machines having higher production capacities and output rates.
3. the volume of products is large.
4. shorter cycle time of production.
5. there is lower in process inventory.
6. production lines can be perfectly balanced.
7. flow of materials, components and parts is continuous and without any back tracking.
8. production planning and control is easy.
9. material handling can be completely automatic.

Advantages

Following are the advantages of mass production:

1. Higher rate of production with reduced cycle time
2. Higher capacity utilization due to line balancing
3. Less skilled operators required
4. Low process inventory
5. Manufacturing cost per unit is low.

Limitations/ Disadvantages

Following are the limitations of mass production:

1. Breakdown of one machine will stop an entire production line
2. Line layout needs major change with the changes in the product design
3. High investment in production facilities
4. The cycle time is determined by the slowest operation.

- **CONTINUOUS PRODUCTION**

Production facilities are arranged as per the sequence of production operations from the first operations to the finished product. The items are made to flow through the sequence of operations by using material handling devices such as conveyors, and transfer devices.

Characteristics

Continuous production is used under the following circumstances:

1. Dedicated plant and equipment with zero flexibility.
2. Material handling is fully automated.
3. Process follows a predetermined sequence of operations.

4. Component materials cannot be readily identified with final product.
5. Planning and scheduling is a routine action.

Advantages

Following are the advantages of continuous production:

1. Standardization of product and process sequence.
2. Higher rate of production with reduced cycle time.
3. Higher capacity utilization due to line balancing.
4. Manpower is not required for material handling as it is completely automatic.
5. Person with limited skills can be used on the production line.
6. Unit cost is lower due to high volume of production.

Limitations/ Disadvantages

Following are the limitations of continuous production:

1. Flexibility to accommodate and process number of products does not exist.
2. Very high investment for setting flow lines.
3. Product differentiation is limited.

Reasons for production

The six reasons for production are;

1. Manufacturing has been the path to **development**. It has been the strategic achievement of rich nations over the last several hundred years to create a high quality manufacturing sector in order to develop national wealth and power.This depicts how rich countries got rich and how poor countries stay poor.

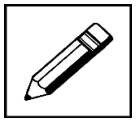
2. Manufacturing is the foundation of global **Great Power**". The most powerful nations in the world, the Great Powers are those that control the bulk of the global production of goods, and have the most advanced, manufacturing technology. That means it is not enough simply to have factories and produce more goods, you have to know how to make the machinery that makes the goods.That is the key to economic power.

3. Manufacturing is the most important cause of **economic growth**. The growth of manufacturing machinery output, and technological improvements in that machinery, are the main drivers of economic growth. **No machinery industries, no sustained, long-term economic growth.**

4. **Global trade** is based on goods, not services. A country cannot trade services for most of its goods. According to O.C Ferrell. (1989) the World Trade Organization (WTO), 80% of world trade among regions is merchandise trade that is; only 20% of world trade is, in services. If in the extreme case where an economy was composed only of services, then it would, be very poor. However for the economies of Hong Kong and Singapore, they have a large service sector but both places are quite wealthy, because it could not trade for goods; its currency would be worth very little.

5. **Services** are dependent on manufactured goods. Services are mostly the act of using manufactured goods. For example in the case of business process outsourcing like call centres, other customer contact centres, and technical support centres.

6. Manufacturing **creates jobs**. Most jobs, directly or indirectly, depend on manufacturing and reviving the sector, could provide tens of millions of new jobs, eradicating the Great Recession



Learning Activity 12.2.1.1: Complete the activities given below.

1. In brief, discuss what is a production system.

_____
_____
_____

2. Define transformation process and identify the activities involved.

_____
_____
_____
_____

3. Briefly discuss what a finished product is in production.

_____
_____
_____
_____

4. Identify the classification of production systems and briefly explain each.

a._____
b._____
c._____
d._____

_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.1.2 Operations Management

Every organization has an operations function, whether or not it is called 'operations'. The goal or purpose of most organizations involves the production of goods and/or services. To do this, they have to procure resources, convert them into outputs and distribute them to their intended users. The term operations embraces all the activities required to create and deliver an organization's goods or services to its customers or clients. Within large and complex organizations operations is usually a major functional area, with people specifically designated to take responsibility for managing all or part of the organization's operations processes. It is an important functional area because it plays a crucial role in determining how well an organization satisfies its customers. In the case of private-sector companies, the mission of the operations function is usually expressed in terms of profits, growth and competitiveness; in public and voluntary organizations, it is often expressed in terms of providing value for money.

What is Operations Management?

Operations management is concerned with the design, management, and improvement of the systems that create the organization's goods or services. The majority of most organizations' financial and human resources are invested in the activities involved in making products or delivering services. Operations management is therefore critical to organizational success.
Managing operations can be enclosed in a frame of general management function as shown in Fig. 1.3. Operation managers are concerned with planning, organizing, and controlling the activities which affect human behavior through models.

Planning

Planning refers to activities that establish an end-result or goal, a course of action to achieve and a guide for future decision-making.The operations manager defines the objectives for the operations subsystem of the organization, and the policies, and procedures for achieving the objectives. This stage includes clarifying the role and focus of operations in the organization's overall strategy. It also involves product planning, facility designing and using the conversion process.

Organizing

Organizing refers to activities that establish a structure of related tasks and authority that collectively achieves the goal.Operation managers establish a structure of roles and the flow of information within the operations subsystem. They determine the activities required to achieve the goals and assign authority and responsibility for carrying them out.

Controlling

Controlling refers to activities that assure that the actual performance is in accordance with planned performance. To ensure that the plans for the operations subsystems are accomplished, the operations manager must exercise control by measuring actual outputs and comparing them to planned operations management. Controlling costs, quality, and schedules are the important functions here.

Behaviour

Operation managers are concerned with how their efforts to plan, organize, and control affect human behavior. They also want to know how the behavior of subordinates can affect management's planning, organizing, and controlling actions. Their interest lies in decision-making and other forms of leading.

Models

As operation managers plan, organize, and control the conversion process, they encounter many problems and must make many decisions. They can simplify their difficulties using models like *aggregate planning models* for examining how best to use existing capacity in short-term, *break even analysis* to identify break even volumes, *linear programming and computer simulation* for capacity utilization, *decision tree analysis* for long-term capacity problem of facility expansion and *simple median model* for determining best locations of facilities.

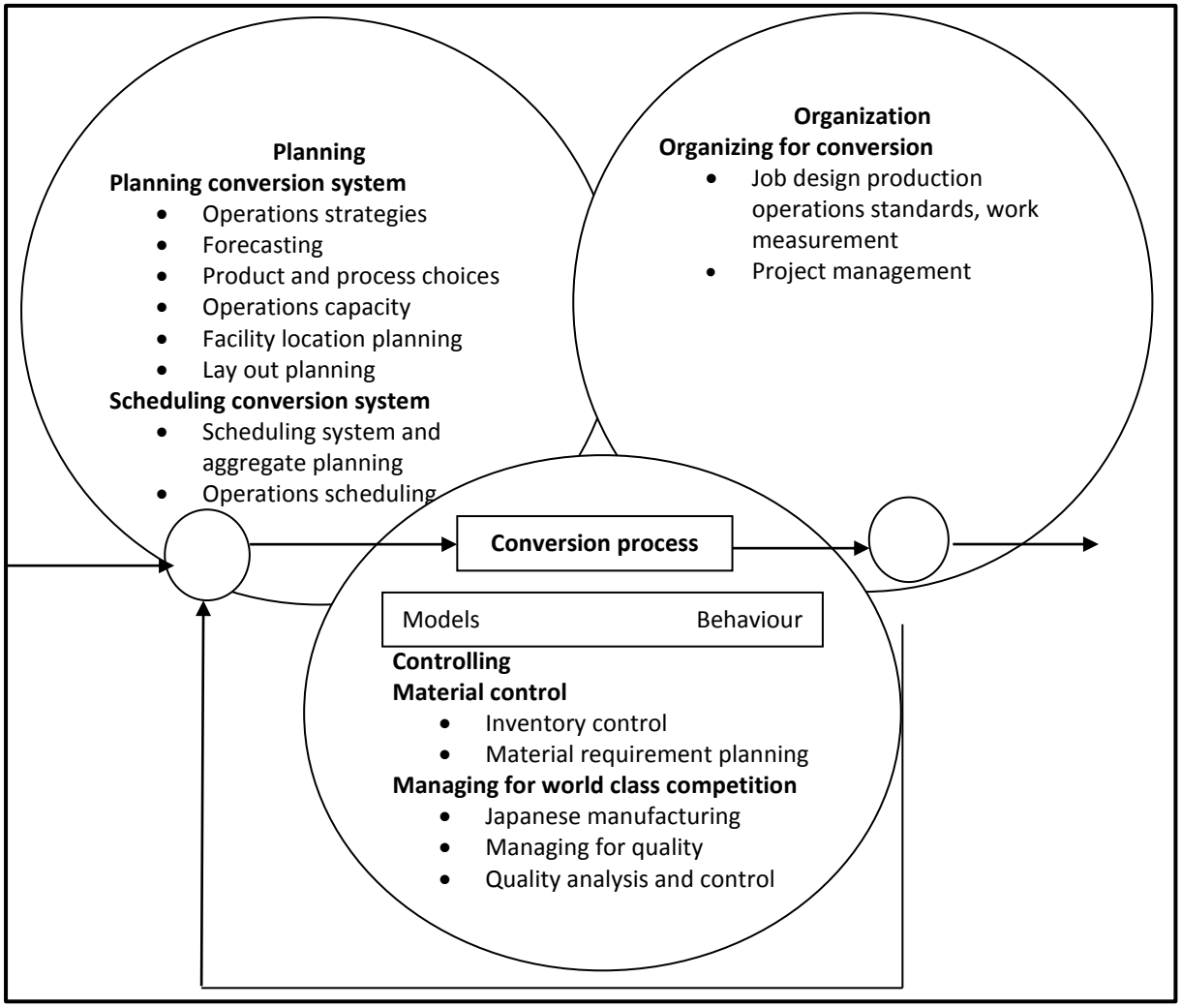


Fig. 1.3. General model for managing operations.

Distinction between Manufacturing Operations and Service Operations

The following characteristics can be considered for distinguishing manufacturing operations from service operations:

1. Tangible/Intangible nature of output
2. Consumption of output
3. Nature of work (job)
4. Degree of customer contact
5. Customer participation in conversion
6. Measurement of performance

Manufacturing is characterized by tangible outputs (products), outputs that customers consume overtime, labor intensive, more equipment, little customer contact, no customer participation in the conversion process (in production), and sophisticated methods for measuring production activities and resource consumption as products are made.

Service is characterized by intangible outputs, outputs that customers consume immediately, jobs that use more labor and less equipment, direct consumer contact, frequent customer participation in the conversion process, and elementary methods for measuring conversion activities and resource consumption. Some service operations (Example; telecommunications, electric power generation and distribution, air transportation, and marine transportation) can be quite capital intensive.

Objectives of Operations Management

Objectives of operations management can be categorized into customer service and resource utilization.

Customer Service

The first objective of operating systems is the customer service to the satisfaction of customer wants. Therefore, customer service is a key objective of operations management. The operating system must provide something to a specification which can satisfy the customer in terms of quality, cost, and timing or reliability of delivery. Thus, primary objective can be satisfied by providing the **'right thing at a right price at the right time'**. These aspects of customer service—specification, cost and timing—are described for four functions in Table 1.1. They are the principal sources of customer satisfaction and must, therefore, be the principal dimension of the customer service objective for operations managers.

Principal Function	Principal Customer Wants	
	Primary Considerations	**Other Considerations**
Manufacture	Goods of a given, requested or acceptable specification	Cost, that is; purchase price or cost of obtaining goods.
Transport	Management of a given, requested or acceptable specification.	Timing, that is, delivery delay from order or request to receipt of goods. Cost, that is., cost of movements. Timing, that is. 1. Duration or time to move. 2. Wait or delay from requesting to its commencement.
Supply	Goods of a given, requested acceptable specification or	Cost, that is, purchase price or cost of obtaining goods. Timing, that is, delivery delay from order or request to receipt of goods
Service	Treatment of a given, requested or acceptable specification.	Cost, that is, cost of movements. Timing, that is. 1. Duration or time required for treatment. Wait or delay from requesting treatment to its commencement.

Table 1.1. Principal sources of customer satisfaction.

In addition customers everywhere want three things at the same time, without trade-offs:

(1) Quality – the product/ service must be able to satisfy customer needs and wants; (2) Cost – the price charged (and the costs of ownership and operation) must be reasonable, affordable, and competitive;

(3) Delivery – the product/service must be available when needed, where needed, and delivered the right way with the right documentation.

Generally an organization will aim reliably and consistently to achieve certain standards and operations manager will be influential in attempting to achieve these standards. Hence, this objective will influence the operations manager's decisions to achieve the required customer service.

Resource Utilization

Another major objective of operating systems is to utilize resources for the satisfaction of customer wants effectively, that *is;* customer service must be provided with the achievement of effective operations through efficient use of resources. Inefficient use of resources or inadequate customer service leads to commercial failure of an operating system. Operations management is concerned essentially with the utilization of resources, that is, obtaining maximum effect from resources or minimizing their loss, underutilization or waste. The extent of the utilization of the resources' potential might be expressed in terms of the proportion of available time used or occupied, space utilization, and levels of

activity. Each measure indicates the extent to which the potential or capacity of such resources is utilized. This is referred to as the objective of resource utilization.

Operations management is also concerned with the achievement of both satisfactory customer service and resource utilization. An improvement in one will often give rise to deterioration in the other. Often both cannot be maximized, and hence a satisfactory performance. However under certain conditions, it will be possible to have both satisfactory customer service and high resource utilization. To do this, mistakes in the process must be prevented, and the process design must be customer focused from the beginning. All the activities of operations management must be tackled with these objectives in mind. Many problems will be faced by operations managers because of this conflict. Hence, operations managers must attempt to achieve these basic objectives.

Table 1.2 summarizes the twin objectives of operations management. The type of balance established both between and within these basic objectives will be influenced by market considerations, competition, the strengths and weaknesses of the organization. Hence, the operations managers should make a contribution when these objectives are set.

The customer service objective. To provide agreed/adequate levels of customer service (and hence customer satisfaction) by providing goods or services with the right specification, at the right cost and at the right time.	The resource utilization objective. To achieve adequate levels of resource utilization (or productivity) example, to achieve agreed levels of utilization of materials, machines and labor

Table 1.2. The twin objectives of operations management.

Learning Activity 12.2.1.2: Complete the activities given below.

1. Explain what Operations Management is.

_____
_____

2. Distinguish between manufacturing and service operation.

_____
_____

3. Explain the main scope of operations management, planning, controlling and organizing.

- Planning

  _____
  _____
  _____

- Controlling

  _____
  _____
  _____

- Organizing

_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.1.3 Roles of an Operations Manager

Some people (especially those professionally involved in operations management) argue that operations management involves everything an organization does. In this sense, every manager is an operations manager, since all managers are responsible for contributing to the activities required to create and deliver an organization's goods or services. However, others argue that this definition is too wide, and that the operations function is about producing the right amount of a good or service, at the right time, of the right quality and at the right cost to meet customer requirement.

A stereotypical example of an operations manager would be a plant manager in charge of a factory, such as an automobile assembly plant. But other managers who work in the factory – quality managers, production and inventory control managers, and line supervisors – can also be considered to be working in operations management. In service industries, managers in hotels, restaurants, banks and stores are operations managers. In the not-for-profit sector, the manager of a nursing home or day centre for older people is an operations manager, as is the manager of a local government tax-collection office and the manager of a charity shop staffed entirely by volunteers.

So, operations managers are responsible for managing activities that are part of the production of goods and services. Their direct responsibilities include; **managing the operations process, embracing design, planning, control, performance improvement, and operations strategy**. Their indirect responsibilities include interacting with those managers in other functional areas within the organization whose roles have an impact on operations. Such areas include **marketing, finance, accounting, personnel and engineering.**

Operations managers' responsibilities or role include:

- **Human resource management** – the people employed by an organization either work directly to create a good or service or provide support to those who do. People and the way they are managed are a key resource of all organizations.
- **Asset management** – an organization's buildings, facilities, equipment and stock are directly involved in or support the operations function.
- **Cost management** – most of the costs of producing goods or services are directly related to the costs of acquiring resources, transforming them or delivering them to customers. For many organizations in the private sector, driving down costs through efficient operations management gives them a critical competitive edge. For organizations in the not-for-profit sector, the ability to manage costs is no less important.
- **Scheduling and capacity**- daily to annual scheduling of all resources (equipment, people and inventory)
- **Quality** – performing responsibilities with accuracy and efficiency.

Decision making is a central role of all operations managers. Decisions need to be made in:
- designing the operations system.
- managing the operations system.
- improving the operations system.

The five main kinds of decisions in each of these relate to:

1. The processes by which goods and services are produced
2. The quality of goods or services
3. The quantity of goods or services (the capacity of operations)
4. The stock of materials (inventory) needed to produce goods or services

The management of human and technical resources. Technical resources such as machinery and facilities are critical to manufacturing and service operations and must be managed to maximize their reliability and productivity.

The Overlapping Roles of Managers

The Interpersonal Role

The interpersonal role consists of three groups of activities:

- representing of his or her unit and department.
- taking the lead in appointing staff, training, motivating others, and evaluating performance.
- maintaining good relations with all stakeholders within the organization.

The Information Role

This role requires managers to obtain information to help them make decisions. It focuses on synthesizing information about change, opportunities or threats in order to analyze the environment. The manager is also required to act as the spokesperson within and for the organization (that is, internally and externally).

The Decision-Making Role

In order to make decisions, managers need to gather and analyze information. This requires them to act like entrepreneurs to seek out a new product or idea. Managers are required to deal with problems as they arise. Resources must be allocated by managers to ensure that the chosen strategy is properly employed. Managers also fulfill the role of negotiators as they constantly interact with individuals, other departments or organizations to negotiate goals and performance standards.

Scheduling

Scheduling can be defined as prescribing of when and where each operation necessary to manufacture the product is to be performed. It is also defined as establishing of times at which to begin and complete each event or operation comprising a procedure. The principal aim of scheduling is to plan the sequence of work so that production can be systematically arranged towards the end of completion of all products by due date.

Principles of Scheduling

1. **The principle of optimum task size:** Scheduling tends to achieve maximum efficiency when the task sizes are small, and all tasks of same order of magnitude.

2. **Principle of optimum production plan:** The planning should be such that it imposes an equal load on all plants.

3. **Principle of optimum sequence:** Scheduling tends to achieve the maximum efficiency when the work is planned so that work hours are normally used in the same sequence.

Inputs to Scheduling

1. *Performance standards:* The information regarding the performance standards (standard times for operations) helps to know the capacity in order to assign required machine hours to the facility.
2. Units in which loading and scheduling is to be expressed.
3. Effective capacity of the work Centre.
4. Demand pattern and extent of flexibility to be provided for rush orders.
5. Overlapping of operations.
6. Individual job schedules.

Scheduling Strategies

Scheduling strategies vary widely among firms and range from 'no scheduling' to very sophisticated approaches.

These strategies are grouped into four classes:

1. **Detailed scheduling:** Detailed scheduling for specific jobs that are received from customers is impracticable in actual manufacturing situation.

2. **Cumulative scheduling:** Cumulative scheduling of total work load is useful especially for long range planning of capacity needs. This may load the current period excessively and under load future periods. It has some means to control the jobs.

3. **Cumulative detailed:** Cumulative detailed combination is both feasible and practical approach, if master schedule has fixed and flexible portions.

4. **Priority decision rules:** Priority decision rules are scheduling guides that are used independently and in conjunction with one of the above strategies, *that is;* first come first serve. These are useful in reducing Work-In-Process (WIP) inventory.

Types of Scheduling

Types of scheduling can be categorized as forward scheduling and backward scheduling.

1. Forward scheduling is commonly used in job shops where customers place their orders on "needed as soon as possible" basis. Forward scheduling determines start and finish times of next priority job by assigning it the earliest available time slot and from that time, determines when the job will be finished in that work centre. Since the job and its components start as early as possible, they will typically be completed before they are due at the subsequent work centers in the routing. The forward method generates in the process inventory that are needed at subsequent work centers and higher inventory cost. Forward

scheduling is simple to use and it gets jobs done in shorter lead times, compared to backward scheduling.

2. Backward scheduling is often used in assembly type industries and commit in advance to specific delivery dates. Backward scheduling determines the start and finish times for waiting jobs by assigning them to the latest available time slot that will enable each job to be completed just when it is due, but done before. By assigning jobs as late as possible, backward scheduling minimizes inventories since a job is not completed until it must go directly to the next work centre on its routing.

Sequencing

It is the arrangement of things in successive order.

Sequencing tools

The sequencing tools include;

- Program Evaluation Review Technique (PERT)
- Grant Charts - a bar graph illustrating the order of events highlighting periods of overlap.
- Critical Path Analysis (CPA) - sequence stages of activity identifying shortest completion time possible.
- PERT and CPA techniques show what needs to be done, how long tasks take, what order is necessary.

Roster

Roster is the coordination and allocation of staff as an input. A roster is a plan of the staffing needs of the business ensuring that there are sufficient numbers of staff (with appropriate skills to match the tasks that require completion)

Rosters need to take into account;

- task type.
- leave entitlements (holidays, sickness, long service, maternity leave).
- working hours: Award hours, overtime, breaks.

Lead time

Lead home is the amount of time that elapse between when a process starts and when it is completed. Lead time is examined closely in manufacturing, supply chain management and project management as companies want to reduce the amount of time it takes to deliver products to the market. Businesses normally prefer minimization of lead time.
Lead time is broken into several components: pre-processing and post processing. Pre-processing involves determining resource requirements and initiating the steps required to fill an order. Processing involves the actual manufacturing or creation of the order. Post processing involves delivery of products to the market. Companies look at each component and compare it against benchmarks to determine where slowdowns are occurring.

Learning Activity 12.2.1.3: Complete the activities given below.

1. Define the following words:

a. Scheduling _____
b. Sequencing _____
c. Roster _____

2. Write down the five (5) responsibilities of an operations manager.

a. _____ d. _____
b. _____ d. _____
c. _____ e. _____

3. Filling in the blank space.

Fill in the blank with the correct word or phases from the list below
Cost management, Quality, Forward scheduling, Asset management, Backward scheduling

a. _____Performing responsibilities with accuracy and efficiency.
b. _____Is commonly used in job shops where customers place their orders on "needed as soon as possible" basis.
c. _____Is often used in assembly type industries and commit in advance to specific delivery dates.
d. _____An organization's buildings, facilities, equipment and stock are directly involved in or support the operations function
e. _____Most of the costs of producing goods or services are directly related to the costs of acquiring resources, transforming them or delivering them to customers.

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.1.4 Production of Goods

Goods

A good is a physical product that you can see, touch or possibly consume.
Example of goods include; orange, flowers, soap, coal, computers, and industry machines.

Types of Goods;

- **Durable –** a durable good is a product that typically lasts at least for three years. Vehicles, dishwashers and furniture are some example of durable goods
- **Nondurable**- non-durable goods are perishable and generally last for less than three years. Example are; toothpaste, software, shoes and fruits

The theory of the consumer is used to explain the market demand for goods and services. The theory of the firm provides an explanation for the market supply of goods and services.

A firm is defined as any organization of individuals that purchases factors of production (labor, capital and raw materials) in order to produce goods and services that are sold to consumers, governments, or other firms. The theory of the firm assumes that the firm's primary objective is to maximize profits. In, maximizing profits, firms are subjected to two constraints, the consumer's demand for their product and the costs of production.

Consider a firm that produces a single good. In order to produce this good, the firm must employ or purchase a number of different factors of production. The firm's production decision is to determine how much of each factor of production to employ.

Variable and Fixed Factors of Production

In the short- run, some of the factors of production that the firm needs are available only in fixed qualities. For example, the size of the firm's factory, its machinery and other capital equipment cannot be varied on a day to day basis. In the long run the firm can adjust the size of its factory and its use of machinery and equipment, but in the short-run the qualities of these factors of production are considered fixed. The shot-run is defined as the period during which changes in certain factors of production are not possible. The long-run is defined as the period during which all factors of production can be varied.

Other factors of production, however are variable in the short run, for example the number of workers the firm employs or the quantities of raw materials the firm uses can be varied on a day-to –day basis. A factor of production that can be varied in the short-run is called a variable factor of production.

A factor of production that cannot be varied in the short- run is called a fixed factor of production. In the short-run, a firm can increase its production of goods and services only by increasing its use of variable factors of production.

Total and Marginal Products

A firm combines its factors of production in order to produce goods or output. The total amount of output the firm produces depends on the quantities of factors that the firm purchases or employs.
The marginal product of a factor of production is the change in the firms total product that results from an increase in that factory by one unit, holding all other factors constant.
To better understand the concepts of total and marginal product, consider a firm that produced a certain good using only labor and capital as inputs. Assume that the amount of capital the firm uses is fixed at 1 unit. When the firm combines its fixed unit of capital with different quantities of labor, it is able to vary its output or total to a 1-unit increase in labor input: this is referred to as the marginal product of labor.

Labor input(works)	Capital inputs	Total product (number of goods)	Marginal product of labor
0	1	0	0
1	1	5	5
2	1	15	10
3	1	23	8
4	1	27	4
5	1	29	2
6	1	30	1

Table 1.3. Marginal product of Labor and Diminishing Returns.

Law of Diminishing Returns

The Law of Diminishing Returns says that as successive units of a variable factor of production are combined with fixed factors of production, the marginal product of the variable factors of production will eventually decline. (The law of diminishing returns is illustrated in the table above).

As more and more workers are combined with the firm's fixed amount of capital, the marginal product of labor eventually starts to decline. In table diminishing returns set in beginning with the third worker. Intuitively, if the firms' capital is fixed at 1 unit, the production possibilities of the firm are limited. Adding more and more workers cannot alleviate this situation and will eventually cause the marginal product of additional workers to fall.

Note that diminishing returns is a short- run phenomenon, that will persist only as long as there are fixed factors of production; in the long run it will be possible to vary the amount of the fixed factor capital so as to eliminate the problem of diminishing returns.

Learning Activity 12.2.1.4: Complete the activities given below.

1. Explain what is a good?

_____
_____
_____

2. Identify the types of goods.

_____
_____
_____

3. What are the factors of production?

_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.1.5 Managing Goods and Services Operations

Service

A service is any primary or complimentary activity that does not directly produce a physical product. Service represents the non-goods part of a transaction between a buyer **(custome**r) and seller (supplier). Common examples of service are hotels, legal and financial firms and airlines and consulting firms.

Difference between goods-producing and service businesses

Goods-producing businesses produce tangible goods; whereas service businesses produce intangible goods. Intangible here means the outcome cannot be touched, held, or seen but only see the effect of the service provided.

The five factors that contribute to increase in number of service businesses

Service businesses are increasing because;

1. Consumers have more disposable income to spend on taking care of themselves.

2. Many services target consumers' needs brought about by changing demographic patterns and lifestyle trends.

3. Consumers need assistance with using and integrating new technology into their business operations and lifestyles.

4. Companies are turning to consultants and other professionals for advice to remain competitive.

5. Barriers to entry in telecommunications, electric power supply, and air transportation (service businesses) are all high.

The diagram depicts the operation of a service production.

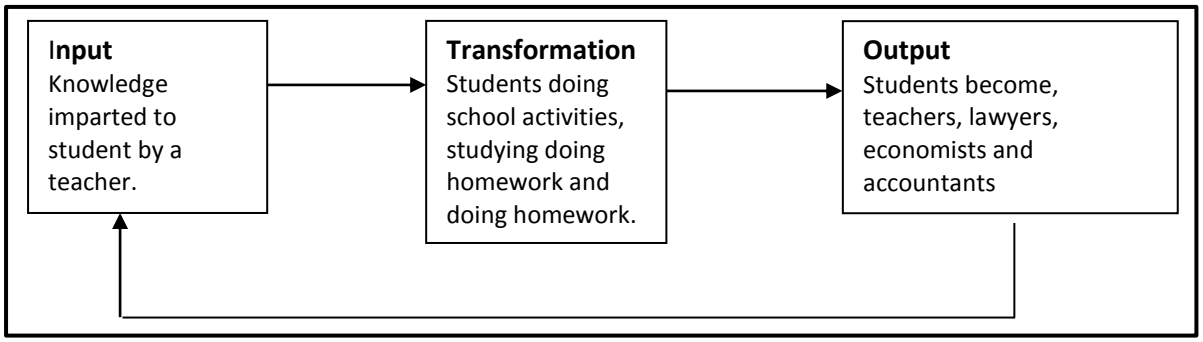


Figure 1. 4. Operation of a Service Production.

In addition good are tangible while service is intangible. This means that goods are consumed, but services are experienced. Goods producing industries rely on machines and "hard technology" to perform work. Goods can be moved, stored and repaired, and generally require physical skills and expertise during production. Customers can often try them before buying.

Services on the other hand, make more use of information systems and other "soft technology," requires strong behavioral skills and is often difficult to describe and demonstrate. A senior executive of the Hilton Corporation stated: "we sell time. You cannot put a hotel room on the shelf."

Learning Activity 12.2.1.5: Complete the activities given below.

1. What is service?

_____
_____
_____

2. What is the difference between service and goods?

_____
_____
_____

3. List down five (5) examples of service?

a._____
b._____
c._____
d._____
e._____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.1.6 Ethics and Social Responsibility in Operations

Ethics

Ethics deals with human action. It can be considered as philosophy, philosophical thinking about morality, moral problems and moral judgments. Ethics can also be defined as a study of what is good or right for human beings, what goals people ought to pursue and what actions they ought to perform. We are guided by our sense of morality based on a combination of beliefs and values, stemming from individual and societal ideologies along with the various Eastern and Western religious cultures.

All managers need to be aware that while they may be employed by an organization as its representative or decision maker, they bring with them entities: people, not organizations, make decisions. Organizations exist within society and as such should be bound by the expectations and moral codes of that society and contribute to its betterment as well as furthering its own interests.

The Nature of Social Responsibility

There are four dimensions of social responsibility: economic, legal, ethical, and voluntary (including philanthropic).
A business whose *sole* objective is to maximize profits is not likely to consider its social responsibility, although its activities will probably be legal.Voluntary responsibilities, on the other hand, are additional activities that may not be required but which promote human welfare or goodwill. Legal and economic concerns have long been acknowledged in business, but voluntary and ethical issues are more recent concerns. A business that is concerned about society as well as earning profits is likely to invest voluntarily in socially responsible activities.

For example, some companies, such as Digicel and Coca cola support numerous social initiatives. Such businesses win the trust and respect of their employees, customers, and society by implementing socially responsible programs and, in the long run, increase profits. Irresponsible companies risk losing consumers as well as encouraging the public and government to take action to constrict their activities. Some well-established companies in the country have worked diligently to improve the conditions in its factories over the past several years. They have removed organic solvents that pose health risks, improved the air quality in their plants, explored nontoxic alternatives in the manufacturing process, and maintained stricter safety standards than required by the Papua New Guinea Occupational Safety and Health Administration. They have also improved working conditions for their workers, reduced overtime, and eliminated fines for disciplinary problems. All of this has been done to show that they are socially responsible in their world of manufacturing of soft drink. Most companies today consider being socially responsible a cost of doing business. Although the concept of social responsibility is receiving more and more attention, it is still not universally accepted.

The Codes of Ethics are important in organizations' ethical behavior. It is not just about having one but also about what is there in it. It certainly would also be about how it is used and *learnt* by the organization, in other words, it should not stay in the document, but through a learning process, become part of the hearts and minds of those who work in and form the organization.

The above make it clear that business ethics is of great importance to good business, and that it cannot be contained within a Code of Ethics. And so, then, how can an organization

be ethical? It is that ethical organization which has virtues and values built upon ethical principles at the very bottom of its corporate culture, as well as normative approaches to implementing such values and principles, and which behaves according to them and so justifies its behavior. It is also argued that an organization becomes ethical through virtues, values, and principles in the culture of the organization.

Ethics guide businesses or organizations to produce or provide the best quality to the preferred standard to meet consumer's expectations through satisfying their needs and wants.

Learning Activity 12.2.1.6: Complete the activities given below.

1. What is ethics?

_____
_____
_____

2. What is social responsibility?

_____
_____
_____
_____

3. Why is ethics important in an organization?

_____
_____
_____
_____
_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2 Operation Management Strategies

In this section you will study the strategies that are applied in managing operations of any one organization in producing a Good or providing a Service. You will look closely at the following, ***Product Choice, Facility Choice, Quality Choice, Planning and Controlling, Dispatch and Purchase, Maintenance, Quality Controls and Quality Measures, and***

***Organising Operation Technology*.** As you go through these topics you will get a glimpse of how each strategy is implemented in the organization to achieve the desired outcome from the output.

Learning Outcomes;

On successful completion of this unit, students will be able to:

- identify and describe the key elements of operations management strategies on how the facilities choice of layout is chosen.
- Identify and explain the planning that goes with large production, dispatchment that goes with production, dispatchment and outsourcing of quality goods and services, as plans to maintain quality in these goods and services.

12.2.2.1 Product Choice

The choice of which product to make is a fundamental decision by a firm. Despite this, most theoretical models of firm behavior take product choice by the firm as given or treat entry into a product market to be the same as the decision to create a firm. Similarly, there is no systematic evidence on the importance of product switching for the firm or on the scope of product switching across industries.

For firms, adding or dropping a product is an important event, affecting more than one third of current products and current output. Over half of all product additions also expand the mix of industries in which the firm participates. Firms choose which product to produce within an industry as well as whether to enter or exit the market. Products differ both in terms of how they are demanded and in their production techniques. Product choice is determined by an interaction between firm characteristics, product characteristics, and market conditions. Changes in market characteristics, production technologies, or consumer tastes are associated with changes in entry and exit rates, industry and product productivity, and product switching by firms. We model firms as being heterogeneous in terms of their productivity and products as differing in terms of their fixed costs of production.

In equilibrium, firm productivity is correlated with product choice, with the most productive firms endogenously choosing to make the products with the highest fixed costs. Both product choice and entry/exit decisions are endogenously determined by market structure. The concentration on interactions of firm characteristics, product characteristics and market conditions determine product switching. However, product choice is not only interesting in its own right, but potentially has implications for the firm's decisions about investment, factor and material purchases, and pricing. Similarly for the industry, we consider the relation of product choice by firms to market structure and productivity growth and leave unmodelled consequences for international trade and investment flows, returns to factors, and the nature of competition.

Product Mix

Product mix refers to the set of all product lines and items that a particular seller offers for sale to buyers. A product mix is also called product assortment.

A product mix is the set of all product lines and items that a particular seller offers for sale. Avon's product mix consists of four major product lines: cosmetics, jewellery, fashion and household items. Each product line consists of several sub-lines. For example, cosmetics break down into lipstick, blusher, powder and so on. Each line and sub line has many individual items. Altogether, Avon's product mix includes 1300 items.

A company's product mix can be described as having a certain **breadth, length, depth,** and **consistency**. These concepts are illustrated in the table below.

Product mix breadth						
Detergents & Softeners	**Cleansers**	**Tooth paste**	**Bar soap**	**Personal care**	**Food**	**Beverages**
Drive Omo Omo micro Rinso Persil Lux Surf Fab Huggie Comfort	Ajax Jif Domestos	Aim colgate maclens	Lux Sunlight Velvet Dove	Rexona Norsca Brut Pears Impulse	Rosella Continental Streets Flora Keems Fray Bentos Oxo Stork Daffordil John West Seakist Ally Plumes copha	Bushells Robert Timms Lan- chooLipton

Table 1.4. Unilever Products.

- The **breadth** of product mix refers to the number of different product lines the company carries. The table 1.3 shows a product mix width of seven broad lines.
- The **length** of product mix refers to the total number of items the company carries. In the table the total is 40.
- The **depth** of product mix refers to the number of versions offered of each product in the line. If Aim toothpaste comes in three sizes and two formulations (paste and gel) Aim has a depth of six. By counting the versions within each brand, we can calculate the average depth of Unilever's product mix.
- The **consistency** of the product mix refers to how closely related the various product lines are used in the end of the production requirements, distribution channels or some other way. Unilever's product lines are consistent so far as they are consumer products that go through the same distribution channels. The lines are less consistent in so far as they perform different functions for buyers.

These four dimensions of the product mix provide the handles for defining the company's product strategy. The organisation can increase its business in four ways. It can **add new products lines**, thus widening its product mix. In this way, its new lines build on the organisations reputation in its other lines, or the company **can lengthen its existing product lines** to become a more full-line company. Or the company can **add more product versions** to each product and thus deepen its product mix. Finally, the company can **pursue more product line consistency– or less**- depending on whether it wants to have a strong reputation in a single field or in several fields.
Thus, product strategy calls for complex decision on **product mix, product line, branding, packaging and service strategy.** These decisions must be made not only with a full understanding of consumer wants and competitors' strategies, but also with increasing attention to the growing public policy affecting product decisions.

Market Mix

The elements of marketing mix are: product, price, place and promotion, or extended marketing mix elements in the case of service organisations: product, price, place and promotion, people and processes and physical evidence.

Learning Activity 12.2.2.1: Complete the activities given below.

1. Discuss what product choice is.

_____
_____
_____
_____

2. Define product mix.

_____
_____
_____
_____

3. List the four (4) dimensions of product mix.

a._____
b._____
c._____
d. _____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2.2 Facility Choice

Facility

Facility is defined as a service or piece of equipment which makes it possible to do something. A facility layout is an arrangement of everything needed for production of goods or delivery of services. A facility is an entity that facilitates the performance of any job. It may be a machine tool, a work centre, a manufacturing cell, a machine shop, a department and a warehouse. (Heragu, 1997).

Figure 1.5. Sample Work Stations 1.

Layout decisions entail determining the placement of departments, work groups within the departments, workstations, machines, and stock-holding points within a production facility. The objective is to arrange these elements in a way that ensures a smooth work flow (in a factory) or a particular traffic pattern (in a service organization).

In general, the inputs to the layout decision are as follows:

1. Specification of the objectives and corresponding criteria to be used to evaluate the design. The amount of space required, and the distance that must be traveled between elements in the layout, are common basic criteria.
2. Estimates of product or service demand on the system.
3. Processing requirements in terms of number of operations and amount of flow between the elements in the layout.
4. Space requirements for the elements in the layout.

5. Space availability within the facility itself, or if this is a new facility, possible building configurations.

Office Layout

The trend in *office layout* is toward more open offices, with personal work space separated only by low divider walls. Companies have removed fixed walls to foster greater communication and teamwork. For example, the Breakthrough Box titled "In New Drug Labs, 'Porches' and 'Huddle Zones.'" Signs, symbols, and artifacts, as discussed in the section on service layout, are possibly even more important in office layout than in retailing.

For instance, size and orientation of desks can indicate the importance or professionalism of the people behind them. Central administration offices are often designed and laid out so as to convey the desired image of the company. Service-Master (the highly profitable janitorial management company) positions its "Know-How Room" at the center of its headquarters. This room contains all of the physical products, operations manuals, and pictorial displays of career paths and other symbols for the key knowledge essential to the business. "From this room, the rest of the company can be seen as a big apparatus to bring the knowledge of the marketplace to its employees and potential customers."

The most common assembly line is a moving conveyor that passes a series of workstations in a uniform time interval called the **workstation cycle time** (which is also the time between successive units coming off the end of the line). At each workstation, work is performed on a product either by adding parts or features (Example, holes, bends, particular and shapes), or by completing assembly operations. The work performed at each station is made up of many bits of work, termed *tasks, elements,* and *work units*. Such tasks are described by motion–time analysis.

Generally, they are groupings that cannot be subdivided on the assembly line without paying a penalty in extra motions. The total work to be performed at a workstation is equal to the sum of the tasks assigned to that workstation. The **assembly-line balancing** problem is one of assigning all tasks to a series of workstations so that each workstation has equal tasks allocated to be done in the workstation cycle time, and so that the unassigned (that is, idle) time across all workstations is minimized. The problem is complicated by the relationships among tasks imposed by product design and process technologies. This is called the **precedence relationship,** which specifies the order in which tasks must be performed in the assembly process.

The steps in balancing an assembly line are straightforward: Facility layout is where the rubber meets the road in the design and operation of a production system. A good factory (or office) layout can provide real competitive advantage by facilitating material and information flow processes. It can also enhance employees' work life. A good service layout can be an effective "stage" for playing out the service encounter. In conclusion, here are some marks of a good layout in these environments.

Figure 1.6. Sample Work Stations 2 and 3.

The production process normally determines the type of plant layout to be applied to the facility:

- **Fixed position plant layout**
  Product stays and resources move to it.
- **Product oriented plant layout**
  Machinery and materials are placed following the product path.
- **Process oriented plant layout (Functional Layout).**
  Machinery is placed according to what they do and materials go to them.
- **Cell layout**
  Hybrid layout that tries to take advantage of different layouts types.

Product plant layout

- **Product- oriented plant layout**
- This type of plant layout is useful when the production process is organized in a continuous or repetitive way.
- Continuous flow: The correct operations flow is reached through the layout design and the equipment and machinery specifications.
- Repetitive flow (assembly line): The correct operations flow will be based in a line balancing exercise, in order to avoid problems generated by bottle necks.
- The plant layout will be based in allocating a machine as close as possible to the next one in line, in the correct sequence to manufacture the product.

Advantages:

- Reduced material handling activities.
- Work in Process almost eliminated.
- Minimum manufacturing time.
- Simplification of the production planning and control systems
- Tasks simplification.

Disadvantages:

- No flexibility in the production process
- Low flexibility in the manufacturing times
- High capital investment
- Every workstation is critical to the process.- The lack of personnel or shut down of a machine stops the whole process
- Monotonous work.

Process- oriented plant layout (Functional Layout)

- This type of plant layout is useful when the production process is organized in batches.
- Personnel and equipment to perform the same function are allocated in the same area.
- The different items have to move from one area to another area, according to the sequence of operations previously established.
- The variety of products to produce will lead to a diversity of flows through the facility.
- The variations in the production volumes from one period to the next one (short periods of time) may lead to modifications in the manufactured quantities as well as the types of products to be produced.

Work cells

- Group of equipment and workers that perform a sequence of operations over multiple units of an item or family of items.
- Looks for the advantages of product and process layouts:
- Product oriented layout: Efficiency
- Process oriented layout: Flexibility
- Group Technology
- Grouping outputs with the same characteristics to families, and assigning groups of machines and workers for the production of each family.

Product and process layout is important because it helps mass production to eventuate efficiently and effectively with quality output.

Learning Activity 12.2.2.2: Complete the activities given below.

1. What is a facility?

_____
_____
_____
_____

2. Identify the types of plant layout and briefly explain each.

_____
_____
_____
_____
_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2.3 Quality Choice

Quality

Different meaning could be attached to the word quality under different circumstances. The word quality does not mean the quality of manufactured product only. It may refer to the quality of the process (*That is*, men, material, and machines) and even that of management. Where the quality manufactured product referred as or defined as "Quality of product is the degree in which it fulfills the requirement of the customer. It is not absolute but judged or realized by comparing with some standards".

Quality begins with the design of a product in accordance with the customer specification; further, it involves the established measurement standards, the use of proper material, and selection of suitable manufacturing process. Quality is a relative term and it is generally used with reference to the end use of the product.

Quality as defined by Crosby and Juran as conformance to requirements or specifications" and is fitness for use", respectively. "The Quality of a product or service is the fitness of that product or service for meeting or exceeding its intended use as required by the customer."

Concept of Quality

Deming (1986) considered quality and process improvement activities as the catalyst necessary to start an economic chain reaction. Improving quality leads to decreased costs, fewer mistakes, fewer delays, and better use of resources, which in turn leads to improved productivity, which enables a firm to capture more of the market, which enables the firm to stay in business, which results in providing more jobs (Summers, 2006).Researchers have defined the concept of quality in different ways ranging from perception of value (Summers, 2006) to conformance to requirements (Deming, 1986), fitness to use (Juran, 1979) and finally to meeting customer's expectations (Oakland, 2004).

Quality is a customer determination based on the customer's actual experience with the product or service, measured against his or her requirements stated or unstated, conscious or merely sensed, technically operational or entirely subjective and always representing a moving target in a competitive market (Cole, 2002). Gupta (2004) point out the importance of quality by saying "quality is an important strategic dimension and a key competitive weapon that cannot be ignored by any corporation."

Product Quality

Quality is one of the market's major positioning tools. Quality has two dimensions- level and consistency. In developing a product, the marketer must first choose a quality level that will support the products position in the target market. Product quality means the ability of a product to perform its functions. It includes the products overall durability, reliability, precision, ease of operation and repair and other valued attributes. Although some of these attributes can be measured objectively, from a marketing point of view quality should be measured in terms of buyers' perception. Companies rarely try to offer the highest levels of

quality that are found in products. They choose a quality level that matches the expectations of the target market or the quality levels of competing products.
Beyond quality level, high quality can also mean consistently delivering the targeted level of quality to consumers. In this sense, quality means 'absence of defects or variation'. A company should strive for high level of quality consistency.

Companies have turned quality into a potent strategic weapon. Strategic quality involves gaining an edge over competitors by consistently offering products and service that give customers better quality. As one expert proclaims, Quality is not simply a problem to be solved; it is a competitive opportunity. Others suggest, however that quality has now become a competitive necessity- that in the 1990s and beyond only companies with the best quality will thrive.

Quality Control

Quality Control (QC) may be defined as a system that is used to maintain a desired level of quality in a product or service. It is a systematic control of various factors that affect the quality of the product. It depends on materials, tools, machines, type of labor, and working conditions.

The phase Quality Control (QC) is a broad term, it involves inspection at particular stage but mere inspection does not mean QC. As opposed to inspection, in quality control activity emphasis is placed on the quality of future production. Quality control aims at prevention of defects at the source, relies on effective feedback system and corrective action procedure. Quality control uses inspection as a valuable tool. According to Juran (1978) "Quality control is the regulatory process through which we measure actual quality performance, compare it with standards, and act on the difference". Another definition of quality control is from ANSI/ASQC standard (1978) quality control is defined as "The operational techniques and the activities which sustain a quality of product or service that will satisfy given needs; also the use of such techniques and activities".

Alford and Beatty (1980)define QC as "In the broad sense, quality control is the mechanism by which products are made to measure up to specifications determined from customers' demands and transformed into sales, engineering and manufacturing requirements. It is concerned with making things right rather than discovering and rejecting those made wrong".

Types of Quality Control

Quality Control (QC) is not a function of any single department or a person. It is the primary responsibility of any supervisor to turn out work of acceptable quality. Quality control can be divided into three main sub-areas. These are:

1. Off-line quality control,

2. Statistical process control

3. Acceptance sampling plans.

1. Off-line quality control: Its procedures deal with measures to select and choose controllable product and process parameters in such a way that the deviations identified the product or process output and the standard will be minimized. Much of this task is accomplished through product and process design. ***Example:*** Taguchi method, and principles of experimental design.

2. Statistical process control: SPC involves comparing the output of a process or a service with a standard and taking remedial actions in case of a discrepancy between the two. It also involves determining whether a process can produce a product that meets desired specifications or requirements. On-line SPC means that information is gathered about the product, process, or service while it is functional. The corrective action is taken in that operational phase. This is on real-time basis.

3. Acceptance sampling plans: A plan that determines the number of items to sample and the acceptance criteria of the lot, based on meeting certain stipulated conditions (such as the risk of rejecting a good lot or accepting a bad lot) is known as an acceptance sampling plan.

Steps in Quality Control

Following are the steps in quality control process;

1. Formulate quality policy.
2. Set the standards or specifications on the basis of customer's preference, cost and profit.
3. Select inspection plan and set up procedure for checking.
4. Detect deviations from set standards of specifications.
5. Take corrective actions or necessary changes to achieve standards.
6. Decide on salvage method *i.e.*, to decide how the defective parts are disposed of: entire scrap or rework.
7. Coordinate the permanent solution of quality problems so they do not recur.
8. Develop quality consciousness both within and outside the organization.
9. Develop policies and procedures for good vendor-vendee relations.

Objectives of Quality Control

Following are the objectives of quality control:

1. To improve the companies income by making the production more acceptable to the customers, that is, by providing long life, greater usefulness, and maintainability.
2. To reduce companies cost through reduction of losses due to defects.
3. To achieve interchangeability of manufacture in large-scale production.
4. To produce optimal quality at reduced price.
5. To ensure satisfaction of customers with products or services or high quality level, to build customer goodwill, confidence and reputation of manufacturer.
6. To make inspection prompt to ensure quality control.
7. To check the variation during manufacturing.

The broad areas of application of quality control are incoming material control, process control and product control.

Benefits of Quality Control

- Improving the quality of products and services.
- Increasing the productivity of manufacturing processes, commercial business, and corporations.
- Reducing manufacturing and corporate costs.
- Determining and improving the marketability of products and services.
- Reducing consumer prices of products and services.
- Improving and/or assuring on time deliveries and availability.
- Assisting in the management of an enterprise.

Seven Tools for Quality Control

To make rational decisions using data obtained on the product, or process, or from the consumer, organizations use certain graphical tools. These methods help us learn about the characteristics of a process, its operating state of affairs and the kind of output we may expect from it. Graphical methods are easy to understand and provide comprehensive information; they are a viable tool for the analysis of product and process data. These tools are effective for quality improvement. The seven quality control tools are;

1. pareto chart
2. check sheets
3. cause and effect diagram
4. scatter diagrams
5. histogram
6. graphs or flow charts
7. control charts

1. Pareto chart

Pareto chart is a vertical bar graph in which values are plotted in decreasing order of relative frequency from left to right. This chart is extremely useful for analyzing what problems need attention first because the taller bars on the chart, which represent frequency, clearly illustrate which variables have the greatest cumulative effect on a given system.

The independent variables on the chart are shown on the horizontal axis and the dependent variables are portrayed as heights of bars. A point to point graph, which shows the cumulative relative frequency, may be superimposed on the bar graph. Because the values of the statistical variables are placed in order of relative frequency, the graph clearly reveals which factors have the greatest impact and where attention is likely to yield the greatest benefit.
In the example below, XYZ clothing Store was seeing a steady decline in business. Before the manager did a customer survey, he assumed the decline was due to customer dissatisfaction with the clothing line he was selling and he blamed his supply chain for his problems. After

charting the frequency of the answers in his customer survey, however, it was very clear that the real reasons for the decline of his business had nothing to do with his supply chain. By collecting data and displaying it in a Pareto chart, the manager could see which variables were having the most influence. In this example, parking difficulties, rude sales people and poor lighting were hurting his business most. Following the Pareto Principle, those are the areas where he should focus his attention to build his business back up.

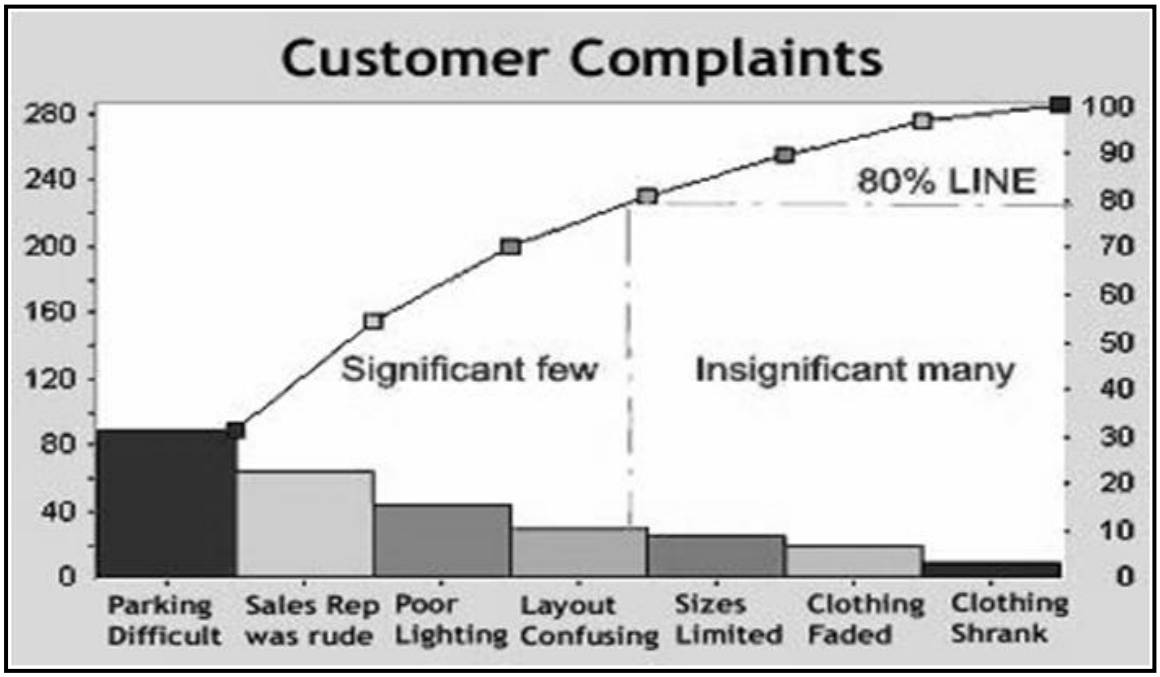


Figure 1.7. Customer Complaints.

2. Check sheets

A check sheet is a structured, prepared form for collecting and analyzing data. This is a generic tool that can be adapted for a wide variety of purposes.

When to use a check sheet

- When data can be observed and collected repeatedly by the same person or at the same location.
- When collecting data on the frequency or patterns of events, problems, defects, defect location, and defect causes.

Procedure

1. Decide what event or problem will be observed. Develop operational definitions.
2. Decide when data will be collected and for how long.
3. Design the form. Set it up so that data can be recorded simply by making check marks or Xs or similar symbols and so that data do not have to be recopied for analysis.
4. Label all spaces on the form.
5. Test the check sheet for a short trial period to be sure it collects the appropriate data and is easy to use.
6. Each time the targeted event or problem occurs, record data on the check sheet.

For example:

The figure below shows a check sheet used to collect data on telephone interruptions. The tick marks were added as data was collected over several weeks.

Telephone Interruptions

Reason	Day					
	Mon	Tues	Wed	Thurs	Fri	Total
Wrong number	𝍸	||	|	𝍸	𝍸 ||	20
Info request	||	||	||	||	||	10
Boss	𝍸	||	𝍸 ||	|	||||	19
Total	12	6	10	8	13	49

Table 1.5. Telephone Interruptions.

3. Cause and effect diagram

Cause and effect graph is a directed graph that maps a set of causes to a set of effects. The causes may be thought of as the input to the program, and the effects may be thought of as the output. Usually the graph shows the nodes representing the causes on the left side and the nodes representing the effects on the right side. There may be combine inputs using logical operators such as AND and OR.

The graph's direction is as follows:

Cause ⟶ intermediate nodes ⟶ Effects

4. Scatter diagrams

A scatter diagrams is a type of mathematical diagram using Cartesian coordinates to display values for typically two variables for a set of data. If the points are color- coded you can increase the number of displayed variables to three.

The data is displayed as a collection of points, each having the value of one variable determining the position on the horizontal axis and the value of the other variable determining the position on the vertical axis. This kind of plot is called a scatter chart, scatter gram, scatter diagram, or scatter graph.

SCATTERPLOT FOR QUALITY CHARACTERISTIC XXX

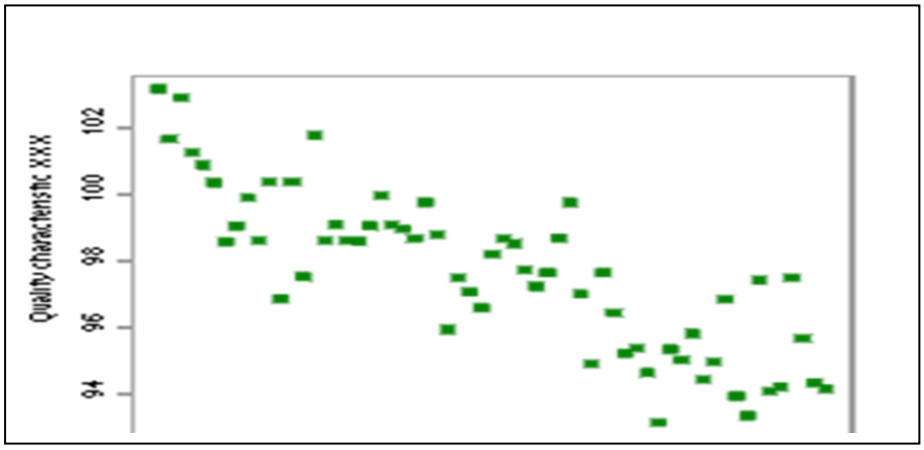


Figure 1.8. Example of a Scatter Gram.

5. Histogram

A histogram is a graphical representation of the distribution of numerical data. it is an estimate of the probability distribution of a continuous variable (quantitative variable).

To construct a histogram, the first step is to bin the range of values – that is divide the entire range of values into a series of intervals – and then count how many values fall into each interval. The bins are usually specified as consecutive, non-over lapping intervals of a variable. The bins (intervals) must be adjacent and are usually equal size.

The purpose of a histogram is to roughly asses the probability distribution of a given variable by depicting the frequencies of observations occurring in certain ranges of values.

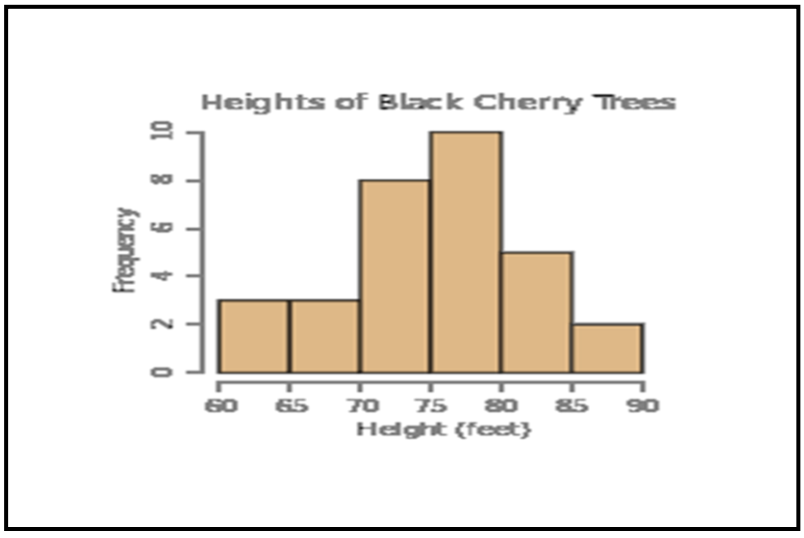


Figure 1.9. Example of a Histogram Graph.

6. Graphs or Flow Charts

A graph is a diagram showing the relation between variable quantities, typically of two variables, each measured along one of a pair of axis at right angle.
Graphs and charts are great because they communicate information visually. For this reason, graphs are often used in newspapers, magazines and businesses around the world. Some organization use graphs and charts in their publication and on the web. Sometimes, complicated information is difficult to understand and needs an illustration. Graphs or charts can help impress people by getting your point across quickly and visually.

Examples of charts are:

- pie chart
- bar graph
- line graph
- area graph

7. Control charts

The control chart is a graph used to study how a process changed over time. Data is plotted in time order. A control chart always has a certain line for the average, an upper line for the upper control limit and a lower line for the lower control limit. These lines are determined from historical data. By comparing current data to these lines, you can draw conclusions about whether the process variation is consistent (in control) or is unpredictable (out of control, affected by special causes of variation).

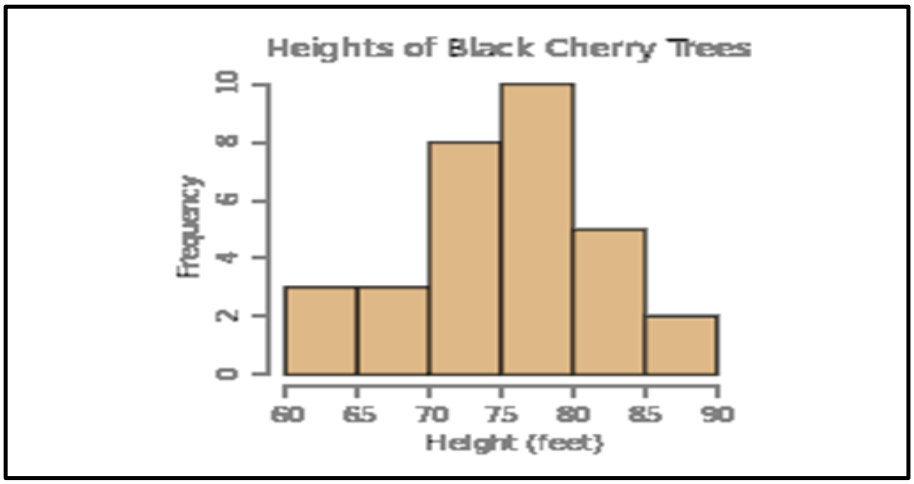


Figure 1.10. A control chart.

Control charts are used in pairs. The top chart monitors the average, or the centering of the distribution of data from the process. The bottom chart monitors the range, or width of the distribution. If your data were shots in target practice, the average is where the shots are clustering and the range is how tightly they are clustered. Control charts for attribute data are used singly.

When to use a control chart

- When controlling ongoing processes by finding and correcting problems as they occur.
- When predicting the expected range of outcomes from a process.
- When determining whether a process is stable (in statistical control).
- When analyzing patterns of process variation from special causes (non-routine events) or common causes (built into the process).
- When determining whether your quality improvement project should aim to prevent specific problems or to make fundamental changes to the process.

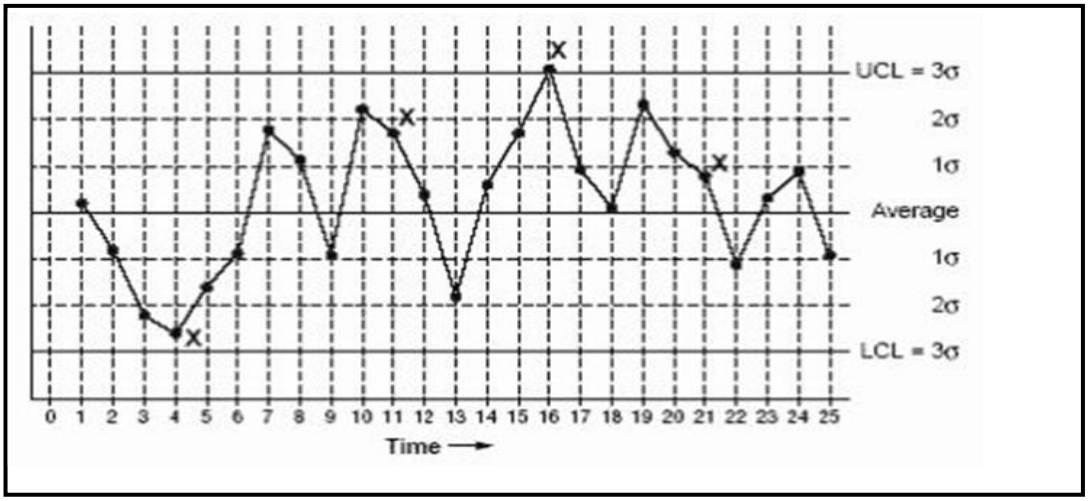


Figure 1.11. Example of a Control Chart.

Just- In -Time (JIT)

Over the past several years, businesses around the world have adopted several innovative manufacturing concepts, such as Just-in-time production (JIT,) early supplier involvement, value analysis, total quality management, quality at source and flexible manufacturing. These practice greatly affect how business marketers sell to and service their customers. For example, Just in time means that production materials arrive at the customer's production facility shortly before they are used or materials, components, and work-in-process arrive at each workstation just before they are to be used or assembled. This calls for close coordination between the production schedule of supplier and customer so that neither has to carry much inventory.

Learning Activity 12.2.2.3: Complete the activities given below.

1. What is quality?

_____
_____
_____

2. Why is it important to produce quality in a product?

_____
_____
_____

3. Explain what quality control is.

_____
_____
_____

4. Discuss the different types of quality control.

_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2.4 Planning and Controlling in Operations

Operations Planning and Control can be defined as, the process of planning the production in advance, setting the exact route of each item, fixing the starting dates for each time to give production orders to shops and to follow up the progress of products according to orders.

Planning

In any organization planning is one of the management functions, besides **organizing, controlling** and **leading.** To enable an organization to function effectively, good planning is crucial.

The principle of production planning and control lies in the statement "First plan your work and then work on your plan. Main functions of production planning and control includes **planning routing, scheduling** and **follow-up.**

Planning – *is deciding in advance what to do, how to do it, when to do it, where to do it and who to do it. Planning bridges the gap from where we are, to where we want to go***.** It makes it possible for things to occur which would not otherwise happen.

Routing- may be defined as the selection of path which each part of the production will follow through which they are transformed from raw materials to finished products. Routing determines the most advantageous path to be followed from department to department and machine to machine till raw materials get their final shape.

Scheduling determines the programme for the operations. **Scheduling** may be defined as "the fixation of time and date for each operation" as accounting to the sequence of operations to be followed"

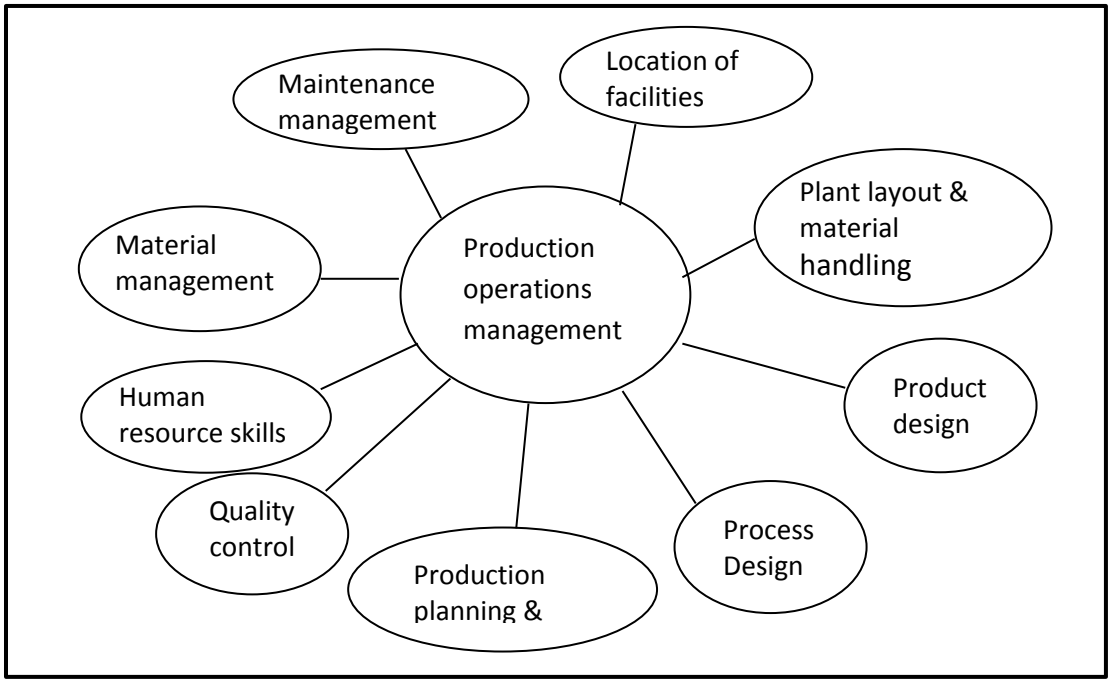


Figure 1.12. Scope of production & operation management.

The function of **follow-up** is to report daily the progress of work in each shop in a prescribed performa and to investigate the causes of deviations from the planned performance.

The Importance of Planning

Planning provides the organization with its direction and it determines the actions that management must take. Planning is important because it provides direction, promotes coordination between the various departments and people within the organization and forces managers to look to the future. Planning also ensures that the organization stays in touch with technology and the latest trends; it ensures cohesion in the sense that it enables top management to see the organization in a holistic way. Lastly, planning promotes stability in the organization by encouraging pro-activeness.

Strategic Planning

Strategic planning is the process of analyzing the organization's external and internal environments, developing a vision and mission, formulating overall goals, identifying general strategies to be pursued, and allocating resources to achieve the organization's goals.
(Source: Thompson & Strickland, 1998:6)

Strategic planning, also referred to as long-term planning, has the following characteristics:

- Top management is responsible;
- It spans a timeframe of three to 10 years or more;
- It focuses on the entire organization;
- It is future oriented;
- It is not concerned with detail – provides broad general guidelines;
- It is used to deploy resources and skills.

Since the 1950s, the business environment has been changing rapidly. Previous approaches like budgeting and management by objectives were of little use in this new unstable economy. Due to this instability, long-term planning came into being in an attempt to survive. Strategic planning was deployed to try and keep on top of changes in the business environment.

Types of Planning

Planning exists in several forms and sizes; Dessler (2001) categorized planning into three main dimensions which are planning based on **format, organization hierarchy** and **frequency of use**.

Figure 1.13 summarizes the types of planning based on these dimensions.

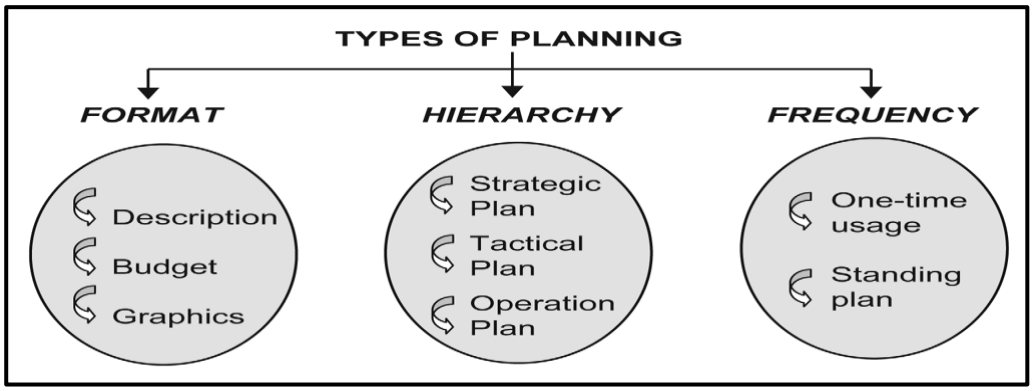


Figure 1.13. Types of planning.

(a) Planning Based on Format

Planning differs from the aspect of format that is the way it is presented. If planning is written in the form of statements that state what needs to be achieved and how it is achievable, it is called descriptive planning. For example, the planning of an individual's career. There is also planning that is stated in the form of financial statements. This type of planning is called budgeting as this plan is stated quantitatively by using financial terms. Graphic planning refers to the planning that explains what needs to be achieved and how to achieve it in the form of charts. Example of graphic planning is the Gantt chart. This chart illustrate the time period required in order to implement an activity, in the form of a bar chart.

(b) Planning Based on Organization Hierarchy

Apart from formats, planning is also different from the aspect of time frames. There are planning that is made for long term and some are for short term. Planning is done by management based on the hierarchy of the organization. Generally, there are three levels in an organization, which are the **top management, middle management** and **lower management level**. An organization's objectives have to be determined at each level of the organization. This type of planning is known as top to bottom planning that comprises of strategic planning/plans, tactical plans and operation plans.

Organizational Hierarchy	**Planning**	**Explanation**
Top-level Management	Strategic Plan	This is the overall planning of the organization that explains the organization's general direction and how it will position itself in the market compared to its competitors (positioning).Strategic planning usually encompasses a long period of time and is made for a period of two to five years in the future. The top management will be responsible to establish this plan.
Middle-level Management	Tactical Plan	This plan is prepared and implemented by the middle management level. It explains how an organization will distribute and use the resources, funds (monetary) as well as the individuals in the organization in order to achieve the objectives that have been determined. This tactical planning usually involves a moderate time period and is made for between six months to two years.

Lower-level Management	Operation Plan	This is the daily planning which is prepared and implemented by the lower level management who are also known as the line managers. Normally this planning will explain the production and distribution of products for a period of thirty days to six months.

Table 1.6. Planning Based on an Organization Hierarchy.

Even though each management level does its own planning, the planning will only be effective when the objectives and actions made at the lower level support and are in accordance with the objectives and actions made by the top and middle levels.

(c) Planning Based on Frequency of Use

Apart from the format and organization hierarchy, planning is also different from the aspect of frequency of use. Some planning is only used once whereas some are used repeatedly. Planning that is only used once is known as one-time usage planning. It is specifically prepared to fulfill specific purposes, for example, the opening of a new branch. Even though the organization may open more than one branch, each plan made will only be applicable to that specific branch only. This is because each branch will definitely have different resources whether in terms of money, manpower, customers' distribution and size of the branch area. Therefore, planning for the opening of a new branch in Lae for instance cannot be used for the opening of another new branch in Popondeta. Other examples of this type of planning will be the budget prepared for a specific time frame.
Plans that are repeatedly used are known as **standing plans**. These plans are used to manage situations that frequently arise in an organization such as employees' disciplinary problems.

According to C. W. Roney (Certo, 2000), generally, planning is made for two purposes. **Firstly**, as a protection for the organization. This means that when planning is done, a manager can forecast the effects from each of the suggestions or alternative actions that will be carried out. In this situation, definitely the manager will choose the alternative action that provides the best results to the organization and protects it from any decision that is not profitable. **Secondly**, planning is made to increase the affirmative levels of an organization. For example, when an organization opens a new branch, it is not a coincidence but is the result of detailed planning. With proper planning, managers will be able to ensure **what needs to be done, how to carry out the actions determined, why it has to be done, when to do it, where to do it, who should implement it, etc**. Without good planning, an organization will not be able to expand. From these discussions, we can conclude how important planning is in order to achieve success in an organization.

Control

What is control?
It is the task of ensuring that the activities are providing the desired results.

The Importance of Control

Why is a control process necessary? The answer is simple. It is necessary because;

- Of the nature of the management process itself and in particular, the task of planning.

- Of the growing nature of the business – as an organization grows, more people are employed, new products developed, etc.
- Managers and subordinates are capable of making poor decisions and committing errors.
- The delegation of tasks to subordinates does not mean that the job of management is now completed.
- Control enables management to cope with change and uncertainty as and when it arises.
- Competition is an important factor in any organization and the organization must remain competitive.
- Control is applied to ensure that the organization's resources that are allocated facilitate the achievement of the set goals.
- Control usually leads to better quality.

The Control Process

The control process consists of four steps. These steps include:

- setting standards against which actual performance to be measured,
- measuring the actual performance,
- evaluating any deviations
- taking corrective actions.

The control process is illustrated in this Figure 2.4.3

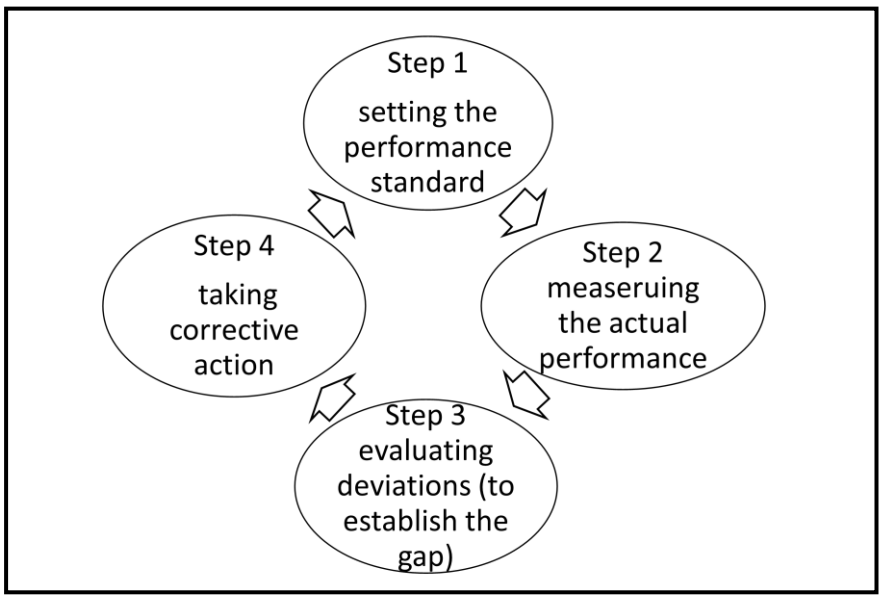


Figure 1.14. Sources: Du Toit, Erasmus & Strydom, 2010:230.

Step 1 – Establish Standards

Control and planning are closely related. This means that the control system should be a mirror image of planning as the plans indicate the goals and setting of standards or norms necessary for control. A performance standard is a planned target against which actual

performance will be compared. Performance standards should be relevant, realistic, attainable and measurable. Standards can include profit standards, market share standards, productivity standards and staff development standards. Performance standards serve two purposes: They enable management to distinguish between acceptable and unacceptable performance and they also enable management to monitor strategies and goals.

Step 2 – Measure Actual Performance

To measure actual performance, activities must be quantifiable and the information and reports collected must be absolutely reliable. It is important to set specific milestones and observations and measurement must occur at these strategic points: "Important considerations in the measurement and reporting of activities are what information and how much should be fed back, and to whom" (Du Toit, Erasmus & Strydom, 2010: 231).Control by exception means that only when there are major discrepancies between planned and actual performance must be reported to top management. The time gap between performance and measurement must be kept to a minimum to allow for timely action to be taken.

Step 3 – Evaluate Deviations

The gap in the performance standard and the actual performance must be measured in this step. It is important to measure whether a standard was met or exceeded and then to determine why, thus exploring the nature and scope of the deviation. Measuring performance allows for determining whether the performance standard and the actual performance have been objectively set and measured as well as whether the deviation is large enough to warrant another investigation. It is good practice to set upper and lower limits for each deviation so that a deviation is investigated when it exceeds the limits. Reasons and activities that lead to the deviation must be explored to enable corrective action.

Step 4 – Take Corrective Action

If necessary, that is, if there is a deviation from the set standard and the actual performance, corrective action is taken at this point. If there is a deviation, management has a choice of three options;

The improvement of actual performance to ensure that the performance standard is reached.

- The improvement of strategies that will lead to the accomplishment of the performance standard;
- The lowering or raising of performance standards to make them more realistic for the current situation. It is important to note that there are limits to the time and money spent on control.

The Focus of Control

This question must now be asked: "what must be controlled?" Control of activities should occur at strategic points, thus at areas responsible for the effectiveness of the organization. When a control system is being designed, the following should be taken into consideration: the nature of the organization, the activities, the size of the organization and the structure.

Areas of control are defined in terms of the basic types of resources used;

- **Physical resources** – such as inventory control band quality control.
- **Financial resources** – most control measures or techniques are quantified in financial terms.
- **Information resources** – such as accurate market forecasting and environmental scanning.
- **Human resources** – selection, placement, training and development and performance appraisals.

Physical Resources

Physical resources can be defined as the tangible assets – like building, vehicles, machinery, equipment and office furniture – of the organization. These types of resources normally appear on an asset registry. Control procedures normally involve inspections, stocktaking and so on. Control procedures for raw material and finished products are: Inventory control and quality control.

"Inventory refers to the reserves of resources held in readiness to produce products and services as well as to the end products that are kept in stock to satisfy consumer's and customers' needs" (Du Toit, Erasmus & Strydom, 2010: 282). There are different types of inventories, that is raw materials, work-in-process, finished goods and in-transit. The main reason organizations keep inventories is the cost of inventory and the need to control that cost. These costs include the cost to finance an inventory, the price of money (interest), storage and insurance costs and risk.

There are three control systems relevant here:

- The concept of Economic Ordering Quantity (EOQ);
- The Materials Requirements Planning (MRP);
- The Just-In-Time system (JIT) (a refinement of the MRP system).

Total Quality Management (TQM) refers to the management of quality. TQM is the responsibility of everyone in the organization.

Quality control refers to the activities that management performs to ensure a level of quality that will satisfy the consumer, on the other hand, and have certain benefits for the organization, on the other hand. (Source: Du Toit, Erasmus & Strydom, 2010:284).

Quality control usually comprises the following steps:

1. Defining quality goals and standards;
2. Measuring quality (benchmarking, statistical control methods, variation measurement);
3. Correcting deviations and solving quality problems in an effort to keep the cost of quality as low as possible.

Financial Resources

Financial resources are at the heart of any organization and must be controlled. Financial control deals with resources as they "flow" into and out of the organization, as well as

resources that are “held” by the organization. Revenues must be adequate to cover expenses. There are various control measures like financial management principles, budgetary control and financial analysis.

Financial resources are allocated in the organization by means of a budget: A budget can be defined as a formal plan, expressed in financial terms, which indicates how resources are to be allocated to different activities, departments or sub-departments.

Budgets can be used to benchmark performance and make comparisons between departments.

A budget contributes to the control process as follows:

- It supports management in controlling resources, departments and projects;
- It provides guidelines on the application of resources;
- It sets standards that are vital to the control process;
- It involves the evaluation of resource allocation.

The manner in which budgets are developed nowadays involves a bottom-up approach which requires participation and input from all managers. A budget allows for effective control by means of assigning a value to actions and operations. It also facilitates coordination between units. A drawback of a budget is that it may sometimes limit flexibility.

Information Resources

Accurate and timely information is crucial in monitoring how well the set goals are achieved, and to ensure that everything is going according to plan. If not, timely information allows for adjustments to be made where necessary.

Human Resources

Performance measurement is used to control the organization’s human resources. It is necessary to develop performance standards to measure actual performance against them. Another useful instrument is specific human resource analysis; i.e. labor turnover, absenteeism and the composition of the labor force. Informal control systems refer to group behavior that is based on the norms laid down by the group members.

Learning Activity 12.2.2.4: Complete the activities given below.

1. What is planning?

_____
_____
_____

2. Why is planning important?

_____
_____

3. What is control? And why is control important?

_____
_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2.5 Dispatch and Purchase

Dispatching is concerned with the starting processes. It gives necessary authority so as to start a particular work, which has already been planned under routing and scheduling. Therefore, dispatching is the release of orders and instructions for the starting of production for items in accordance with the route sheet and schedule charts.

A purchase order must be approved or have passed the commitment control budget check to be eligible for dispatch.

Dispatching Approved Purchase Orders

A manual process must be initiated on a regular basis to dispatch POs that can be mailed or emailed. Many agencies assign an individual to print the POs on a daily basis for the previous day's work. In some agencies the buyer may be responsible for printing his or her own. The following is a process that should be set up for this purpose. Once the process criteria is defined and saved, it will be available for future use.

There are three (3) phases used to complete this process:

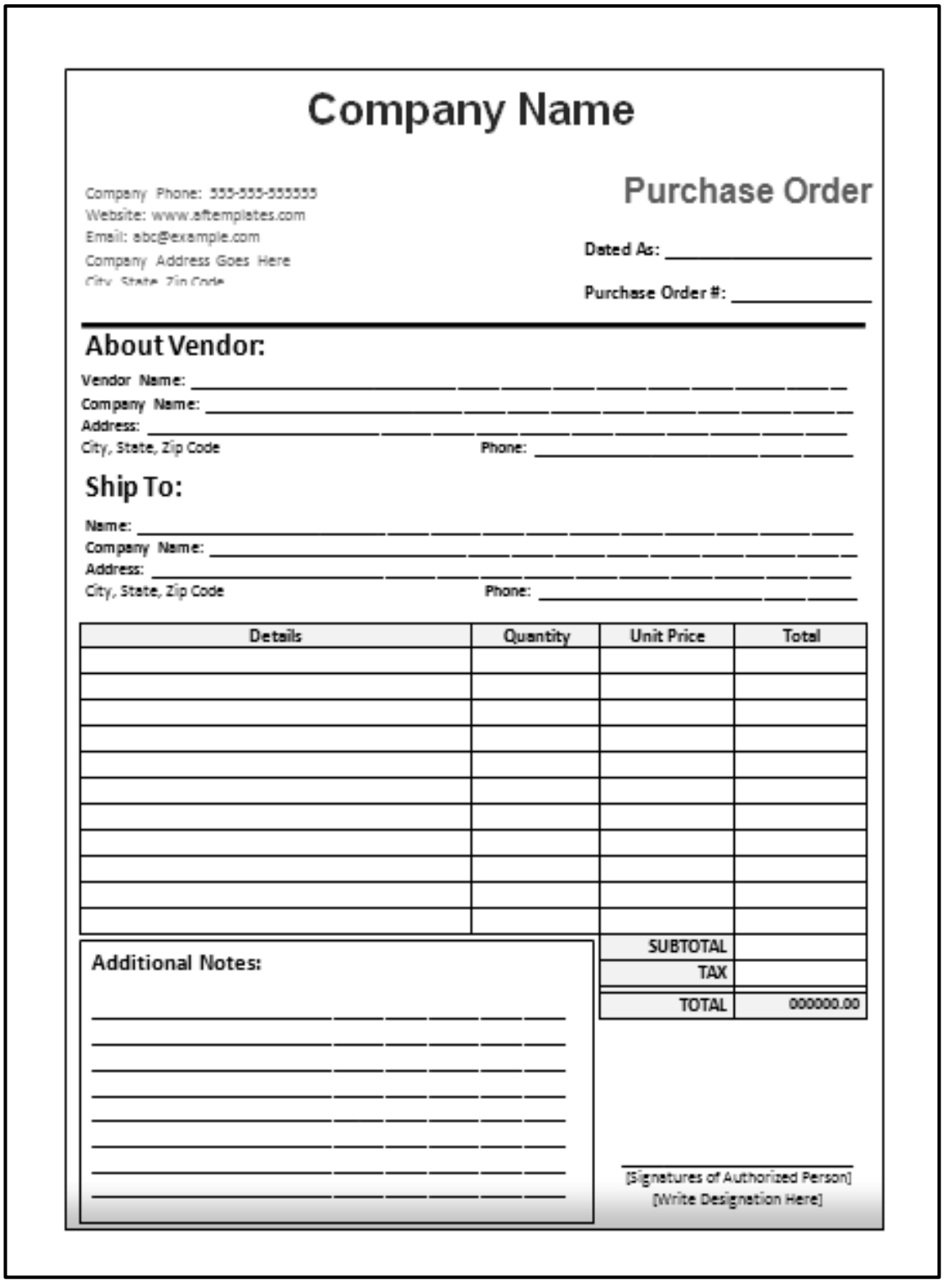
a. Dispatch Purchase Orders page (setup)

b. Process Scheduler Request page (run)

c. Process List page (view/verify results)

Turn to the next page to see the sample of the Purchase Order.

DISPATCH PURCHASE ORDERS BY BATCH



Company Name

Company Phone: 555-555-555555
Website: www.aftemplates.com
Email: abc@example.com
Company Address Goes Here
City, State, Zip Code

Purchase Order

Dated As: _____

Purchase Order #: _____

About Vendor:

Vendor Name: _____
Company Name: _____
Address: _____
City, State, Zip Code Phone: _____

Ship To:

Name: _____
Company Name: _____
Address: _____
City, State, Zip Code Phone: _____

Details	Quantity	Unit Price	Total
		SUBTOTAL	
		TAX	
		TOTAL	000000.00

Additional Notes:

_____
_____
_____
_____
_____
_____
_____
_____

[Signatures of Authorized Person]
[Write Designation Here]

Figure 1.15. Dispatch Purchase Order by batch.

Input your Buyer ID and click the Approved Radio box located in the Status section.

SAMPLE OF COMPUTERIZED DISPATCH AND PURCHASE ORDER SYSTEM

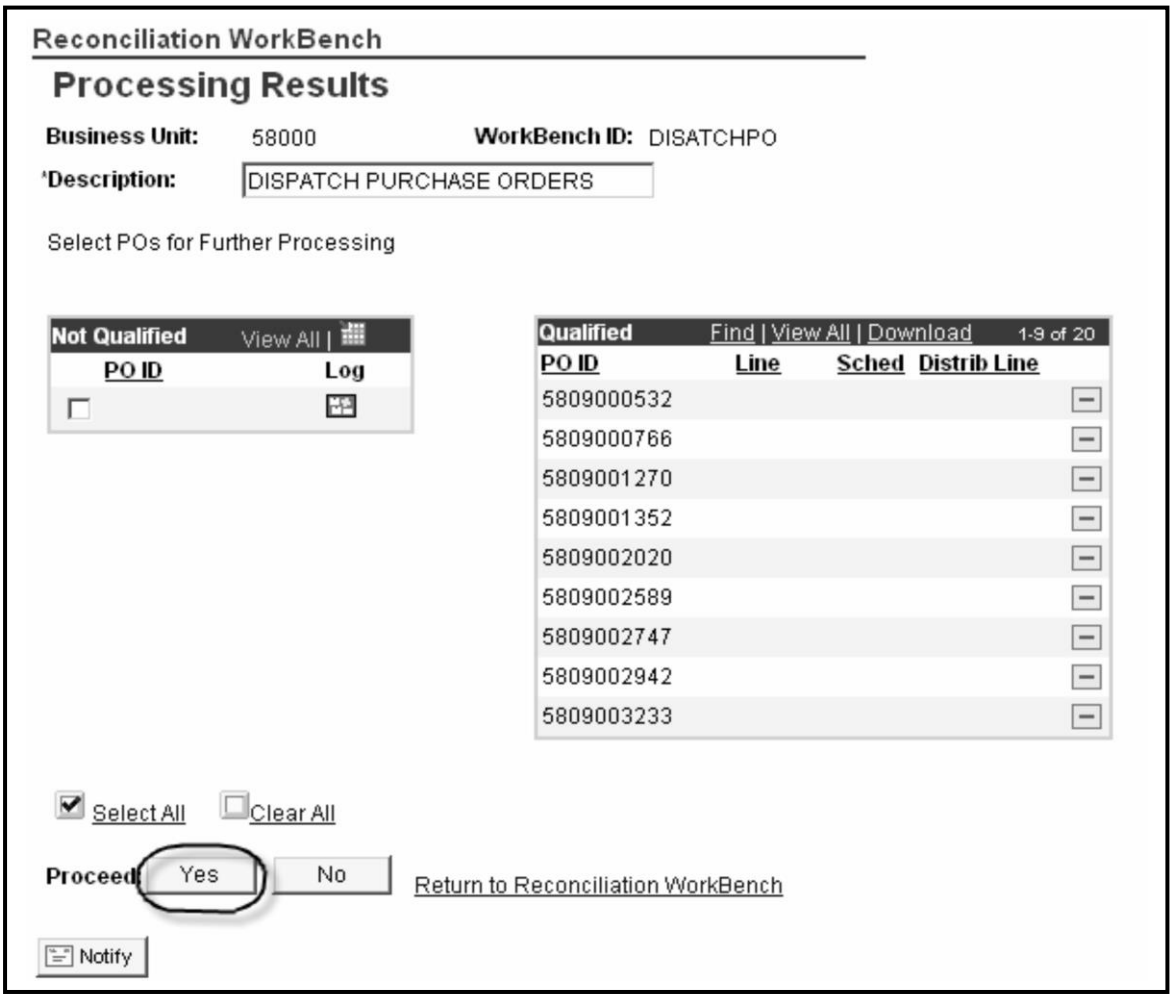


Figure 1.16. Electronic processing of Purchase Order.

Reconciliation WorkBench

Business Unit: 58000 **WorkBench ID:** DISATCHPO

Description: DISPATCH PURCHASE ORDERS

Select POs for Further Processing

List of Purchase Orders Customize | Find | View 10 | Download First 1-20 of 20 Last

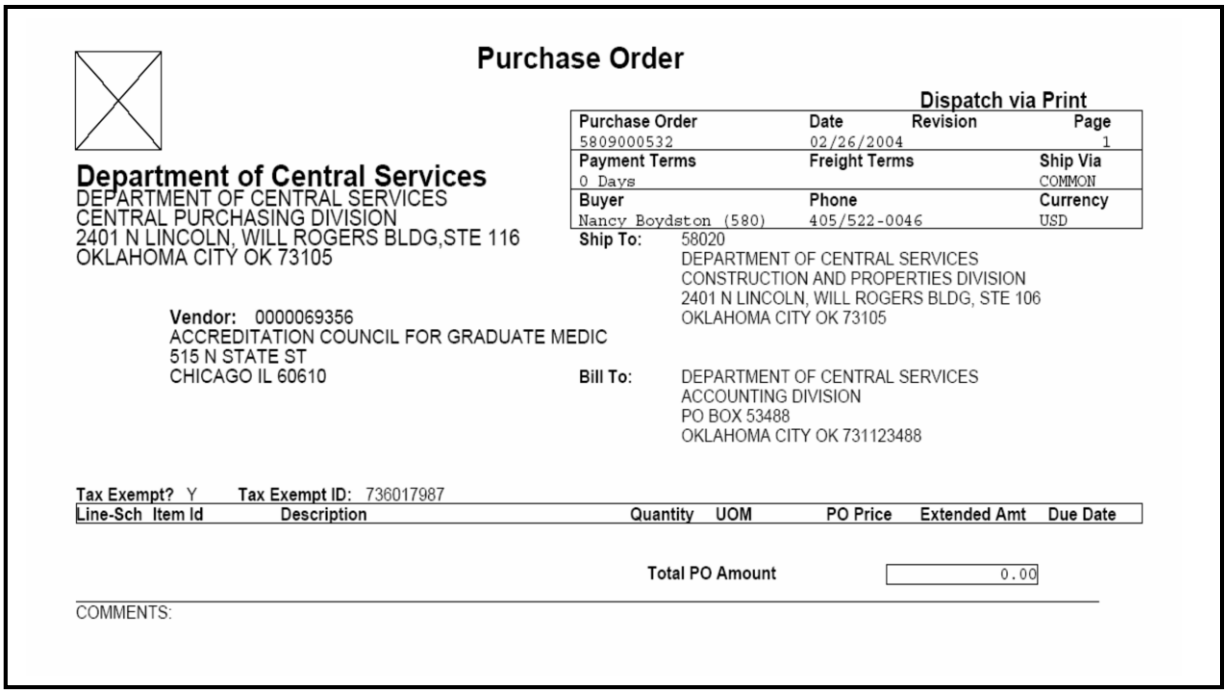
Detail | Other

Purchase Order	Doc Status	PO Status	Hold	PO Date	Last Activity	Vendor ID	Buyer	Match Action	Change Order	Blanket PO	Lines
5809000532		Approved	N	02/26/2004	06/27/2005	0000069356	Nancy Boydston (580)	Standard			
5809000766		Approved	N	04/08/2004	08/04/2006	0000059443	Theresa Howell	Standard	1		
5809001270		Approved	N	06/26/2004	11/18/2005	0000069633	Keith Hicks	Standard	1		
5809001352		Approved	N	07/07/2004	11/19/2005	0000066849	Keith Hicks	Standard	4		
5809002020		Approved	N	11/18/2004	11/29/2005	0000056253	Gwen Martin	Standard	1		
5809002589		Approved	N	04/19/2005	12/27/2005	0000071553	Cathye Vester	Standard	1		
5809002747		Approved	N	05/18/2005	11/13/2005	0000068366	Marti Anderson	Standard	3		
5809002942		Approved	N	06/30/2005	07/31/2006	0000041355	Gary Rowland (580)	Standard	2		
5809003233		Approved	N	08/23/2005	07/05/2006	0000077976	Keith Hicks	Standard	1		
5809003321		Approved	N	09/02/2005	02/15/2006	0000068165	Marti Anderson	Standard	1		
5809003398		Approved	N	09/20/2005	06/23/2006	0000072246	Marti Anderson	Standard	1		
5809003473		Approved	N	10/03/2005	02/28/2006	0000076796	Carol Morris (580)	Standard	1		
5809003510		Approved	N	10/13/2005	05/25/2006	0000068366	Marti Anderson	Standard	1		
5809003517		Approved	N	10/14/2005	06/27/2006	0000068366	Marti Anderson	Standard	1		
5809003930		Approved	N	02/03/2006	02/15/2006	0000068165	Marti Anderson	Standard	1		
5809004208		Approved	N	04/11/2006	04/12/2006	0000016942	Gwen Martin	Standard	1		
5809004379		Approved	N	05/23/2006	05/24/2006	0000072648	Marti Anderson	Standard	1		
5809004580		Approved	N	06/29/2006	06/29/2006	0000073373	Keith Hicks	Standard	1		
5809004689		Approved	N	07/21/2006	07/25/2006	0000068165	Marti Anderson	Standard	1		
Y008715		Approved	N	07/12/2001	12/27/2005	0000075261	Theresa Johnson (580)	Standard	8		

Select All Clear All

Action: Approve | Unapprove | Cancel | Close | Dispatch | Preview

Figure 1.17. Reconciliation Workbench.



Purchase Order

Dispatch via Print

Purchase Order	Date	Revision	Page
5809000532	02/26/2004		1
Payment Terms	**Freight Terms**		**Ship Via**
0 Days			COMMON
Buyer	**Phone**		**Currency**
Nancy Boydston (580)	405/522-0046		USD

Department of Central Services
DEPARTMENT OF CENTRAL SERVICES
CENTRAL PURCHASING DIVISION
2401 N LINCOLN, WILL ROGERS BLDG,STE 116
OKLAHOMA CITY OK 73105

Ship To: 58020
DEPARTMENT OF CENTRAL SERVICES
CONSTRUCTION AND PROPERTIES DIVISION
2401 N LINCOLN, WILL ROGERS BLDG, STE 106
OKLAHOMA CITY OK 73105

Vendor: 0000069356
ACCREDITATION COUNCIL FOR GRADUATE MEDIC
515 N STATE ST
CHICAGO IL 60610

Bill To: DEPARTMENT OF CENTRAL SERVICES
ACCOUNTING DIVISION
PO BOX 53488
OKLAHOMA CITY OK 731123488

Tax Exempt? Y **Tax Exempt ID:** 736017987

Line-Sch	Item Id	Description	Quantity	UOM	PO Price	Extended Amt	Due Date

Total PO Amount 0.00

COMMENTS:

Figure 1.18. Purchase Order.

Supplier Rationalization

It is the optimization and prioritization of your supply base and as much about how you manage engagement with them as the number you have or the price they charge you. Mapping your supply base to business needs could either decrease or increase the number of suppliers you work with as well as enhancing the opportunity presented to them. **Rationalization** is about making changes based on knowing who you are buying from, how much it costs your organization to do so. Rationalization can actually be a way for procurement people to help departments improve the way they buy from their chosen suppliers.

Job scheduling and dispatch software utilizes built –in scheduling criteria to automate much of the scheduling process. These includes resource details such as work data and scheduling policies can be created, deleted, or modified as needed. Scheduling is important because it assists to make the job easier.

Learning Activity 12.2.2.5: Complete the activities given below.

1. Briefly explain what dispatch is.

_____
_____
_____
_____

2. What is supplier rationalization?

_____
_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2.6 Maintenance, Quality Control and Quality Measures

Quality Maintenance

It is aimed towards customer delight with highest quality through defect-free manufacturing. Focus is on eliminating non-conformances in a systematic manner, much like Focused Improvement. We gain understanding of which parts of the equipment affect product quality and begin to eliminate current quality concerns, and then move to potential quality concerns. Transition is from reactive to proactive (Quality Control to Quality Assurance).

Quality Maintenance activities **are to set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products**. The conditions are checked and measured in time series to verify that measured values are within standard values to prevent defects. The transition of measured values is watched to predict possibilities of defects occurring and to take counter measures beforehand.

Policy

1. Defect free conditions and control of equipment.
2. Quality maintenance activities to support quality assurance.
3. Focus of prevention of defects at source.
4. Focus on poka-yoke (mistake-proof system).
5. In-line detection and segregation of defects.
6. Effective implementation of operator quality assurance.

Target

1. Achieve and sustain customer complaints at zero.
2. Reduce in-process defects.
3. Reduce cost of quality.

Data Requirements

Quality defects are classified as *customer end* defects and *in house* defects. For customer and data, we have to get data on;

1. Customer end line rejection.
2. Field complaints.

In-house, data, includes data related to products and data related to process.

Data Related to Product

1. Product-wise defects.
2. Severity of the defect and its contribution—major/minor.
3. Location of the defect with reference to the layout.
4. Magnitude and frequency of its occurrence at each stage of measurement.

5. Occurrence trend in beginning and the end of each production/process/changes (like pattern change and ladle/furnace lining.

6. Occurrence trend with respect to restoration of breakdown/modifications/periodical replacement of quality components.

Data Related to Processes

1. The operating condition for individual sub-process related to men, machines, materials, methods, measurements (through which process control is done), and the environment (the working conditions under which the process operates, e.g., lighting, ambient temperature, sanitation and noise). If anything is wrong with any one of them, there will be process problems. For a process to work smoothly, all six must be in their optimal states.

2. The standard settings/conditions of the sub-process; and

3. The actual record of the settings/conditions during the defect occurrence.

Total Quality Management

Total Quality Management is a recognized system that empowers employees to accept or reject their own output to agreed standards, based on the premise that each work group is a customer of the preceding group, and that continual advancement should be made towards zero defects.

Many companies have adopted Total Quality Management program, to improve the quality of their products, service and marketing processes constantly. Quality has a direct impact on product's performance and hence on customer satisfaction.

Quality Measures

Why measure performance?
'When you can measure what you are speaking about and express it in numbers, you know something about it'. (Kelvin - date to be inserted)
'You cannot manage what you cannot measure'. (Anon- date to be inserted)

These are two often-quoted statements that demonstrate why measurement is important. Yet it is surprising that organizations find the area of measurement so difficult to manage.

In the cycle of never-ending improvement, performance measurement plays an important role in;

- identifying and tracking progress against organizational goals.
- identifying opportunities for improvement.
- comparing performance against both internal and external standards.

Reviewing the performance of an organization is also an important step when formulating the direction of the strategic activities. It is important to know where the strengths and weaknesses of the organization lie, and as part of the *'Plan –Do – Check – Act'* cycle, measurement plays a key role in quality and productivity improvement activities. The main reasons it is needed are;

- To ensure customer requirements ***have*** been met.
- To be able to set sensible ***objectives*** and comply with them.
- To provide ***standards*** for establishing comparisons.
- To provide ***visibility*** and a "scoreboard" for people to ***monitor*** their own performance level.
- To highlight ***quality problems*** and determine areas for ***priority attention.***
- To provide ***feedback*** for driving the improvement effort.

It is also important to understand the impact of TQM on improvements in business performance, on sustaining current performance and reducing any possible decline in performance.

Learning Activity 12.2.2.6: Complete the activities given below.

1. What is quality maintenance?

_____
_____
_____

2. What is measurement and why is it important in operations management?

_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.2.7 Organising Operation Technology

Technology

Technology is the study of the application of science and scientific knowledge for practical purposes in industries, farming, medicine or business, example, computer technology**.**

Technology is perhaps the most dramatic force now shaping our destiny. Technology has released such wonders as penicillin, organ transplants, supercomputers and the microcomputer. It has also released such horrors as the machine gun, nuclear submarines, hydrogen bombs, nerve gas, cruise missiles and smart bombs, among others. It has released such mixed blessings as the motor car, television, credit cards and now the World Wide Web and electronic commerce. Our attitude towards technology depends on whether we are more impressed with its wonders or its blunders.

Every new technology replaces an older technology. Transistors hurt the vacuum tube industry, xerography hurt the carbon paper business, the car hurt the railroads and television hurt the movies etc. When old industries fought or ignored new technologies, their businesses declined. New technologies create new markets and opportunities. The market should watch the trend in technology development.

Information Technologies are mostly software applications for commercial decision making, planning, business processes management and resource allocation. Information Technology applications can include, among others;

- **Enterprise Resource Planning** – ERP. For managing financial and human resources, materials and assets.
- **Enterprise Asset Management** – EAM. For supply chain, inventory management, work and asset management.
- **Mobile Workforce Management** – MWFM. For managing mobile field crews, mapping, work scheduling and optimization.
- **Customer Information Systems** – CIS. For managing customer data, metering data, settlements and invoicing.
- **Energy Portfolio Management** – EPM. For energy planning, portfolio optimization, scheduling, energy trading and risk management, market analysis, retail management, price and load forecasting, ISO bidding, settlements and post analysis.
- **Demand Response Management** – DRMS. For managing demand response programs and Virtual Power Plants (VPP).
- **Advanced Metering Infrastructure** – AMI. For gathering and managing metering data (interval and non-interval). Includes remote reading, and possibly remote control.

Operation Technologies are software applications that provide operational control of assets in the organization in real time (or near real time).

The operations are responsible for execution, monitoring and control system, making sure the organization is operating within the allowed ranges of reliability, quality and cost set by the regulations and parameters of the corresponding agencies. This control and monitoring is executed via control and protection devices such as switches, voltage regulators, capacitor controls, and feeder protection.

The decisions that the operations group make are aimed at (in priority order):

1. Meeting commitments to customers in terms of quality and delivery
2. Producing output in the most cost effective or economical way

Technology is a broad concept that deals with a species' usage and knowledge of tools and crafts, and how it affects a species' ability to control and adapt to its environment. In human society, it is a consequence of science and engineering, although several technological advances predate the two concepts (Stoneman and Diederen, 1994). In order to achieve and maintain competitiveness in the international market, small and medium enterprise manufacturers must embrace modern technologies that enable them develop efficient production (Greenway, 1994). Maintaining consistent quality of products and reducing human content are major factors affecting a firm's decision to upgrade manufacturing technology.

Advanced manufacturing technology can improve quality throughout the entire manufacturing process in areas such as materials handling, inventory control, and production planning and scheduling. Advanced systems lead to quality improvements in the design stage because errors are discovered earlier in the process and more quickly. This allows adjustments to be made much faster and more accurately than without advanced manufacturing technology, helping to ensure quality in the manufacturing process (Ariss, Raghunathan and Kunnathar, 2000). Its adoption by small manufacturers gives them advantages over traditional manufacturing systems, such as lower cost quality improvements, higher productivity, and less working capital tied up in inventory (Phillips & Ledger wood, 1994).Technology is mainly concerned with production automation, flexible manufacturing and advanced processing equipment. Technology contributes to the competitive advantages of product quality, flexibility and low cost (Chen, 1999).

Studies have shown that Kenya's small and medium enterprise manufacturers are applying relatively old technology compared to its neighbors. SMEs in Kenya are finding it difficult to access the local and export market due to poor production techniques (GoK, 2007). Most of the plants and machinery is sourced from Europe and Asia. Increasing value addition in the entire production chain is imperative if Kenya is to achieve industrialization (GoK, 2007).

The ever increasing intensity of market competition has made the implementation of quality practices a prerequisite Technology is making a tremendous impact on business. Robots and machines are doing the work that people used to do and the computer is at the heart of business activity. The top managers, who can use powerful computer and specialized software to process and exchange information, eliminate the need for many hierarchical structures and middle management personnel. This, in combination with global competition, has forced many organizations to become less labor intensive and adopt more flexible structures.

Computer- Aided Design (CAD)

It is the use of computers and computer graphics to help design things. It makes the job easy for manufacturing companies to go through the hazard of drawing, cutting and pasting. Instead everything is done in the computer and printed out.

Computer Aided Manufacturing (CAM)

It is the use of computer to help design and manufacture goods. It helps operations management to manufacture goods with less labor and supervision.

Learning Activity 12.2.2.7: Complete the activities given below.

1. Discuss what technology is.

2. State two advantages and disadvantages of operations technology.

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.3 Identifying Management Issues

In this section you will study the concept and nature of Operations Management. In particular the Production System, Operations Management, Roles of Operations Manager, Production of Goods, Managing Goods and Services Operations and Ethics and Social Responsibility in Operation. As you progress on with your study, it will give you an insight of the importance of being equipped with management strategies to address any management issues that may arise in product or service providing organisation. Management issues differ according to the type of activity that is carried out in that organization. Operation management personnel must be informed and equipped to handle management issues that may arise in any organization.

Learning Outcomes;

On successful completion of this module, students will be able to:

- identify and describe management issues and finding soulutions to them and be prepared at all times for challenges in the production or provision of goods and services
- use a case study of an industry to demonstrate understanding of the need for industry to combine inputs to generate environmentally responsible finished product.

12.2.3.1 Minimising Cost

Cost

Costs are the monetary value of expenditures for suppliers, services, labour, products, equipment and other items purchased for use by a business. It is the amount denoted on the invoices as the price and recorded in book keeping records as an expense.

When starting up a business at any time it is important to ensure that your business is lean and efficient but this is particularly the case when wider economic conditions are difficult. Minimising cost even this early in your business may have you reduce your business costs, just by considering whether any element of your business product or services can be removed while still allowing the product or service to meet its requirements. There are cost-effective alternatives to high-cost elements. You may be able to make savings on your fixed costs often called **overhead**, which you pay for regardless of how much you produce or sell. They include **rent, rates per hour** and **wages**. You may be able to make savings on your variable costs, which are linked to how much you produce or sell. Variable costs include **materials, packaging, overtime** and **transport costs**.

Choosing and Managing your Suppliers

Different suppliers can vary greatly in terms of value for money, reliability and quality. Be prepared to shop around until you find the best suppliers to meet your specific needs. To minimise your costs, relationships with suppliers should be managed effectively and their performance assessed regularly.

Become a valuable customer by being reliable in placing orders and paying on time. Consider drawing up a contract or service level agreement to ensure that you receive good service from them.

Your bank is also a supplier so try to minimise your banking costs and make sure you get the cheapest form of credit available. Maintain a good relationship with your bank or other lenders.

Always try to be personally involved in dealing between your business and the lender. Take a personal approach to every aspect of your business start-up to create a good rapport with the suppliers and customers who will be instrumental in helping your business succeed.

Types of Costs

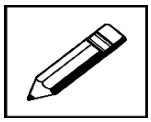
Fixed costs - (also known as overhead expenses) are costs that do not vary with production or sales level. Examples of fixed costs are: rent, heat, interest, salaries, bills,

Variable Costs- are costs that vary directly with the level of production. Examples of variable costs are: wires, plastic, packaging and other materials that go into production of a good.

Total costs- are the sum of the fixed and variable costs for any given level of production. Management wants to charge a price that will at least cover the total production costs at a given level of production. The company must watch its costs carefully. If it costs the business

more than its competitors to produce and sell its product, the business will have to charge a higher price or make less profit, putting it at a competitive disadvantage.

The price you charge for your product or service is one of the most important business decisions you make. Setting a price that is too high or too low will at best limit your business growth. At worst it could cause serious problems for your sales and cash flow. If you're starting a business, carefully consider your pricing strategy before you start. Established businesses can improve their profit ability through regular pricing reviews. When setting your prices you must make sure that the price and sales levels you set will allow your business to be profitable. You must also take note of where your product or service stands when compared with your competition and the ability and willingness of your customers to pay.



Learning Activity 12.2.3.1: Complete the activities given below.

1. What is cost?

_____
_____
_____
_____

2. Briefly explain why it is important to minimize costs.

_____
_____
_____
_____

3. State the types of costs and briefly explain each.

_____
_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.3.2 Pricing a Product

Price

It is defined as a selling price for a product, no matter what type of product you sell. The price you charge your customers or client will have a direct effect on the success of your business.

Though pricing strategies can be complex, the basic rules of pricing are straight forward. All prices must cover costs and profits. The most effective way to lower prices is to lower costs. Review prices frequently to assure that they reflect the dynamics of cost, market response to the competition and profit objectives. Price must be established to assume sales. Before setting a price for your product, you have to know the costs of running your business. If the price for your product or service doesn't cover costs, your cash flow will be cumulatively negative, and you will exhaust your financial resources and your business will ultimately fail.

To determine how much it costs to run your business, include property and or equipment leases, loan repayment, inventory, utilities, financing costs and salaries/wages/commission. Do not forget to add the costs of markdowns, shortages, damaged merchandise, employee, discounts, cost of goods sold and desired profit to your list of operation expenses. Most important is to add profit in you calculation of costs. Treat profit as a fixed cost, like loan repayment or payroll, since none of us is in business to break even. Because pricing of decisions require time and market research, the strategy of money business owners is to set prices once and hope for the best. However, such a policy risks profits that are elusive or not as high as they could be.

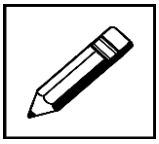
When is the right time to review your price? Do so if;

- You introduce a new product or product line.
- Your costs change.
- You decide to enter a new market.
- Your competitors change their prices.
- The economy experiences either inflation or recession.
- Your sales strategy changes.
- Your customers are making more money because of your product or service.

Prices are generally established in one of the four ways;

1. **Cost-plus pricing** – many manufacturers use cost-plus pricing. The key to being successful with this method is making sure that the plus figure not only covers all overhead but generates the percentage of profit you require as well. If your overhead figure is not accurate, you risk profits that are too low.

2. **Demand pricing** - demand price is determined by the optimum combination of volume and profit. Products usually sold through different channels (For example; discount chains, wholesalers. or direct mail marketers) at different prices are examples of goods whoseprice is determined by demand.



A wholesaler might buy greater quantities than a retailer, which results in purchasing at a lower unit price. The wholesaler profits form a greater volume of sales of a product priced lower than that of the retailer. The retailer typically pays more per unit because he or she is unable to purchase stock, and sell as great a quantity of product as a wholesaler does. This is why retailers charge higher prices to customers.

Demand pricing is difficult to master because you must correctly calculate beforehand what price will generate the optimum relation of profit to volume.

3. Competitive pricing-is generally used when there is an established market price for a particular product or service. If all your competitors are charging K100 for a replacement windshield, for example, that is what you should charge. Competitive pricing is used most often within markets with commodity products, those that are difficult to differentiate from one another. To use competitive pricing effectively, know the prices each competitor has established. Then figure out your optimum price and decide, based on direct comparison, whether you can defend the prices you have set.

4. Mark-up pricing- used by manufacturers, wholesalers and retailers, a markup is calculated by adding a set amount to the cost of a product, which results in the price charged to the customer.

In addition other pricing schemes are:

1. Penetration pricing – pricing lower than the existing dominant competitor to be able to enter a market. It gives customers an incentive to try out the new entrant.
2. Predatory pricing – an existing dominant competitor drops its price even lower than that of the new entrant, in an effort to drive the latter out of the market. When the effort is successful, the price returns to the former higher level.
3. Inventory-based pricing – pricing low when stocks are still plentiful but raising the price when supply runs low
4. Prestige pricing – deliberately charging a higher, or premium, price as part of a strategy to create an image of high quality or exclusivity.

The price you charge for your product or service is one of the most important business decisions you make. Setting a price that is too high or too low will at best limit your business growth .At worst it could cause serious problems for your sales and cash flow. If you are starting a business, carefully consider your pricing strategy before you start. Established businesses can improve their profit ability through regular pricing reviews. When setting your prices you must make sure that the price and sales levels you set will allow your business to be profitable. You must also take note of where your product or service stands when compared with your competition and your customers.

Learning Activity 12.2.3.2: Complete the activities given below.

1. Define the term price.

_____
_____
_____

2. Why is price very important in business?

_____
_____
_____

3. List four (4) different ways of establishing price.

a._____
b._____
c._____
d._____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.3.3 Issues of Maintaining Quality in Product Growth

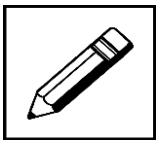
Concept of Quality

Deming (1986) considered quality and process improvement activities as the catalyst necessary to start an economic chain reaction. Improving quality leads to decreased costs, fewer mistakes, fewer delays, and better use of resources, this in turn leads to improved productivity, which enables a firm to capture more of the market, which enables the firm to stay in business, which results in providing more jobs (Summers, 2006).

The quality concept has been a popular research topic in marketing and management literature where researchers have attempted to identify key dimensions of quality initiatives and performance. Researchers have defined the concept of quality in different ways ranging from perception of value (Summers, 2006) to conformance to requirements (Deming, 1986), fitness for use (Juran, 1979) and finally to meeting customer's expectations (Oakland, 2004). Quality is a customer determination based on the customer's actual experience with the product or service, measured against his or her requirements stated or unstated, conscious or merely sensed, technically operational or entirely subjective and always representing a moving target in a competitive market (Cole, 2002). Gupta (2004) point out the importance of quality by saying **"quality is an important strategic dimension and a key competitive weapon"**

Maintaining quality in a product is one important aspect to promote product growth. As customers we would like the product to be worth the money we pay. If the producer can meet the consumer's expectations by providing a quality product, the consumers will want to have more of it; in return the demand will increase and thus will result in more of the good to be produced or an expansion of production of that particular good which result in product growth.

In business, it is all about meeting customer's expectations and satisfying their needs and wants and making profit. Therefore for the business to be profitable it must promote and maintain quality in its product to attract more customers. In the same manner it will have advantage over its competitors.



Learning Activity 12.2.3.3: Complete the activities given below.

1. Briefly explain why it is important to maintain quality in a product.

_____
_____
_____
_____

2. What is the main motive of a business?

_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

12.2.3.4 Product Ethics and Social Responsibilities

Ethics

Ethics has been defined as "moral philosophy: the study of the general nature of morals and of the specific moral choices to be made by a person."
(The American Heritage® Dictionary of the English Language, 4th edition.).
Product ethics –refers to the standards that determine the quality and durability of an output.
Ethics and morals, however, are not the same thing, even though they are inextricably linked. A moral philosophy develops over time as a result of encountering and resolving moral problems as they arise.

Business Ethics and Social Responsibility

The acceptability of behavior in business is determined by customers, competitors, government regulators, interest groups, and the public, as well as each individual's personal moral principles and values.

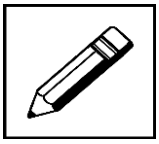
> For example, the ICCC had taken a bus driver to Waigani National Court for overcharging his passengers, (passengers were asked to pay K2.00 while they were supposed to pay only .80t) and he was asked to pay a fine of K300.00.

Many consumers and social advocates believe that businesses should not only make a profit but also consider the social implications of their activities. We define **social responsibility** as "a business's obligation to maximize its positive impact and minimize its negative impact on society".

Although many people use the terms *social irresponsibility* and *ethics* interchangeably, they do not mean the same thing. Business ethics relates to an *individual's* or a *work group's* decisions that society evaluates as right or wrong, whereas social responsibility is a broader concept that concerns the impact of the *entire business's* activities on society.

From an ethical perspective, for example, we may be concerned about a health care organization or practitioner overcharging the provincial government for medical services. From a social responsibility perspective, we might be concerned about the impact that this overcharging will have on the ability of the health care system to provide adequate services for all citizens.

The most basic ethical and social responsibility concerns have been codified as laws and regulations that encourage businesses to conform to society's standards, values, and attitudes. At a minimum, managers are expected to obey these laws and regulations. Most legal issues arise as choices that society deems unethical, irresponsible, or otherwise unacceptable. However, all actions deemed unethical by society are not necessarily illegal, and both legal and ethical concerns change over time. Business law refers to the laws and regulations that govern the conduct of business. Many problems and conflicts in business can be avoided if owners, managers, and employees know more about business law and the legal system. Business ethics, social responsibility, and laws together act as a compliance system requiring that businesses and employees act responsibly in society.



Learning Activity 12.2.3.4: Complete the activities given below.

1. What is business ethics?

_____
_____
_____

2. Why is business ethics important?

_____
_____
_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

This case study signifies the importance of quality management in an organisation.

Case study

Toyota Motor Corporation
Pub Date: 2010
Country: Japan; Global
Industry: Automotive
By: 1 Tech industry.

This case study is about quality management at Toyota Motor Corporation, the world's leading automotive. Over the years the Japan's automaker had built up a reputation for manufacturing reliable cars and trucks. Toyota's products were a byword for quality for customers so much so that its manufacturing techniques were followed by its competitor's world over. Toyota's commitment to manufacturing world class and quality automobiles was entrenched in its entire manufacturing philosophy right through the development stage to manufacturing. At Toyota, quality was in built into each manufacturing process and employees from all divisions ensured that defective items did not pass on to the next process.

At the core of the company's success was the Toyota Production System (TPS), which made use of concepts like genchi genbutsu, Just –in –Time (JIT), Kaizen, Kanban and Jidoka to reach a high level of efficiency in production.

Toyota recognised quality as one of the most important factors affecting customer satisfaction and strove to achieve excellence in manufacturing quality products. To ensure zero defects in the finished product, Toyota set up quality assurance systems across various divisions, including development, purchasing and production.

To overcome quality assurance problems caused due to rapid globalization, Toyota adopted the "Toyota way"- a set of management principles and communicated them to all its overseas manufacturing plants. Due to its efficiency in manufacturing, Toyota became one of the most trusted brands in the global automobile industry.

But some analysts felt that Toyota had become a victim of its own success. In the mid –2000s Toyota expanded its production facilities rapidly in a bid to grow globally and to achieve its goal of becoming the number one auto maker in the world. Toyota's rapid growth affected its product quality with the company reportedly compromising on its manufacturing techniques. Customers began to face safety related problems in Toyota vehicles. Later a series of recalls followed which put the company's hard earned reputation for quality at risk.

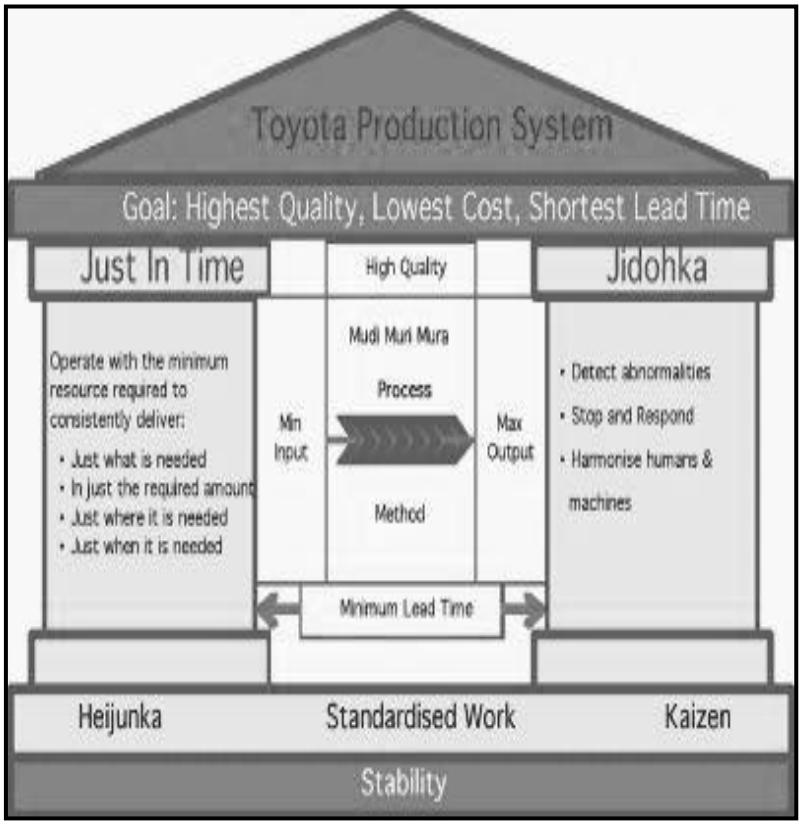
Analysts opined that constant recalls had damaged the reputation of the company and brand image of Toyota and hindered its return to profitability. In quest for market share, Toyota had sacrificed its legendary quality and ignored its own management principles and customers, they said. To verify the cause of recalls and improve quality, Toyota set up a

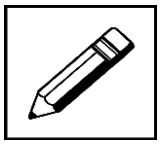
committee headed by its president Akio Toyoda in early 2010. The committee was to inspect every process in the Toyota production system to ensure delivery of quality products to customers.

Issues

- Study quality management practise at Toyota that helped it earned a reputation for quality.
- Analyse the importance of quality in the Toyota production system.
- Understanding the manufacturing principles adopted by the Toyota production system.
- Examine the reasons for the quality related problems faced by Toyota.
- Discuss and debate whether Toyota was losing its quality edge.
- Explore strategies that Toyota could adopt in the future to regain its quality edge.

Adapted from 1 Tech case studies.www.icmrindia.org/../opero95.htm





Learning Activity 12.2.3.4 (b)

1. Give a brief explanation of why Toyota drop or fail in its delivery of quality automobiles.

_____

_____

_____

_____

_____

2. One way for Toyota to regain its customer confidence of its product is to install one of those sophisticated robots that can detect defects in its production line. Do you agree? Yes or no. Give an explanation for answer.

_____

_____

_____

NOW CHECK YOUR ANSWERS AT THE END OF THE MODULE

Summary

- Production system is a result of arranging inputs, their conversion/transformation process and output based on some logic and functions. Production system fails if any such arrangement made doesn't give a desired level of outcome.
- Production system consists of three main components:
  Input – includes raw- materials, machines, man-hours, components or parts, drawing instructions and other paper works.
  Transformation process- includes operations (actual production process). Operations may be manual, mechanical or chemical. Operations transform inputs into outputs. Transformation process also includes supporting activities, Production planning and control purchase of raw materials, receipt, storage and issue of materials, inspection of parts and work-in progress, testing of products, quality control and warehousing of finished products which help the process of transformation.
  Output- includes finished products, finished goods (parts) and services.
- Production systems can be classified as:
  - Job shop production is characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed time and cost.
  - Batch production is *"a form of manufacturing in which the job passes through the functional departments in lots or batches and each lot may have a different routing"* As defined by American Production and Inventory Control Society (APICS).
  - Mass production the production of discrete parts or assemblies using a continuous process. The production is done in very big volume.
  - In Continuous Production, production facilities are arranged as per the sequence of production operations from the first operations to the finished product.
- The six reasons for production are: for economic growth, job creation, global trade, power, development and for the use of service.
- Operations management (OM) is the science and art of ensuring that goods and services are created and delivered successfully to customers.
- Operation managers are concerned with planning, organizing, and controlling the activities which affect human behavior.
- Planning is a set of activities that establishes a goal, a course of action to achieve, and a guide for future decision-making.
- Controlling – are activities that assures the actual performance is in accordance with planned performance.
- Behavior – is concerned with human efforts to plan, organize and control effects on human behavior.
- Models- refer to the models that are used to execute planning, organizing and controlling.

- Manufacturing- is characterized by tangible outputs (products).
- Service-is characterized by intangible outputs.
- The first objective of operating systems is the customer service to the satisfaction of customer wants. Therefore, customer service is a key objective of operations management.
- Another major objective of operating systems is to utilize resources for the satisfaction of customer wants efficiently, that *is*, customer service must be provided with the achievement of effective operations through efficient use of resources.
- Operations managers are responsible for managing activities that are part of the production of goods and services. Their direct responsibilities include; **managing the operations process, embracing design, planning, control, performance improvement, and operations strategy**. Their indirect responsibilities include interacting with those managers in other functional areas within the organization whose roles have an impact on operations. Such areas include marketing, finance, accounting, personnel and engineering.
- **Operations managers' responsibilities or role include:**
  - human resource management
  - asset management
  - cost management
  - scheduling and capacity
  - quality
- **The Overlapping Roles of Managers are:**
  - The Interpersonal Role.
  - The interpersonal role consists of three groups of activities.
  - Representing of his or her unit or department.
  - Taking the lead in appointing staff, training, motivating others, evaluating and performance.
  - Maintaining good relations with all stakeholders within the organization.
- **The Information Role**
  This role requires managers to obtain information to help them make decisions. It focuses on synthesizing information about change, opportunities or threats in order to analyze the environment.
- **The Decision-Making Role**
  In order to make decisions, managers need to gather and analyze information. This requires them to "act" like entrepreneurs to seek out a new product or idea. Decision making is a central role of all operations managers. Decisions need to be made in;
  - designing the operations system.
  - the operations system.
  - managing improving the operations system.

Sequencing - It is the arrangement of things in successive order.
Roster - is the coordination and allocation of staff as an input.

- A good is a physical product that you can see, touch or possibly consume.
  There are two types of goods and they are known as:

Durable – a durable good is a product that typically lasts at least three years.
Nondurable - non-durable goods are perishable and generally last for less than three years.

- The factors of production are labor, capital and raw materials are used in order to produce goods and services that are sold to consumers, governments, or other firms.
- Some of the factors of production that the firm needs are available only in fixed quantities, while other factors of production, however, are variable in the short- run,
- A firm combines its factors of production in order to produce goods or output. The total amount of output the firm produces, the firm's total product, depends on the quantities of factors that the firm purchases or employs.
- The Law of Diminishing Returns says that as successive units of a variable factor of production are combined with fixed factors of production, the marginal product of the variable factors of production will eventually decline.
- The choice of which product to make is a fundamental decision by a firm. Firms choose which product to produce within an industry as well as whether to enter or exit the market. Product choice is determined by an interaction between firm characteristics, product characteristics, and market conditions.
- Product mix refers to the set of all product lines and items that a particular seller offers for sale to buyers.

The four dimension of product mix:

- The **breadth** of product mix refers to the number of different product lines the company carries.
- The **length** of product mix refers to the total number of items the company carries.
- The **depth** of product mix refers to the number of versions offered for each product in the line.
- The **consistency** of the product mix refers to how closely relate the various product lines are in end use, production requirements, distribution channels or some other way.
- The elements of marketing mix are: product, price, place and promotion.

Product mix refers to the set of all product lines and items that a particular seller offers for sale to buyers.

- A facility is an entity that facilitates the performance of any job. It may be a machine tool, a work centre, a manufacturing cell, a machine shop, a department, a warehouse, etc. (Heragu, 1997).
- Layout determines the placement of departments, work groups within the departments, workstations, machines, and stock-holding points within a production facility. The objective is to arrange these elements in a way that ensures a smooth work flow (in a factory) or a particular traffic pattern (in a service organization).
- The trend in *office layout* is toward more open offices, with personal work space separated only by low divider walls.

- In a workstation, work is performed on a product either by adding parts or features by completing assembly operations. The work performed at each station is made up of many bits of work, termed *tasks, elements,* and *work units*.
- Product plant layouts useful when the production process is organized in a continuous or repetitive way.
- Continuous flow: The correct operations flow is reached through the layout design and the equipment and machinery specifications.
- Repetitive flow (assembly line): The correct operations flow will be based in a line balancing exercise, in order to avoid problems generated by bottle necks.
- Process-oriented plant layout comprises of the following: This type of plant layout is useful when the production process is organized in batches.
- Personnel and equipment to perform the same function are allocated in the same area.
- The different items have to move from one area to another one, according to the sequence of operations previously established.
- The variety of products to produce will lead to a diversity of flows through the facility.
- The variations in the production volumes from one period to the next one (short periods of time) may lead to modifications in the manufactured quantities as well as the types of products to be produced.
- Quality is of great importance as consumers are only interested to pay for goods or service that is worth their money**.**
- Quality begins with the design of a product in accordance with the customer specification. Further, it involved the established measurement standards, the use of proper material and selection of suitable manufacturing process. Quality is a relative term that is generally used with reference to the end use of the product.
- Product quality refers the ability of a product to perform its functions. It includes the products' overall durability, reliability, precision, ease of operation and repair and other valued attributes.
- According to Juran "Quality control is the regulatory process through which we measure actual quality performance, compare it with standards, and act on the difference".

- Types of Quality Control are:

1. Off-line quality control: Its procedure deal with measures to select and choose controllable product and process parameters in such a way that the deviations identify the product or process output and the standard will be minimized.

2. Statistical process control: SPC involves comparing the output of a process or a service with a standard and taking remedial actions in case of a discrepancy between the two. The corrective action is taken in that operational phase. This is on real-time basis.

Acceptance sampling plans: A plan that determines the number of items to sample and the acceptance criteria of the lot, based on meeting certain stipulated conditions (such as the risk of rejecting a good lot or accepting a bad lot) is known as an acceptance sampling plan.

The seven quality control tools are: **Pareto charts, Check sheets, Cause and effect diagram, Scatter diagrams, Histogram , Graphs or flow charts and Control charts**

Just- In- Time is a manufacturing concept adopted by firms to control production quality and flexibility.

- Operations Planning and control is the process of planning the production in advance, setting the exact route of each item, fixing the starting dates for each item to give production orders to shops and to follow up the progress of products according to orders.
- Planning – is deciding in advance what to do, how to do it, when to do it, where to do it, and who to do it. Planning bridges the gap from where we are, to where we want to go. It makes it possible for things to occur which would not otherwise happen.
- Planning exists in several forms and sizes; Dessler (2001) categorized planning into three main dimensions which are planning based on **format, organization hierarchy** and **frequency of use.** Planning is important.
- Control is the task of ensuring that the activities are providing the desired results
- Quality control is the activities that management performs to ensure a level of quality that will satisfy the consumer, on one hand, and have certain benefits for the organization, on the other hand.
- Dispatching is concerned with the starting processes. It gives necessary authority so as to start a particular work, which has already been planned under routing and scheduling.
- A purchase order must be approved or dispatched and have passed the commitment control budget check to be eligible for dispatch.
- Rationalization is about making changes based on knowing who you are buying from, how much it costs your organization to do so.
- Scheduling is important because it assist to make the job easier.

Quality Management activities are to set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products. The conditions are checked and measured in time series to verify that measured values are within standard values to prevent defects.

- Measurement is important for the following reasons;
  - To ensure customer requirements ***have*** been met.
  - To be able to set sensible ***objectives*** and comply with them.
  - To provide ***standards*** for establishing comparisons.
  - To provide ***visibility*** and a “scoreboard” for people to ***monitor*** their own performance level.
  - To highlight ***quality problems*** and determine areas for ***priority attention.***
  - To provide ***feedback*** for driving the improvement effort.

- Technology has released such wonders as penicillin, organ transplants, supercomputers and the microcomputer. It has also released such horrors as the machine gun, nuclear submarines, hydrogen bombs, nerve gas, cruise missiles and smart bombs, among others. Every new technology replaces an older technology. When old industries fought or ignored new technologies, their businesses declined. New technologies create new market at opportunities.
- Technology is mainly concerned with production automation, flexible manufacturing and advanced processing equipment. Technology contributes to the competitive advantages of product quality, flexibility and low cost.
- Technology is making a tremendous impact on business. Robots and machines are doing the work that people used to do and the computer is at the heart of business activity. This, in combination with global competition, has forced many organizations to become less labor intensive and adopt more flexible structures.
- Costs are the monetary value of expenditures for suppliers, services, labour, products, equipment and other items purchased for used by a business. It is the amount denoted on the invoices as the price and recorded in book keeping, records as an expenses or cost basis.
- There are three types of costs, and they are;

Fixed costs - (also known as overhead expenses) are costs that do not vary with production or sales level. Examples of fixed costs are; rent, heat, interest, salaries, bills,
Variable Costs- are costs that vary directly with the level of production. Examples of variable costs are; wires, plastic, packaging and other materials that go into production of a good.
Total costs- are the sum of the fixed and variable costs for any given level of production.
The company must watch its costs carefully. If it costs the business more than its competitors to produce and sell its product, the business will have to charge a higher price or make less profit, putting it at a competitive disadvantage.

Price is a selling price for a product, no matter what type of product you sell. The price you charge your customers or client will have a direct effect on the success of your business. All prices must cover costs and profits. The most effective way to lower prices is to lower costs.

The right time to review your price is when:

You introduce a new product or product line

- Your costs change
- You decide to enter a new market
- Your competitors change their prices
- The economy experience either inflation or recession
- Your sales strategy changes
- Your customers are making more money because of your product or service.

The ways of establishing price are;

- **Cost-plus** – many manufacturers use cost plus pricing
- **Demand price**- demand price is determined by the optimum combination of volume and profit.

- **Competitive pricing**-is generally used when there's an established market price for a particular product or service.
- The price you charge for your product or service is one of the most important business decisions you make. Setting a price that is too high or too low will at best limit your business growth. If you're starting a business, carefully consider your pricing strategy before you start.
- The business or organization producing goods must practice business ethics in their operations. This will assist the business to produce within the business's recommended standards to fully satisfy the customers' need.
- Ethics are important because they play a vital role in adding the correct value to a product. It further assists in reducing disgruntles from consumers.
- Many consumers and social advocates believe that businesses should not only make a profit but also consider the social implications of their activities. Therefore all manufactured products must be customer and environmentally friendly.

Answers to Learning Activities

12.2.1

12.2.1.1

1. In brief, discuss what is a production system?
   It is a production function that that is concern with the transformation of inputs into the required output.

2. Define transformation process and identify the activities involved.
   It refers to the conversion of outputs into desired output. The activities involved are; production planning, raw materials, storage and work in progress.

3. Briefly discuss what a finished product is in production.
   It is the final outcome of an input as an output after going through all the stages of production.

4. Identify the different production systems and briefly explain each.
   Job shop *production is characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed time and cost.*
   Batch production *is defined "as a form of manufacturing in which the job passes through the functional departments in lots or batches and each lot may have a different routing.*
   Manufacture of discrete parts or assemblies using a continuous process is called ***mass production.*** *This production system is justified by very large volume of production.*
   Continuous Production*- is where Production facilities are arranged as per the sequence of production operations from the first operations to the finished product. . . and where individual work station capacities are balanced to allow uninterrupted operation of the entire system.*

12.2.1.2

1. Explain what Operations Management is?
   It is the science and art of ensuring that goods and services are created and delivered successfully to customers.

2. Distinguish between manufacturing and service operation.
   Manufacturing is concerned with tangible goods and service is concern with intangible goods.

3. Explain the main scope of operations management, planning, controlling and organizing.
   Planning-is set plan of activities that establishes a course of action and guide future decision-making is planning.
   Controlling - are activities that assure the actual performance in accordance with planned performance.
   *Organizing - Activities that establish a structure of tasks and authority****.***

12.2.1.3

1. Define the following words:
   Scheduling*- it is establishing of times at which to begin and complete each event or operation comprising a procedure*
   Sequencing *It is the arrangement of things in successive order.*

Roster - *is the coordination and allocation of staff as an input*

2. Write down the five responsibilities of an operations manager?
   a. Human resource management
   b. Asset management
   c. Cost management
   d. Scheduling and capacity
   e.Quality

3. Filling in blank
   a. *quality*
   b. *forward scheduling*
   c. *backward scheduling*
   d. *asset management*
   e. *cost management*

12.2.1.4

1. Explain what is a good?
   A good is a physical product that you can see, touch or possibly consume.

2. Identify the types of goods.
   Durable – a durable good is a product that typically lasts at least three years.
   Nondurable- a non-durable good is perishable and generally lasts for less than three years

3. What are the factors of production?
   The factors of production are labor, capital and raw materials

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12.2.1.5

Read and answer the following questions.

1. What is service? *A service is any primary or complimentary activity that does not directly produce a physical product.*

2. What is the difference between service and goods? *Service is intangible, work that is done for a customer. Goods are tangible.*

3. List down 5 (five) examples of services.
   a. Banking
   b. Insurance
   c. Transportation, shipping
   d. Health care
   e. Education

12.2.1.6

1. What is ethics?
   A study of what is good or right for human beings, what goals people ought to pursue and what actions they ought to perform.

2. What is social responsibility? *It is concern with promoting human welfare and good will.*

3. Why is ethics important in an organization? *Because it assists to maintain and control human behavior with respect to performing their responsibility, to at least give their best.*

12.2.2

12.2.2.1

1. Discuss what product choice is.
   It refers to which product to make.

2. Define product mix.
   Refers to the set of all product lines and items that a particular seller offers for sale to buyers.

3. List the four (4) dimensions of product mix.
   a. Breadth
   b. length
   c. depth
   d. consistency

12.2.2.2

1. What is a facility?

A service or piece of equipment which makes it possible to do something.

2. Identify the types of plant layout and briefly explain each.
   -Fixed position plant layout
   Product stays and resources move to it.

   -Product oriented plant layout
   Machinery and materials are placed following the product path.

   -Process oriented plant layout (Functional Layout).
   Machinery is placed according to what they do and materials go to them.

   -Cell layout
   Hybrid layout that tries to take advantage of different layouts types.

12.2.2.3

1. What is quality?
   Quality is conformance to requirement or specifications or Quality is fitness for use".

2. Why is it important to produce quality in a product?
   Because customers prefer something that is worth their money. Therefore to be profitable, producing quality is a prerequisite.

3. Explain what is quality control?
   A system that is used to maintain a desired level of quality in a product or service.
   Discuss the different types of quality control.
   Off-line quality control*- procedure deal with measures identifies and choose controllable product and process parameters.*
   Statistical process control*- involves comparing the output of a process or a service with a standard and taking remedial actions in case of a discrepancy between the two*
   Acceptance sampling plans*- plan that determines the number of items to sample and the acceptance criteria of the lot, based on meeting certain stipulated conditions.*

12.2.2.4

1. What is planning?
   Is deciding in advance what to do, how to do it, when to do it and who to do it.

2. Why is planning important?
   Because it helps to prepare in advance

3. What is control? And why is control important?
   Control is the task of ensuring that the activities are providing the desired results.
   Because it assists to ensure that what has being planned it carried out accurately.

12.2.2.5

1. Briefly explain, what dispatch is?
   Is concerned with the starting processes

2. What is it used for?
   It gives necessary authority so as to start a particular work, which has already been planned under, Routing and scheduling.

3. List down five (5 examples) of services.
   a. Banking
   b. Transportation, shipping
   c. Insurance
   d. Health care
   e. Education

12.2.2.6

1. What is quality maintenance?
   Refers to activities that set equipment conditions that preclude quality defects, based on the basic concept of maintaining perfect equipment to maintain perfect quality of products.

2. What is measurement and why is it important in operations management?
   It refers to identifying quality and quantity of something. It is important because it provides requirements and standards for the organization to meet.

12.2.2.7

1. Discuss what technology is.
   Technology is mainly concerned with production automation, flexible manufacturing and advanced processing equipment.

2. State two (2) advantages and disadvantages of operations technology.

   Advantage
   Reduce labor
   *Produce in large quantities**.***
   Disadvantage
   Makes people become lazy and reliant.
   *Reduce employment opportunity**.***

12.2.3

12.2.3.1

1. What is cost?
   It is the amount denoted on the invoices as the price and recorded in book keeping records as an expense or cost basis.
2. Briefly explain why it is important to minimize costs.
   It is important to minimize cost should the organization wants to be profitable.
3. State the types of costs and briefly explain each.
   Fixed costs - are costs that do not vary with production or sales level.
   Variable Costs- are costs that vary directly with the level of production.
   Total costs- are the sum of the fixed and variable costs for any given level of production.

12.2.3.2

1. Define the term price.
   As a selling price for a product, no matter what type of product you sell.
2. Why is price very important in business?
   Because it affects the success of your business. Wrong prices will cause loss of profit for your business.
3. List four (4) different ways of establishing price.
   a. Cost- plus pricing
   b. Demand price pricing
   c. Competitive pricing
   d. Mark-up pricing

12.2.3.3

1. Briefly explain why it is important to maintain quality in a product**.**
   Basically to attract more customers and be profitable.
2. What is the main motive of a business?
   Is to make profit.

12.2.3.3.3

1. What is business ethics?
   Business Ethics the study of the general nature of morals and of the specific moral choices to be made by a person." .
2. Why is business ethics important?
   Business Ethics are important because they play a vital role in adding the correct value to a product.

12.2.3.4(a)

1. What is product quality?

   Refers to the standards that determine the quality and durability of an output.
2. Why is product ethics important?

It is important because it determines the quality and durability of a product.

12.2.3.4 (b)

1. Give a brief explanation of why Toyota drop or fail in its delivery of quality automobiles.
   Toyota in its quest for a bigger share of the world automobile market have:
   a. *Became over confident as a manufacturer and compromised quality especially in its manufacturing techniques.*
   b. *Sacrificed their reputation built over time*
   c. *ignored their management principles*

2. One way for Toyota to regain its customer confidence of its product is to install one of those sophisticated robots that can detect defects in its production line. Do you agree? Yes or no. Give an explanation for answer.
   Yes, robots do not get tired and will pick up mistakes very quickly and show them on the computer screen manned by specialist who will stop or notify quality control managers or
   No. robots can pick up mistakes but if humans cannot take note of these mistakes due to customer demands, production deadlines the products continue to move on until the end. Since money and time have been used it will be hard to stop.

NOW YOU MUST COMPLETE ASSIGNMENT 2. THEN SEND IT TO THE PROVINCIAL CO-ORDINATOR FOR MARKING

GLOSSARY

Computer Aided Design (CAD) - the use of computers and computer graphics to help design things

Control-is the process of making sure that actual activities comply with rules to planned activity

Fixed costs- are costs that do not vary with production or sales level.

Mass production- production in large quantities.

Operations management-is a process of planning, organizing, directing and controlling the activities of the production function.

Planning- the process of setting goals for the future organizational performance and deciding on the tasks and use of resources needed to attain them.

Price- the amount of money you have to pay to buy something.

Product- anything that can be offered to a market for attention. It includes physical objects, services, places, organisations and ideas.

Production- is the process of manufacturing or growing something in large quantities.

Quality- refers to how good something is.

Quality control- a system that is used to maintain a desired level of quality in a product or service.

Robot- a machine which is programmed to move and perform tasks automatically.

Cost- is the amount of money needed to buy, do or make something.

Ethics- are morals beliefs about right and wrong.

Roster- is the coordination and allocation of staff as an input

Schedule- a plan that gives a list of events or tasks in a pre-determined time sequence..

Services- any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything.

Sequencing- It is the arrangement of things in successive order

Strategic planning- the process of developing and maintaining a strategic fit between the organization's goals and capabilities and its changing marketing opportunities.

Supplier- someone who provides goods and services

Technology- is the application of scientific knowledge to products, services, and the processes that produce and deliver them.]

Transformation- is when something is changed completely.

Variable costs- are costs that vary directly with the level of production.

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STUDENTS AND MARKR'S COMMENTS

STUDENT'S COMMENTS:

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Sign: ………………………………….   Date: …. /…../……

MARKER'S COMMENTS:

Student's Mark	:	…….
Student's Percentage	:	……. …….
Marker's Name	:	…….
Marker's Signature	:	……
Date	:	……

FODE PROVINCIAL CENTRES CONTACTS

PC NO.	FODE PROVINCIAL CENTRE	ADDRESS	PHONE/FAX	CUG PHONES	CONTACT PERSON		CUG PHONE
1	DARU	P. O. Box 68, Daru	6459033	72228146	The Coordinator	Senior Clerk	72229047
2	KEREMA	P. O. Box 86, Kerema	6481303	72228124	The Coordinator	Senior Clerk	72229049
3	CENTRAL	C/- FODE HQ	3419228	72228110	The Coordinator	Senior Clerk	72229050
4	ALOTAU	P. O. Box 822, Alotau	6411343 / 6419195	72228130	The Coordinator	Senior Clerk	72229051
5	POPONDETTA	P. O. Box 71, Popondetta	6297160 / 6297678	72228138	The Coordinator	Senior Clerk	72229052
6	MENDI	P. O. Box 237, Mendi	5491264 / 72895095	72228142	The Coordinator	Senior Clerk	72229053
7	GOROKA	P. O. Box 990, Goroka	5322085 / 5322321	72228116	The Coordinator	Senior Clerk	72229054
8	KUNDIAWA	P. O. Box 95, Kundiawa	5351612	72228144	The Coordinator	Senior Clerk	72229056
9	MT HAGEN	P. O. Box 418, Mt. Hagen	5421194 / 5423332	72228148	The Coordinator	Senior Clerk	72229057
10	VANIMO	P. O. Box 38, Vanimo	4571175 / 4571438	72228140	The Coordinator	Senior Clerk	72229060
11	WEWAK	P. O. Box 583, Wewak	4562231/ 4561114	72228122	The Coordinator	Senior Clerk	72229062
12	MADANG	P. O. Box 2071, Madang	4222418	72228126	The Coordinator	Senior Clerk	72229063
13	LAE	P. O. Box 4969, Lae	4725508 / 4721162	72228132	The Coordinator	Senior Clerk	72229064
14	KIMBE	P. O. Box 328, Kimbe	9835110	72228150	The Coordinator	Senior Clerk	72229065
15	RABAUL	P. O. Box 83, Kokopo	9400314	72228118	The Coordinator	Senior Clerk	72229067
16	KAVIENG	P. O. Box 284, Kavieng	9842183	72228136	The Coordinator	Senior Clerk	72229069
17	BUKA	P. O. Box 154, Buka	9739838	72228108	The Coordinator	Senior Clerk	72229073
18	MANUS	P. O. Box 41, Lorengau	9709251	72228128	The Coordinator	Senior Clerk	72229080
19	NCD	C/- FODE HQ	3230299 Ext 26	72228134	The Coordinator	Senior Clerk	72229081
20	WABAG	P. O. Box 259, Wabag	5471114	72228120	The Coordinator	Senior Clerk	72229082
21	HELA	P. O. Box 63, Tari	73197115	72228141	The Coordinator	Senior Clerk	72229083
22	JIWAKA	c/- FODE Hagen		72228143	The Coordinator	Senior Clerk	72229085

SUBJECT AND GRADE TO STUDY

GRADE LEVELS	SUBJECTS/COURSES
Grades 7 and 8	1. English
	2. Mathematics
	3. Personal Development
	4. Social Science
	5. Science
	6. Making a Living
Grades 9 and 10	1. English
	2. Mathematics
	3. Personal Development
	4. Science
	5. Social Science
	6. Business Studies
	7. Design and Technology- Computing
Grades 11 and 12	1. English – Applied English/Language& Literature
	2. Mathematics - Mathematics A / Mathematics B
	3. Science – Biology/Chemistry/Physics
	4. Social Science – History/Geography/Economics
	5. Personal Development
	6. Business Studies
	7. Information & Communication Technology

REMEMBER:

- For Grades 7 and 8, you are required to do all six (6) courses.
- For Grades 9 and 10, you must study English, Mathematics, Science, Personal Development, Social Science and Commerce. Design and Technology-Computing is optional.
- For Grades 11 and 12, you are required to complete seven (7) out of thirteen (13) courses to be certified.

Your Provincial Coordinator or Supervisor will give you more information regarding each subject.

GRADES 11 & 12 COURSE PROGRAMMES

No	Science	Humanities	Business
1	Applied English	Language & Literature	Language & Literature/Applied English
2	Mathematics A/B	Mathematics A/B	Mathematics A/B
3	Personal Development	Personal Development	Personal Development
4	Biology	Biology/Physics/Chemistry	Biology/Physics/Chemistry
5	Chemistry/ Physics	Geography	Economics/Geography/History
6	Geography/History/Economics	History / Economics	Business Studies
7	ICT	ICT	ICT

Notes: You must seek advice from your Provincial Coordinator regarding the recommended courses in each stream. Options should be discussed carefully before choosing the stream when enrolling into Grade 11. FODE will certify for the successful completion of seven subjects in Grade 12.

CERTIFICATE IN MATRICULATION STUDIES		
No	**Compulsory Courses**	**Optional Courses**
1	English 1	**Science Stream:** Biology, Chemistry, Physics
2	English 2	**Social Science Stream:** Geography, Intro to Economics and Asia and the Modern World
3	Mathematics 1	
4	Mathematics 2	
5	History of Science & Technology	

REMEMBER:

You must successfully complete 8 courses: 5 compulsory and 3 optional.