

WOLAITA SODO UIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ACCOUNTING AND FINANCE

MODULE Name: Managerial Accounting

COURSES INCLUDED

COST AND MANAGEMENT ACCOUNTIG I (AcFn3031)

COST AND MANAGEMENT ACCOUNTIG II (AcFn3032)

BY:

Ms. TSEGANESH TESFAYE (MSc, Assistant Professor), Coordinator

and

Mr. FRANCHISCO BALCHA (MSc, Lecturer)

WOLAITA SODO, ETHIOPIA

MARCH 2015E.C (2023)

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CHAPTER ONE

1. Overview of Cost and Management Accounting

1.1 Objectives of Cost & Management Accounting

Accounting is the process of identifying, measuring, recording and communicating financial information to interested users so that they can make the best possible decisions. Thus, cost accounting is the process of identifying, measuring, recording and communicating cost information which will be used for determination of cost of a products or services on the basis of historical data. This was the emphasis of cost of accounting for many years, however in the course of time, the determination of cost of product or service has become equally important with cost control due to competitive nature of the market and because of technological developments in all areas. Thus, now a day's cost control and reduction has also come within the scope of cost accounting.

Modern cost accounting is, thus, concerned with recording, classifying and reporting cost information for:

- Determination of costs of products or services,
- Planning, controlling and reducing costs and
- Furnishing of information to management for decision making.

Cost accounting measures and reports financial and other information related to the acquisition or consumption of an organization's resources. Cost accounting provides information to both management accounting and financial accounting.

Management accounting is the process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial (and non-financial) information used by management to plan, evaluate, and control the organization and to assure appropriate use and accountability for its resources.

Management accounting information helps organization make better decisions. Such decisions make all organizations become more cost effective and help manufacturing, retail and service organizations becomes more profitable. The major objectives of managerial accounting activity are:

- ✓ Providing managers with information for decision making and planning
- ✓ Assisting managers in directing and controlling operational activities
- ✓ Motivating managers and other employees toward the organizational goals

- ✓ Measuring the performance of subunits, managers and other employees within the organization.

1.2 Cost and management accounting in comparison with financial accounting

Cost accounting refers to the accounting procedures relating to recording of all incomes and expenditure and the preparation of periodical statements and reports with the object of ascertaining and controlling costs. It is thus the formal mechanism by means of which the cost of products or services are ascertained and controlled.

Cost accounting: is primarily concerned with determination of cost of something, which may be a product, service, a process or an operation. A cost accountant is primarily charged with the responsibility of providing cost data for whatever purposes they may be required.

Financial accounting: is primarily concerned with the preparation of financial statement, which summarizes the results of operation for selected period of time and show the financial position of the corporation at a particular date.

1.3 Cost terms, concepts and classification

Costs: Accountants usually define cost as resource scarified or forgone to achieve a specific objective. It refers to an out lay or expenditure of money to acquire goods and services in the course of generating revenue.

Expense is an expired portion of cost i.e. as the asset is used in generating revenue; the amount consumed becomes an expense. The cost of asset used should then be recognized as expense to properly match revenue and expense in the process of determining the income of the organization over a given period

Cost object: is anything for which a separate measurement of cost is desired. In manufacturing company, the cost object is the unit of finished goods produced.

Cost accumulation: is the collection of cost data in some organized way by means of an accounting system. For example, organizations that manufacture consumer goods accumulate the costs incurred in producing the commodities.

Cost assignment is a general term that encompass both (1) tracing accumulated cost that have direct relationship to the cost object and (2) allocating accumulated costs that have an indirect relationship to a cost object.

Cost -tracing is used to describe the assignment of direct costs to the particular cost object and can be traced to it in an economically feasible (cots effective) way

Cost allocation is used to describe the assignment of indirect costs to the particular cost object but cannot be traced to it in an economically feasible (cots effective) way.

Cost driver/cost determinant: is any activity that causes costs to be incurred. A cost Driver is characteristics of an activity or event that causes that activity or event to incur costs. The cost driver of variable costs is the level of activity or volume whose change causes the (variable) costs to change proportionately.

Cost management: is the set of actions that a manager takes to satisfy customers while continuously reducing and controlling cost.

1.3.1 Cost classification

- **Direct and indirect costs,**

Direct costs are costs that are directly traceable to the product. Costs that can be identified specifically with or traced to a given cost object in an economically feasible way. Example:

- ✓ Direct material cost
- ✓ Direct labor cost

Indirect cost, Costs that cannot be identified specifically with or traced to a given cost object in an economically feasible way (manufacturing overhead or factory overhead): are costs which are not directly traced to the product but allocated to it by using some criteria. Example:

- ✓ Cost of electricity
- ✓ Depreciation of equipment
- ✓ Indirect labor

- **Fixed and variable costs**

Fixed cost is a cost which remains constant within a given relevant range regardless of change in output level, **Variable cost**: are costs that vary in total, in direct proportion to changes in the level of activity or cost driver i.e. if activity increase by n%, total variable cost also increase by n%, but the per unit cost remains constant.

E.g. direct material cost, direct labor cost, commission paid to sales personnel, wages paid to employees will increase as level of output increases.

- **Period and product costs**

A. Product costs: are cost producing goods that are sold to customers. They are also called manufacturing cost and are composed of Direct Material, Direct Labor & Factory overhead.

Direct Material Costs: - All manufactured products are made from basic direct materials. Direct

materials are the acquisition costs of materials that can be conveniently and economically traced to specific unit of product. Acquisition cost of direct materials includes freight –in charges, sales taxes and customs duties. Some examples of direct materials are iron ore for steel, sheet steel for automobiles and sugar for candy.

Direct Labor Costs: are the costs of labor to complete production activities that can be conveniently and economically traced to specific units of product. The wages of machine operators and other workers involved in actually shaping the product are direct labor costs.

Manufacturing Overhead Costs: The third elements of product cost include all manufacturing costs that cannot be classified as direct materials or direct labor costs. Manufacturing overhead costs are production related costs that can't be practically or conveniently traced directly to an end product. This assortment of costs is also called factory overhead, or indirect manufacturing costs. Three common components of manufacturing overhead costs are indirect material costs, indirect labor costs and other manufacturing overhead costs.

Indirect material costs: are the costs of materials that cannot be conveniently or economically traced to a unit of product e.g. cost of nails, reverts, lubricants and small tools.

Indirect labor costs: are labor costs for production related activities that cannot be conveniently or economically traced to a unit of product. E.g. cost of labor for maintenance, inspection, engineering design, supervision, materials handling and machine handling.

Other indirect manufacturing costs: Cost of building and machine maintenance, property taxes, property insurance and depreciation on plant and equipment used in production.

These costs are treated as assets until the product is sold as raw material inventory, work in process inventory and finished goods inventory and later expensed in the form of cost of goods sold when the product is sold.

B. Period (non-manufacturing) costs: Period costs are all goods in the income statement other than cost of goods sold. These costs are treated as expenses of the period in which they are incurred because they are assumed not to benefit future periods. Expensing these costs immediately best matches to revenues.

- **Controllable and uncontrollable costs**

A cost which is under the control of a given manager is **controllable** cost where as a cost which is beyond the control of a given manager is **uncontrollable**. Controllability of a cost depends on the level of management and time period. All costs are controllable by someone at some level in

the organization if the time period is longer enough.

- **Avoidable and unavoidable costs**

An **avoidable cost** is a cost that is not incurred if the activity is not performed. For example, supply expenses are avoidable costs. You can simply decide to not buy the supplies, and no expense will be incurred. These costs are often identified as variable costs, which vary based on production. If there is no production, there is no cost.

An **unavoidable cost**, on the other hand, is a cost that is still incurred even if the activity is not performed. For example, if a manufacturing plant shuts down, its avoidable costs (i.e. variable costs), like materials or supplies, will be $0, but it still needs to pay for idle equipment, property taxes, lease payments, etc. These costs are often considered fixed costs. Fixed costs are expenses that do not depend on production.

Sunk costs: A sunk cost refers to a cost that has already occurred and has no potential for recovery in the future. For example, your rent, marketing campaign expenses or money spent on new equipment can be considered sunk costs. A sunk cost can also be referred to as a past cost.

1.4 The concepts of cost units, cost centers and profit centers

Cost center refers to one of the convenient unit into which the whole factory organization has been appropriately divided for costing purposes. Each such unit consists of a department or a sub department or item of equipment or, machinery or a person or a group of persons.

Cost unit- a unit of product or service in relation to which costs are ascertained. The forms of measurement used as cost units are usually the units of physical measurements like number, weight, area, length, time etc. Unit selected should be unambiguous, simple and commonly used. We may for instance determine the cost per machine hour.

A **profit center** is a section of a company treated as a separate business. Thus profits or losses for a profit center are calculated separately.

CHAPTER TWO

2. Cost determination: The costing of resource inputs

2.1 Materials

Material is what everything that you can touch is made of. Even material that is too small to touch, is called material. We use materials to make things. We can also call material "physical substances."

2.1.1 Accounting for stock (Inventory) Movements

Inventory control is the core of materials management. The need and importance of material varies in direct proportion to the idle time cost of men and machinery and the urgency of requirements. If men and machinery in the factory could wait and so could customers, materials would not lie in want for then and no inventories, need be carried.

Material control is a planned method of determining what to indent, so that purchasing and storing cost are minimum without affecting production or sales. Without proper control, materials have a tendency to grow beyond economic limits. Funds are tied up unnecessarily in surplus stores and stocks, productive operations are stalled, and finances of the plant are severely strained. Lack of control over material also leads to excessive consumption and wastage as operatives are liable to become careless with irrational supply of materials.

Techniques of inventory control (material control)

The following are the common techniques of inventory control:

(i) Min-max plan: It is one of the oldest methods of material control. Under this plan the analyst lays down a maximum and minimum for each stock item keeping in view its usage, requirements and margin of safety required to minimize risks of stock-outs. The minimum level establishes the reorder point and order is placed for that quantity of material which will bring it to the maximum level.

The method is very simple and based upon the premise that minimum and maximum quantity limits for different items can fairly be well defined and established. Considerations like economic order quantity and identification of high value and critical items of stock for special management attention are not cared for under this plan.

(ii) The two-bin system: The basic procedure used under this system is that for each item of stock, two piles, bundles, or bins are maintained. The first bin stocks that quantity of material which is sufficient to meet its usage during the period that elapses between receipt of an order

and the placing of the next order. The second bin contains the safety stock and also the normal amount used from order to delivery date. The moment stock contained in the first bin is exhausted and the second bin is tapped, a requisition for new supply is prepared and submitted to the purchasing department. Since no bin-tag (quantity record of materials) card is maintained, there is absence of perpetual material record under this bin.

(iii) Order cycling system: In the order cycling system, quantities in hand of each item or class of stock are reviewed periodically say, 30, 60 or 90 days. If in the course of a scheduled periodic review it is observed that the stock level of a given item will not be sufficient till the next scheduled review keeping in view its probable rate of depletion, an order is placed to replenish its supply. Review period will vary from firm to firm and also among different materials in the same firm. Critical items of stock usually require a short review cycle. Order for replenishing a given stock item, is placed to bring it to some desired level which is often expressed in relation to number of day's or week's supply.

(iv) ABC analysis: With the numerous parts and materials that enter into each and every industrial product, material control lends itself, first and foremost, to a problem of analysis. Such analytical approach is popularly known as ABC analysis (Always Better Control), which is believed to have originated in the `General Electric Company" of America. ABC plan is based upon segregation of materials for selection control. It measures the money value, i.e., cost significance of each material item in relation to total cost and material value. The logic behind this kind of analysis is that the management should study each item of stock in terms of its usage, lead time, technical or other problems and its relative money value in the total investment in inventories.

(v) Fixation of various levels: Fixation of Norms of Inventory Holdings Either the top management or by Materials department set the norms for inventories. The top management usually sets monitory limits for investment in inventories. The materials department has to allocate this investment to the various items and ensure the smooth operation of the concern. A number of factors enter into consideration in the determination of stock levels for individual items for the purpose of control and economy. Some of them are: 1. Lead time for deliveries, 2.The rate of consumption, 3. Requirements of funds, 4. Keeping qualities, deterioration, evaporation etc., 5. Storage cost, 6. Availability of space, 7. Price fluctuations, 8. Insurance cost, 9. Obsolescence price, 10. Seasonal consideration of price and availability, 11. EOQ (Economic

Order Quantity), and 12. Government and other statuary restriction.

The fixation of inventory levels is also known as the demand and supply method of inventory control. Generally the organization fixes following stock levels:

(a) Maximum Level: This represents the minimum quantity above which stocks should not be held at any time.

(b) Minimum Level: This represents the minimum quantity of stock that should be held at all times.

(c) Danger Level: Normal issues of stock are usually stopped at this level and made only under specific instructions.

(d) Ordering Level: It is the level at which indents should be placed for replenishing stocks.

(e) Ordering Quantity: It is the quantity that is ordered.

(e) Ordering Quantity or Economic Ordering Quantity: The basic problems of material control are two viz., what quantity of an item should be ordered at a time and when an order should be placed. While deciding economic ordering quantity, the efforts are directed to ascertain the ideal order size. While deciding the ideal order size, factors such as material carrying charges and the ordering cost associated with the placement of purchase orders are to be considered; the total of both has to be minimized.

The material carrying charges include interest on the capital invested in the stores of materials, rent for the storage space, salaries and wages of the store-keeping department, any loss due to pilferage and deterioration, stores insurance charges, stationery, etc. used by the stores, taxes on inventories, etc.

2.1.2. Determination of optimum purchase quantities

Procurement is the purchase of goods and services at the best possible price to meet a purchasers demand in terms of quantity, quality, dimensions and site. It means that the goods/services are appropriate and that they are procured at the best possible cost in terms of quality and quantity, time, and location. Every business should define procurement processes intended to promote fair and open competition while minimizing exposure to fraud and collusion.

Procurement documentation

Documents which are involved in the procurement are called procurement documents. Procurement documents serve an important aspect of the organizational element in the project process. It is a kit which is used in process bidding and submitting project proposals and the

facets of work that make up a project. In a simple way, these are the contractual relationship between the purchaser and the supplier of goods or services.

Methods of purchasing

Purchasing is an art. Wrong purchases increase the cost of materials, store equipment's and the finished goods. Hence, it is imperative that purchases should be effectively, efficiently and economically performed. The methods of purchasing can be broadly classified as centralized and localized purchasing.

Purchase procedure

Though different concerns adopt different practices regarding details recorded, forms and records used. The routine followed for the purchase of materials is usually the same. The steps may be enumerated as follows:

(i) Indenting for materials

(ii) Issuing of tenders & receiving quotations

(iii) Placing of order

(iv) Inspecting stores received

(v) Receiving the stores accepted in inspection

(vi) Checking and passing bills for payment.

2.1.3. Identification of accounting for stock losses

Losses of materials may arise during handling, storage or during process of manufacture. Such losses may be classified into two categories, i.e. normal loss and abnormal loss. Normal loss is that loss which has necessarily incurred and thus is unavoidable. Examples: Loss by evaporation, Loss due to loading and unloading, Loss due to breaking the bulk, etc.

Normal losses of material cannot be completely avoided but may be controlled to a limited extent.

Abnormal loss is that loss which arises due to inefficiency in operations, mischief, carelessness, etc. Examples: Theft or pilferage; Breakage; Fire, accident, flood, etc.; Use of inaccurate instruments; and Improper storage, etc.

Accounting Treatment

As a principle, all normal losses which are necessarily incurred are treated as a part of the cost and abnormal losses should not be included in the cost. In order to absorb normal material losses in cost, the rates of usable units are inflated so that such losses are absorbed.

Alternatively, normal material loss is transferred to factory overhead. However abnormal losses of material are charged to Costing Profit and Loss account. Materials losses may arise in the form of waste, scrap, spoilage or defectives.

Waste: comprises of invisible loss, visible loss that cannot be collected and also the un saleable portion of the collected loss. Waste is excluded from output quantity. Examples of waste are smoke, dust, gases, slag, etc.

Accounting Treatment: Standards are established for waste. Actual wastage is recorded and variation from standards are reported.

(i) **Normal Waste**: This is unavoidable and uncontrollable and treated as part of the product cost. The wastage cost is borne by the good units.

(ii) **Abnormal Waste**: It is valued as if the output is good. This cost is transferred to the Costing Profit and Loss Account.

Scrap: represents the unusable loss which can be sold. It is a residue which is measurable and has a minor value. It may result from the processing of materials, obsolete stock or defective parts.

The sale value is credited to the concerned department which produced it. If the value is

negligible, it is credited to the Costing Profit and Loss Account. Scrap may arise in the form of turnings, borings, filings etc. from metal; sawdust in timber industry, off-cuts and cut pieces in leather industry.

Accounting Treatment

i. Where the scrap has negligible value, it is charged to good units. Income is credited to other income.
ii. The sale value can be reduced from the material cost.
iii. If the scrap has very little value, only a quantity record need be kept.
iv. The cost is calculated by reducing the sale price by the selling cost and this sum is taken as a credit to the production overhead account.
v. Scrap arising in one job may be used in another. Such transfers should be properly recorded on material transfer notes.

Spoilage: are those materials or components which are so damaged in the manufacturing process that they cannot be repaired or reconditioned. Some spoilage may be sold as seconds. If they are badly spoiled they can be sold as waste or scrap. Spoiled units do not attain the quality required and it is not economic to correct them.

Spoilage occurs due to some defect in operations or materials. Sometimes the entire production in a batch may have to be rejected or a part of it may be rejected.

Accounting Treatment

i. Loss due to spoilage can be debited to the job/product/process in which it occurred.
ii. It may be charged to factory overheads so that the loss is borne by all products.
iii. Abnormal loss which is unexpected but controllable should be transferred to the Costing Profit and Loss Account.

Defectives are that portion of the process loss which can be converted into a finished product by incurring more material and labor expenses. The additional expenses are added to the cost of manufacture and the rectified units to total units. Imperfections may arise because of substandard materials, bad workmanship, inadequate inspection, lack of plans, etc. It should be ensured that the benefit resulting from rectification is more than the cost incurred on rectifications.

Rectification of defective units may be done by the department in which it was produced. In larger concerns a separate Department may be set up for this purpose.

Accounting Treatment

(i) Defectives inherent in the manufacturing process are classified as normal and treated in the following manner:

a. The loss is charged to good products.
b. The additional cost of rectification is charged to factory overheads and apportioned to various goods as part of the factory overhead.
c. If a particular department is responsible for the additional cost of rectification, it can be charged to that department.

(ii) If the defective units can be traced to a specific job/order, the additional costs can be charged to that job/order.

(iii) If the defectives are abnormal and due to uncontrollable factors, the additional costs are charged to Costing Profit and Loss Account.

Control of material losses

While designing a control system, controllable and uncontrollable losses should be distinguished. The system should determine standard levels which can be attained. Losses may be uncontrollable in the short- term but controllable over a period of time. Moreover, it takes time to control a new process. The various levels should be frequently reviewed. Losses can be minimized by proper storage, proper handling, maintenance of suitable inventory levels etc.

A control system should calculate and report production and data regarding waste, scrap, spoilage and defectives should be regularly collected. Periodic reports help to evaluate performance and also in taking corrective action. Standards should be set. Variances of actuals from standards should be examined so that it can be effectively controlled.

2.2 Labor

Labor cost is a significant element of cost specially in an organization using more manual operations. It is the cost of human endeavor in the product and requires coordinated efforts for its control. The management objective of keeping labor cost as low as possible is achieved by balancing productivity with wages. Low wages do not necessarily mean low labor cost. Low labor cost is possible by giving substantial increase in wages against corresponding increase in productivity. The gain is reflected both in labor cost as well as in overheads expense per unit, since overheads are distributed over larger volume. Again, the productivity of labor is quite

flexible. Given right type of motivation and incentive, it can reach amazing scale.

2.2.1. The difference between direct and indirect labor

Classification of labor cost

The total labor cost can be classified as follows: (a) Direct labor costs & (b) Indirect labor costs.

Direct Labor Cost: refers to all labor expended in altering the construction, composition, conformation or condition of the product. The wages paid to skilled and unskilled workers for his labor can be allocated specifically to the particular product or the process as the case may be. In any manufacturing process or department, the workers employed may be of the following two categories:

i. Those who are directly engaged on the production or in the carrying out of an operation or process;
ii. Those who are assisting in the process by way of supervision, maintenance, transportation of materials, etc.

The workers coming under the first category constitute direct labor and the wages paid to them are called direct wages. In a factory, where production of a number of products is undertaken or in a jobbing concern, workers are given job cards on which they note the time devoted to each job or product. These job cards are then analyzed job wise so that the wages attributable to each job can be computed.

Direct labor cost is that portion of wages or salaries which can be identified with and charged to a single costing unit. It can be easily identified with and charged to a single costing unit as there is a direct relationship with the product/process. Direct labor cost can be easily calculated and is quite significant in amount.

Indirect Labor Costs: refers to labor expended that does not alter the construction, conformation, composition or condition of the product, but which contributes generally to such work and to the completion of the product and its progressive movement and handling up to the point of dispatch. In other words, labor employed for the purpose of carrying out tasks incidental to goods produced or services provided is regarded as indirect labor. Wages or salaries paid to foremen, supervisors, inspectors, clerks, store-keepers, managers, accountants, salesmen, directors, etc., are examples of indirect labor cost.

These costs are not easily identifiable with particular units of cost. Indirect labor cost can be

classified as that expended in production departments and that in service departments. (bulk of the labor cost in a production department will be direct). The classification should enable control over such costs and codification of indirect labor accounts.

Accounting and control of labor cost

Accounting for labor by a manufacturer usually involves three activities:

(1) Time keeping; (2) Computation of total payroll; and (3) Allocation of payroll costs.

1. Time Recording:

Recording of time has two purposes - time-keeping and time-booking. It is necessary for both type of workers: direct and indirect. It is necessary even if the workers are paid on piece basis. Timekeeping is necessary for the purpose of recording attendance and for calculating wages. Time booking means a record from the utilization point of view; the purpose is cost analysis and cost apportionment.

Methods of time keeping: Various methods of time keeping are available, which may be grouped under manual and mechanical methods, as under:

(1) **Manual methods**:

(a) **Attendance register method**: An attendance register is kept at the entrance of the factory gate in this method. The in and out timing are noted, either by the worker himself or by a staff of the time office. Later, entries are made to the individual attendance records of the workmen.

(b) **Disc method**: Under this method, metal discs bearing employees numbers allotted by the personnel department are placed on hooks on a board provided either at the gate or at the entrance of the department. On entering the factory, the worker removes the disc bearing his number from the board and places it in a box kept for this purpose. The box is taken away as soon as normal reporting time is over.

(2) Mechanical methods: The attendance cards are used in time clocks installed at the entrance of the factory. On entering the factory, the worker takes his card from „OUT" racks and press it inside the clock, which will print arrival time in „IN" column. He then places it in „IN" rack of the department where he reports for duty.

Time-Booking: Different methods used for time booking are: (1) Daily Time Sheets, (2) Weekly Time Sheets, and (3) Job Cards.

Daily Time Sheets: Under this method, a daily time sheet is provided to each worker on which

time spent by him on various work orders is mentioned.

Weekly Time Sheets: In this method time is recorded for all the jobs done during the week instead of recording the work done for a day only. One sheet is allotted to each worker.

Job Card: is a method of recording details of time with reference to the jobs or work orders undertaken by the workers. This method facilitates the computation of labor cost with reference to jobs or work orders.

Attendance and payroll procedure

Preparation of payrolls

The payroll is a record which shows details of the gross wages earned by each worker in a particular period, the deductions made and the net wages payable. The payroll can be prepared at weekly, fortnightly or monthly periods. It can be prepared department wise or shift wise.

Idle time

When workers are paid on time basis there is usually a difference between the time for which the workers are paid and the time actually spent by them in production. The loss of time for which the employer pays but obtains no direct benefit is termed as idle time.

In other words, Idle time cost represents the wages paid for the time lost, i.e., time during which the worker was idle.

Accounting Treatment of Idle Time

Idle time cost arising due to normal and unavoidable causes should be charged as overheads and those due to abnormal causes should be charged to Costing Profit and Loss Account.

Normal idle time such as loss in tool setting etc. can be charged at inflated rate. Jobs are charged at inflated rate.

Labor Turnover: is a common feature in any concern that some employees leave the concern and others join it. Workers change the job either for personal betterment or for better working conditions or due to compulsion. Labor turnover is the ratio of the number of persons leaving in a period to the average number employed. It is the change in the composition of the labor force in an organization. It can be measured by relating the engagements and losses in the labor force to the total number employed at the beginning of the period. All the losses must be taken into account regardless of the cause for leaving.

Example: If 20 employees leave an organization in a year and the average labor force is 400,

then the labor turnover is 5%.

Causes of labor turnover: The main causes of labor turnover in an organization/industry can be broadly classified under the following three heads: Personal Causes, Unavoidable Causes, and Avoidable Causes.

Effects of Labor Turnover: It increases cost of production due to the following reasons:

i. Cost of selecting/replacing workers,
ii. Cost of training imparted to new workers
iii. Production planning cannot be properly executed and this results in production loss
iv. Loss due to defectives and wastage
v. Loss due to mishandling of tools, equipment's, breakages, etc.

2.2.2. Types of labor remuneration methods

(1) Time Rate System

The time rate or day rate is related to the hours of wage and is commonly used. The wage rate can be fixed on hourly, daily, weekly, fortnightly or monthly basis depending on the nature of his skill.

(2) Payment by Results

Payment by results is a method of paying wages which depends on the output or units produced by the worker. The worker can increase his income by producing more units.

2.3 Overheads

Overhead may be defined as the cost of indirect material, indirect labor and such other expenses, including services, as cannot be conveniently charged direct to specific cost centers or cost units. It should be noted that direct costs (materials, labor, etc.) are associated with individual jobs or products. Indirect expenses or overheads are not associated with individual jobs or products; they represent the cost of the facilities required for carrying on the operations.

Collection of Overheads

For the collection of overhead expenses the following are some of the primary documents used:

(i) Stores requisitions, (ii) Job cards or tickets, (iii) Invoices or purchase voucher, (iv) Salary or pay bills, (v) Cash book, and (vi) Subsidiary records.

Indirect materials originate in store requisitions. Each stores requisitions note specifies the standing order number and the department for which the stores are drawn. The

departmentalization is done at sources. A material issue analysis sheet is prepared from store requisitions.

Indirect labor is obtained in the first place, from the time cards and pay rolls. Wages paid to workers against each standing order number can be obtained from the time tickets or job cards. From the time tickets, the wages analysis sheet is prepared each month and at the end of the month, the total is debited to Factory Overhead Control Account and credited to the Wages account.

Indirect expense can come from several sources such as cash book, factory journals or vouchers. In the case of cash outlays, the entry may come from the cash book. Expenses such as depreciation and other adjustment items which do not result from cash outlays are taken from subsidiary records. At the end of the period, the total of factory overheads would be debited to Factory Overhead Control Account and credited to the Cost Ledger Control Account.

Apportionment of Overheads

Apportionment refers to the distribution of overheads among departments or cost centers on an equitable basis. In other words, apportionment involves charging a share of the overheads to a cost center or cost unit.

It as "that part of cost attribution which shares costs among two or more cost centers or cost units in proportion to the estimated benefit received, using a proxy". Apportionment is done in case of those overhead items which cannot be wholly allocated to a particular department.

Allocation of Overheads

After having collected the overheads under proper standing order numbers the next step is to arrive at the amount for each department or cost center. This may be through allocation or absorption. According to the Chartered Institute of Management Accountants, London, cost allocation is "that part of cost attribution which charges a specific cost to a cost center or cost unit". Thus, the wages paid to maintenance workers as obtained from wages analysis book can be allocated directly to maintenance service cost center. Similarly indirect material cost can also be allocated to different cost centers according to use by pricing stores requisitions.

Absorption of overheads refers to charging of overheads to individual products or jobs. The overhead expenses pertaining to a cost center are ultimately to be charged to the products, jobs etc. which pass through that cost center. For the purpose of absorption of overhead to individual

jobs, processes or products, overheads absorption rates are applied.

The overhead rate of expenses for absorbing them to production may be estimated on the following three basis.

i. The figure of the previous year or period may be adopted as the overhead rate to be charged on production in the current year.
ii. The overhead rate for the year may be determined on the basis of the estimated expenses and anticipated volume of production or activity.
iii. The overhead rate for the year may be determined on the basis of normal volume of output or capacity of the business.

Actual and pre-determined overhead rate: The overhead absorption rate may be computed either based on actual cost or on the basis of estimated cost:

Actual Overhead Rate: This is also known as historical overhead rate. This rate is obtained by dividing the overhead expenses incurred during the accounting period by the actual quantum (quantity/value) of the base selected.

Pre-determined Overhead Rate

Pre-determined overhead rate is determined in advance of the actual production and is computed by dividing the budgeted overhead expenses for the accounting period by the budgeted base for the period

Blanket and Multiple Overhead Rates

Blanket overhead rate refers to the use of one single or general overhead rate for the whole factory.

The blanket rate is used in those factories:

(a) Where only one major product in continuous process is being produced.

(b) Where several products are produced it can be applied only if:

i. all products pass through all departments; and
ii. all products are processed for the same length of time in each department.

Methods of Absorbing Production Overheads

1. Percentage of direct material cost: In this method the cost of direct materials used in the manufacture of a product is used as the base in absorption of factory overheads.

2. Percentage on prime cost: An actual or pre-determined rate of overhead absorption is

calculated by dividing the overheads to be absorbed by the prime cost incurred or expected to be incurred and expressing the result as a percentage.

3. Percentage of direct labor cost: According to this method, the manufacturing overhead expenses are charged as a percentage of the direct wages incurred on jobs.

4. Direct labor hour rate: This method is a distinct improvement on the percentage of direct wages basis, as it fully recognizes the significance of the element of time in the incurring and application of manufacturing overhead expenses. This method is admirably suited to operations which do not involve any large use of machinery. A direct labor hour rate is calculated for each category of workers.

5. Machine hour rate: By the machine hour rate method, manufacturing overhead expenses are charged to production on the basis of a number of hours a machine or machines are used on jobs or work orders. There is a basic similarity between the machine hour and the direct labor hour rate methods, in so far as both are based on the time factor. The choice of one or the other method is conditioned by the actual circumstances of the individual case.

2.3.3. Accounting for the over- and under absorption of costs

Overhead expenses are usually applied to production on the basis of predetermined rates. The predetermined rates may represent estimated, actual or normal costs. In either case, the amount of expenses actually incurred and the amount of overheads applied to production will seldom be the same. Some difference is inevitable. If the actual expenses fall short of the amount applied, there is said to be an over-absorption of overheads, and, conversely, if the actual expenses exceed the amount applied to production, it is a case of under-absorption. Such over or under-absorption may also be termed as overhead variance, the amount of over-absorption being represented by the credit balance on the variance account, and, conversely, the amount of under-absorption by a debit balance.

CHAPTER THREE

3. Costing methods: The costing of resource outputs

3.1 Job order, batch and contract costing methods

Job order costing is a costing method which is used to determine the cost of manufacturing each

product. This costing method is usually adopted when the manufacturer produces a variety of products which are different from one another and needs to calculate the cost for doing an individual job. Under a job order cost system, the three basic elements of cost—direct materials, direct labor, and factory overhead—are accumulated according to assigned job numbers. The unit cost for each job is obtained by dividing the total units for the job into the job's total cost.

- ✓ It is used by entities that make relatively small quantities or distinct batches of identifiable unique products (services).
- ✓ Businesses using job costing include: Printing jobs at a printing Co., ship-builders, and Custom furniture manufactures, Construction companies, Film-producing companies, accounting and law firms, advertising agencies, Medical clinics, etc.
- ✓ Here an individual job is considered as a cost object. Sometimes a job consists of an individual product, and sometimes it consists of a batch of products.
- ✓ Job cost information is used (a) to determine the profitability of individual jobs, (b) to assist in bidding on future jobs, and (c) to evaluate professionals who are in charge of managing individual jobs.
- ✓ Service organizations would most likely use job-order costing to assign and track costs to each client's job. Eg. Hospitals, Doctor's offices, Engineering firms, Law firms, Accounting companies**.**

3.1.1. Features of Job Costing

- ❖ The products are produced only against customer's order and not for maintaining stock for sale.
- ❖ The costs are accumulated to each job separately.
- ❖ A job is performed according to the customer's specifications.
- ❖ The job costing method falls under the category of specific order costing.

3.2 Materials and cost flows in a job order system and the accounting treatment

Costs of jobs are accumulated in two inventory accounts for manufacturing sector companies. These are: work-in-process and finished goods inventory accounts.

Work-in-process inventory: accumulates all costs of resources used on jobs that have not been

completed. When direct materials and direct labor costs are incurred they immediately entered into the job cost sheet and debited for the work-in-process account. After allocation/application the manufacturing overhead account is also debited for WIP inventory account.

Finished goods inventory: accumulates all costs of resources used on jobs that have been completed. When goods are completed the costs of materials and labor held at WIP inventory account is transferred to finished goods inventory account.

To truck materials and cost flows from the acquisition stage until the sale of finished goods to customers, the accounting system use different controlling accounts in the general ledger and other special accounts in the subsidiary ledger.

General ledger:

General ledger accounts with "Control" in the titles (for example, Materials Control and Accounts Payable Control) have underlying subsidiary ledgers that contain additional details, such as each type of material in inventory and individual suppliers that a company must pay. A general ledger should be viewed as only one of many tools that assist management in planning and control.

The **general ledger** account Work-in-Process Control presents the total of these separate job-cost records pertaining to all unfinished jobs. The job-cost records and Work-in-Process Control account track job costs from when jobs start until they are complete. Materials and cost flows and their respective journal entries for manufacturing companies are as follows:

1. Purchase/acquisition of raw materials (both direct and indirect)

Raw materials- Control xx

Account payable/cash – Control xx

(To record the cost of purchasing materials)

Therefore, when materials are purchased they are recorded as assets not as expenses.

2. Requisition or issuing of direct and indirect materials by the production department from the store.

Work-in-process (for direct materials) – Control xx

Manufacturing overhead (for indirect materials) – Control xx

Raw materials – Control xx

Direct materials entered into the WIP account are also recorded on the appropriate job cost sheet. The job cost sheet form a subsidiary ledger. Indirect materials costs are charged to manufacturing overhead controlling account in the general ledger and it should be separated from WIP account. It is used to accumulate all manufacturing overhead costs as they are incurred during a period.

3. Incurred direct and indirect wages (labor cost)

As work is performed each day in various departments, employees' time tickets (labor time card) are filled out by workers, collected, and forwarded to the accounting department. In the accounting department, wages are computed and the resulting costs are classified as either direct or indirect labor. Hence, the journal entry to record wage is by debiting WIP account for direct labor cost and manufacturing overhead controlling account for the indirect

Work-in-process – Control xx

Manufacturing overhead – Control xx

Salaries and wages payable – Control xx

4. Recording various actual indirect costs other than indirect materials and indirect labor costs.

Manufacturing overhead – Control xx

Accounts payable – Control xx

Prepaid expense xx

Property tax payable xx

Accumulated depreciation xx

5. Allocations of indirect cost to WIP account (overhead application).

Work-in-process – Control xx

Manufacturing overhead applied xx

6. To record cost of products are completed and transferred out from production department to the ware house.

Finished goods - Control xx

Work-in-process – Control xx

Overhead application is the process of charging manufacturing overhead costs to job cost

sheets and to work-in-process account.

7. To record the sale of finished goods to customers

Accounts receivable/cash - Control	xx	
Sales		xx
Cost of goods sold	xx	
Finished goods – Control		xx

Note: All actual overhead costs incurred throughout a period are added (debited) to the Manufacturing Overhead Control account. These costs are *not* debited to Work-in-Process Control because, unlike direct costs, they cannot be traced to individual jobs. Manufacturing overhead costs are added (debited) to individual jobs and to Work-in-Process Control only when manufacturing overhead costs are allocated in Transaction (e). At the time these costs are allocated, Manufacturing Overhead Control is, *in effect*, decreased (credited) via its contra account, Manufacturing Overhead Allocated.

Job order costing system-illustration

Example:

Consider the following transactions for XY-Furniture Company for the month of January, 2011 and pass the necessary journal entries assuming the perpetual inventory system.

a) Raw materials were purchased on account for $600,000
b) Raw materials were requisitioned for use in production during the month costs $500,000 (direct materials of $480,000 and indirect materials of $20,000)
c) Total payroll of the company for the month was about $200,000 (direct manufacturing labor, indirect manufacturing labor, sales commission for marketing personnel and administrative salary of 60%, 15%, 18% and 7% respectively)
d) Other overhead costs consists of depreciation for $10,000 (80%, 20% related to factory operation and selling and administrative activities respectively), insurance expired during the year total $2,000 and other manufacturing overheads costs of $27,000 (70% is paid in cash).
e) Manufacturing overhead application to jobs totals $70,000.
f) Work completed and transferred to finished goods considering from goods started 90% were completed.

g) Sales for the period total $650,000 (40% is received in cash) and 90% of the sales price represents cost of goods sold).

Solution:

a) Raw materials – Control $600,000
Accounts payable – Control 600,000
(To record the purchase of raw materials)

b) Work-in-process – Control $480,000
Manufacturing overhead– Control 20,000
Raw materials 500,000
(To record the requisition of raw materials from the ware house by the production dep't)

c) Work-in-process – Control $120,000
Manufacturing overhead – Control l30, 000
Wages payable 150,000
(To record the accumulation of direct and indirect manufacturing labor costs or inventoriable costs of labor)

Sales commission expense $36,000
Administrative salary expense 14,000
Salaries payable 50,000
(To record period/non inventoriable costs of labor)

Direct manufacturing labor = 60% of $200,000 = $120,000

Indirect manufacturing labor = 15% of $200,000 = $30,000

Sales commission = 18% of $200,000 = $36,000

Administrative salary = 7% of $200,000 = $14,000

Total wage = $200,000

d) Depreciation expense – administrative and selling $2,000
Manufacturing overhead – Control 37,000
Accumulated depreciation 10,000
Prepaid insurance 2,000
Accounts payable 8,100
Cash 18,900
(To record other manufacturing overhead costs)

Depreciation expense of factory is charged to MOH (i.e. 80% of $10,000 = $8,000), the $2,000 depreciation is not product cost rather it is period cost and recorded as expense during the year of incurrence.

e) Work-in-process – Control $70,000

	Manufacturing overhead allocation		70,000
f)	Finished goods – Control	$603,000	
	Work-in-process – Control		603,000

(To record the cost of completed goods during the period)

The total cost of manufacturing during the year = direct materials cost used + direct manufacturing labor used + manufacturing overhead cost applied= $480,000 + 120,000 + 70,000 = $670,000 (i.e. the balance of WIP inventory account). 90% of 670,000 = 603,000

g)	Cash	$260,000	
	Accounts receivable	390,000	
	Sales		650,000

(To record the sale of goods during the year)

Cost of goods sold	$585,000	
Finished goods – Control		585,000

(To record cost of goods sold = 90% of $650,000 = $585,000

Subsidiary ledger

Subsidiary ledger consists of a summary of the **job-cost record**. Subsidiary ledgers present the underlying details regarding to the controlling accounts in the general ledger. The sum of all entries in underlying subsidiary ledgers equals the total amount in the corresponding general ledger control accounts.

Materials records by type of materials: keeps a continuous record of quantity received, quantity issued to jobs, and inventory balances for each type of material. As direct materials are used, they are recorded as issued in the Materials Records. Direct materials are also charged to Work-in-Process Inventory Records for Jobs, which are the subsidiary ledger accounts for the Work-in-Process Control account in the general ledger. As indirect materials are used, they are charged to the Manufacturing Department overhead records subsidiary ledger for Manufacturing Overhead Control.

Labor records by employee: Labor records by employee are used to trace direct manufacturing labor to individual jobs and to accumulate the indirect manufacturing labor in Manufacturing Department overhead records. The labor records are based on the labor-time sheet source documents. The subsidiary ledger for employee labor records shows the different jobs that an organization worked on and the amount of wages owed to different parties.

Manufacturing department overhead records by month: The Manufacturing Department overhead records are consists of the subsidiary ledger for Manufacturing Overhead Control,

show details of different categories of overhead costs such as indirect materials, indirect manufacturing labor, engineering, plant insurance and utilities, and plant depreciation.

Work-in-process inventory records by jobs: As we have already discussed, the job-cost record for each individual job in the subsidiary ledger is debited by the actual cost of direct materials and direct manufacturing labor used by individual jobs. The job-cost record for each individual job in the subsidiary ledger is also debited for manufacturing overhead allocated based on the budgeted manufacturing overhead rate times the actual direct manufacturing labor-hours used in that job.

Finished goods inventory records by jobs: includes the total cost of all jobs completed and transferred to finished goods during a particular period. When goods are sold out the cost is transferred from finished goods inventory record to cost of goods sold.

Other subsidiary records: Just as in manufacturing payroll, a company may maintains employee labor records in subsidiary ledgers for marketing and customer service payroll as well as records for different types of advertising costs (print, television, and radio).

3.3 Allocation of manufacturing overhead costs

It is the process of applying or assigning the overhead costs from the controlling account (i.e. manufacturing overhead) to the work-in-process account. Under the normal approach actual overhead costs are not charged to jobs; actual overhead costs do not appear on the job cost sheet nor do they appear in the work-in-process account. Only the applied overhead cost based on the predetermined overhead rate, appears on the job cost sheet and in the work-in-process account. Applied overhead cost is a predetermined overhead cost established by using normal costing approach at the beginning of each period.

Manufacturing overhead cost is applied to WIP based on budgeted rate under the normal costing approach. Under normal costing, **manufacturing overhead allocated**—also called **manufacturing overhead applied**—is the amount of manufacturing overhead costs allocated to individual jobs based on the budgeted rate multiplied by actual quantity used of the allocation base.

Predetermined MOH cost rate = estimated total MOH cost for a period/estimated total units in the allocation base

There are generally five allocation bases to allocate MOH costs among different jobs. From those bases, the company manager selects one that can be a best cost driver to the manufacturing overhead costs or indirect costs of the factory.

- ✓ **Physical output allocation base:** it applies or allocates MOH costs equally to each unit produced. It is appropriate when a company manufacture only one type of product. In this case, number of units produced is the causes (cost drivers) for the cost of MOH.

Predetermined MOH cost rate = Estimated total MOH cost/Estimated units of production

*Indirect cost allocated to a job = predetermined MOH cost rate * Actual units of a job*

- ✓ **Direct materials cost:** is used to allocate indirect materials cost. Here MOH cost rate is expressed as a percentage of direct materials cost. In other words, direct materials cost is a cost driver/cause for the manufacturing overhead cost.

$$Predetermined\ MOH\ cost\ rate = (Estimated\ total\ MOH\ cost/Estimated\ total\ DM\ cost) * 100\%$$

$$Indirect\ cost\ allocated\ to\ a\ job = predetermined\ rate * actual\ total\ DM\ cost$$

- ✓ **Direct labor cost:** is used to allocate indirect labor costs. Here, MOH cost rate is expressed as a percentage of direct labor/DL cost.

$$Predetermined\ MOH\ cost\ rate = (Estimated\ total\ MOH\ cost/Estimated\ total\ DL\ cost) * 100\%$$

$$Indirect\ cost\ allocated\ to\ a\ job = predetermined\ rate * actual\ total\ DL\ cost$$

- ✓ **Direct labor hour:** if there is a cause and effect relationship between direct labor hour and MOH cost, direct labor hour is used as an allocation base. Direct labor hour is used as an allocation base for allocating indirect labor cost.

$$Predetermined\ MOH\ cost\ rate = estimated\ total\ MOH\ cost/estimated\ DL\ hour\ available$$

Hence,

$$Indirect\ cost\ allocated\ to\ a\ job = predetermined\ MOH\ cost\ rate * actual\ DL\ hour\ consumed\ for\ a\ job$$

- ✓ **Machine hours:** if the job is machine intensive, machine hours can be taken as allocation base.

$$Predetermined\ MOH\ cost\ rate = estimated\ total\ MOH\ cost / estimated\ machine\ hours\ available$$

$$Indirect\ cost\ allocated\ to\ a\ job = predetermined\ MOH\ cost\ rate * actual\ machine\ hours\ consumed\ for\ a\ job$$

Note: actual factory overhead costs are debited to the account manufacturing overhead - control as they are incurred day by day throughout an accounting period. At certain interval during the year usually when a job is completed, overhead cost is applied to the job by means of the predetermined overhead rate. The journal entry to record the application of overhead costs on the general ledger is:

Work-in-process - control	xx	
Manufacturing overhead – applied		xx

Application of overhead cost is done when a job is completed to determine its total cost.

$$Total\ cost\ of\ a\ job = direct\ materials\ cost\ (actual) + direct\ labor\ cost\ (actual) + MOH\ cost\ of\ a\ job\ (applied)$$

Illustration: Assume the following budgeted data for ABC Company for the year 2011. And the Company wants to undertake three jobs (job No. 1, job No.2 and job No. 3) during the year. The estimated total manufacturing overhead cost for the year is birr 450,000.

Estimated direct materials cost	Birr 300,000
Estimated units of production	200,000 units
Estimated direct labor cost	Birr 900,000
Estimated direct labor hours	30,000 hours
Estimated machine hours	90,000 hours

Required: computed the predetermined MOH rate based on physical output, DM cost, DL cost,

DL hours and machine hours.

Allocation base	**Computation**	**Predetermined MOH rate**
Physical output level	Birr 450,000/200,000 units	Birr 2.25 per unit
DM cost	Birr (450,000/birr 300,000) * 100%	150% of DM cost
DL cost	(Birr 450,000/birr 900,000) * 100%	50 % of DL cost
DL hour	Birr 450,000/30,000 hours	Birr 1.5 per DL hour
Machine hours	Birr 450,000/90,000 hours	Birr 5 per machine hour

Assume all information in the above example and the following additional information for actual data for job No. 2. The actual units of job No.2 completed during the year is 2000 units, actual direct materials used by the job is birr 30,000 (from job cost sheet), actual direct labor cost incurred for the job is birr 20,000 (from the job cost sheet), direct labor hours worked for the job is 400 hours and machine hours used for the job is 240 hours.

Required: record the applied MOH and determine the total cost of the job under each of the above cost allocation bases.

Allocation base (1)	**Predetermined allocation rate (2)**	**Actual activity consumption (3)**	**Total MOH applied to Job No.2 (2*3)**	**Total cost of Job No.2 (DM + DL + MOH)**
Physical output level	Birr 2.25 per unit	2000 units	Birr 4,500	Birr 54,000 (30,000 +20,000 +4,500)
DM cost	150% of DM cost	Birr 30,000	Birr 45,000	Birr 95,000 (30,000 + 20,000 +45,000)
DL cost	50 % of DL cost	Birr 20,000	Birr 10,000	Birr 60,000 (30,000 + 20,000 +10,000)
DL hour	Birr 1.5 per DL hour	400 hours	Birr 45,000	Birr 95,000 (30,000 + 20,000 +45,000)

Machine hours	Birr 5 per machine hour	240 hours	Birr 1,200	Birr 51,000

The journal entries to record the application of overhead costs debit WIP controlling account and crediting MOH applied account. For instance, if the allocation base is the physical output level, the journal entry to record the application of MOH is:

Work-in-process - control	birr 4,500	
Manufacturing overhead- applied		4,500

$$Unit\ cost\ of\ Job\ No.2 = total\ cost\ of\ Job\ No.2\ under\ the\ selected\ allocation\ base / total\ units\ of\ Job\ No.2\ produced$$

Hence, if the allocation base is the physical output level, the total cost of Job No.2 is birr 54,000. And the unit cost of Job No. 2 = birr 54,000/2000 units produced = birr 27.25 per unit.

Under applied and over applied overhead

Using budgeted indirect-cost rates and normal costing instead of actual costing has the advantage that indirect costs can be assigned to individual jobs on an ongoing and timely basis, rather than only at the end of the fiscal year when actual costs are known. However, budgeted rates are unlikely to equal actual rates because they are based on estimates made up to 12 months before actual costs are incurred. We now consider adjustments that are needed when, at the end of the fiscal year, indirect costs allocated differ from actual indirect costs incurred

The difference between the overhead applied to work-in-process and the actual overhead costs of a period is called either under applied or over applied overhead. Under the actual costing approach there is no under/over estimation or application but this problem exists in normal costing approach only. Under allocated (over allocated) indirect costs are also called **under applied (over applied) indirect costs** and **under absorbed (over absorbed) indirect costs**.

If applied overhead cost < actual overhead cost, the difference between applied overhead and actual overhead is called under applied overhead.

If applied overhead cost > actual overhead cost, the difference between applied overhead and actual overhead is called over applied overhead.

$$Under/over\ applied\ overhead\ =\ (MOH-control)-(MOH-applied)$$

Manufacturing overhead control indicate the actual indirect manufacturing costs incurred during a particular period taken from the manufacturing overhead subsidiary ledger. Whereas, the manufacturing overhead applied indicate the indirect manufacturing costs allocated to WIP under the predetermined rate. Generally, there are two indirect-cost accounts in the general ledger that have to do with manufacturing overhead: 1) Manufacturing Overhead Control, the record of the actual costs in all the individual overhead categories (such as indirect materials, indirect manufacturing labor, supervision, engineering, utilities, and plant depreciation) and 2) Manufacturing Overhead Allocated, the record of the manufacturing overhead allocated to individual jobs on the basis of the budgeted rate multiplied by actual unit of the allocation base.

- ✓ **Disposition of under applied and over applied overhead:** is the process of removing under/over applied overhead from manufacturing overhead account at the end of an accounting period. There are three approaches to dispose-off under/over applied overhead costs. These are: adjusted allocation rate approach, proration approach and write-off to cost of goods sold approach.

i. Adjusted allocation rate approach

The **adjusted allocation-rate approach** restates all overhead entries in the general ledger and subsidiary ledgers using actual cost rates rather than budgeted cost rates. First, the actual manufacturing overhead rate is computed at the end of the fiscal year. Then, the manufacturing overhead costs allocated to every job during the year are recomputed using the actual manufacturing overhead rate (rather than the budgeted manufacturing overhead rate). Finally, end-of-year closing entries are made. The result is that at year-end, every job-cost record and finished goods record—as well as the ending Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold accounts—represent actual manufacturing overhead costs incurred.

ii. Proration approach

Proration approach spreads under allocated overhead or over allocated overhead among ending

work-in-process inventory, finished goods inventory, and cost of goods sold. Materials inventory is not included in this proration, because no manufacturing overhead costs have been allocated to it. Companies prorates under allocated or over allocated amounts on the basis of the total amount of manufacturing overhead allocated during a particular accounting period (before proration) in the ending balances of Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold. On the other hand, some companies use the proration approach but base it on the ending balances of Work-in-Process Control, Finished Goods Control, and Cost of Goods Sold before proration.

iii. Write-off to cost of goods sold approach

Closing the over/under application to cost of goods sold is the simplest method. The over application is closed to cost of goods sold by debiting manufacturing overhead control account and crediting cost of goods sold account for the total over application. On the other hand, the under application is closed by debiting cost of goods sold account and crediting manufacturing overhead control account. Therefore, the under applied overhead results increase in cost of goods sold, whereas, the over applied overhead results decrease in cost of goods sold.

CGS xx

MOH – control xx

(To record the disposition of under applied overhead)

MOH – control xx

CGS xx

(To record the disposition of over applied overhead)

MOH – control	
actual → xx	xx ← applied
Under application – xxx	xxx – disposition of under applied MOH
0	

Illustration: assume the following data for a particular company at the end of 2011. The applied overhead for job no. 2 from the job cost sheet of the job was 3,520.

MOH – control (actual indirect manufacturing cost)	$ 1,215,000
MOH – applied (estimated indirect manufacturing cost)	1,080,000
Cost of goods sold (CGS) at the end of a period	2,375,000
Finished goods (FG) at the end of a period	75,000

Work-in-process (WIP) at the end of a period	50,000

MOH – applied is prorated to CGD, FG and WIP based on the following percentage:

CGS	$1,032,480 (95.6%)
FG	31,320(2.9%)
WIP	16,200 (1.5%)
Total	$1,080,000 (100%)

Required:

1) compute the over/under applied overhead
2) present the required closing entry assuming

a) Adjusted allocation rate approach

b) Proration approach

- the MOH applied to each account
- end balance of the selected accounts

c) Write – off to cost of goods sold approach.

Solution:

1) **Over/under applied MOH** = MOH –control – MOH – applied

= Actual MOH - Estimated MOH

Under applied overhead = $1,215,000 – 1,080,000 = $135,000

2) a) Adjusted allocation rate approach

Under applied overhead = 135,000/1,080,000 = 12.5%

For the job No.2, 12.5% of the applied overhead is allocated. Hence the cost reallocated to job No. 2 is 12.5% of 3,520 = $440. Similar to this the remaining under applied over head is allocated to all other jobs done during a period. Finally, the after reapplying the under applied overhead to all jobs based on the actual rate, the balance in manufacturing overhead – control and applied accounts will be equal. Hence, the closing entry at the end of the period is required to close all under applied to each job CGS, FG and WIP.

Cost of Goods Sold (J1)	xx	
Finished Goods (J1)	xx	
Work-In-Process (J1)	xx	
Manufacturing overhead – applied (J1)		xx

b) Proration approach

Alternative 1: Disposition of under applied overhead based on the amount of MOH applied to

each (CGS, FG and WIP). Hence, the disposition of the under applied overhead of $ 135,000 is as follows:

CGS = 95.6% of under applied overhead = 0.956 * $135,000 = $129,060

FG = 2.9% of under applied overhead = 0.029 * $135,000 = $3,915

WIP = 1.5% of under applied overhead = 0.015 * $135,000 = $2,025

Total $135,000

Hence, the closing entry to close the under applied MOH cost is as follows:

Cost of goods sold	$129,060	
Finished goods	3,915	
Work-in-process	2,025	
Manufacturing overhead – applied	1,080,000	
Manufacturing overhead – control		1,215,000

Alternative 2: The under applied overhead is allocated to CGS, FG and WIP based on their yearend balance:

Accounts	Ending balance	Percentage
CGS	$2,375,000	95%
FG	75,000	3%
WIP	50,000	2%
Total	$2,500,000	100%

Therefore, under applied overhead closed to

CGS = 95% of $135,000 = $128,000

FG = 3% of $135,000 = $4,050

WIP = 2% of $135,000 = $2,700

The closing entry will be:

Cost of goods sold	$128,000	
Finished goods	4,050	
Work-in-process	2,700	
Manufacturing overhead – applied	1,080,000	
Manufacturing overhead – control		1,215,000

c) Write – off to cost of goods sold approach

The total under applied overhead (i.e. $135,000) is charged to cost of goods sold account only. Hence the closing entry is;

Cost of goods sold	$135,000

Manufacturing overhead – applied 1,080,000

Manufacturing overhead – control 1,215,000

CHAPTER FOUR

4. The Process and Operation or service costing methods

4.1 Process costing methods

Equivalent units of production for a period can be computed in different ways. The **FIFO method** of process costing is a method in which equivalent units and unit costs relate only to work done during the current period. In contrast, the **weighted average method** blends together units and costs from the current period with units and costs from the prior period. In the weighted-average method, the **equivalent units of production** for a department are the number of units transferred to the next department (or to finished goods) plus the equivalent units in the department's ending work in process inventory. The choice between these two methods of costing is based on the presence of the beginning and ending inventory with in a department. Generally there are three cases to see the application of FIFO and Weighted average methods under the process costing system.

Case 1: process costing with no/zero beginning and zero ending work-in-process inventories. (That is, all units are started and fully completed within the accounting period.) This case presents the most basic concepts of process costing and illustrates the feature of averaging of costs. This is a common situation in service sector companies. For instance, banks to compute the unit cost of processing a certain amount of customers deposit.

Case 2: process costing with zero beginning but some ending WIP inventories. This case introduces the five steps of process costing and the concept of equivalent units.

Case 3: process costing with both beginning and ending WIP inventory. This case adds more complexity and illustrates the effect of weighted-average and first-in, first-out (FIFO) cost flow assumptions on cost of units completed and cost of work-in-process inventory.

Case 1:

Illustration: XY- auto assembling company has two processing departments, the Assembling department (department 1) and the Testing department (department 2).Assume all direct material costs are added to the production at the beginning and conversion costs evenly throughout the

production process. Data for the Assembling department for the month of January, 2012 are as follows:

Units' data:

- Work-in-process, beginning ---------- 0 units
- Units started during the current period ---------- 50,000 units
- Units completed and transferred out to testing department ---------- 50,000 units

Cost data:

- Direct materials ---------- birr 60,000
- Conversion costs ---------- birr 95,000

Required: prepare the cost of production report for the assembly department for the year 2012 ended on December 31.

XY- auto assembling company
Cost of production report – Assembling department
For the month ended, January 31, 2012

Quantity schedule:

- Units to account for:
- WIP, beginning ---------- 0 units
- Units started during the period ---------- 50,000 units

Total units to account for ----------50,000 units

- Units accounted for:
- Units completed and transferred to testing department --- 50,000 units
- Units still in process (WIP – ending) ---------- 0 units --- 50,000 units

Equivalent units schedule:

	Direct materials	**Conversion costs**
Items completed and transferred to testing department	50,000 units	50,000 units
Units still in process	0 units	0 units
Total equivalent units	50,000 units	50,000 units

Cost to account for schedule:

Costs added by assembling department (dep't 1)	**Total cost**	**Equivalent units (EU)**	**Weighted average cost per EU**
- Direct materials	Birr 60,000	50,000 units	Birr 60,000/50,000 units = birr 1.2 per unit

- Conversion costs	Birr 95,000	50,000 units	Birr 95,000/50,000 units = birr 1.9 per unit
Total cost to account for:	Birr 155,000		Birr 3.1 per unit

Cost accounted for schedule:

- Cost of units completed and transferred to testing department (50,000 units * birr 3.1 per unit) ---------- birr 155,000
- Cost of WIP, ending inventory (0 units * birr 3.1 per unit) ---------- 0
- Total cost accounted for ---------- birr 155,000

Assembling department (dep't 1):

Work-in-process – Assembling dep't ---------- birr 60,000

Accounts payable ---------- 60,000

(To record direct materials purchased and used in production during January)

Work-in-process – Assembling dep't ---------- birr 95,000

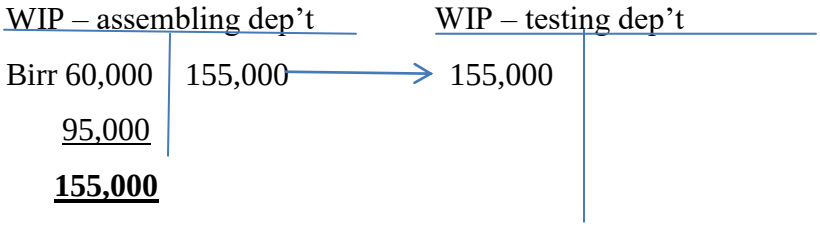
Various accounts such as Wages Payable Control and accumulated Depreciation ---- 95,000

(To record conversion costs for January; examples include energy, manufacturing supplies, all manufacturing labor, and plant depreciation).

Work-in-process – Testing dep't ---------- birr 155,000

Work-in-process – assembling dep't ---------- 155,000

(To record cost of goods completed and transferred from assembly to testing during February).



Case 2: process costing with zero beginning and some ending inventory

Illustration

Consider the following information for the Testing department in the above example for the month of January, 2012.

Units' data:

- WIP, beginning inventory (January 1) ---------- 0 units
- Units started or received from dep't 1 during the month ---------- 50,000 units
- WIP, ending inventory (100% completed as to direct materials and 40% as to conversion costs) --15,000 units

Cost data:

- Direct materials added by the department ---------- birr 60,000
- Conversion costs ---------- birr 82,000

Required: prepare the cost of production report for department 2 (Testing department).

XY- auto assembling company
Cost of production report – Assembly department
For the month ended, January 31, 2012

Quantity schedule:

- Units to account for
  - WIP, beginning ---------- 0 units
  - Units started during January ---------- 50,000 units
- Units accounted for
  - Units completed and transferred to Finished goods ------- 35,000 units
  - WIP, ending (100% DM and 40% CC) ---------- 15,000 units -- 50,000 units

Equivalent units schedule:

	Direct materials (DM)	**Conversion costs (CC)**
Items completed and transferred out from the department	35,000 units	35,000 units
WIP, end (Units still in process)	15,000	6,000 (40% of 15,000)
Total equivalent units	50,000 units	41,000 units

Cost to account for schedule (costs incurred to date):

Costs added by the Assembly department	**Total cost**	**Equivalent units of work done during the month of February**	**Weighted average cost per EU**
- Direct materials (DM)	Birr 60,000	50,000 units	Birr 60,000/50,000 units = birr 1.2per unit
- Conversion costs (CC)	Birr 82,000	41,000 units	Birr 82,000/41,000 units = birr 2 per unit
Total cost to account for:	Birr 142,000		Birr 3.2 per unit

Costs accounted for schedule (assignment of costs):

- Cost of finished goods (35,000 units * birr 3.2 per unit) ---------- birr 178,500
- Cost of WIP, ending inventory

DM (15,000 * birr 1.2 per unit) ---------- birr 18,000
CC (6,000 * birr 2 per unit) ---------- birr 12,000 birr 30,000

- Total cost accounted for ---------- birr 142,000

Note that: steps 1 and 2 measure the physical units of output and equivalent units of output for a particular production department. Whereas, step 3 and 4 compute costs per equivalent units, summarize total costs to account for and assign total costs to: units completed and to units in ending work-in-process inventory account.

Journal entries to record the accumulation and assignment of costs to the Assembling and Testing department are:

Case 3: process costing with both beginning and ending WIP

There are two methods of costing in this case: these are

1) Weighted average process costing method (WA)
2) First-in-First out process costing method (FIFO)

Illustration: assume in the previous example, the company add all direct materials at the start of the process for the assembly department and at the end of the process in testing department. Conversion costs are applied uniformly throughout the process in both departments. Information for the Assembling department for the month of January is as follows:

Unit data for February:

- WIP, beginning (100% DM, 2/3 completed for CC) ---------- 3,000
- Units started during January ----------9,000 12,000
- Units completed and transferred to dep't 2 ---------- 8,000
- WIP, ending (100% DM, 1/2 completed for CC) ----------4,000 12,000

Cost data:

- WIP, beginning (prior period cost)

Direct materials ---------- birr 9,600
Conversion costs ---------- birr 6,400

- Current period cost:

Direct materials ---------- birr 27,000
Conversion costs ---------- birr 24,000

Required: prepare cost of production report for the Assembly department for the month of January by using:

1) Weighted average/WA method
2) First in First out/FIFO method

Solution:

1) Weighted average method

The **weighted-average process-costing method** calculates cost per equivalent unit of all *work*

done to date (regardless of the accounting period in which it was done) and assigns this cost to equivalent units completed and transferred out of the process and to equivalent units in ending work-in-process inventory. The weighted-average cost is the total of all costs entering the Work in Process account (whether the costs are from beginning work in process or from work started during the current period) divided by total equivalent units of work done to date.

$$The\ cost\ per\ equivalent\ unit = cost\ incurred\ in\ the\ previous\ period + current\ cost/total\ equivalent\ units$$

XY- auto assembling company
Cost of production report - Assembly department
For the month ended, January 31, 2012

Quantity schedule:

- Units to account for
  - WIP, beginning (2/3 completed) ---------- 3,000 units
  - Units received from department 1 ---------- 9,000 units 12,000
- Units accounted for
  - Units completed and transferred to dep't 2 ---------8,000 units
  - WIP, ending (1/2 completed) ---------- 4,000 units -- 12,000 units

Equivalent units schedule:

	Direct materials (DM)	**Conversion costs (CC)**
Items completed and transferred out to the Testing department	8,000 units	8,000 units
WIP, end (Units still in process)	4,000	2,000 (50% of 4,000)
Total equivalent units	12,000 units	10,000 units

Cost to account for schedule:

	Total cost	**Equivalent units of work done during the month of February**	**Weighted average cost per EU**
DM:WIP–beginning ---- birr 9,600 Current month ---- birr 27,000	Birr 36,600	12,000 units	Birr 36,000/12,000 units = birr 3.05 per unit
CC: WIP –beginning --- birr 6,400 Current month ---- birr 24,000	Birr 30,400	10,000 units	Birr 30,400/10,000 units = birr 3.04 per unit
Total cost to account for:	Birr 67,000		Birr 6.09 per unit

Costs accounted for schedule (assignment of costs):

- Cost of completed and transferred out units (8,000 units * birr 6.09 per units) --- birr 48,720
- Cost of WIP, ending inventory

DM (4,000 * birr 3.05 per unit) ---------- birr 12,200
CC (2,000 * birr 3.04 per unit) ---------- birr 6,080 birr 18,280

- Total cost accounted for ---------- birr 67,000

2) First in first out (FIFO) method

The **first-in, first-out (FIFO) process-costing method** (1) assigns the cost of the previous accounting period's equivalent units in beginning work-in-process inventory to the first units completed and transferred out of the process, and (2) assigns the cost of equivalent units worked on during the ***current*** period first to complete beginning inventory, next to start and complete new units, and finally to units in ending work-in-process inventory. The FIFO method assumes that the earliest equivalent units in work in process are completed first.

A distinctive feature of the FIFO process-costing method is that work done on beginning inventory before the current period is kept separate from work done in the current period. Costs incurred and units produced in the current period are used to calculate cost per equivalent unit of work done in the current period. In contrast, equivalent-unit and cost per-equivalent-unit calculations under the weighted-average method ***merge*** units and costs in beginning inventory with units and costs of work done in the current period.

Units completed and transferred out = Units in beginning WIP + units started and completed during the current period (for the remaining units)

XY- auto assembling company
Cost of production report - Assembly department
For the month ended, January 31, 2012

Quantity schedule:

- Units to account for
  - WIP, beginning (2/3 completed) ---------- 3,000 units
  - Units received from department 1 ---------- 9,000 units 12,000 units
- Units accounted for
  - Units completed and transferred to dep't 2

Units from WIP, beginning ---------- 3,000
Units started during January ---------- 5,000 8,000

- WIP, ending (1/2 completed) ---------- 4,000 units -- 12,000 units

Equivalent units schedule:

	Direct materials (DM)	**Conversion costs (CC)**
WIP – beginning inventory	3,000 * 0 = 0 units	(3000 * 1/3) = 1,000
Items started and completed during the current month	5,000 units	5,000 units
WIP, end (Units still in process)	4,000	2,000 (50% of 4,000)
Total equivalent units	9,000 units	8,000 units

Cost to account for schedule:

	Total cost	**Equivalent units of work done during the month of February**	**Cost per EU for the work done during January**
WIP–beginning: (prior period cost) - DM ------- birr 9,600 - CC -------- birr 6,400	Br. 16,000		
Costs added during January: - DM -------- birr 27,000 - CC --------- birr 24,000	Br. 51,000	9,000 units 8,000 units	Birr 27,000/9,000 units = birr 3 per equivalent unit& 24,000/8,000 units = birr 3 per equivalent unit
Total cost to account for:	Br. 67,000		Birr 6 per unit

Costs accounted for schedule (assignment of costs):

	Total cost = DM + CC	**Direct materials (DM)**	**Conversion cost (CC)**
Cost of units completed and transferred out: (8,000 units)			
➢ WIP, beg (3,000 units)			
- Costs added to beginning work in process in the previous period	Birr 16,000	9,600	6,400
- Costs added to beginning WIP during	Birr 3,000 **Birr 19,000**	0 units * birr 3= birr 0	1,000 * birr3 = birr 3000

the current period - Total cost from beginning inventory ➢ Units Started and completed (5,000 units) Total costs of units completed and transferred out	 **Birr 30,000** **Birr 49,000**	5,000* birr 3 = birr 15,000	 5,000 * birr 3 = birr 15,000
Work in process, ending (4,000 units):	Birr 18,000	4000 * birr 3	2000 * birr 3
Total costs accounted for	**Birr 67,000**		

Note that: The weighted-average ending inventory is higher than the FIFO ending inventory by $280. This would be a significant difference when aggregated over the many thousands of products that the company makes. When completed units are sold, the weighted-average method in our example leads to a lower cost of goods sold and, therefore, higher operating income and higher income taxes than the FIFO method.

Transferred-in costs:

Many process-costing systems have two or more departments or processes in the production cycle. As units move from department to department, the related costs are also transferred by monthly journal entries. **Transferred-in costs** (also called **previous-department costs**) are costs incurred in previous departments that are carried forward as the product's cost when it moves to a subsequent process in the production cycle. *Transferred-in costs are treated as if they are a separate type of direct material added at the beginning of the process.* That is, transferred-in costs are always 100% complete as of the beginning of the process in the new department. When successive departments are involved, transferred units from one department become **all** or a **part** of the direct materials of the next department; however, they are called transferred-in costs, not direct material costs.

Illustration:

Consider the following information for the Testing department in the above example for the month of January, 2012.

Units' data:

- WIP, beginning inveneetory (100% DM, 60% CC) ---------- 1,000 units
- Units started or received from dep't 1 during the

month (transferred-in units) ---------- 8,000 units

- WIP, ending inventory (100% completed as

To direct materials and 40% as to conversion costs) ---------- 2,000 units

WIP, beginning (prior period cost)

- Transferred-in cost ---------- birr 14,280
- Direct materials ---------- birr 0
- Conversion costs ---------- birr 6,400

Cost data: (for January or current period)

- Transferred-in cost ---------- birr 48,720
- Direct materials added by the department ---------- birr 0
- Conversion costs ---------- birr 71,600

Required: prepare the cost of production report for department 2 (Testing department).

1) Weighted average method
2) FIFO method

Solution:

1) Transferred- in costs and the Weighted average method

The transferred-in cost is birr 48,720 (i.e. cost of goods completed in the Assembly and transferred out to the Testing department).

XY- auto assembling company

Cost of production report – Testing department

For the month ended, January 31, 2012

Quantity schedule:

- Units to account for
  - WIP, beginning ----------1,000 units
  - Units received from department 1 (Assembling dep't) ------- 8,000 units 9,000 units
- Units accounted for
  - Units completed and transferred to Finished goods ------- 7,000 units

- WIP, ending (100% DM and 40% CC) ---------- 2,000 units -- 9,000 units

Equivalent units schedule:

	Transferred-in costs	**Direct materials (DM)**	**Conversion costs (CC)**
Items completed and transferred out from the department to FG	7,000 units	0 units	7,000 units
WIP, end (Units still in process)	2,000 units	0 units	800 (40% of 2,000)
Total equivalent units	9,000 units	0 units	7,800 units

Cost to account for schedule (costs incurred to date):

	Total production cost	**Equivalent units of work done during the month of February**	**Weighted average cost per EU**
Costs of goods received from the Assembling department (dep't 1) (Transferred-in cost) - WIP, beginning- 14,280 - Current period –48,720	Birr 63,000	9,000	Birr 63,000/9,000 units = birr 7per unit
Costs added by the Testing department (department 2)			
➢ Direct materials (DM) - WIP, beginning –birr 0 - Current period – birr 0	Birr 0	0 units	Birr 0/0 units = birr 0 per unit
➢ Conversion costs (CC) - WIP, beginning– 6,400	Birr 78,000	7,800 units	Birr 78,000/7,800 units = birr 10per unit

- Current period– 71,600			
Total cost to account for:	Birr 141,000		Birr 17per unit

Costs accounted for schedule (assignment of costs):

- Cost of finished goods (7,000 units * birr 17per unit) ---------- birr 119,000
- Cost of WIP, ending inventory

Transferred-in costs (2000 * birr 7) ---------- birr 14,000

DM (2,000 * birr 0 per unit) ---------- birr 0

CC (800 * birr 10per unit) ---------- birr 8,000birr 22,000

- Total cost accounted for ---------- birr 141,000

Journal entries:

Work-in-process- Testing dep't ---------- birr 48,720
Work –in-process – Assembly dep't ---------- birr 48,720
(To record the transferred in cost from the Assembly dep't to the Testing dep't)

Work-in-process – Testing dep't ---------- birr 72,600
Various accounts such as Wages Payable Control and
Accumulated Depreciation ---------- 72,600
(To record all conversion costs incurred in the Testing department during the month of January)

Finished goods ---------- birr 119,000
Work-in-process – Testing dep't ---------- birr 119,000
(To record the cost of goods completed and transferred out from the Testing department)

2) Transferred- in costs and FIFO method

The transferred-in cost is birr 49,000 (i.e. cost of goods completed in the Assembly and transferred out to the Testing department) under the FIFO method for the Assembly dep't.

XY- auto assembling company

Cost of production report - Assembly department

For the month ended, January 31, 2012

Quantity schedule:

- Units to account for:
  - WIP, beginning (60% completed)---------- 1,000 units
  - Units received from department 1(assembly dep't) ---------8,000 units 9,000 units
- Units accounted for:
  - Units completed and transferred to finished goods

Units from WIP, beginning ---------- 1,000

Units transferred-in January ---------- 6,000 7,000

- WIP, ending (40% completed) ---------- 2,000 units ------- 9,000 units

Equivalent units schedule:

	Transferred-in costs (TIC)	**Direct materials (DM)**	**Conversion costs (CC)**
Units completed and transferred out to finished goods: - WIP beginning inventory	0 units	0 units	= 400 (1000 * 40%)
- Units completed transferred from the current month transferred-in units	6,000	0 units	6,000 units
WIP, end (Units still in process) from the current period units	2,000 units	0 units	800 (40% of 2,000)
Total equivalent units	8,000 units	0 units	7,200 units

Cost to account for schedule:

	Total cost	**Equivalent units of**	**Cost per EU for**

		work done during the month of February	**the work done during January**
WIP, beginning: - Transferred-in cost -- 14,280 - Direct material ------- 0 - Conversion costs ----- 6,400	Birr 20,680		
Costs added during January: - Transferred-in cost - 49,000 - DM ---------- 0 - CC ---------- 71,600	Birr 120,600	8,000 units 0 units 7,200 units	Birr 49,000/8,000 = birr 6.125 per unit; 0/0 = birr 0 per unit 71,600/7200 = birr 9.94
Total cost to account for:	**Birr 141,280**		Birr 16.1per unit

Costs accounted for schedule (assignment of costs):

	Total cost	**Transferred-in costs**	**Direct materials**	**Conversion cost**
Cost of units completed: (7,000 units)				
➢ WIP, beg (1,000) - Costs added to beginning work in process in	Birr 20,680	0 EU * birr 6.125 (0 birr)	0 EU * birr 0 (birr o)	400 EU * birr 9.94 (3,978birr)

current period -Total from beginning WIP ➢ Total cost of Units transferred and completed (6,000 units)	Birr 3,978 Birr 24,658 Birr 96,417	6,000 EU * birr 6.125 per EU = birr 36,750	0 EU * birr 0 per EU = birr 0	6,000 EU * birr 9.94 per EU = birr 59,667
Total cost of units transferred out to FG	Birr 121,075			
Work in process, ending (2,000 units):	Birr 20,205	2,000 EU * birr 6.125 per EU = birr 12,250	0 EU * birr 0 per EU = birr 0	800 EU * 9.94 per EU = birr 7,955
Total costs accounted for	**Birr 141,280**			

Note: for the transferred-in costs

1. Be sure to include transferred-in costs from previous departments in your calculations.
2. In calculating costs to be transferred on a FIFO basis, do not overlook costs assigned in the previous period to units that were in process at the beginning of the current period but are now included in the units transferred.
3. Unit costs may fluctuate between periods. Therefore, transferred units may contain batches accumulated at different unit costs.
4. Units may be measured in different denominations in different departments. Consider each department separately.

CHAPTER FIVE

5. Joint products and byproducts costing

Introduction

Product is any output that has a positive total sales value or an output that enables a company to avoid incurring costs. The total sales value can be high or low. Many companies, such as petroleum refiners, produce and sell two or more products simultaneously. For instance, companies like ExxonMobil simultaneously produce crude oil, natural gas, and raw liquefied petroleum gas (LPS) from petroleum, in a single process. This chapter examines methods for allocating costs to joint products.

5.1 Joint products and Byproducts

Joint products are products produced in a single production process. There are two joint products that are resulted from a single production process. These are:

- ✓ **Main products:** are products with a higher total sales value compared with total sales value of other products of a joint production process.
- ✓ **Byproducts:** are the products of a joint production process that have low total sales value compared with the total sales value of the main product/s.

In the absence of by products at the split off point all products are termed as joint products or main products.

Distinctions among main products, joint products, and byproducts are not so definite in practice. It depends up on the relative selling value of products. Moreover, the classification of products—main, joint, or byproduct—can change over time due to the change in the selling price of products over time. Generally, in practice, it is important to understand how a specific company chooses to classify its products.

Example:

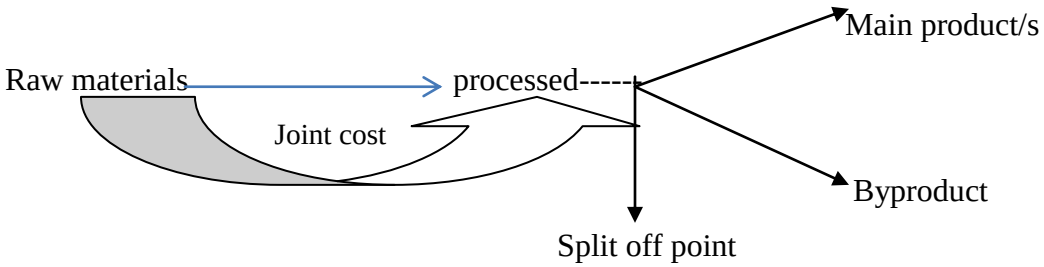
If timber (logs) is processed into standard lumber and wood chips, standard lumber is a main product and wood chips are the byproduct, because standard lumber has a high total sales value compared with wood chips. If, however, logs are processed into fine-grade lumber, standard

lumber, and wood chips, fine-grade lumber and standard lumber are joint products, and wood chips are the byproduct. That's because both fine-grade lumber and standard lumber have high total sales values when compared with wood chips.

Joint costs: are the costs of a production process that yields multiple products simultaneously. In other words, joint cost is the cost incurred until the split off point.

Split off point: is the juncture in a joint production process when two or more products become separately identifiable. An example is the point at which coal becomes coke, natural gas, and other products.

Separable costs: are all costs—manufacturing, marketing, distribution, and so on—incurred beyond the split off point that are assignable/traceable to each of the specific products identified at the split off point. At or beyond the split off point, decisions relating to the sale or further processing of each identifiable product can be made independently of decisions about the other products.



5.1.1 Joint cost allocation and its objectives

Joint cost allocation is the process of assigning joint costs to multiple products produced in a joint production process. The objectives for joint cost allocation are:

- Computation of cost of products and cost of goods sold for financial accounting purpose and internal reporting purpose;
- To compute cost reimbursement for companies In thiscase, stringent rules typically specify the manner in which joint costs are assigned to the products or services covered by the cost-plus agreement;

- Rate or price regulation for one or more of the jointly produced products or services. This issue is conceptually related to the previous point, and is of great importance in the extractive and energy industries where output prices are regulated to yield a fixed return on a cost basis that includes joint cost allocations. In telecommunications, for example, it is often the case that a firm with significant market power has some products subject to price regulation (e.g., interconnection) and other activities that are unregulated (such as end-user equipment rentals). In this case, it is critical in allocating joint costs to ensure that costs are not transferred from unregulated services to regulated ones.
- Insurance settlement computation for damage claims made on the basis of cost information of jointly produced products. In this case, the joint cost allocations are essential in order to provide a cost-based analysis of the loss in value.
- Any commercial litigation situation in which costs of joint products or services are key inputs requires the allocation of joint costs.

5.1.2 Joint cost allocation methods

There are two approaches are used to allocate joint costs. These are:

Approach 1: Allocate joint costs using *market-based* data such as revenues. Thischapter illustrates three methods that use this approach:

1. Sales value at split-off method
2. Net realizable value (NRV) method
3. Constant gross-margin percentage NRV method

Approach 2: Allocate joint costs using *physical measures*, such as the weight, quantity (physical units), or volume of the joint products.

In preceding chapters, we used the cause-and-effect and benefits-received criteria for guiding cost-allocation decisions. Joint costs do not have a cause-and-effect relationship with individual products because the production process simultaneously yields multiple products. Using the benefits-received criterion leads to a preference for methods under approach 1 because revenues are, in general, a better indicator of benefits received than physical measures.

Example 1: MAMA Farmers' Dairy purchases raw milk from individual farms and processes it

until the split-off point, when two products—cream and liquid skim—emerge. These two products are sold to an independent company, which markets and distributes them to supermarkets and other retail outlets.In May 2012, Farmers' Dairy processes 110,000 gallons of raw milk. During processing, 10,000 gallons are lost due to evaporation and spillage, yielding 25,000 gallons of cream and 75,000 gallons of liquid skim. Summary data follow:

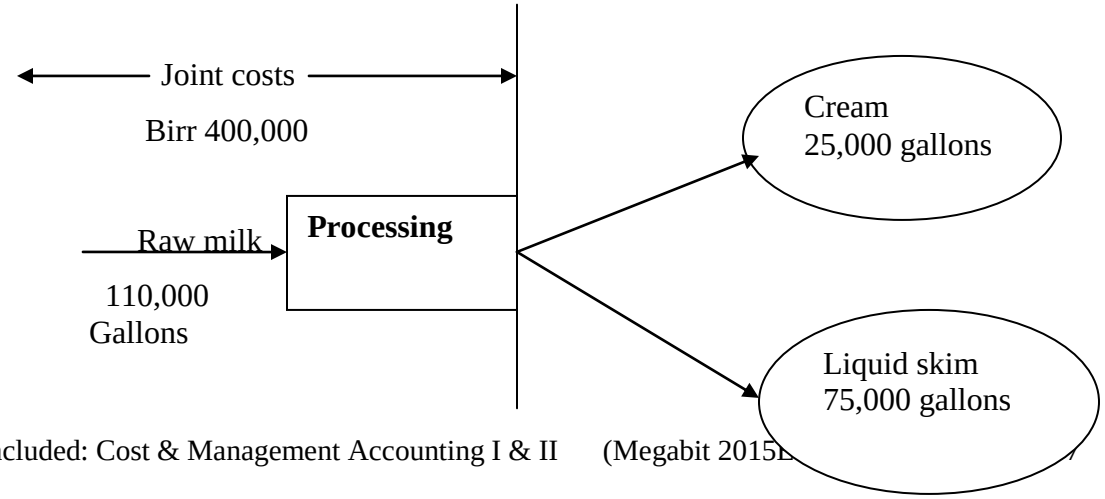
	Joint Costs	
Joint costs (costs of 110,000 gallons raw milk and processing to split-off point)	Birr 400,000	
	Cream	Liquid skim
Beginning inventory (gallons)	0	0
Production (gallons)	25,000	75,000
Sales (gallons)	20,000	30,000
Ending inventory (gallons)	5,000	45,000
Selling price per gallon	Birr 8	Birr 4

Required: How much of the $400,000 joint costs should be allocated to the cost of goods soldof 20,000 gallons of cream and 30,000 gallons of liquid skim, and how much should beallocated to the ending inventory of 5,000 gallons of cream and 45,000 gallons of liquid skim?

Approach 1 – market based (revenue based) joint cost allocation

1. **Sales value at split-off point method**

This method allocates joint costs to joint products on the basis of the relative total sales volume at the split-off point of the total production of these products during an accounting period. This method is used when joint products are sold at the split-off point without further processing.



Split-off point

Allocation of joint cost by using the sales value at the split-off method	**Cream (1)**	**Liquid skim (2)**	**Total (1) + (2)**
Sales value of total production at split-off point	25,000 * birr 8 = birr 200,000	75,000 * birr 4 = birr 300,000	Birr 500,000
Weighting	40%	60%	
Joint cost allocated	40% of birr 400,000 = birr 160,000	60% of birr 400,000 = birr 240,000	Birr 400,000
Joint production cost per gallon	Birr 160,000/25,000 gallons = birr 6.4	Birr 240,000/75,000 gallon = birr 3.2	
Product line income statement using the sales value at the split-off point	**Cream (1)**	**Liquid skim (2)**	**Total (1) + (2)**
Revenue	20,000 * birr 8 = birr 160,000	30,000 * birr 4 = birr 120,000	Birr 280,000
Cost of goods sold (joint costs): - Production cost - Less: Ending inventory Cost of goods sold (joint cost)	 160,000 5,000 * 6.4 = birr 32,000 Birr 128,000	 240,000 45,000 * 3.2 = birr 144,000 Birr 96,000	 Birr 400,000 Birr 176,000 Birr 224,000
Gross profit	Birr 32,000	Birr 24,000	Birr 56,000
Gross profit percentage	20%	20%	20%

$$\boldsymbol{Gross\ margin\ =\ Revenue\ -\ cost\ of\ goods\ sold}$$

$$\boldsymbol{Revenue\ =\ selling\ price\ per\ unit\ *\ number\ of\ units\ sold\ out}$$

$$\textbf{Cost of goods sold} = [\textbf{cost of beginning inventory} + \textbf{total cost of production}] - [\textbf{cost of ending inventory}]$$

$$\textbf{Cost of production} = \textbf{joint cost allocated to a product} + \textbf{separable cost of a product}$$

$$\textbf{Cost of ending inventory} = \textbf{units left at hand} * \textbf{cost per unit}$$

Approach 2 - physical measure method at the split of point

The **physical-measure method** allocates joint costs to joint products produced during the accounting period on the basis of a *comparable* physical measure, such as the relative weight, quantity, or volume at the split off point.Because the physical-measure method allocates joint costs on the basis of the number of gallons, cost per gallon is the same for both products.

Under the benefits-received criterion, the physical-measure method is much less desirable than the sales value at split-off method, because the physical measure of the individual products may have no relationship to their respective revenue-generating abilities.

Byproducts are also often excluded from the denominator used in the physical-measure method because of their low sales values relative to the joint products or the main product. The general guideline for the physical-measure method is to include only the joint product outputs in the weighting computations.

In Example 1, the $400,000 joint costs produced 25,000 gallons of cream and 75,000 gallons of liquid skim. Using the number of gallons produced as the physical measure, the following table shows how joint costs are allocated to individual products to calculate the cost per gallon of cream and liquid skim.

Allocation of joint cost by using the physical measure method	**Cream (1)**	**Liquid skim (2)**	**Total (1) + (2)**

Physical measure of total production (gallons)	25,000 gallons	75,000 gallons	100,000 gallons
Weighting	25%	75%	
Joint cost allocated	25% of birr 400,000 = birr 100,000	75% of birr 400,000 = birr 300,000	Birr 400,000
Joint production cost per gallon	Birr 100,000/25,000 gallons = birr 4	Birr 300,000/75,000 gallon = birr 4	
Product line income statement using the Physical-Measure Method for May 2012	**Cream (1)**	**Liquid skim (2)**	**Total (1) + (2)**
Revenue:	20,000 * birr 8 = birr 160,000	30,000 * birr 4 = birr 120,000	Birr 280,000
Cost of goods sold (joint costs): - Production cost - Less: Ending inventory Cost of goods sold (joint cost)	 100,000 5,000 * 4 = birr 20,000 Birr 80,000	 300,000 45,000 * 4 = birr 180,000 Birr 120,000	 Birr 400,000 (Birr 200,000) Birr 200,000
Gross profit	Birr 80,000	Birr 0	Birr 80,000
Gross profit percentage	50%	0%	28.6%

When products are processed beyond the split off point or if they have no sales value at the split off point, the following market based joint cost allocation methods are used:

- ✓ **Net realizable value (NRV) method**

The **net realizable value (NRV) method** allocates joint costs to joint products produced during the accounting period on the basis of their relative NRV—final sales value minus separable costs. The NRV method is typically used in preference to the sales value at split off method only

when selling prices for one or more products at split off do not exist. It uses assumptions/estimations for events occurring beyond the split off point such as: separable costs, final units of goods made and selling price of final goods.

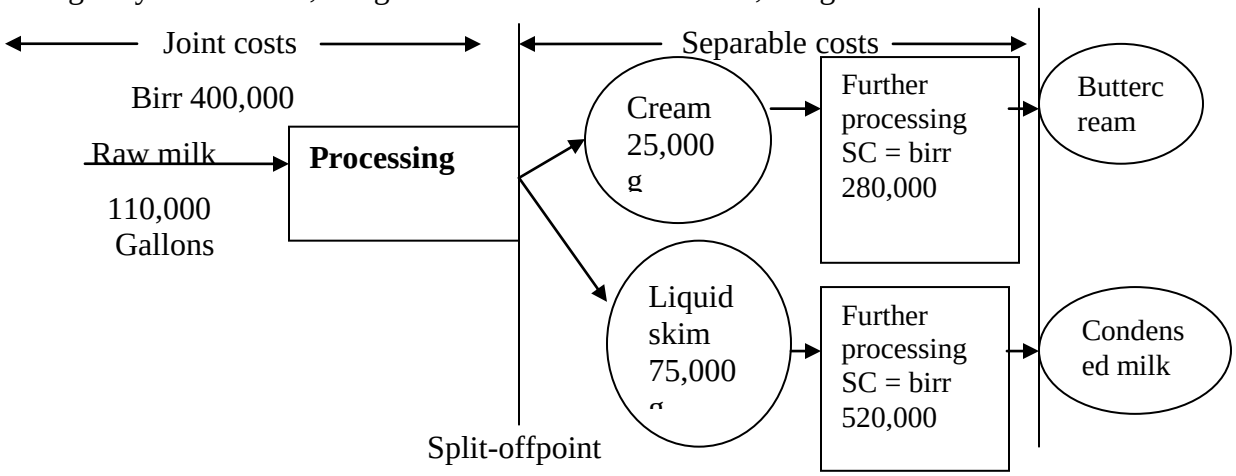
$$NRV = Final\ sales\ value - Separable\ cost$$

Example 2: Assume the same data as in Example 1 except that both cream and liquid skim is needs further processing to be buttercream and condensed milk respectively beyond the spit off point.

Cream →Buttercream: 25,000 gallons of cream are further processed to yield 20,000 gallons of buttercream at additional processing costs of $280,000. Buttercream, which sells for $25 per gallon, is used in the manufacture of butter-based products.

Liquid Skim→ Condensed Milk: 75,000 gallons of liquid skim are further processed to yield 50,000 gallons of condensed milk at additional processing costs of $520,000. Condensed milk sells for $22 per gallon.

Sales during May 2012 are 12,000 gallons of buttercream and 45,000 gallons of condensed milk.



	Joint costs	Buttercream	Condensed milk
Joint costs (costs of 110,000 gallons raw milk and processing to split off point)	Birr 400,000		
Separable cost of processing 25,000 gallons cream into 20,000 gallons buttercream		Birr 280,000	

Separable cost of processing 75,000 gallons liquid skim into 50,000 gallons condensed milk			Birr 520,000

	Cream	**Liquid Skim**	**Buttercream**	**Condensed milk**
Beginning inventory (gallons)	0	0	0	0
Production (gallons)	25,000	75,000	20,000	50,000
Transfer for further processing (gallons)	25,000	75,000		
Sales (gallons)			12,000	45,000
Ending inventory (gallons)	0	0	8,000	5,000
Selling price per gallon	Birr 8	Birr 4	Birr 25	Birr 22

Cost allocation according to the NRV method

Allocation of Joint Costs Using Net Realizable Value Method	Buttercream	Condensed milk	Total
Final sales value of total production during accounting period	20,000 gallons * birr 25 per gallon = Birr 500,000	50,000 gallons * birr 22 per gallon = birr 1,100,000	Birr 1,600,000
Deduct separable costs(separable cost)	Birr 280,000	Birr 520,000	Birr 800,000
NRV at split off point	Birr 220,000	Birr 580,000	Birr 800,000
Weighting	220,000/800,000 = 27.5%	580,000/800,000 = 72.5%	

Joint cost allocated	27.5% of birr 400,000 = birr 110,000	72.5% of birr 400,000 = birr 290,000	Birr 400,000
Production cost per gallon	(birr 110,000 + 280,00)/20,000 gallons = birr 19.5 per gallon	Birr 290,000 + 520,000/50,000 = birr 16.2 per gallon	
Product-Line Income Statement Using Net Realizable Value Method for May 2012	Buttercream	Condensed milk	Total
Revenues	12,000 gallons × $25 per gallon = birr 300,000	45,000 gallons × 22 per gallon = birr 990,000	Birr 1,290,000
Cost of goods sold: - Joint cost - Separable cost Total production cost Less ending inventory:(8,000 gallons × $19.50 per gallon; 5,000 gallons × $16.20 per gallon) - Cost of goods sold	 Birr 110,000 Birr 280,000 Birr 390,000 (birr 156,000) Birr 234,000	 Birr 290,000 Birr 520,000 Birr 810,000 (birr 81,000) Birr 729,000	 Birr 400,000 Birr 800,000 Birr 1,200,000 (birr 237,000) Birr 963,000
Gross profit	Birr 66,000	Birr 261,000	Birr 327,000
Gross margin percentage	22%	26.4%	25.3%

✓ **Constant gross margin percentage NRV method.**

The **constant gross-margin percentage NRV method** allocates joint costs to joint products produced during the accounting period in such a way that each individual product achieves an identical gross-margin percentage. It has three steps:

Step 1: Compute overall gross margin percentage. The overall gross-margin percentage for all joint products together is calculated first. This is based on the final sales value of *total production* during the accounting period, not the *total revenues* of the period.

Step 2: Compute total production costs for each product. The gross margin (in dollars) for each product is computed by multiplying the overall gross-margin percentage by the product's final sales value of total production. The difference between the final sales value of total production and the gross margin then yields the total production costs that the product must bear.

Step 3: Compute allocated joint costs. As the final step, the separable costs for each product are deducted from the total production costs that the product must bear to obtain the joint-cost allocation for that product.

Example: allocation of joint costs (birr 400,000) to Butter cream and condensed milk by using constant gross margin percentage NRV method.

Solution:

Step 1:

$$Final\ sales\ value\ of\ production\ during\ May = sales\ value\ of\ Butter\ cream + sales\ value\ of\ condensed\ milk$$

= 20,000 * birr 25 +50,000 * birr 22

= birr 500,000 + 1,100,000

= birr 1,600,000

Overall gross margin = total sales value – total cost of production

= total sales value – (joint cost + separable cost)

= Birr 1,600,000 – (birr 400,000 + 280,000 + 520,000)

= birr 400,000

Overall gross margin percentage = overall gross margin/total sales value * 100%

$$overall\ gross\ margine\ percentage = \frac{overall\ gross\ margin}{total\ sales\ value} * 100\%$$

= birr 400,000/birr 1,600,000 * 100% = 25%

Hence 25% of the total sales value for each product is going to be gross margin

Step 2:

Gross margin for better cream = 25% of birr 500,000 = birr 125,000

Gross margin for condensed milk = 25% of birr 1,100,000 = birr 275,000

Total cost of buttercream = total sales value – gross margin

= birr 500,000 – 125,000 = birr 375,000

Total cost of condensed milk = birr 1,100,000 – 275,000 = birr 825,000

Step 3:

$$Total\ cost\ of\ production\ =\ joint\ cost\ +\ separable\ cost$$

Joint cost allocated to better cream = total cost of butter cream – separable cost of buttercream

= Birr 375,000 – 280,000 = birr 95,000

Joint cost allocated to condensed milk = total cost of condensed milk – separable cost of CM

= birr 825,000 – 500,000 = birr 305,000

Production cost per gallon = total production cost/total units produced

Butter cream = birr 375,000/20,000 gallons = birr 18.75 per gallon

Condensed milk = birr 825,000/50,000 gallons = birr 16.5 per gallon

Product-Line Income Statement Using Constant Gross-Margin Percentage NRV Method for May 2012	**Butter cream**	**Condensed Milk**	**Total**
Revenue	Birr 300,000	Birr 990,000	Birr 1,290,000
Cost of goods sold:			
- Joint cost	Birr 95,000	305,000	Birr 400,000
- Separable cost	280,000	520,000	800,000
Production cost	375,000	825,000	1,200,000
Less ending inventory	(150,000)	(82,500)	(237,000)
Cost of goods sold	Birr 225,000	Birr 724,500	Birr 967,500
Gross margin	Birr 75,000	Birr 247,500	Birr 322,500
Gross margin percentage	25%	25%	25%

5.2 Accounting for byproducts

Joint production processes may yield not only joint products and main products but also byproducts. Although byproducts have relatively low total sales values, the presence of byproducts in a joint production process can affect the allocation of joint costs.

There are two byproduct costing accounting methods

i) Production method

ii) Sales method

i. Production method

Recognizes the byproduct in the financial statements in the period it is produced. The NRV from the byproduct produced is offset against the costs of the main product. The following journal entries illustrate the production method:

Byproduct inventory – wood chips…… XX

Finished goods- fine grade lumber …… XX

Work-in-process ……..…… XX

(To record cost of goods completed during a particular period)

$$Total\ cost\ of\ main\ product\ at\ split\ off\ point = Total\ joint\ cost - estimated\ realizable\ value\ for\ Byproduct$$

$$Eatimated\ realizable\ value\ for\ Byproduct = Estimated\ selling\ price\ per\ unit * units\ produced$$

$$per\ unit\ cost\ of\ main\ product = \frac{total\ cost\ of\ main\ product}{total\ units\ of\ main\ product\ produced}$$

$$cost\ of\ goods\ sold\ for\ MP = per\ unit\ cost * number\ of\ units\ sold$$

$$cost\ of\ ending\ inventory\ for\ Mp = per\ unit\ cost * number\ of\ units\ on\ hand$$

$$gross\ margin = revenue - cost\ of\ goods\ sold$$

$$gross\ margin\ percentage = \frac{gross\ margin}{total\ revenue}$$

ii. Sales method

This method makes no journal entries for byproducts until they are sold. Revenues of the byproduct are reported as a revenue item in the income statement at the time of sale. These revenues are either grouped with other sales, included as other income, or are deducted from cost of goods sold. Assume in the previous example, sale of wood chips takes place in the following month. Therefore, the entry to record the cost of goods manufactured will be:

Finished goods – fine grade lumber ……. XX

Work-in-process …….. XX

Note: The production method is conceptually correct in that it is consistent with the matching principle. This method recognizes byproduct inventory in the accounting period in which it is produced and simultaneously reduces the cost of manufacturing the main or joint products, thereby better matching the revenues and expenses from selling the main product.

However, the sales method is simpler and is often used in practice, primarily on the grounds that the dollar amounts of byproducts are immaterial and they may be stored for several periods. Then again, the sales method permits managers to "manage" reported earnings by timing when they sell byproducts. Managers may store byproducts for several periods and give revenues and income a "small boost" by selling byproducts accumulated over several periods when revenues and profits from the main product or joint products are low. Therefore, the two methods have their own advantages and disadvantages. Generally, the best method for which it's benefit over weight its cost/disadvantage. **Problem**

Example: ABC Company processes timber into fine grade lumber and wood chips. Fine-Grade lumber (the main product)—sells for birr 20 per board foot (b.f.) Wood chips (the byproduct)—sells for birr 1 per cubic foot (c.f.)

Data for July 2012 are as follows:

	Beginning Inventory	Production	Sales	Ending Inventory
Fine-Grade lumber (b.f.)	0	50,000	40,000	10,000
Wood chips (c.f.)	0	4,000	1,200	2,800

Joint manufacturing costs for these products in July 2012 are birr 250,000, comprising birr 150,000 for direct materials and birr 100,000 for conversion costs.

Required: record the cost of goods completed and the sale of the main and byproduct under production and sales method.

a) Production method

1 To record direct materials purchased and used in production during July.

Work in Process …….. 150,000

Accounts Payable……. 150,000

2 To record conversion costs in the production process during July; examples include energy, manufacturing supplies, all manufacturing labor, and plant depreciation.

Work in Process …….. Birr 100,000

Various accounts such as Wages Payable and Accumulated Depreciation ……. 100,000

3 To record cost of goods completed during July.

$$\textit{The cost of main product (fine grade lumber)} = \textit{Total joint cost} - \textit{NRV of byproduct (wood chip)}$$

= birr 250,000 – (birr 1 per c.f. * 4000 c.f.)

= birr 250,000 – birr 4,000 = birr 246,000

Therefore, the joint cost allocated to fine grade lumber is birr 246,000.

Cost per unit (b.f.) for the main product = birr 246,000/50,000 = birr 4.92 per b.f.

Byproduct Inventory—Wood Chips (4,000 c.f. * birr 1 per c.f.) …… birr 4,000

Finished Goods—Fine-Grade Lumber (birr 250,000 – birr 4,000) …… 246,000

Work in Process (birr 150,000 + birr 100,000) …… 250,000

$$Revenue\ from\ the\ sale\ of\ main\ product\ (fine\ grade\ lumber)$$
$$= selling\ price\ for\ FGL\ per\ b.f.$$
$$* \ the\ number\ of\ fine\ grade\ lumbers\ sold$$

= birr 20 per b.f. * 40,000 b.f. = birr 800,000

Revenue from the sale of byproduct (wood chip) = birr 1 per c.f. * 1,200 c.f.

= birr 1,200

4 (a) to record the cost of the main product sold during July

Cost of Goods Sold (birr 4.92 * 40,000 b.f.) …… 196,800

Finished Goods—Fine-Grade Lumber …….. 196,800

4 (b) to record the sales of the main product during July

Cash or Accounts Receivable (40,000 b.f. * birr 20 per b.f.) ……. 800,000

Revenues—Fine-Grade Lumber ……. 800,000

5 To record the sales of the byproduct during July

Cash or Accounts Receivable (1,200 c.f. * birr 1 per c.f.) …… 1,200

Byproduct Inventory—Wood Chips ……. 1,200

The sale of byproduct is reported as the reduction of by product inventory.

b) Sales method

Under the sales method of the joint cost are allocated to the main product at the split off point. Therefore, the journal entry to record cost of finished goods at the split of point will be:

1 and 2 are the same as in the case of production method

Work in Process …… 150,000

Accounts Payable ……150,000

Work in Process …… 100,000

Various accounts such as Wages Payable and Accumulated Depreciation …… 100,000

3 is to record cost of main product completed during July

Finished Goods—Fine-Grade Lumber ……. Birr 250,000

Work in Process ……. 250,000

The cost per unit for the main product (fine grade lumber) = birr 250,000/50,000 b.f.

= birr 5 per b.f.

4 (a) to record the cost of the main product sold during July.

Cost of fine grade lumber sold = birr 5 per b.f. * 40,000 b.f. = birr 200,000

Cost of Goods Sold ……..……. Birr 200,000

Finished Goods—Fine-Grade Lumber …… 200,000

4 (b) to record the sale of main product (fine grade lumber) the same as production method

Revenue from the sale of fine grade lumber = birr 20 per b.f. * 40,000 = birr 800,000

Revenue from the sale of wood chips = birr 1 per b.f. * 1,200 b.f. = birr 1,200

Cash or Accounts Receivable (40,000 b.f. * birr20 per b.f.) ……. 800,000

Revenues—Fine-Grade Lumber ……. 800,000

5 to record the sale of byproduct (wood chips)

Cash or Accounts Receivable ……..…… birr 1,200

Revenues—Wood Chips …….. 1,200

(To record the sales of the byproduct during July)

CHAPTER SIX

6. Activity-Based Costing and Management

6.1 Activity-based costing; use of cost drivers and activities

The Activity-Based Costing (ABC) is a costing system, which focuses on activities performed to produce products. ABC is that costing in which costs are first traced to activities and then to products. This costing system assumes that activities are responsible for the incurrence of costs and create the demands for activities. E.g. an accounting firm prepares tax returns; a University teaches students. Costs are charged to products based on individual product's use of each activity. In traditional absorption costing system, costs are first traced not to activities but to an organizational unit, such as department or plant and then to products. It means under both, ABC and traditional absorption costing system the second and final stage consists of tracing costs to the product.

ABC aims at identifying as many costs possible to be subsequently accounted as direct costs of production. Any cost that is traced to a particular product via its consumption of activity becomes direct cost of the product. For instance, in conventional costing system, cost of setup and adjustment time is considered as factory overhead and subsequently assigned to different products on the basis of direct labor hours. But in ABC, setup and adjustment time is determined for each product and its costs are directly charged to each product.

ABC is generally used as a tool for understanding product and customer cost and profitability. cost attribution to cost units on the basis of benefit received from indirect activities e.g. ordering, setting up, assuring quality.'

ABC has also been defined by CAM-1 organization of Arlinton Texas as "the collection of financial and operation performance information tracing the significant activities of the firm to product Costs".

The **features** of ABC are as under:

- Activity-based costing (ABC) is a two-stage product costing method that first assigns costs to activities and then allocates them to products based on the each product's consumption of activities.
- The cost pools in the two-stage approach now accumulate activity-related costs.
- An activity is any discrete task that an organization undertakes to make or deliver a product or service.
- Activity-based costing is based on the concept that products consume activities and activities consume resources.
- Activity-based costing can be used by any organization that wants a better understanding of the costs of the goods and services it provides, including manufacturing, service, and even nonprofit organizations.

The **objectives** of Activity Based Costing are as under:

a. To improve product costing
b. To identify non-value adding activities in the production process which might be a suitable focus for attention or elimination
c. To provide required information for decision making

d. To reduce the frivolous (nonessential) use of common resources

Importance of ABC are:

1. To link the cost to its causal factor – i.e. the Cost Driver
2. To identify costs of activities rather than cost centers
3. To ascertain product costs with greater accuracy by relating overheads to activities
4. To overcome the inherent limitations of traditional absorption costing and use of blanket overhead rates
5. To assist managers in budgeting and performance measurement
6. To provide the links between the activities, the organizational acts and the resources consumed, and illustrate the differences between resource consumption and resource provision
7. To help in cost control and cost reduction, as well as improved profitability.
8. To provide valuable economic information to support a company's operational improvement and customer satisfaction programs.

6.2 Activity Based Costing for Customer Profitability

Customer profitability: Though most of the costs incurred for individual customers are simply product costs, there is also an overhead component, such as unusually high customer service levels, product return handling, and cooperative marketing agreements.

An ABC system can sort through these additional overhead costs and determine which customers are actually providing a reasonable profit. This analysis may result in some unprofitable customers being turned away, or more emphasis being placed on those customers who are contributing more in profits.

Illustration 1

Auto lite Private Ltd. an auto repair business, uses activity based costing and accumulates overhead costs in the following cost pools:

- Human Resources
- Parts management
- Purchasing
- Quality Control
- Equipment set-up
- Training employees

• Assembly department

• Receiving department

You are to find out for each cost pool whether the cost pool would be unit-level, batch-level, product-level or facility level.

Solution*:*

ACTIVITY COST	POOL HIERARCHY
Human Resources	Facility-level
Parts management	Product-level
Purchasing	Batch-level
Quality Control	Unit-level
Equipment set-up	Unit-level
Training employees	Facility-level
Assembly department	Unit-level
Receiving department	Batch-level

CHAPTER SEVEN

7. Cost-Volume-Profit Analysis and Cost Estimation

Introduction

All managers want to know how profits will change as the units sold of a product or service change. **Cost–volume–profit (CVP)** analysis examines the behavior of total revenues, total costs and operating profit as changes occur in the output level, selling price, variable costs or fixed costs of a product within a short run. A certain company manager Might wonder how many units of a new product must be sold to break even or make a certain amount of profit and some others might ask themselves how expanding their business into a particular foreign market would affect costs, selling price, and profits. Such types of questions can be answered through CVP analysis. Examining the results of these what-if possibilities and alternatives help managers make better decisions. Managers must also decide how to price their products and understand the effect of their pricing decisions on revenues and profits.

In general, Some of the ways cost-volume-profit analysis may be used include: Analyzing the effects of changes in selling prices on profits; analyzing the effects of changes in costs on profits; analyzing the effects of changes in volume on profits; Setting selling prices; Selecting the mix of products to sell and Choosing among marketing strategies. While this chapter deals with the mechanics and terminology of CVP analysis, you should keep in mind that CVP analysis is an integral part of financial planning and decision making. Every accountant and manager should be thoroughly conversant with its concepts, not just the mechanics.

7.1 Assumptions of Cost-Volume-Profit Analysis

Cost-volume-profit analysis (CVP analysis) is a powerful tool for planning and decision making. Because CVP analysis emphasizes the interrelationships of **costs, quantity sold**, and **price**, it brings together all of the financial information of the firm.CVP analysis can be a valuable tool to identify the extent and magnitude of the economic trouble a division is facing and to help pinpoint the necessary solution. Generally, CVP analysis focuses on the factors that effect a change in the components of profit (such as fixed and variable cost per unit, selling price and quantity sold).

The profit-volume and cost-volume-profit graphs rely on some important assumptions. Some of these assumptions are as follows:

1. The analysis assumes a **linear** revenue function and a **linear** cost function. In other words, a percentage change in the level of units sold result in the same percentage change in the revenue and cost level with in the relevant range.

When represented graphically, the behaviors of total revenues and total costs are linear(meaning they can be represented as a straight line) in relation to units sold within a relevant range (and time period).

Total cost = Total variable cost + Total fixed cost

TC= Variable cost per unit * **Quantity of units sold** + total fixed cost

TR= selling price per unit * **Quantity of units sold**

2. Total costs can be separated into two components: a fixed component that does not vary with units sold and a variable component that changes with respect to units sold. The shorter the time horizon/relevant range, the higher the percentage of total costs considered fixed.
3. The analysis assumes that selling price, total fixed costs, and unit variable costs canbe accurately identified and remain constant over the **relevant range**. Within the relevant range of operating activity, the efficiency of operations does not change.

Fortunately, we do not need to consider all possible ranges of production and sales for a firm. Remember that CVP analysis is a short-run decision-making tool. (We know that it is short run in orientation because some costs are fixed.) It is only necessary for us to determine the current operating range, or **relevant range**, for which the linear cost and revenue relationships are valid. The **relevant range** is the range of volume where total fixed costs remain constant and the variable cost *per unit* remains constant. The relevant range is the range of events (or other activity) where total fixed costs and variable cost per unit stays the same.

In actuality, firms seldom know prices, variable costs, and fixed costs with certainty. A change in one variable usually affects the value of others. Often there is a probability distribution to contend with. Furthermore, there are formal ways of explicitly building uncertainty into the CVP

model.

Note that the cost and revenue relationships are roughly linear in this range, allowing us to use our linear CVP equations. Of course, if the relevant range changes, different fixed and variable costs and different prices must be used. The third assumption is linked to the definition of relevant range. Once a relevant range has been identified, then the cost and price relationships are assumed to be known and constant.

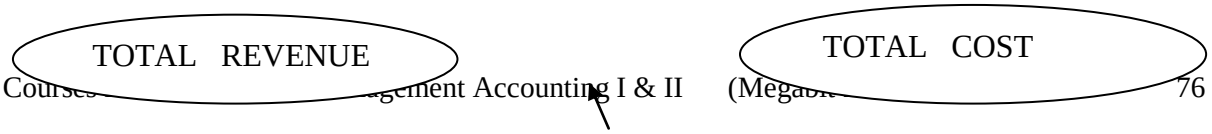
Changes in the levels of revenues and costs within the relevant range arise only because of changes in the number of product (or service) units sold. The number of units sold is the only revenue driver and the only cost driver. Just as a cost driver is any factor that affects costs, a **revenue driver** is a variable, such as volume, that causally affects revenues.

4. The analysis assumes that what is produced is sold. There is no change in inventory over the period. That inventory has no impact on break-even analysis makes sense. Break-even analysis is a short-run decision making technique; we are looking to cover all costs of a particular period of time. Inventory embodies costs of a previous period and is not considered.

5. For multiple-product analysis, the **sales mix** is assumed to be known. In single-product analysis, the sales mix is obviously constant— one product accounts for 100 percent of sales. Multiple-product break-even analysis requires a constant sales mix. However, it is virtually impossible to predict with certainty the sales mix. Typically, this constraint is handled in practice through **sensitivity analysis**. By using the capabilities of spreadsheet analysis, the sensitivity of variables to a variety of sales mixes can be readily assessed.

7.2. Break-even point and target operating income/profit

Break-even point (BEP): is that quantity of output sold at which total revenues equal total costs—that is, the quantity of output sold that results in birr zero of operating income/profit before income tax. **Note that** we are using the term *operating income* to denote income or profit before income taxes. **Operating income** includes only revenues and expenses from the firm's normal operations. **Net income** is operating income minus income taxes.



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BREAK-EVEN POINT

There are three related ways (we will call them methods) to think more deeply about and model CVP relationships and also break-even:

i. Equation method:

It is also termed as income statement approach.

Revenues - Variable costs - Fixed costs = Operating income

Revenues = Selling price (SP) * Quantity of units sold (Q)

Variable costs = Variable cost per unit (VCU) * Quantity of units sold (Q)

So,

*[(Selling price (SP) * quantity of units sold (Q)) – (Variable cost per unit (VCU) * Quantity of units sold (Q))] – Fixed cost = operating income ---------- Equation 1*

At break-even point the operating revenue is zero, hence,

$$Break\ even\ quantity\ sold\ = \frac{fixed\ cost}{selling\ price\ -\ variable\ cost\ per\ unit(VCU)}$$

ii. Contribution Margin Method

The **contribution margin** is sales revenue minus variable costs (expenses). It is called the contribution margin because the excess of sales revenue over variable costs contributes to covering fixed costs and then to providing operating income.

The only numbers that change from selling different quantities of packages are *total revenues* and *total variable costs*. The difference between total revenues and total variablecosts is called contribution margin. That is,

Contribution margin = Total revenues - Total variable costs

Contribution margin indicates why operating income changes as the number of units sold changes.

$$[(Selling\ price\ -\ variable\ cost\ per\ unit)\ *\ (Quantity\ of\ units\ sold)]\ -\ fixed\ cost$$
$$=\ operating\ income$$
$$Contribution\ margin\ per\ unit\ *\ Quantity\ of\ units\ sold\ -\ fixed\ cost$$
$$=\ Operating\ Income\ \ ---------\ Equation\ 2$$

$$Break\ even\ number\ of\ units\ = \frac{fixed\ cost}{contribution\ margin\ per\ unit}$$

$$Breakeven\ revenues\ =\ Breakeven\ number\ of\ units\ *\ Selling\ price$$

In practice (because they have multiple products), companies usually calculatebreakeven point directly in terms of revenues using contribution margin percentages.

$$Contribution\ margin\ percentage\ = \frac{contribution\ margin\ per\ unit}{selling\ price}$$

$$Break\ even\ revenue\ = \frac{fixed\ cost}{contribution\ margin\ percentage}$$

While the breakeven point tells managers how much they must sell to avoid a loss, managers are equally interested in how they will achieve the operating income targets underlying their strategies and plans.

The target operating income

$$Quantity\ of\ units\ required\ to\ be\ sold\ = \frac{Fixed\ costs\ +\ Target\ operating\ income}{contribution\ margin\ per\ unit}$$

iii. Graph Method

In the graph method, we represent total costs and total revenues graphically. Each is shown as a line on a graph.

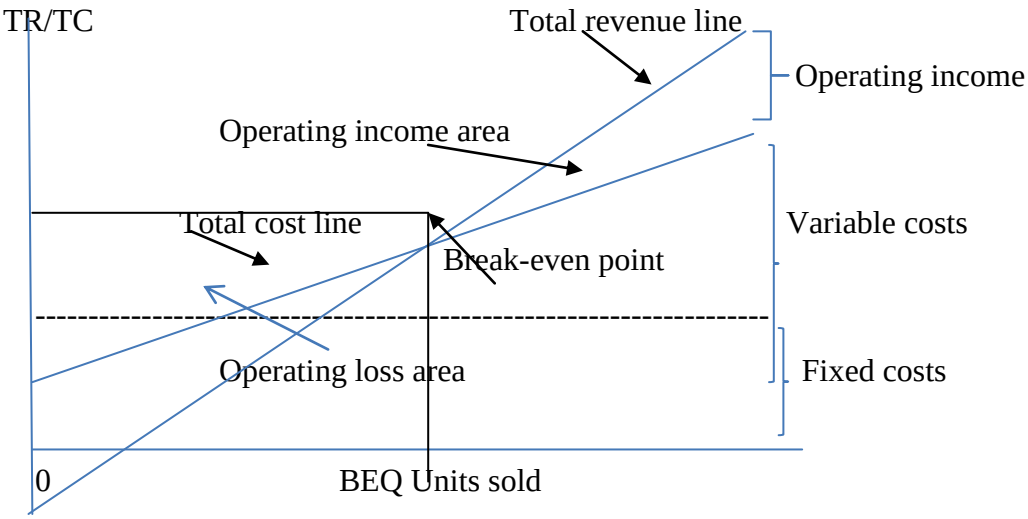
The cost-volume-profit chart below is constructed using the following steps:

Step 1: Volume in units of sales is indicated along the horizontal axis. The range of volume shown is the relevant range in which the company expects to operate. Birr amounts of total sales and costs are indicated along the vertical axis.

Step 2: A sales line is plotted by beginning at zero on the left corner of the graph. A second point is determined by multiplying any units of sales on the horizontal axis by the unit sales price. The sales line is drawn upward to the right from zero through the point found after multiplying sales price by unit of sale.

Step 3: A cost line is plotted by beginning with total fixed costs, on the vertical axis. A second point is determined by multiplying any units of sales on the horizontal axis by the unit variable costs and adding the fixed costs

Step 4: The break-even point is the intersection point of the total sales and total cost lines. A vertical dotted line drawn downward at the intersection point indicates the units of sales at the break-even point. A horizontal dotted line drawn to the left at the intersection point indicates the sales dollars and costs at the break-even point.



Slope of the total costs line is the variable cost per unit, whereas, Slope of the total revenues line is the selling price. The above graph is called a **cost-volume-profit (CVP) chart,** or a break-even chart or break-even graph.

Note: The breakeven point is the quantity of output at which total revenues equal total costs. The three methods for computing the breakeven point and the quantity of output to achieve target operating income are the **equation** method, the **contribution margin** method, and the **graph** method. Each method is merely a restatement of the others. Managers often select the method they find easiest to use in the specific decision situation.

Illustration: Derba Cement Factory For the coming year, the controller/chief accounting officer has prepared the following projected income statement:

Sales (2,000 quintals of cement @ birr 160) ---------- birr 320,000
Less: Variable expenses ----------120,000
Contribution margin ----------birr 200,000
Less: Fixed expenses ---------- (120,000)
Operating income ---------- birr 80,000

Required: How many quintals of cement Derba should sell in order to break even (BENQ)?

Solution: At the break-even point, the operating-income equation would take the following form:

Equation method:

0 = (Birr 160/quintal * BENQ – birr 60/quintal * BENQ) – birr 60,000

0 = BENQ (birr 160 - 60) – birr 120,000

Birr 120,000 = birr 100 BENQ

$$BENQ = \frac{birr\ 120{,}000}{birr\ 100} = 1{,}200\ quintals\ of\ cement$$

Therefore, Derba must sell 1,200 quintals of cement to just cover all fixed and variable expenses.

A good way to check this answer is to formulate an income statement based on 1,200 units sold.

Sales (1,200 units @ birr 160) ---------- birr 192,000

Less: Variable expenses (1,200 units * birr 60) ---------- 72,000

Contribution margin ---------- birr 120,000

Less: Fixed expenses ---------- 120,000

Operating income ---------- birr 0

Indeed, selling 1,200 quintals of cement does yield a zero profit.

Contribution margin method:

In our **Derba** example, contribution margin per unit is birr 100 (birr 160- birr 60)

$$Break\ even\ number\ of\ Quintals = \frac{fixed\ cost}{contribution\ margin\ per\ unit}$$

$$BENQ = \frac{birr\ 120{,}000}{birr\ 160 - 60}$$

BENQ = 1,200

Break even revenue = fixed cost/contribution margin percentage

$$Contribution\ margin\ percentage = \frac{contribution\ margin\ per\ unit}{selling\ price\ per\ unit}$$

$$= \frac{birr\ 100}{birr\ 160} = 62.5\%$$

$$Break\ even\ revenue = \frac{120{,}000}{0.625} = birr\ 192{,}000$$

If Derba sell less than 1,200 quintals of cement, the Factory will incur operating loss because it

cannot cover its fixed costs with its contribution margin.

Note that: at break-even point the total contribution margin is equal to the fixed cost

Birr 100 * 1,200 quintals = birr 120,000 = fixed cost

Target operating income: While the break-even point is useful information, most firms would like to earn operating income greater than zero. CVP analysis gives us a way to determine how many units must be sold to earn a particular targeted income. Targeted operating income can be expressed as a birr amount or as a percentage of sales revenue. Both the operating-income approach and the contribution margin approach can be easily adjusted to allow for targeted income.

Illustration: Assume that Derba Cement Factory wants to earn operating income of birr 250,000. How many quintals of cement must be sold to achieve this result? Let's use the income statement to find out:

[(Selling price (SP) * quantity of units sold (Q)) – (Variable cost per unit (VCU) * Quantity of units sold (Q))] – Fixed cost = operating income

Birr 250,000 = [(birr 160 per quintal * number of quintals sold) – (birr 60 per quintal * number of quintals sold)] – birr 120,000

Birr 250,000 = number of quintals sold (birr 160 - 60) – 120,000

Birr 250,000 + 120,000 = birr 100 * number of quintals sold

Birr 370,000 = birr 100 * number of quintals sold

$$Number\ of\ quintals\ to\ be\ sold\ = \frac{birr\ 370{,}000}{birr\ 100}$$

Number of quintals to be sold = 3,700

Derba must sell 3,700 quintals of cement to earn a before-tax profit of birr 250,000. In general, assuming that fixed costs remain the same, the impact on a firm's profits resulting from a change in the number of units sold can be assessed by multiplying the unit contribution margin by the change in units sold.

7.3. Target net income and income tax

Net income is operating income plus non-operating revenues (such as interest revenue) minus non-operating costs (such as interest cost) minus income taxes. For simplicity, throughout this

chapter we assume non-operating revenues and non-operating costs are zero. Thus,

$$Net\ income\ =\ Operating\ income\ -\ Income\ taxes$$

Until now, we have ignored the effect of income taxes in our CVP analysis. In many companies, the income targets for managers in their strategic plans are expressed in terms ofnet income. That's because top management wants subordinate managers to take into account the effects their decisions have on operating income after income taxes. Some decisions may not result in large operating incomes, but they may have favorable tax consequences, making them attractive on a net income basis—the measure that drives shareholders' dividends and returns.

When calculating the break-even point, income taxes play no role. This is because the taxes paid on zero income are zero. However, when the company needs to know how many units to sell to earn a particular net income, some additional consideration is needed. Recall that net income is operating income after income taxes and that our targeted income figure was expressed in before-tax terms. As a result, when the income target is expressed as net income, we must add back the income taxes to get operating income.

To make net income evaluations, CVP calculations for target income must be stated in terms of target net income instead of target operating income. In general, income taxes are computed as a percentage of income. The after-tax profit is computed by subtracting the tax from the operating income (or before-tax profit).

$$Target\ net\ income$$

$$=\ (a\ target\ operating\ income)-\ (a\ target\ operating\ income\ *\ tax\ rate)$$

$$Target\ net\ income\ =\ (Target\ operating\ income)*\ (1\ -\ Tax\ rate)$$

$$Target\ operating\ income\ =\frac{target\ net\ income}{1\ -\ tax\ rate}$$

Suppose that Derba Cement Factory wants to achieve net income of birr 200,000 and its corporate income tax rate is 30%. Hence, the before tax target profit for the Factory is:

$$Target\ operating\ income\ =\frac{birr\ 200{,}000}{1\ -\ 0.3}=\ birr\ 285{,}714.3$$

In other words, with an income tax rate of 30%, Derba must earn Birr 285,714.3 before income taxes to have birr 200,000 after income taxes.

7.4 Sensitivity "what if" analysis and margin of safety

Before choosing strategies and plans about how to implement strategies, managers frequently analyze the sensitivity of their decisions to changes in underlying assumptions of CVP analysis. **Sensitivity analysis** is a "what-if" technique that managers use to examine how an outcome will change if the original predicted data are not achieved or if an underlying assumption changes. In the context of CVP analysis, sensitivity analysis answers questions such as, "What will operating income be if the quantity of units sold decreases by5% from the original prediction?" and "What will operating income be if variable cost per unit increases by 10%?" Sensitivity analysis broadens managers' perspectives to possible outcomes that might occur *before* costs are committed.

Note: Because CVP analysis uses estimates, knowing how changes in those estimates impact break-even is useful. For example, a manager might form three estimates for each of the components of breakeven: optimistic, most likely, and pessimistic. When selling prices can be increased without impacting costs, break-even quantity decreases. When competition drives selling prices down and the company cannot reduce costs, break-even level quantity increases. Increases in either variable or fixed costs, if they cannot be passed on to customers via higher selling prices, will increase break-even quantity. If costs can be reduced and selling prices held constant, the break-even decreases.

Illustration: Assume that Derba Cement Factory is looking into buying a new machine that would increase annual fixed costs from birr 120,000 to birr 134,000 but decrease variable costs from birr 60 per unit to birr 50 per unit. The machine is used to produce output whose selling price will remain unchanged at birr 160. Hence, what is the revised break even revenue and level of production and sale?

$$Revised\ break-even\ point\ in\ birr\ = \frac{revised\ fixed\ cost}{revised\ contribution\ margin\ percentage}$$

Revised contribution margin per unit is birr 110 (birr 160 – birr 50)

Revised contribution margin ratio is 68.75% of selling price (birr 110/birr160)

This results in increases in both the unit contribution margin and the contribution margin ratio.

$$= \frac{birr\ 134{,}000}{0.6875} = birr\ 194{,}909$$

Therefore, using CVP analysis, Derba revised break-even point in birr would be birr 194,909.

$$Revised\ break\ even\ quantity = \frac{Revised\ fixed\ cost}{revised\ selling\ price\ per\ unit - revised\ variable\ cost\ per\ unit}$$

$$= \frac{birr\ 134{,}000}{birr\ 160 - birr\ 50} = 1{,}218\ quintals\ of\ cement$$

The revised break even revenue and quantity due to the change in the assumption of CVP or expectation is pessimistic condition. Because of this condition Derba is expected to produce 1,218 quintals of cement (generate birr 194,909) to cover its costs that is above estimated break-even level of production and sale (i.e. 1,200) by 18.

Another aspect of sensitivity analysis is **margin of safety**: The margin of safety answers the "what-if" question: If budgeted revenues are above breakeven and drop, how far can they fall below budget before the breakeven point is reached? Sales might decrease as a result of a competitor introducing a better product, or poorly executed marketing programs, and so on.

$$Margin\ of\ safety\ in\ birr = Budgeted\ (or\ actual) revenues - Breakeven\ revenues$$

$$Margin\ of\ safety\ (in\ units) = Budgeted\ (or\ actual)\ sales\ quantity - Breakeven\ quantity$$

$$Margin\ of\ safety\ percentage = \frac{margin\ of\ safety\ in\ birr}{budgeted\ (or\ actual) revenue}$$

Illustration: Assume that Derba Cement Factory has fixed costs of birr 120,000, a selling price of birr 160 and variable costs per unit of birr 60. For 2,000 units sold, the budgeted revenues are birr 320,000 and the budgeted operating profit is birr 80,000. The breakeven point for this set of assumptions is 1,200 units (birr 120,000 ÷ birr 100). Hence, the margin of safety is birr 128,000

(birr 320,000 – birr 192,000) or 800 units.

Sensitivity analysis is a simple approach to recognizing **uncertainty**, which is the possibility that an actual amount will deviate from an expected amount. Sensitivity analysis gives managers a good feel for the risks involved. As the level of margin of safety rise, the capacity to accommodate risk will increase.

7.5 CVP analysis with multiple products

Cost-volume-profit analysis is fairly simple in the single-product setting.Most companies sell more than one product. Selling price and variable costs differ for each product, so each product makes a different contribution to profits. The same CVP formulas we used earlier apply to a company with multiple products.

To calculate break even for each product, we must compute the *weighted-average contribution margin* of all the company's products. The sales mix provides the weights that make up total product sales. The weights equal 100% of total product sales. **Sales mix** (or *product mix*) is the combination of products that make up total sales.

The definition of sales mix

Sales mix: The term **sales mix** refers to the relative proportions in which a company's products are sold. The idea is to achieve the combination, or mix, that will yield the greatest amount of profits. Most companies have many products, and often these products are not equally profitable. Hence, profits will depend to some extent on the company's sales mix.Profits will be greater if high-margin rather than low-margin items make up a relatively large proportion of total sales. The sales mix can be measured in units sold or in proportion of revenue.

Sales mix and break even analysis: In contrast to the single-product (or service) situation, the total number of units that must be sold to break even in a multiproduct company depends on the sales mix. In preparing a break-even analysis, an assumption must be made concerning the sales mix. Usually the assumption is that it will not change. However, if the sales mix is expected to change, then this must be explicitly considered in any CVP computations.

The **direct fixed expenses** are those fixed costs that can be traced to each product and would be avoided if the product did not exist. The common fixed expenses are the fixed costs that are not traceable to the products and would remain even if one of the products was eliminated.

Illustration 1: Consider ABC PLC, a small company that imports DVDs from abroad. At present, the company sells two DVDs: the SONY DVD and the SAMSUNG DVD with the sells mix of 2:8. The company's forecasted sales, expenses, operating income to sale 20 units of SONY and 80 units of SAMSUNG for the coming month are shown below:

ABC PLC
Contribution Income Statement
For the Month of September

	SONY DVD		SUMSUNG DVD		Total	
	Amount	**Percent**	**Amount**	**Percent**	**Amount**	**Percent**
Sales	birr 20,000	100%	birr 80,000	100%	birr 100,000	100%
Variable expenses	15,000	75%	40,000	50%	55,000	55%
Contribution margin..... .	Birr 5,000	25%	birr 40,000	50%	45,000	45%
Fixed expenses.....						27,000
Net operating income						birr 18,000

Required:

a) Calculate the break even revenue for the company as a whole and SONY and SAMSUNG independently for the coming month

b) Determine the break even quantity for the company as a whole and SONY and SAMSUNG independently for the coming month

Solution:

a) Computation of the break-even revenue:

$$Break\ even\ sales\ = \frac{over\ all\ fixed\ cost}{over\ all\ CM\ \%age}$$

$$Break-even\ sales\ = \frac{birr\ 27{,}000}{0.45} = \ birr\ 60{,}000$$

Verification of the break-even revenue:

SONY DVD	**SUMSUNG DVD**	**Total**
Current dollar sales	birr 20,000	birr 80,000 birr 100,000
Percentage of total dollar sales	20%	80% 100%

Sales at the break-even point... Birr 12,000 (***20% of 60,000***) birr 48,000 (***80% 0f 60,000***) birr 60,000

SONY DVD	**Amount**	**Percent**	**SUMSUNG DVD Amount**	**Percent**	**Total Amount**	**Percent**
Sales	birr 12,000	100%	birr48,000	100%	birr 60,000	100%
Variable expenses.....	9,000	75%	24,000	50%	33,000	55%
Contribution margin ...	birr 3,000	25%	birr 24,000	50%	27,000	45%
Fixed expenses.....					(27,000)	
Net operating income					birr 0	

$$Over\ all\ Break\ even\ quantity\ = \frac{overall\ fixed\ cost}{weighted\ average\ contribution\ margin\ per\ unit}]$$

$$= \frac{birr\ 27{,}000}{birr\ 450} = \ 60\ units$$

Break even quantity of SONY = 20% of 60 units = 12 units

Break even quantity of SAMSUNG = 80% of 60 units = 48 units

	SONY	**SAMSUNG**	**Total**

Sale price per unit	Birr 1000	Birr 1000	
Variable cost per unit	750 (15,000/20)	500 (40,000/80)	
Contribution margin per unit	Birr 250	Birr 500	
Sales mix in units	2	8	10
Contribution margin	Birr 500 (250 * 2)	Birr 4,000 (500 * 8)	Birr 4,500
Weighted-average contribution margin per unit (birr 4,500/10)			Birr 450

Illustration 2

XYZ Furniture sold 6,000 beds and 4,000 office tables during the past year. The sales mix of 6,000 beds and 4,000 tables creates a ratio of 6,000/10,000 or 60% beds and 4,000/10,000 or 40% tables. You could also convert this to the least common ratio, as 6/10 is the same as 3/5 beds and 4/10 is the same as 2/5 tables. So, we say the sales mix or product mix is 3:2, or for every three beds, XYZ expects to sell two tables. XYZ's total fixed costs are birr 40,000. The bed's unit selling price is birr 44 and variable cost per bed are birr 24. The tables unit selling price is birr 100 and variable cost per post is birr 30. To compute breakeven sales in units for both products

XYZ Furniture completes the following two steps.

STEP 1: Calculate the weighted-average contribution margin per unit, as follows:

Calculate the breakeven point for multiple products or services

	Beds	**Tables**	**Total**
Sale price per unit	Birr 44	Birr 100	
Variable cost per unit	24	30	
Contribution margin	Birr 20	Birr 70	

per unit			
Sales mix in units	3	2	5
Contribution margin	Birr 60	Birr 140	Birr 200
Weighted-average contribution margin per unit (birr 200/5)			Birr 40

STEP 2: Calculate the breakeven point in units for each product. Multiply the"package" breakeven point in units by each product's proportion ofthe sales mix.

$$Breakeven\ sales\ in\ total\ units\ = \frac{fixed\ cost\ +\ operating\ income}{weighted\ average\ contribution\ margin\ per\ unit}$$

$$= \frac{Birr\ 40{,}000\ +\ birr\ 0}{birr\ 40} = 1{,}000\ items$$

Breakeven sales of beds (1,000 * 3/5)..... 600 beds

Breakeven sales of tables (1,000 * 2/5)..... 400 tables

Break even revenue = SP/unit of bed * BEQ bed + SP/unit of tables * BEQ table

= birr 44 * 600 + birr 100 * 400

= birr 26,400 + 40,000

= birr 66,400

Break even revenue of bed = 3/5 of birr 66,400 = birr 39,840

Break even revenue of table = 2/5 of birr 66,400 = birr 26,560

Illustration (Sensitivity Analysis)

Assume that XY- Farming is looking into buying a new machine that would increase annual fixed costs from birr 240,000 to birr 252,000 but decrease variable costs from birr 45 per quintal to birr 42 per quintal. The machine is used to produce output whose selling price will remain unchanged at birr 60. Hence, what is the revised break even revenue and level of production and sale?

$$Revised\ break-even\ point\ in\ birr\ = \frac{revised\ fixed\ cost}{revised\ contribution\ margin\ percentage}$$

Revised contribution margin per unit is birr 18 (birr 60 – birr 42)

Revised contribution margin ratio is 30% of selling price (birr 18/birr60)

This results in increases in both the unit contribution margin and the contribution margin ratio.

$$Break\ even\ revenue = \frac{birr\ 252{,}000}{0.3} = birr\ 840{,}000$$

Therefore, using CVP analysis, XY Farming revised break-even point in birr would be birr 840,000.

$$Revised\ break\ even\ quantity = \frac{Revised\ fixed\ cost}{revised\ selling\ price\ per\ unit - revised\ variable\ cost\ per\ unit}$$

$$= \frac{birr\ 252{,}000}{birr\ 60 - birr\ 42} = 14{,}000\ quintals\ of\ cement$$

The revised break even revenue and quantity due to the change in the assumption of CVP or expectation is optimistic condition. Because of this condition XY Farming is expected to produce 14,000 quintals of Teff (generate birr 840,000) to cover its costs that is below estimated break-even level of production and sale (i.e. 16,000) by 2,000.

Another aspect of sensitivity analysis is **margin of safety**: The margin of safety answers the "what-if" question: If budgeted revenues are above breakeven and drop, how far can they fall below budget before the breakeven point is reached? Sales might decrease as a result of a competitor introducing a better product, or poorly executed marketing programs, and so on.

$$Margin\ of\ safety\ in\ birr = Budgeted\ (or\ actual) revenues - Breakeven\ revenues$$

$$Margin\ of\ safety\ (in\ units) = Budgeted\ (or\ actual)\ sales\ quantity - Breakeven\ quantity$$

$$Margin\ of\ safety\ percentage = \frac{margin\ of\ safety\ in\ birr}{budgeted\ (or\ actual) revenue}$$

Illustration: Assume that XY Farming Company has fixed costs of birr 240,000, a selling price of birr 60 and variable costs per unit of birr 45. For 20,000 units sold, the budgeted revenues are birr 1,200,000 and the budgeted operating profit is birr 60,000. The breakeven point for this set of assumptions is 16,000 units (birr 240,000 ÷ birr 45). Hence, the margin of safety is birr 240,000 (birr 1,200,000 – birr 960,000) or 4,000 quintals of Teff.

Sensitivity analysis is a simple approach to recognizing **uncertainty**, which is the possibility that an actual amount will deviate from an expected amount. Sensitivity analysis gives managers a good feel for the risks involved. As the level of margin of safety rise, the capacity to accommodate risk will increase.

Illustration (CVP for multiple product case)

Assume XY Farming Company for the coming 3 months planned to produce and sell two products **Onion** and **Tomato** with the available capacity. The company **s**old 6,000 quintals of Onion and 4,000 quintals of Tomato during the past year. The sales mix of 6,000 quintals of Onion and 4,000 quintals of Tomato creates a ratio of 6,000/10,000 or 60% Onion and 4,000/10,000 or 40% Tomato. You could also convert this to the least common ratio, as 6/10 is the same as 3/5 Onion and 4/10 is the same as 2/5 Tomato. So, we say the sales mix or product mix is 3:2, or for every three quintals of Onion, XY expects to sell two quintals of Tomato. XY's total fixed costs are birr 584,000. The onion's unit selling price is birr 1000 per quintal and variable cost per quintal of onion are birr 540. The Tomato unit selling price is birr 1,200 and variable cost per quintal is birr 400. To compute breakeven sales in units for both products
XY Farming completes the following two steps.

STEP 1: Calculate the weighted-average contribution margin per unit, as follows:
Calculate the breakeven point for multiple products or services

	Onion	**Tomato**	**Total**
Sale price per unit	Birr 1000	Birr 1200	
Variable cost per unit	540	400	

Contribution margin per unit	Birr 440	Birr 800	
Sales mix in units	3	2	5
Contribution margin	Birr 1,320	Birr 1,600	Birr 2,920
Weighted-average contribution margin per unit (birr 2,920/5)			Birr 584

STEP 2: Calculate the breakeven point in units for each product. Multiply the"package" breakeven point in units by each product's proportion of the sales mix.

$$Breakeven\ sales\ in\ total\ units\ = \frac{fixed\ cost\ +\ operating\ income}{weighted\ average\ contribution\ margin\ per\ unit}$$

$$= \frac{Birr\ 584{,}000 +\ birr\ 0}{birr\ 584} = 1{,}000\ quintals$$

Breakeven sales of Onion (1,000 * 3/5)..... 600 quintals

Breakeven sales of Tomato (1,000 * 2/5)..... 400 quintals

Break even revenue = SP/unit of onion* BEQ onion+ SP/unit of tomato* BEQ tomato

= birr 44 * 600 + birr 100 * 400

= birr 26,400 + 40,000

= birr 66,400

Break even revenue of onion = 3/5 of birr 66,400 = birr 39,840

Break even revenue of tomato = 2/5 of birr 66,400 = birr 26,560

7.6 Methods of measuring cost function

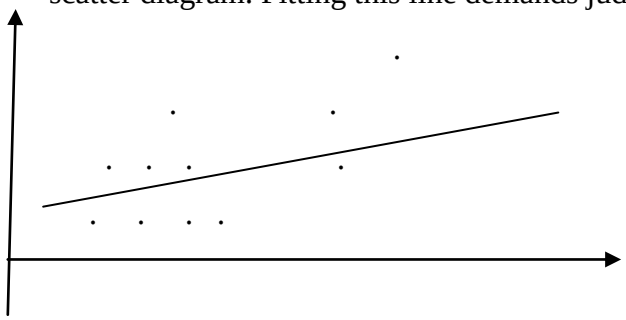
Identifying and measuring cost behavior requires careful analysis and judgment. An important part of this process is to identify costs that can be classified as either fixed or variable, which often requires analysis of past cost behavior.

Quantitative cost estimation methods

Quantitative analyses of cost relationships are formal methods to fit linear cost functions to past data observations.

There are six steps in estimating a cost function on the basis of an analysis of current or past cost relationships. (1) Choose the dependent variable (the variable to be predicted, which is some type of cost); (2) identify the cost driver(s) (independent variable(s)); (3) collect data on the dependent variable and the cost driver(s); (4) plot the data; (5) estimate the cost function; and (6) evaluate the estimated cost function. As we discussed earlier in this chapter, choosing a cost driver is not always straightforward. Frequently, the cost analyst will cycle through these steps several times trying alternative economically plausible cost drivers to see which cost driver best fits the data.Three quantitative methods are commonly used to analyze past costs: scatter diagrams, high-low method, and least-squares regression.

i. **Scatter diagrams** display past cost and unit data in graphical form. In preparing a scatter diagram, units are plotted on the horizontal axis and cost is plotted on the vertical axis. Each individual point on a scatter diagram reflects the cost and number of units for a prior period. The **estimated line of cost behavior** is drawn on a scatter diagram to reflect the relation between cost and unit volume. This line best visually "fits" the points in a scatter diagram. Fitting this line demands judgment.



$$Variable\ cost\ per\ unit\ = \frac{change\ in\ cost}{change\ in\ units}$$

ii. The **high-low method** is a way to estimate the cost equation by graphically connecting the two cost amounts at the highest and lowest unit volumes.

Total cost = fixed cost + (variable cost per unit * units)

This cost equation differs slightly from that determined from the scatter diagram method. A deficiency of the high-low method is that it ignores all cost points except the highest and lowest. The result is less precise because the high-low method uses the most extreme points rather than the more usual conditions likely to recur.

iii. **Least-squares regression** is a statistical method for identifying cost behavior. For our purposes, we use the cost equation estimated from this method but leave the computational details for more advanced courses. Such computations for least-squares regression are readily done using most spreadsheet programs or calculators.

Note that: The three cost estimation methods result in slightly different estimates of fixed and variable costs. Estimates from the scatter diagram are based on a visual fit of the cost line and are subject to interpretation. Estimates from the high-low method use only two sets of values corresponding to the lowest and highest unit volumes. Estimates from least-squares regression use a statistical technique and all available data points.

We must remember that all three methods use *past data*. Thus, cost estimates resulting from these methods are only as good as the data used for estimation. Managers must establish that the data are reliable in deriving cost estimates for the future.

Qualitative cost estimation methods

iv. Engineering analysis

The **industrial engineering method**, also called the **work-measurement method,** estimates cost functions by analyzing the relationship between inputs and outputs in physical terms. This method has its roots in studies and techniques developed by Frank and Lillian Gilbreth in the early twentieth century. Consider, for example, a carpet manufacturer that uses inputs of cotton, wool, dyes, direct labor, machine time and power. Production output is square meters of carpet. Time-and-motion studies analyze the time and materials required to perform the various operations to produce the carpet. For example, a time-and-motion study may conclude that to produce 20 square meters of carpet requires 2 kilograms of cotton and 3 liters of dye. Standards and budgets transform these physical input and output measures into costs. The result is an estimated cost function relating total manufacturing costs to the cost driver, square meters of carpet.

The industrial engineering method can be very time-consuming. Some government contracts mandate its use. Many organizations, however, find it too costly for analyzing their entire cost structure. More frequently, organizations use this approach for direct-cost categories such as materials and labor but not for indirect-cost categories such as manufacturing overhead. Physical

relationships between inputs and outputs may be difficult to specify for individual overhead cost items.

v. Account analysis

The **account analysis method** estimates cost functions by classifying cost accounts in the ledger as variable, fixed, or mixed with respect to the identified cost driver. Typically, managers use qualitative rather than quantitative analysis when making these cost-classification decisions. The account analysis approach is widely used.

Organizations differ with respect to the care taken in implementing account analysis. In some organizations, individuals thoroughly knowledgeable about the operations make the cost-classification decisions. For example, manufacturing personnel may classify costs such as machine lubricants and materials-handling labor, while marketing personnel may classify costs such as advertising brochures and sales salaries. In other organizations, only cursory analysis is conducted, sometimes by individuals with limited knowledge of operations, before cost-classification decisions are made. Clearly, the former approach would provide more reliable cost classifications, and hence estimates of the fixed and variable components of the cost, than the latter. Supplementing the account analysis method by the conference method improves its credibility.

CHAPTER EIGHT

8. Relevant information and decision making

Decision making is the process of **selecting** among alternative courses of action. Managers usually follow a *decision model* for choosing among different courses of action. A **decision model** is a formal method of making a choice that often involves both quantitative and qualitative analyses. Management accountants analyze and present relevant data to guide managers' decisions. The formal decision model involves five major steps. These are: identifying the Problem and uncertainties; Obtain information regarding to different alternatives; Make predictions about the future; Make decisions by choosing among alternatives and implement the decision, evaluate performance, and learn.

Regardless of whether decisions are significant or routine, most people follow a simple, logical

process when making them. This process involves gathering information, making predictions, making a choice, acting on the choice, and evaluating results. It also includes deciding what costs and benefits each choice affords. Some costs are irrelevant.This chapter will explain which costs and benefits are relevant and which are not—and how you should think of them when choosing among alternatives.

8.1 The concept of relevance

While managers chose among alternative courses of action for a specific problem, they are using relevant information. Only those projected costs and benefits that differ in total between alternatives are relevant in a decision. If the total amount of a cost will be the same regardless of the alternative selected, then the decision has no effect on the cost, so the cost can be ignored. Much of this chapter focuses on the concepts of relevant costs and relevant revenues when choosing among alternatives.

Relevant costs are *expected future costs,* and **relevant revenues** are *expected future revenues* that differ among the alternative courses of action being considered. Revenues and costs that are *not relevant* are said to be *irrelevant*. It is important to recognize that to be relevant costs and relevant revenues they *must*:

- **Occur in the future**—every decision deals with selecting a course of action based on its expected future results. Past costs are also called **sunk costs** because they are unavoidable and cannot be changed no matter what action is taken. Hence, past costs are called irrelevant for decision making. In other word, since sunk costs are already spent (sunk), they are never used in future decision making.
- **Differ among the alternative courses of action**—costs and revenues that do not differ will not matter and, hence, will have no bearing on the decision being made.

Key features of relevant information:

- ✓ Past (historical) costs may be helpful as a basis for making *predictions*. However, past costs themselves are always irrelevant when making *decisions*.
- ✓ Different alternatives can be compared by examining differences in expected total future revenues and expected total future costs.

- ✓ Not all expected future revenues and expected future costs are relevant. Expected future revenues and expected future costs that do not differ among alternatives are irrelevant and, hence, can be eliminated from the analysis. The key question is always, "What difference will an action make?"
- ✓ Appropriate weight must be given to qualitative factors and quantitative nonfinancial factors.
- ✓ Managers should avoid two potential problems in relevant-cost analysis. First, they must watch for incorrect general assumptions, such as all variable costs are relevant and all fixed costs are irrelevant. Second, unit-cost data can potentially mislead decision makers in two ways: *When irrelevant costs are included and when the same unit costs are used at different output levels.* The best way for managers to avoid these two potential problems is to keep focusing on (1) total revenues and total costs (rather than unit revenue and unit cost) and (2) the relevance concept. Managers should always require all items included in an analysis to be expected total future revenues and expected total future costs that differ among the alternatives.

Qualitative and quantitative relevant information

Managers divide the outcomes of decisions into two broad categories: *quantitative* and *qualitative*.

Quantitative factors: are outcomes that are measured in numerical terms. Some quantitative factors are financial; they can be expressed in monetary terms. Examples include the cost of direct materials, direct manufacturing labor, and marketing. Other quantitative factors are non-financial; they can be measured numerically, but they are not expressed in monetary terms. Reduction in new product-development time and the percentage of on-time flight arrivals are examples of quantitative non-financial factors.

Qualitative factors: are outcomes that are difficult to measure accurately in numerical terms. Relevant qualitative information has the same characteristics as relevant financial information. The qualitative effect occurs in the *future* and it *differs* between alternatives. Employee morale is an example.

Relevant-cost analysis generally emphasizes quantitative factors that can be expressed in financial terms. But just because qualitative factors and quantitative non-financial factors cannot be measured easily in financial terms does not make them unimportant. In fact, managers must wisely weigh these factors. Managers who ignore qualitative factors can make serious mistakes.

Illustration:

Consider a strategic decision facing management at Precision Sporting Goods, a manufacturer of different sport materials: Should it reorganize its manufacturing operations to reduce manufacturing labor costs? Precision Sporting Goods has only two alternatives: Do not reorganize or reorganize. Reorganization will eliminate all manual handling of materials.

Current manufacturing labor consists of 20 workers—15 workers operate machines, and 5 workers handle materials. The 5 materials-handling workers have been hired on contracts that permit layoffs without additional payments. Each worker works 2,000 hours annually. ”The financial data underlying the choice between the do-not reorganize and reorganize alternatives for Precision Sporting Goods are as follows:

	All Revenues and Costs		**Relevant Revenues and Costs**	
	Alternative 1 (do not reorganize)	**Alternative 2 (reorganize)**	**Alternative 1 (do not reorganize)**	**Alternative 2 (reorganize)**
Revenues	Birr 6,250,000 (birr 250 * 2,500 units)	Birr 6,250,000 (birr 250 * 2,500 units)	-	-
Costs: - Direct materials - Manufacturing labor - Manufacturing overhead - Marketing	 1,250,000 640,000 750,000 2,000,000 - 4,640,000	 1,250,000 480,000 750,000 2,000,000 90,000 4,570,000	 - 640,000 - - - 640,000	 - 480,000 - - 90,000 570,000

- Reorganization costs - Total costs				
Operating income	Birr 1,610,000	Birr 1,680,000	Birr (640,000)	Birr (570,000)
Difference	Birr 70,000		Birr 70,000	

There are two ways to analyze the data. The first considers "All revenues and costs," while the second considers only "Relevant revenues and costs. The analysis in the above table indicates that reorganizing the manufacturing operations will increase predicted operating income by birr 70,000 each year. Note that the managers at Precision Sporting Goods reach the same conclusion whether they use all data or include only relevant data in the analysis.

8.2 Relevant information and Making Short-Term Special Decisions

Our approach to making short-term special decisions is called the **relevant information approach**, or the **incremental analysis approach**. Instead of looking at the company's entire income statement under each decision alternative, we will just look at how operating income would differ under each alternative. Using this approach, we will leave out irrelevant information—the costs and revenues that will not differ between alternatives. We will consider five kinds of short-term special decisions in this chapter such as decisions to make or buy a component, to keep or drop a segment or product line, to accept a special order at less than the usual price, and to process a joint product further or sell it at the split-off point, and other several decisions.

Note: The two keys to making short term decisions are:

- To focus on relevant revenues, costs, and profits, and
- To use a contribution margin approach to separate variable and fixed costs. Because fixed costs and variable costs behave differently, they must be analyzed separately. Traditional (absorption costing) income statements, which blend fixed and variable costs together, can mislead managers. Contribution margin income statements, which isolate costs by behavior (variable or fixed), help managers gather the cost-behavior information they

need. Keep in mind that unit manufacturing costs are mixed costs, too, so they can also mislead managers. If you use unit manufacturing costs in your analysis, be sure to first separate the unit cost into its fixed and variable portions.

8.2.1 Accept or reject a one-time special order decision

A special order occurs when a customer requests a one-time order at a *reduced* sale price. Before agreeing to the special deal, first, managers must consider available manufacturing **capacity**. If the company is already using all its existing manufacturing capacity and selling all units made at its regular sales price, it would not be profitable to fill a special order at a reduced sales price. Therefore, available excess capacity is a necessity for accepting a special order. This is true for service firms as well as manufacturers.

Second, managers need to consider whether the special reduced **sales price** is high enough to cover the incremental costs of filling the special order. The special price mustbe greater than the variable costs of filling the order or the company will lose money on the deal. In other words, the special order must provide a positive contribution margin.

Next, the company must consider fixed costs. If the company has excess capacity, fixed costs probably will not be affected by producing more units (or delivering more service). However, in some cases, management may have to incur some **other fixed cost** to fill the special order, such as additional insurance premiums. If so, they will need to consider whether the special sales price is high enough to generate a positive contribution margin *and* cover the additional fixed costs.

Finally, managers need to consider whether the special order will affect **regular sales** in the long run. Will regular customers find out about the special order and demand a lower price? Will the special order customer come back *again andagain*, asking for the same reduced price? Will the special order price start a price war with competitors? Managers should determine the answers to these questions and consider how customers will respond. Managers may decide that any profit from the special sales order is not worth these risks.

Illustration: MC Alexander Company makes tennis balls. It can produce up to 2,500,000 cans of

balls per year. Current production is 2,000,000 cans. The total annual manufacturing, selling, and administrative fixed costs are $700,000. The variable cost of making and selling each can of balls is $1.00. Stockholders expect a 12% annual return on the company's $3,000,000 of assets. Assume MC Alexander is a price-taker, and the current market price is $1.45 per can of balls.

Nike has just asked MC Alexander to supply the company with 400,000 cans of balls at a special order price of $1.20 per can. **Nike** wants MC Alexander to package the balls under the **Nike** label (MC Alexander will imprint the **Nike** logo on each ball and can). MC Alexander will have to spend $10,000 to change the packaging machinery. Assuming the original volume and costs, should MC Alexander accept this special order? (Unlike the chapter problem, assume MC Alexander will incur variable selling costs as well as variable manufacturing costs related to this order.)

Solution:

Step1: compare the practical capacity level (i.e. 2,500,000 cans of tennis balls per year) with the actual production (i.e. 2,000,000 cans of tennis per year). The company has excess production capacity of producing 500,000 cans of tennis balls per year. Hence, the company can fill the special order from Nike (i.e. 400,000 cans of tennis balls) with in its practical capacity of without affecting its long term strategic decisions. **Nike's** special order price ($1.20) is less than the current full cost of each can of balls $1.35 (VC per unit (1.00) + FC per unit (0.35)). However, this should not influence management's decision. MC Alexander could fill **Nike's** special order using existing excess capacity.

Step 2: compare the extra revenue from the special order with the incremental cost to fill the special order. MC Alexander takes an incremental analysis approach to its decision, comparing the extra revenue with the incremental costs of accepting the order. Variable costs will increase if MC Alexander accepts the order, so the variable costs are relevant. Only the *additional* fixed costs of changing the packaging machine ($10,000) are relevant since all other fixed costs will remain unchanged.

Revenue from special order (400,000 * $1.20 per unit)	$ 480,000
Less: Variable cost of special order (400,000 * $1.00).....	400,000
Contribution margin from special order.....	$ 80,000
Less: Additional fixed costs of special order.....	10,000
Operating income provided by special order	$ 70,000

Decision: MC Alexander should accept the special order because it will increase operating income by $70,000. However, MC Alexander also needs to consider whether its regular customers will find out about the special price and demand lower prices too.

8.2.2 In sourcing (make) Versus Outsourcing (buy) decision

Outsourcing is purchasing goods and services from outside vendors rather than producing the same goods or providing the same services within the organization, which is **in sourcing**. For example, Kodak prefers to manufacture its own film (in sourcing) but has IBM do its data processing (outsourcing). Honda relies on outside vendors to supply some component parts but chooses to manufacture other parts internally. Decisions about whether a producer of goods or services will in-source or outsource are also called **make-or-buy decisions.**

Managers are often faced with the decision of whether to make or buy components used in manufacturing. Indeed, management periodically should evaluate past decisions concerning production. Conditions upon which prior decisions were based may have changed, and as a result, a different approach may be required. Periodic evaluations, of course, are not the only source of these **make-or-buy decisions**.

In order to outsource the company's variable costs should be greater than the outsourcing cost. The manager should look in to fixed costs that can be avoidable if the company outsource and see what the company could do with the freed manufacturing capacity. If the incremental costs of making **exceed** the incremental costs of outsourcing, make **Outsourcing decision.**

Illustration:

Shelly's Shades produces standard sunglasses having different types of shades/lenses: the selling price per pair is $20 and the variable cost per pair is $16. The company has 15,000 machine hours available. In one machine hour, Shelly's can produce 70 pairs of the standard model. Shelly's incurs the following costs for 20,000 of its hiking Shades/lenses:

Direct materials..... $ 20,000
Direct labor..... 80,000
Variable manufacturing overhead..... 40,000
Fixed manufacturing overhead (direct) 80,000
Total manufacturing cost..... $220,000
Cost per pair ($220,000/20,000)..... $ 11

Another manufacturer has offered to sell similar shades to Shelly's for $10, a total purchase cost of $200,000. If Shelly's outsources *and* leaves its plant idle, it can save $50,000 of fixed overhead cost. Or, it can use the freed manufacturing facilities to make other products that will contribute $70,000 to profits. In this case, the company will not be able to avoid any fixed costs. Identify and analyze the alternatives. What is the best course of action?

	In-source shades	*Outsource (Buy) Shades*	
	Make Shades	**Facilities Idle**	**Make Other Products**
Relevant costs:			
- Direct materials	$ 20,000	-	-
- Direct labor	80,000	-	-
- Variable overhead	40,000	-	-
- Fixed overhead	80,000	$ 30,000 (80,000 – 50,000)	$ 80,000
- Purchase cost (20,000 * $10)	-	200,000	200,000
Total cost of obtaining shades	220,000	230,000	280,000
Profit from other products	-	-	(70,000)
Net cost of obtaining shades	$220,000	$230,000	$210,000

***Decision*:** Shelly's should buy the hiking shades from the outside supplier and use the freed manufacturing facilities to make other products.

8.2.3 Keep or drop service, product or department decision

Often, a manager needs to determine whether or not a segment, such as a product line, should be kept or dropped. Segmented reports prepared on a variable-costing basis provide valuable information for these **keep-or-drop decisions**. Both the segment's contribution margin and its segment margin are useful in evaluating the performance of segments. However, while segmented reports provide useful information for keep-or-drop decisions, relevant costing describes how the information should be used to arrive at a decision.

Before deciding to keep or drop a product managers should analyze first, whether the product provide **positive contribution margin**. If the product has a negative contribution margin, then the product is not even covering its variable costs. Therefore, the company should drop the product. However, if the product has a positive contribution margin, thenit is *helping* to cover some of the company's fixed costs. Secondly, in addition to its contribution margin the manager should see some **fixed cost** that would **continue** and **direct fixed costs** that can be **avoided** if the company drops the product. Then, what would the company do with the **freed capacity**. Finally, the manager should see the impact of dropping a product on sales of the company's other products. The relevant financial data are still the changes in revenues and expenses. But now we are considering a *decrease* in volume rather than an *increase*, as we did in the special sales order decision.

Illustration:

Assume ANBESA Shoe Factory currently produces and sells two types of shoe: Standard shoe and First class shoe. The company's contribution margin income statement by product, assuming fixed costs are shared by both products is shown bellow. Because the First class shoe line has an operating *loss* of birr 520, management is considering dropping the product.

ANBESA Shoe Factory **Income Statement** For the Month Ended March 31, 2013			
		Products	
	Total	Standard shoe**(10,000 shoes)**	First class shoe**(1000 shoes)**

Sales revenue	Birr 6,700,000	Birr 6,000,000	Birr 700,000
Variable expenses:			
- Manufacturing	4,860,000	4,400,000	460,000
- Marketing and administrative	2,020	2,000	20
- Total variable expenses	4,862,020	4,402,000	460,020
Contribution margin	Birr 1,837,980	Birr 1,598,000	Birr 239,980
Fixed expenses:		600,000	239,500
- Manufacturing	(839,500)	30,000	1000
- Marketing and administrative	(31,000)	630,000	240,500
- Total fixed expenses	870,500		
Operating income (loss)	Birr 967,480	Birr 968,000	Birr520

Step 1: Consideration of contribution margin: In ANBESA's case, the First class shoeprovide a positive contribution margin of birr 239,980. Positive contribution margin then is *helping* to cover some of the company's fixed costs. Therefore, ANBESA's managers now need to consider fixed costs under the following two assumptions.

Step 2:

Assumption 1: the fixed costs continue to exist *even if* the product is dropped.

Fixed costs that will continue to exist even after a product is dropped are often called unavoidable fixed costs. Unavoidable fixed costs are *irrelevant* to the decision because they *will not change* if the company drops the product. Let's assume that all of ANBESA's fixed costs of birr 870,500 will continue to exist even if the company drops the First class shoe. Assume that ANBESA makes the First class shoe in the same plant using the same machinery as the Standard shoe. Thus, only the contribution margin the First class shoe**s provide** is relevant. If ANBESA drops the First class shoe, it will lose the birr 239,980 contribution margin.

Expected decrease in revenues (1000 females' shoe * birr 700.00) …….. Birr (700,000)
Expected decrease in variable costs (birr 460,000 + birr 20) ……. 460,020
Expected *decrease* in operating income ……... birr (239,980)

Decision: This analysis suggests that management should *not* drop First class shoe. It is actually more beneficial for ANBESA to lose birr 520 than to drop the First class shoe and lose birr 239,980 in operating income.

Assumption 2: *Direct* fixed costs of the First class shoe that can be avoided if the product is dropped. Assume that birr 240,500 of the fixed costs will be avoidable if ANBESA drops the First class shoe product. Then, birr 240,500 is avoidable fixed cost and *is relevant* to the decision because it would change (go away) if the product is dropped.

Expected decrease in revenues (1000 females' shoe * birr 700.00) …….. Birr (700,000)
Expected decrease in variable costs (birr 460,000 + birr 20)……. 460,020
Expected decrease in fixed costs……..…….. 240,500
Expected decrease in total expenses……..…… 700,520
Expected increase in operating income …… birr 520

Decision: This analysis suggests that management should drop First class shoeto have the rise in operating income by birr 520.

Note: The key to deciding whether to drop products, departments, or territories is to compare the lost revenue against the costs that can be saved and to consider what would be done with the freed capacity.

8.2.4 Product mix decision under capacity constraints

We now examine how the concept of relevance applies to **product-mix decisions**—the decisions made by a company about which products to sell and in what quantities. These decisions usually have only a short-run focus, because they typically arise in the context of capacity constraints that can be relaxed in the long run. Companies do not have unlimited resources. **Constraints** that restrict production or sale of a product vary from company to company.

To determine product mix, a company maximizes operating income, subject to constraints such as **capacity** and **demand**. Throughout this section, we assume that as short run changes in product mix occur, the only costs that change are costs that are variable with respect to the number of units produced (and sold). Under this assumption, the analysis of individual product contribution margins provides insight into the product mix that maximizes operating income. Before determining its product mix a manager should answer the following questions: What **constraint**(s) stop(s) the company from making (or displaying) all the units the company can sell? Which products offer the **highest contribution margin** per unit of the constraint? Would

emphasizing one product over another affect **fixed costs**?

Illustration:

Assume ANBESA Shoe Factory in the previous example can sell all the Standard shoes and all the First class shoes it produces, but it only has 2,000 machine hours of manufacturing capacity. The company uses the same machines to make both types of shoes. In this case, a machine hour is the constraint. Note that this is a short-term decision because in the long run, ANBESA could expand its production facilities to meet sales demand if it made financial sense to do so. Assume that ANBESA can produce either 16Standard shoes *or* 10 First class shoes per machine hour. *The company will incur the same fixed costs either way so fixed costs are irrelevant.* Which product should it emphasize?

	Standard shoe	**First class shoe**
Sale price per shoe	Birr 600	Birr 700
Variable cost per shoe	440.20	460.02
Contribution margin per unit	159.80	239.98
Contribution margin ratio: - Males' shoe birr 159.8/birr 600 - Females' shoe birr 239.98/birr390	27%	34%

Solution:

Because *machine hour* is the constraint, ANBESA needs to figure out which product has the *highest contribution margin per machine hour*.

	Standard shoe	**First class shoe**
(1) shoes that can be produced each machine hour	16	10
(2) Contribution margin per shoe	Birr 159.80	Birr 239.98
Contribution margin per machine hour (1) * (2)	Birr 2,556.8	Birr 2,399.80
Available capacity—number of machine hours	2,000	2,000
Total contribution margin at full capacity	Birr 5,113,600	Birr 4,799,600

To maximize profit, ANBESA should make 32,000 Standard shoe (2,000 machine hours * 16 males' shoe per hour) and zero First class shoe. Why should ANBESA make zero First class shoe? Because for every machine hour spent making First class shoe, ANBESA would *give up* birr 157 of contribution margin (birr 2,556.8 per hour for Standard shoe versus birr 2,399.80 per

hour for First class shoe). We made two assumptions here: (1) ANBESA sales of other products will not be hurt by this decision and (2) ANBESA can sell as many Standard shoes as it can produce. Let's challenge these assumptions. First, how could making only Standard shoe hurt sales of other products? By producing the First class shoe, the factory also sells many of its standard offerings like the Standard shoe that coordinate with the First class shoe. Other shoe sales might fall if the factory no longer offers First class shoe.

Let's challenge our second assumption. Suppose that a new competitor has decreased the demand for ANBESA's Standard shoe. Now the company can only sell 24,000 Standard shoes. ANBESA should only make as many Standard shoes as it can sell and use the remaining machine hours to produce First class shoe. How will this constraint in sales demand change profitability?

Recall from the above table, ANBESA will make birr 5,113,600 of contribution margin by using all 2,000 machine hours to produce Standard shoe. However, if ANBESA only makes 24,000 Standard shoes, it will only use 1,500 machine hours (24,000 standard shoes ÷ 16standard shoes per machine hour). That leaves 500 machine hours available for making First class shoe.

	Standard shoe	**First class shoe**	**Total**
(1) shoes that can be produced each machine hour	16	10	
(2) Contribution margin per shoe from the table above	Birr 159.80	Birr 239.98	
Contribution margin per machine hour (1) * (2)	Birr 2,556.8	Birr 2,399.80	
Machine hours devoted to product	1,500	500	
Total contribution margin at full capacity	Birr 3,835,200	Birr 1,199,900	Birr 5,035,100

Because of the change in product mix, ANBESA's total contribution margin will fall from Birr 5,113,600 to Birr 5,035,100, a birr 78,500 decrease. ANBESA had to give up birr 157 of contribution margin per machine hour (birr 2,556.8 – birr 2,399.80) on the 500 hours it spent producing First class shoe rather than Standard shoe. However, ANBESA had no choice—the

company would have incurred an *actual loss* from producing Standard shoe that it could not sell. If ANBESA had produced 32,000 Standard shoe but only sold 24,000, the company would have spent birr 3,521,600 to make the unsold shoes (8,000 Standard shoes * birr 440.20 variable cost per Standard shoe), yet received no sales revenue from them.

8.2.5 Sell or process further decision

Joint products have common processes and costs of production up to a split-off point. At that point, they become distinguishable. For example, certain minerals such as copper and gold may both be found in a given ore. The ore must be mined, crushed, and treated before the copper and gold are separated. The point of separation is called the **split-off point**. The costs of mining, crushing, and treatment are common to both products. Often, joint products are sold at the split-off point. Sometimes, it is more profitable to process a joint product further, beyond the split-off point, prior to selling it.

Determining whether to **sell or process further** is an important decision that a manager must make. When a company is considering selling a product as is or processing it further, if the extra revenue (revenue –separable costs) from processing the product further exceeds the revenue from the sale of the product without further processing, then the company should process the product further.

Illustration:

Suppose **Addis Mojo oil Factory** spent birr 1,000,000 to process vegetable into 50,000 gallons of standard oil. After processing vegetable into standard oil, should Addis Mojo sell the standard oil as is or should it spend more to process the standard oil in to fine grade oil? In making the decision, **Addis Mojo's** managers consider the following relevant information: **The company** could sell fine grade oil for birr 100 per gallon, for a total of birr 5,000,000 (50,000 * birr 100). **Addis Mojo** could sell regular standard oil for birr 95 per gallon, for a total of birr 4,750,000 (50,000 * birr 95). **Addis Mojo** would have to spend birr 3.75 per gallon, or birr 187,500 (50,000 gallons * birr 3.75), to further process standard oil into fine grade oil.

Solution:

Notice that **Addis Mojo's** managers do *not* consider the birr 1,000,000 spent on processing vegetable into standard oil. Why? It is a *sunk* cost. **Addis Mojo** has incurred birr 1,00,000—regardless of whether it sells the standard oil as is or processes it further into fine grade oil. Therefore, the cost is *not* relevant to the decision.

	Sell as is	**Process further**	**Difference**
Expected revenue from selling 50,000 gallons of standard oil at birr 95 per gallon	Birr 4,750,000		
Expected revenue from selling 50,000 fine grade oil at birr 100 per gallon		Birr 5,000,000	Birr 250,000
Additional costs of birr 3.75 per gallon to convert 50,000 gallons of regular gasoline into fine grade oil		(187,500)	**(187,500)**
Total net revenue	Birr 4,750,000	Birr 4,812,500	**Birr 62,500**

Decision: Managers see that they can increase profit by birr 62,500 if they convert the standard oil into fine grade oil. The birr 250,000 extra revenue (birr 5,000,000 – birr 4,750,000) outweighs the incremental birr 187,500 cost of the extra processing.

8.3 Irrelevance of past cost and equipment replacement cost

At several points in this chapter, when discussing the concept of relevance, we reasoned that past (historical or sunk) costs are irrelevant to decision making. That's because a decision cannot change something that has already happened. We now apply this concept to decisions about replacing equipment. We stress the idea that **book value**= original cost minus accumulated depreciation—of existing equipment is a past cost that is irrelevant.

Illustration:

Kaliti Metal works Factory, a manufacturer of different types of metals, is considering replacing a metal-cutting machine with a newer model. The new machine is more efficient than the old machine, but it has a shorter life. Revenues from sale of different types of metals (birr 2 million per year) will be unaffected by the replacement decision. Here are the data the management accountant prepares for the existing (old) machine and the replacement (new) machine:

	Old Machine	**New Machine**
Original cost	Birr 1,000,000	Birr 600,000

Useful life	5 years	2 years
Current age	3 years	0 years
Remaining useful life	2 years	2 years
Accumulated depreciation	Birr 600,000	Not acquired yet
Book value	Birr 400,000	Not acquired yet
Current disposal value (in cash)	Birr 40,000	Not acquired yet
Terminal disposal value (in cash 2 years from now)	Birr 0	Birr 0
Annual operating costs (maintenance, energy, repairs, coolants, and so on)	Birr 800,000	Birr 460,000

Kaliti Metal works Factory uses straight-line depreciation. To focus on relevance, we ignore the time value of money and income taxes.

Required: Should Kaliti replace its old machine?

Solution:

1. **Book value of old machine, birr 400,000 is** irrelevant, because it is a past or sunk cost. All past costs are "down the drain." Nothing can change what has already been spent or what has already happened.

2. **Current disposal value of old machine, birr 40,000.** Relevant, because it is an expected future benefit that will only occur if the machine is replaced.

3. **Loss on disposal, birr 360,000.** This is the difference between book value and current disposal value (400,000 – 40,000). It is a meaningless combination blurring the distinction between the irrelevant book value and the relevant disposal value. Each should be considered separately, as was done in items 1 and 2.

4. **Cost of new machine, birr 600,000.** Relevant, because it is an expected future cost that will only occur if the machine is purchased.

	Two Years Together		
	Keep (1)	**Replace (2)**	**Difference (3) = (1) – (2)**
Revenues	Birr 4,000,000	Birr 4,000,000	-
Operating costs:			
- Cash operating costs (birr 800,000/yr * 2 yrs), (birr 460,000/yr * 2 yrs)	1,600,000	920,000	680,000
- Book value of old machine - Periodic write-off as	400,000	-	

depreciation or - Lump-sum write-off	-	400,000	-
Current disposal value of old machine	-	(40,000)	40,000
- New machine cost, written off periodically as depreciation	-	600,000	(600,000)
- Total operating cost	2,000,000	1,880,000	120,000
- Operating income	2,000,000	2,120,000	(120,000)

Decision: to get higher operating income as a result of lower costs of birr 120,000 by replacing the machine—is obtained even though the book value is omitted from the calculations. Hence, the company should replace its machine.

CHAPTER NINE

9 Information for budgeting, planning and control purposes

Introduction

Budgeting is a common accounting tool that companies use for implementing strategy. Management uses budgets to communicate directions and goals throughout a company. Budgets turn managers' perspectives forward and aid in planning and controlling the actions managers must undertake to satisfy their customers and succeed in the marketplace. Budgets provide measures of the financial results a company expects from its planned activities and help define objectives and timelines against which progress can be measured. Through budgeting, managers learn to anticipate and avoid potential problems. Interestingly, even when it comes to entrepreneurial activities, business planning has been shown to increase a new venture's probability of survival, as well as its product development and venture organizing activities. Budgets are tools that, by themselves, are neither good nor bad. Budgets are useful when administered skillfully. Therefore, this chapter focuses on the different components of master budget and their preparation.

9.1 Budget and the budgeting process

A ***budget*** is a quantitative expression of a proposed plan of action by management for a future time period and is an aid to the coordination and implementation of the plan. It can cover both

financial and non-financial aspects of these plans and acts as a blueprint for the company to follow in the forthcoming period. Plan is what an organization wants to do and the way to do it.

Budgets covering financial aspects quantify management's expectations regarding future income, cash flows and financial position. Just as individual financial statements are prepared covering past periods, so they can be prepared covering future periods – for example, a budgeted income statement, a budgeted cash-flow statement and a budgeted balance sheet. Underlying these financial budgets can be non-financial budgets for, say, units manufactured, number of new products introduced to the market, or head count.

Strategic plans are expressed through long-run budgets and operating plans are expressed via short-run budgets. Budgets help managers assess strategic risks and opportunities by providing them with feedback about the likely effects of their strategies and plans. Sometimes the feedback signals to managers that they need to revise their plans and possibly their strategies.

Well-managed companies usually cycle through the following budgeting steps during the course of the fiscal year:

1. Working together, managers and management accountants plan the **performance** of the company as a whole and the performance of its subunits (such as departments or divisions). Taking into account past performance and anticipated changes in the future, managers at all levels reach a common understanding on what is expected.
2. Senior managers give subordinate managers a frame of reference, a set of specific financial or non-financial expectations against which actual results will be compared.
3. Management accountants help managers investigate variations from plans, such as an unexpected decline in sales. If necessary, corrective action follows, such as a reduction in price to boost sales or cutting of costs to maintain profitability.
4. Managers and management accountants take into account market feedback, changed conditions, and their own experiences as they begin to make plans for the next period.

For example, a decline in sales may cause managers to make changes in product features for the next period.

Advantages of budget

Budgets are an integral part of management control systems. When administered thoughtfully by managers, budgets do the following:

- **Promote coordination and communication among subunits within the company**

Coordination is meshing and balancing all aspects of production or service and all departments in a company in the best way for the company to meet its goals. *Communication* is making sure those goals are understood by all employees. Coordination forces executives to think of relationships among individual departments within the company, as well as between the company and its supply chain partners.

- **Provide a framework for judging performance and facilitating learning**

Budgets enable a company's managers to measure actual performance against predicted performance. Budgets can overcome two limitations of using past performance as a basis for judging actual results. One limitation is that past results often incorporate past miscues and substandard performance. The other limitation of using past performance is that future conditions can be expected to differ from the past. It is important to remember that a company's budget should not be the only benchmark used to evaluate performance. Many companies also consider performance relative to peers as well as improvement over prior years.

- **Motivate managers and other employees**

Challenging budgets improve employee performance because employees view falling short of budgeted numbers as a failure. Most employees are motivated to work more intensely to avoid failure than to achieve success.

Note: Before budget preparation the management should consider the benefits and costs of budget. Budgets should be prepared when their expected benefits exceed their expected costs.

Generally budgets have the following advantages:

1. Budgets *communicate* management's plans throughout the organization.
2. Budgets force managers to *think about* and *plan* for the future. In the absence of the necessity to prepare a budget, many managers would spend all of their time dealing with day-to-day emergencies.
3. The budgeting process provides a means of *allocating resources* to those parts of the

organization where they can be used most effectively.

4. The budgeting process can uncover potential *bottlenecks* before they occur.

5. Budgets *coordinate* the activities of the entire organization by *integrating* the plans of its various parts. Budgeting helps to ensure that everyone in the organization is pulling in the same direction.

6. Budgets define goals and objectives that can serve as *benchmarks* for evaluating subsequent performance.

Time coverage of budget

The most frequently used budget period is one year. The annual budget is often subdivided by months for the first quarter and by quarters for the remainder of the year. The budgeted data for a year are frequently revised as the year unfolds. For example, at the end of the first quarter, the budget for the next three quarters is changed in light of new information.

- ✓ **Long – range budgets:** - LRB, are coordinated with capital budgets. It provides forecasted financial statement for 5 to 10 years periods. Strategic Plan: - It is the most forward looking plan which sets overall goals and objectives of the organization. In other word, LRB is the quantitative expression of strategic plan. Capital budget is a budget that details the planned expenditures for facilities, equipment, new products and other long-term investments.
- ✓ **Short Range Budget/Master budget:** - it is an extensive analysis of the first year of the long-range plan. It summarizes the planning activities of all subunits of an organization-sales, production, distribution and finance. It is the quantitative expression of operating plans. Operating plan is short term quantitatively expressed by using short term budget or master budget.
- ✓ **Continuous or Rolling budgets:** - It is a form of master budget that adds one period in the future as the period just ended is dropped. Budgeting thus becomes an ongoing instead of periodic process. Continuous budgets force managers to always think about the next 12 methods, not just the remaining months in a fixed budgeting cycle.

9.2 The master budget

The working document at the core of budgeting process is called the *master budget*. The **master budget** expresses management's **operating** and **financial plans** for a specified period (usually a

fiscal year), and it includes a set of budgeted financial statements. The master budget is the initial plan of what the company intends to accomplish in the budget period.

A master budget coordinates or summarizes the financial projections of all the organizations individual budgets. It includes the impact of both **operating** and **financing decisions**. Operating decision, **centers** on the acquisition and uses of scarce resources. Financing decisions **centers** on how to get the funds to acquire resources. It focuses on the impact of operations and capital outlay in cash.

Thus, the major components of master budget are operating budget and financial budget. Operating budget is budgeted income statement and it's supporting budget schedules. It includes revenue, production, direct material usage and purchases, direct labor, manufacturing overhead, ending inventory, cost of goods sold, operating expenses, budget and budgeted income statement. Financial budget comprises the capital budget, cash budget, budgeted balance sheet and budgeted statement on cash flows. Both budgeted statement and financial statements are the same in the content. However, budgeted statement is budgeted for the future period and in order to do this you have to predict the future and the content of financial statements because the amount is not actual whereas financial statement is stated on past actual data.

The terminology used to describe budgets varies among organizations. For example, budgeted financial statements are sometimes called **pro forma statements**. The budgeted financial statements of many companies include the budgeted profit statement, the budgeted balance sheet, and the budgeted statement of cash flows.

9.2.1 Parts of master budget

Operating budget:

The operating budget is the budgeted income statement and its supporting budget schedules. The starting point for the operating budget is generally the revenues budget. The following supporting schedules are derived from the revenues budget and the activities needed to support the revenues budget: production budget, direct material usage budget, direct material purchases budget, direct manufacturing labor cost budget, manufacturing overhead costs budget, ending inventories budget, cost of goods sold budget, R&D/product design cost budget, marketing cost

budget, distribution cost budget, and customer-service cost budget.

1. **Revenue budget:** The revenue budget (schedule 1) is the usual starting point for budgeting. Why? Because production (and hence costs) and stock levels generally depend on the forecast level of revenue. Many factors influence the sales forecast, including the sales volume in recent periods, general economic and industry conditions, market research studies, pricing policies, advertising and sales promotions, competition, and regulatory policies.

Pressures can exist for budgeted revenues to be either over- or underestimates of the expected amounts. Pressure for employees to underestimate budgeted revenues can occur when a company uses the difference between actual and budget amounts to evaluate marketing managers. These managers may respond by giving highly conservative forecasts. **Padding** the budget or introducing **budgetary slack** refers to the practice of underestimating budgeted revenues (or overestimating budgeted costs) in order to make budgeted targets more easily achievable. Introducing budgetary slack makes it more likely that actual revenues will exceed budgeted amounts. From the marketing manager's standpoint, budgetary slack hedges against unexpected adverse circumstances.

Occasionally, revenues are limited by available production capacity. For example, unusually heavy market demand, shortages of personnel or materials, or strikes may cause a company to exhaust its finished goods stock completely. Additional sales cannot be made because no stock of the product is available. In such cases, the production capacity – the factor that limits revenue – is the starting point for preparing the revenue budget.

Budgeted revenue = target selling price per unit * budgeted sells (units)

2. **Production budget (in units):** After revenues are budgeted, the production budget (schedule 2) can be prepared. The total finished goods units to be produced depends on planned sales and expected changes in stock levels:

Budgeted production (units) = Budgeted sales (units) +Target ending finished goods inventory (units) – Opening finished goods inventory (units)

When unit sales are not stable throughout the year, managers must decide whether (1) to adjust production levels periodically to minimize stock held, or (2) to maintain constant production levels and let stock rise and fall. Increasingly, managers are choosing to adjust production. When Just-in-time production systems whose objective is to keep extremely low levels of stock throughout the year, production is allowed to change but inventory is kept constant.

3. **Direct materials usage budget and direct materials purchases budget:** The decision on the number of units to be produced (schedule 2) is the key to computing the usage of direct materials in quantities and in birr's.

The purchasing manager prepares the budget for direct material purchases, calculated in Schedule 3B, based on the budgeted direct materials to be used, the beginning inventory of direct materials, and the target ending inventory of direct materials:

Purchases of direct materials = Usage of direct materials + Target ending inventory of direct materials - Beginning inventory of direct materials

Budgeted direct materials usage = budgeted production (units) * budgeted direct material usage per unit.

4. **Direct manufacturing labor budget:** In this step, manufacturing managers use *labor standards*, the time allowed per unit of output, to calculate the direct manufacturing labor costs budget in Schedule 4.These costs depend on wage rates, production methods and hiring plans. The computation of budgeted direct manufacturing labor costs appear in schedule 4.

Budgeted direct labor usage (hours) = budgeted production (units) * budgeted direct labor hour per unit

Budgeted direct labor cost = budgeted direct labor usage (hours) * budgeted wage rate

1. **Manufacturing overhead budget:** The total of these costs depends on how individual overhead costs vary with the assumed cost driver or allocation base. The specific variable- and fixed-cost categories may be obtained, following discussions with company personnel in different areas. The calculations of budgeted manufacturing overhead costs appear in schedule 5.

Budgeted variable MOH cost = allocation base (hours or units) * budgeted rate per allocation

base.

2. **Ending inventory budget:** Schedule 6Ashows the computation of unit costs for the different products. These unit costs are used to calculate the costs of target ending inventory of direct materials and finished goods in schedule 6B.

Budgeted ending inventory = budgeted manufacturing cost per unit * budgeted ending inventory (units)

3. **Cost of goods sold budget:** The information from schedules 3 to 6 leads to schedule 7:

Budgeted cost of goods sold = beginning finished goods inventory + budgeted cost of production – budgeted cost of ending finished goods inventory.

Budgeted cost of production = budgeted direct materials usage cost + budgeted direct labor usage cost + budgeted manufacturing overhead cost.

4. **Other (non-production) costs budget:** include budget of variable and fixed costs for other value chain activities like Research and Development, marketing, distribution, and customer service and administrative.
5. **Budgeted operating profit statement** Schedules 1, 7 and 8 provide the necessary information to complete the budgeted operating profit statement. Of course, more details could be included in the profit statement, and then fewer supporting schedules would be prepared.

Top management's strategies for achieving revenue and operating profit goals influence the costs planned for the different business functions of the value chain. As strategies change, the budget allocations for different elements of the value chain will also change. For example, a shift in strategy towards emphasizing product development and customer service will result in increased resources being allocated to these parts of the master budget. The actual data resulting from this strategy will be compared with budgeted results. Management can then evaluate whether the focus on product development and customer service has been successful. This feedback is an important input in subsequent plans.

Illustration:

Consider the following data XY-furniture company producing and selling two types of dining tables: casual and deluxe. The company plan to use two types of direct materials which are red

oak and granite.

- The bill of materials would indicate that 12 board feet of red oak and 6 square feet of granite are needed to produce each Casual coffee table, and 12 board feet of red oak and 8 square feet of granite to produce each Deluxe coffee table. Each board feet red oak costing birr 7 and each square feet of granite costing birr 10.
- Four and six direct labor hours are required for producing a single casual and deluxe table respectively and budgeted at Br 20 per hour.
- Variable overhead is budgeted at Br 8 per direct labor hour (cost driver).
- Fixed overhead is budgeted at Br 5,000,000 per year. 2,000,000 of casual table and 3,000,000 of Deluxe table.
- Variable non-manufacturing costs are expected to be Br 0.14 per Birr of revenue.
- Fixed non-manufacturing costs are Br 3,000,000 for casual table and 4,000,000 for deluxe table per year.
- The company expects to sell 50,000 casual tables and 10,000 units of deluxe tables at a target price of birr 600 and 800 respectively.
- Assume that target ending finished goods inventory is 11,000 units of casual and 500 units of deluxe tables. At the beginning of the year 2013, the company has 1,000 and 500 units of casual and deluxe tables' respectively.
- At the beginning of the period Read oak and Granite inventory equals 70,000 b.f and 60,000 s.f. respectively. At the end of the period the expected ending inventory for read oak and granite equals to 80,000 b.f and 20,000 s.f respectively. Assume the company uses FIFO cost flow assumption.

Required: Prepare the supporting scheduled of operational budget and budgeted income statement for XY-Furniture Company for the year 2013

Schedule 1: Revenues Budget For the Year Ending December 31, 2013			
	Budgeted sales units	Target selling price	Budgeted revenue
Casual table	50,000	Birr 600	Birr 30,000,000
Deluxe table	10,000	800	8,000,000
Total budgeted revenue			Birr 38,000,000

Schedule 2: Production Budget (in Units) For the Year Ending December 31, 2013		
Product	**Casual**	**Deluxe**
Budgeted unit sales (Schedule 1)	50,000	10,000
Add target ending finished goods inventory	11,000	500
Total required units	61,000	10,500
Deduct beginning finished goods inventory	1,000	500
Units of finished goods to be produced (budgeted production)	60,000	10,000

Schedule 3A: Direct Material Usage Budget in Quantity and Birrs For the Year Ending December 31, 2013			
	Materials		
	Red Oak	**Granite**	**Total**
Physical Units Budget			
Direct materials required for Casual tables (60,000 units * 12 b.f. and 6 sq. ft.)	720,000 b.f.	360,000 sq. ft.	
Direct materials required for Deluxe tables (10,000 units * 12 b.f. and 8 sq. ft.)	120,000 b.f.	80,000 sq.ft.	
Total quantity of direct materials to be used	840,000 b.f.	440,000 sq.ft.	
Cost Budget			
Available from beginning direct materials inventory (under a FIFO cost-flow assumption) - Red Oak: 70,000 b.f. * $7 per b.f. $ 490,000 - Granite: 60,000 sq. ft. * $10 per sq. ft. $ 600,000	Birr 490,000	Birr 600,000	
To be purchased this period - Red Oak: (840,000 – 70,000) b.f. * birr7 per b.f. - Granite: (440,000 – 60,000) sq. ft. * birr 10 per sq. ft.	5,390,000	3,800,000	
Direct materials to be used this period	Birr 5,880,000	Birr 4,400,000	Birr 10,280,000

Schedule 3B: Direct Material Purchases Budget For the Year Ending December 31, 2013			
	Material		
	Red Oak	**Granite**	**Total**

Physical Units Budget			
To be used in production (from Schedule 3A)	840,000 b.f.	440,000 sq. ft.	
Add target ending inventory	80,000	20,000	
Total requirements	920,000	460,000	
Deduct beginning inventory	70,000	60,000	
Purchases to be made	850,000 b.f.	400,000 sq. ft.	
Cost Budget			
Red Oak: 850,000 b.f. * birr 7 per b.f.	Birr 5,950,000		
Granite: 400,000 sq. ft. * birr 10 per sq. ft.		Birr 4,000,000	
Purchases	Birr 5,950,000	Birr 4,000,000	Birr 9,950,000

Schedule 4: Direct Manufacturing Labor Costs Budget For the Year Ending December 31, 2013					
	Budgeted production **(Schedule 2)**	**Direct Manufacturing Labor-Hours per Unit**	**Total Hours**	**Hourly Wage Rate**	**Total direct labor cost budget**
Casual	60,000	4	240,000	Birr 20	Birr 4,800,000
Deluxe	10,000	6	60,000	20	1,200,000
Total			300,000		Birr 6,000,000

Schedule 5: Manufacturing Overhead Costs Budget For the Year Ending December 31, 2012			
	Casual	Deluxe	Total
Variable manufacturing overhead - Casual (birr 8 per dl hour * 240,000 dl hours) - Deluxe (birr 8 per dl hour * 60,000 dl hours)	Birr 1,920,000	Birr 480,000	Birr 2,480,000
Fixed manufacturing overhead	2,000,000	3,000,000	5,000,000
Total budgeted manufacturing overhead	Birr 3,920,000	Birr 3,480,000	Birr 7,480,000

Schedule 6A: Unit Costs of Ending Finished Goods Inventory December 31, 2012					
		Product			
		Casual Tables		**Deluxe Tables**	
	Cost per Unit of Input	**Input per Unit**	**Total cost per unit of**	**Input per Unit**	**Total cost per unit of**

		of Output	**output**	**of Output Total**	**output**
Red Oak	Birr 7	12 b.f.	Birr 84	12 b.f.	Birr 84
Granite	10	6 sq.ft.	60	8 sq.ft.	80
Direct manufacturing labor	20	4 hrs	80	6 hrs	120
Variable Manufacturing overhead	Birr 8	4	32	6	48
Fixed manufacturing overhead	33.3 and 300 respectively		33.3		300
Total			Birr 289.3		Birr 632

Under the FIFO method, this unit cost is used to calculate the cost of target ending inventories of finished goods in Schedule 6B.

Schedule 6B: Ending Inventories Budget December 31, 2013				
	Quantity	**Cost per Unit**		**Total**
Direct materials				
- Red Oak	80,000	Birr 7	Birr 560,000	
- Granite	20,000	10	200,000	760,000
Finished goods				
- Casual	11,000	289.3	3,182,300	
- Deluxe	500	632	316,000	3,498,300

Schedule 7: Cost of Goods Sold Budget For the Year Ending December 31, 2012			
	From schedule		**Total**
Beginning finished goods inventory, January 1, 2012	Given*		Birr 646,000
Direct materials used	3A	Birr 10,280,000	
Direct manufacturing labor	4	6,000,000	
Manufacturing overhead	5	7,480,000	
Cost of goods manufactured			23,760,000
Cost of goods available for sale			24,406,000

Deduct ending finished goods inventory, December 31, 2012	6B		3,498,300
Cost of goods sold			20,907,700

Schedule 8: Nonmanufacturing Costs Budget For the Year Ending December 31, 2012			
Variable non manufacturing costs	0.14 * 38,000,000	Birr 5,320,000	
Fixed non manufacturing costs		7,000,000	
Total budgeted non manufacturing costs			Birr 12,320,000

XY-Furniture Company Budgeted income statement For the year ended on December, 2013		
Revenue	Schedule 1	Birr 38,000,000
Cost of goods sold	Schedule 7	(20,907,700)
Gross margin		17,092,300
Non manufacturing costs	Schedule 8	(12,320,000)
Operating income		Birr 4,772,300

CHAPTER TEN

10. Flexible budget and variance analysis

Introduction

In the previous chapter, you saw how budgets help managers with their planning function. We now explain how budgets, specifically flexible budgets, are used to compute variances, which assist managers in their control function. Flexible budgets and variances enable managers to make meaningful comparisons of actual results with planned performance, and to obtain insights into why actual results differ from planned performance. They form the critical final function in the five step decision-making process, by making it possible for managers to evaluate performance and learn after decisions are implemented. In this chapter and the next, we explain

how.

10.1 Flexible versus static budget

The **static budget**, or master budget, is based on the level of output planned at the start of the budget period. The master budget is called a static budget because the budget for the period is developed around a single (static) planned output level. A **flexible budget** calculates budgeted revenues and budgeted costs based on *the actual output in the budget period*. The flexible budget is prepared at the end of the period, after the actual output of is known. The flexible budget is the *hypothetical* budget that an organization would have prepared at the start of the budget period if it had correctly forecast the actual output. In other words, the flexible budget is not the plan an organization initially had in mind for a budget period. Rather, it is the budget an organization *would have* put together for a budget period if it knew in advance its output.

Note: The *only* difference between the static budget and the flexible budget is that the static budget is prepared for the planned output, whereas the flexible budget is based on the actual output. The static budget is being "flexed," or adjusted, from planned output to actual.

An organization develops its flexible budget in three steps.

Step 1: Identify the Actual Quantity of Output.

Step 2: Calculate the Flexible Budget for Revenues Based on Budgeted Selling Price and Actual Quantity of Output.

Step 3: Calculate the Flexible Budget for Costs Based on Budgeted Variable Cost per Output Unit, Actual Quantity of Output, and Budgeted Fixed Costs.

Characteristics of flexible budget

A **flexible budget** summarizes costs (expenses) and revenues for several different volume levels within a relevant range. Flexible budgets separate variable costs from fixed costs; the variable costs put the "flex" in the flexible budget.To create a flexible budget, you need to know the following:

- Budgeted selling price per unit
- Variable cost per unit (which includes variable cost of goods sold and all variable operating expenses)

- Total fixed costs (such as fixed cost of goods sold and fixed operating expenses)
- Different volume levels within the relevant range

Variance analysis

Variances lie at the point where the planning and control functions of management come together. They assist managers in implementing their strategies by enabling **managementby exception**. This is the practice of focusing management attention on areas that are not operating as expected (such as a large shortfall in sales of a product) and devoting less time to areas operating as expected.

Variances are also used in performance evaluation and to motivate managers. Production-line managers at Maytag may have quarterly efficiency incentives linked to achieving a budgeted amount of operating costs. Sometimes variances suggest that the company should consider a change in strategy. For example, large negative variances caused by excessive defect rates for a new product may suggest a flawed product design. Managers may then want to investigate the product design and potentially change the mix of products being offered.

Variance analysis contributes in many ways to making the five-step decision-making process more effective. It allows managers to evaluate performance and learn by providing a framework for correctly assessing current performance. In turn, managers take corrective actions to ensure that decisions are implemented correctly and that previously budgeted results are attained. Variances also enable managers to generate more informed predictions about the future, and thereby improve the quality of the five-step decision making process.

Static Budget Variances

A static budget variance is the difference between an actual result and a budgeted amount in the static budget.

A Favorable variance (F) is a variance that increases operating income relative to budgeted amount. For revenue items, F means actual revenues exceed budgeted revenues. For cost items, F means actual costs are less than budgeted costs. An unfavorable variance (U) is a variance that decreases operating income relative to the budgeted amount.

Static budget based variance analysis provides level o and level 1 analysis:

Level 0 analysis

Actual results (operating income)	XX
Less: Static-budget amount (operating income)	XX
Static- budget variance of operating income	XXX

Level 1 Analysis

Level 1 analysis provides mangers with more detailed information on the operating income static budget variance.

	Actual results	**Static budget variance**	**Static budget**
Units sold	XX	XX	XX
Revenues	XX	XX	XX
Variable costs - Direct materials - Direct mfg labor - Variable mfg OH Total variable cost	 - Xx - Xx - xx xx	 - xx - xx - xx xx	 - xx - xx - xx xx
Contribution margin	XX	XX	XX
Fixed costs	XX	XX	XX
Operating income	XX	XX	XX

Although level 1 analysis provides more information (detailed) than does level 0 analysis, mangers might require still more detail about the causes of variance. A flexible budget enables this more detailed level of analysis.

10.2 Flexible budget variance and sales volume variance (level 2 variance analysis)

- **Performance evaluation using flexible budget**

Comparing the flexible budget to actual result accomplishes an important performance evaluation purpose. There are basically two reasons why actual results might differ from master budget.

1. Sales and other cost activities were not the same as originally forecasted.
2. Revenue or variable cost per unit of activity and fixed costs per period were not as expected.

Because the flexible budget is prepared at actual level of activities, any variance between the flexible budget and actual results cannot be due to changes in activity levels. Thus flexible budget variances must be due to departures of actual costs and revenues from flexible budget format amount i.e. because of pricing or cost control.

And any differences between the master budget and flexible budget are due to activity level variances or sales volume variance. Thus flexible budget is used as a bridge between static budget and actual results.

When evaluating performance, it is useful to distinguish between effectives (the degree to which a target is met) and efficiency the degrees to which in puts are used in relation to given level of out puts). Flexible budget variances measure the efficiency of operations at actual level of activity.

Performance measures increasingly focus on reducing the total cost of the company as a whole. Such a focus is central to the total value chain analysis theme.

- **Efficiency is measured on resources utilization rate**

Flexible budget variance—arises because the company had different revenues and/or costs than expected for the *actual* units sold. The flexible budget variance occurs because sales price per unit, variable cost per unit, and/or fixed cost was different than planned on the budget.

The **flexible-budget variance** is the difference between an actual result and the corresponding flexible-budget amount.

Flexible budget variance is the difference between the actual results and the flexible-budget amount based on the level of output actually achieved in the budget period. The sales-volume variance is the difference between the flexible budget amount and the static budget amount. Flexible budget variances and sales volume variances are level 2 analysis.

FB Variance = Actual results – Flexible budget amount

Sales volume variance—arises because the actual number of units sold differed from the number of units on which the static budget was based. Sales volume variance is the volume

difference between actual sales and budgeted sales.

The **sales-volume variance** is the difference between a flexible-budget amount and the corresponding static-budget amount.

Sales Volume Variance = Flexible Budget for the number of units actually sold - Static (Master) Budget for the number of units expected to be sold

Sales volume variance = flexible budget amount – static budget amount

Sales- volume variance represents the difference caused solely by the difference in the quantities of units sold from that in the static budget.

Performance evaluation by using flexible budget variance analysis for price and efficiency (level 3 variance analysis)

- **Flexible budget variance of revenue:**The flexible budget variance pertaining to revenue is often called selling price variance because it arises solely from differences between the actual selling price and the budgeted selling price.

Selling price variance =	***Actual Selling price***	***– budgeted selling price***	***X***	***Actual unit sold***

- **Price variance and efficiency variance for direct cost inputs**

To gain further insight, almost all companies subdivide the flexible-budget variance for direct-cost inputs into two more-detailed variances:

1. A price variance that reflects the difference between an actual input price and a budgeted input price

2. An efficiency variance that reflects the difference between an actual input quantity and a budgeted input quantity

The information available from these variances (which we call level 3 variances) helps managers to better understand past performance and take corrective actions to implement superior strategies in the future. Managers generally have more control over efficiency variances than

price variances because the quantity of inputs used is primarily affected by factors inside the company (such as the efficiency with which operations are performed), while changes in the price of materials or in wage rates may be largely dictated by market forces outside the company

- **Actual input data from past periods.** Most companies have past data on actual input prices and actual input quantities. These historical data could be analyzed for trends or patterns to obtain estimates of budgeted prices and quantities. The advantage of past data is that they represent quantities and prices that are real rather than hypothetical and can serve as benchmarks for continuous improvement. Another advantage is that past data are typically available at low cost. However, there are limitations to using past data. Past data can include inefficiencies such as wastage of direct materials. They also do not incorporate any changes expected for the budget period.
- **Data from other companies that have similar processes.** The benefit of using data from peer firms is that the budget numbers represent competitive benchmarks from other companies. The main difficulty of using this source is that input price and input quantity data from other companies are often not available or may not be comparable to a particular company's situation.
- **Standards developed.** A **standard** is a carefully determined price, cost, or quantity that is used as a benchmark for judging performance. Standards are usually expressed on a per-unit basis. There are two advantages of using standard times: (i) They aim to exclude past inefficiencies and (ii) they aim to take into account changes expected to occur in the budget period.

A standard in put is a carefully predetermined quantity of inputs (such as pounds of materials or manufacturing labor-hours) required for one unit of output.

A standard cost is a carefully predetermined cost. Standard costs can relate to units of inputs or units of out puts. Budgeted cost for each variable direct cost item is computed as follows:

Standard in put allowed For one output unit	***X***	***Standard cost per input unit***

A price variance is the difference between the actual price and the budgeted price multiplied by the actual quantity of input in question (Such as direct material purchased or used). Price variance is sometimes called in put- price variances or rate variance (especially when those

variances are for direct labor).

Price variance = ***(Actual price of Input – Budgeted price of in put) X Actual quality of in put***

An efficiency variance is the difference between the actual quantity of input used (such as yards or cloth of direct materials) and the budgeted quantity of input that should have used, multiplied by the budgeted price. Efficiency variances are sometimes called usage variances.

Efficiency variance:

(Actual quantity Of input used – Budgeted quantity of input allowed for Actual out put) X Budgeted price of in put

The idea is that an organization is inefficient if it uses more inputs than budgeted for the actual output units achieved, and it is efficient if it uses fewer in puts than budgeted for the actual output units achieved.

This level 3 information helps managers had better understand past performance and better plan for future performance.

Always consider a broad range of possible cavies in order to comment on variances.

Favorable direct material price variance could be due to one or more of the following reasons:

- Good price negotiation by purchasing manger
- Purchased larger lot sizes than budgeted, thus obtaining quaintly discount.
- Materials price decreased unexpectedly due to say industry oversupply
- Standard wrongly (unrealistically set)
- The purchasing manger received unfavorable terms on non-purchase price factors (Such as lower quality materials or minimal inspections by the suppler)

Unfavorable direct material price variance could be due to:-

- Standard wrongly (unrealistically) set
- Poor price negotiation
- Purchase of higher quality materials
- Materials price unexpectedly increased due to external shocks.

- Purchased in smaller lot sizes than budgeted and did not get quantity discount.
- Change in supplier when lower priced supplier went out of business.

Unfavorable Direct-labor price variance could be due to: -

- Standard wrongly (unrealistically) set
- Use of higher skill mix than budgeted
- Poor negotiations with labor
- Unexpected labor shortage due to external factors
- Personnel manger hired under skilled workers
- Production scheduler inefficiently scheduled work, resulting in more manufacturing labor time being used per output.
- Maintain ace department did not properly maintain machines, resulting in more manufacturing labor time being used per output.

Favorable Direct Materials Efficiency variance could be due to:-

- Standard wrongly (unrealistically) set
- Increased skills of workers
- Use of more automated machinery
- Workers did more extensive planning and scheduling for materials
- Economics of scale in production

Unfavorable direct manufacturing labor efficiency variance could be due to: -

- Standard wrongly (unrealistically) set
- Labor may be less efficient at higher output levels due to tiredness
- Scheduler assigned less skilled workers to production
- Machine break downs required more use of labor
- Lower quality materials purchased requiring more labor input to finish out puts.

ILLUSTRATION

Items	**Actual results**	**Static budget**
Units sold	10,000	12,000
Revenue	1,850,000	2,160,000
Variable cost		
Direct material	688,200	720,000
Direct manufacturing labor	198,000	192,000
Direct marketing labor	57,600	72,000
Variable manufacturing OH	130,500	144,000
Variable marketing QH	45,700	60,000
Fixed costs	705,000	710,000

	Budgeted usage and cost			**Actual usage and cost**		
	Input per output	**Price per input**	**Total cost per output**	**Input per output**	**Price per input**	**Total cost per output**
Direct material	2	Birr 30	Birr 60	2.22	Birr 31	68.82
Direct manufacturing labor	0.8	Birr 20	16	0.9	22	19.8
Direct marketing labor	0.25	Birr 24	6	0.2304	25	5.76

Required:

Determine level 0, level 1, level 2, and level 3, variances analysis. Level 3 analysis is applied only direct input costs i.e., direct materials, direct manufacturing labor and direct marketing labor.

Solution

Level 0 analysis

Actual operating income	$25,000
Budgeted operating income	262,000
Static budget variance of operating income	237,000 U

Level 1 analysis

	Actual result (a)	Static budget variance (b) = (a) – (c)	Static budget amount (c)
Units sold	10,000	2000 U	12,000
Revenue	1,850,000	310,000 U	2,160,000
Variable costs	1,120,000	68,000 F	1,188,000
Contribution margin	730,000	237,000 U	972,000
Fixed costs	705,000	5,000 F	710,000
Operating income	25,000	273,000U	262,000

Birr 237,000 U
Total static budget variance

Effectiveness can't be measured by level 0 and 1 analysis.

Level 2 analysis

	Actual results	Flexible budget variance	Flexible budget amount	Sales volume variance	Static budget amount
Units sold	10,000	0	10,000	2,000 U	12,000
Revenue	1,850,000	50,000 F	1,800,000	360,000 U	2,160,000
Variable costs	1,120,000	130,000 U	990,000	198,000 F	1,188,000
Contribution margins	730,000	80,000 U	810,000	162,000 U	972,000
Fixed costs	705,000	5,000 F	710,000	0	710,000
Operating income	25,000	75,000 U	100,000	162,000 U	262,000

birr 75,000 **birr 162,000**
total flexible budget variance **total sales volume variance**
birr 237,000
total static budget variance

Level 3 analyses

Selling price variance (flexible budget variance of revenue)
Selling price variance = (actual selling price – budgeted selling price) * actual quantity
= (birr 185 - 180) * 10,000 = birr 55,000 F

Direct input price variance

	Actual price of inputs – budgeted price of inputs	Actual quantity of input per output	Direct input price variance
Direct material	31-30 = 1	22,200 (22.2 * 10,000)	22,200 U

Direct manufacturing labor	22 – 20 = 2	9,000 (0.9 * 10,000)	18,000 U
Direct marketing labor	25 – 24 = 1	2,304 (0.2304 * 10,000)	2,304 U

Direct input efficiency variance

	Actual input used – budgeted input allowed for actual output units	**Budgeted price of input**	**Efficiency variance**
Direct material	22,200 – 20,000 = 2,200	30	66,000 U
Direct manufacturing labor	9,000 – 8,000 = 1,000	20	20,000 U
Direct marketing labor	2,304 – 2,500 = 196	24	4,704 F

Summary of level 3 analysis

	Actual Costs Incurred (Actual Input Quantity * Actual Price)	**Actual Input Quantity * budgeted price**	**Flexible Budget (Budgeted Input Quantity Allowed for Actual Output * Budgeted Price)**
Direct materials	(22,200 sq. yds. * birr 31/sq. yd.) = birr 688,200	(22,200 sq. yds. * birr 30/sq. yd.) = birr 666,000	(10,000 units *2 sq. yds./unit * birr 30/sq. yd.) = birr 600,000
Level 3	**Price variance = birr 22,200 U**	**Efficiency variance = birr 66,000 U**	
Level 2	**Flexible budget variance = birr 88,200 U**		
Direct manufacturing labor	9,000 hours * birr 22/hr. = birr 198,000	9,000 hours * birr 20/hr = birr 180,000	10,000 units * 0.8 hr./unit * birr 20/hr. = birr 160,000
Level 3	**Price variance = birr 18,000 U**	**Efficiency variance = birr 20,000U**	
Level 2	**Flexible budget variance = birr 38,000 U**		
Direct marketing labor	**2,304 hours * birr 25/hr = birr 57,600**	**2,304 hours * birr 24/hr = birr 55,296**	**10,000 * 0.25 hr/unit * birr 24/hr = birr 60,000**
Level 3	**Price variance = birr 2,304 U**	**Efficiency variance = birr 4,704 F**	
Level 2	**Flexible budget variance = birr 2,400 F**		

Flexible budget variance

The best source of information for efficiency variance is production department will the purchasing manger is responsible for price variance.

Direct material flexible budget variance = 22,200 U + 66,000 U = birr 88,200 U

Direct manufacturing labor FBV = 18,000 U + 20,000 U = 38, 000 U

Direct marketing labor FBV= 2,304 U + 4,704 F = 2, 400 F

Illustration 2:ABC enterprises manufacture tires for the formula motor racing circuit. For August 2003, it budgeted to manufacture and sell 3000 tires at variable costs of birr 74 per tire and total fixed cost of birr 54,000. The budgeted selling price was birr 110 per tire. Actual results in August 2003 were 2800 tires manufactured and sold at a selling price of birr112 per tire. The actual total variable costs were birr 229600 and the actual total fixed costs were birr 50,000.

Required: Prepare a performance report that uses a fixable budget and a static budget

Solution: Preparation of performers report

	Actual result	**Flexible budget variance**	**Flexible budget amount**	**Sales volume variance**	**Static budget amount**
Units sold	2,800	0	2,800	200 U	3,000
Revenue	313,600	5,600 F	308,000	22,000 U	330,00
Variable cost	229,600	22,400 U	207,200	14,800 F	222,000
Contribution margin	84,000	16,800 U	100,800	7,200 U	108,000
Fixed cost	50,000	4,000 F	54,000	0	54,000
Operating income	34,000	12,800 U	46,800	7,200 U	54,000
Static budget variance = birr 20,000 U					

10.3 Flexible budget variance in detail for factory overhead

- Effective planning of variable overhead costs involves undertaking only value added variable overhead activities and managing the **cost driver** of those activities in the most efficient way.
- Effective planning of fixed overhead costs includes undertaking only value added fixed overhead activities and then determining the appropriate level for those activities.

A value added cost is once that is eliminated would reduce the value customers obtain from using the product or service. Thus, only non-value added costs should be eliminated.

At the start of an accounting period, management will likely have made most of the key decisions that determine the level of fixed overhead costs to be incurred. In contrast, day-to-day ongoing management decisions play a larger role in determining the level of variable overhead costs incurred in that period.

The key added challenge with planning fixed overhead is choosing the appropriate level of capacity of investment that will benefit the company over an extended time period.

Example, Leasing

Failure to lease sufficient machine capacity will result in an inability to meet demand and thus in-lost sales of output. In contrast, if the firm greatly overestimates demand, it will incur additional fixed leasing costs on machines not fully utilized during the year.
The firm should examine how each of the activities in its variable overhead cost pools is related to delivering a product or service to customers.

Variable Overhead Variance Analysis

Variable overhead cost allocation rates can be developed and budgeted variable overhead rate per output can be determined as follows:

$$\text{Budgeted costs per input unit} = \frac{Budgeted VOH\ costs}{Budgeted cost allocation base}$$

Budgeted VOH rate per output = Budgeted in puts allowed per output X Budgeted cost Per input unit

- A variable overhead flexible budget variance measures the difference between the actual variable overhead costs and the flexible budget variable overhead costs.
- The variable overhead flexible budget variance can be classified as efficiency variance and spending variance. The efficiency variance measures the efficiency with which the cost allocation base is used. The variable overhead spending variance is the difference between the actual amount of variable overhead incurred and the budgeted amount allowed for the actual quantity of the variable overhead allocation base used for the actual output units produced.

VOH flexible Actual Flexible- budget

Budget variance = results - amount

VOH efficiency variance = Δ unit of VOH cost Allocation base allowed For actual output X Budgeted variable overhead rate

VOH EV = (Actual units of Variable overhead Used for actual output - Budgeted units of variable OH cost-allocation base allowed for actual output) X Budgeted variable overhead rate

The efficiency variance for variable overhead cost is based on the efficiency with which the cost-allocation base is used.

VOH spending Variance = Δ VOH cost per unit Of cost allocation base X Actual quantity VOH cost allocation Base used for actual out put

VOH SV = (Actual variable OH cost per unit Of cost allocation Base - Budgeted VOH cost per unit of cost –allocation base) X Actual quantity of VOH cost-allocation base used for actual output

Illustration

Items	Actual results	Flexible budget amount
Output units	10,000	10,000
Machine hours	4,500	4,000
Machine hour per output (2/1)	0.45	0.4
Variable manufacturing OH cost	Birr 130,500	120,000
VMOH costs per machine hour (4/2)	Birr 29	Birr 30
VMOH costs per output (4/1)	13.05	12

Required: - compute the following variable manufacturing overhead variances

A. VOH. FBV (B) VOHEV (c) VOH SV

Solution

A) VOH FBV = Actual results - Flexible budget amount
= 130,500 - 120,000 = 10,500U

B) VOH_{EV} = Δ units of OH cost Allocation base Used for actual out put X Budgeted VOH rate
= (4,500 – 4,000) x 30 = birr 15,000U

C) VOHSV = Δ variable OH cost Per unit of cost allocation base X Actual quantity of VOH cost allocation base used for actual out put
= (29-30) 4500 = birr 4,500 F

CHAPTER ELEVEN

11. Pricing decision and cost management

Introduction

Most companies make a tremendous effort to analyze their costs and prices. They know if the price is too high, customers will look elsewhere, too low, and the firm won't be able to cover the cost of making the product. Some companies, however, understand that it is possible to charge a low price to stimulate demand and meet customer needs while relentlessly managing costs to earn a profit.

11.1 Major influences on pricing decision

Customers, Competitors, and Costs

Customers, competitors, and costs influence prices through their effects on demand and supply; customers and competitors affect demand, and costs affect supply.

Customers

Customers influence price through their effect on the demand for a product or service, based on factors such as the features of a product and its quality. Companies must always examine pricing decisions through the eyes of their customers and then manage costs to earn a profit. The product price should not be too high than the value given the customers.

Competitors

No business operates in a vacuum. Companies must always be aware of the actions of their competitors. At one extreme, alternative or substitute products of competitors hurt demand and force a company to lower prices. At the other extreme, a company without a competitor is free to set higher prices. When there are competitors, companies try to learn about competitors' technologies, plant capacities, and operating strategies to estimate competitors' costs—valuable information when setting prices. Because competition spans international borders, fluctuations in exchange rates between different countries' currencies affect costs and pricing decisions. For example, if the yen weakens against the U.S. dollar, Japanese products become cheaper for American consumers and, consequently, more competitive in U.S. markets.

Costs

Costs influence prices because they affect supply. The lower the cost of producing a product, the

greater the quantity of product the company is willing to supply. Generally, as companies increase supply, the cost of producing an additional unit initially declines but eventually increases. Companies supply products as long as the revenue from selling additional units exceeds the cost of producing them. Managers who understand the cost of producing products set prices that make the products attractive to customers while maximizing operating income.

Weighing Customers, Competitors, and Costs

Surveys indicate that companies weigh customers, competitors, and costs differently when making pricing decisions. At one extreme, companies operating in a **perfectly competitive** market sell very similar commodity-type products, such as wheat, rice, steel, and aluminum. These companies have no control over setting prices and must accept the price determined by a market consisting of many participants. **Cost information** is only helpful in deciding the quantity of output to produce to maximize operating income.

In **less-competitive markets**, such as those for cameras, televisions, and cellular phones, products are differentiated, and all three factors affect prices: The value customers place on a product and the prices charged for competing products affect demand, and the costs of producing and delivering the product influence supply. As **competition lessens even more**, the key factor affecting pricing decisions is the customer's willingness to pay based on the value that customers place on the product or service, not costs or competitors. In the extreme, there are **monopolies**. A monopolist has no competitors and has much more leeway to set high prices. Nevertheless, there are limits. The higher the price a monopolist sets, the lower the demand for the monopolist's product as customers seek substitute products. In the monopoly market customers' value and costs play important role in pricing.

11.2 Costing & pricing for short – run & long – run

When reducing costs, a company must consider costs across all its value-chain business functions, from R&D to customer service. In computing the costs within these functions that are relevant in a pricing decision, the time horizon of the decision is critical. Most pricing decisions are either short run or long run. Many pricing decisions have both short-run and long-run implications.

11.2.1 Costing and Pricing for the Short Run

Short run pricing decisions are responses to short run demand and supply conditions. Short-run pricing decisions typically have a time horizon of less than a year and include decisions such as (a) pricing a *one-time-only special order* with no long-run implications and (b) adjusting product mix and output volume in a competitive market. As it was discussed under chapter 2 acceptance or rejection of the special order will not affect the revenues (units sold or the selling price per unit) from existing sales outlets. The customer is unlikely to place any future sales orders.

Two key factors affect short-run pricing.

1. When making short-run pricing decisions companies only consider those (relevant) costs that will change in total as a result of the decision.

2. Pricing is done opportunistically based on demand and competition: Short-run pricing is opportunistic. Prices are decreased when demand is weak and competition is strong and increased when demand is strong and competition is weak. As we will see, long-run prices need to be set to earn a reasonable return on investment.

Illustration:

The English Tea Company (ETC) operates a plant with a monthly capacity of 1 million cases (each case consisting of 200 cans) of iced tea. Current production and sales are 600,000 cases per month. The selling price is €90 per case. Costs of R&D and product and process design at ETC are negligible. Customer-service costs are also small and are included in marketing costs. All variable costs vary with respect to output units (cases), and production is equal to sales. The variable cost per case and the fixed cost per case (based on a production quantity of 600,000 cases per month) are as follows:

	Variable cost per case	Fixed cost per case	Variable and fixed cost per case
Manufacturing costs			
- Direct material cost	€ 7	-	€7
- Packaging costs	18	-	18
- Direct manufacturing labor cost	4	-	4
	6	13	19
- Manufacturing overhead	35	13	48

costs Manufacturing costs			
Marketing costs	5	16	21
Distribution costs	9	8	17
Full product costs	€49	€37	€86

Variable manufacturing overhead of €6 per case is the cost of heating, cooling and lighting. Details of the fixed manufacturing overhead costs and their per case unitized costs (based on a production quantity of 600,000 cases per month) are as follows:

	Total fixed manufacturing overhead costs	Fixed manufacturing overhead costs per case
Depreciation and production support costs	€3,000,000	€5
Materials procurement costs	600,000	1
Salaries paid for process changeover	1,800,000	3
Product and process engineering costs	2,400,000	4
Total fixed manufacturing overhead costs	€7,800,000	€13

Greek Tea (GT) is constructing a new plant to make iced tea in Athens. The plant will not open for four months. GT's management, however, wants to start selling 250,000 cases of iced tea each month for the next 4 months in Greece. GT has asked ETC and two other companies to bid on this special order. From a manufacturing-cost viewpoint, the iced tea to be made for GT is identical to that currently made by ETC. If ETC makes the extra 250,000 cases, the existing total fixed manufacturing overhead (€7,800,000 per month) would continue to be incurred. In addition, ETC would incur a further €300,000 in fixed manufacturing overhead costs (materials procurement costs of €100,000 and process-changeover costs of €200,000) each month. No additional costs will be required for R&D, design, marketing, distribution or customer service. The 250,000 cases will be marketed by GT in Greece, where ETC does not sell its iced tea.

A senior manager of GT notifies each potential bidder that a bid above €45 per case will probably be non-competitive. ETC knows that one of its competitors, with a highly efficient plant, has sizable idle capacity and will definitely bid for the contract. What price should ETC bid for the 250,000-case contract?

Solution:

ETC should analyze the relevant costs of felling the order. In this example, only manufacturing costs such as direct and indirect variable manufacturing costs plus materials procurement costs and process-changeover salaries related to the special order. *Existing* fixed manufacturing overhead costs are irrelevant. Why? Because these costs will not change if the special order is accepted. But the *additional* materials procurement and process-changeover salaries of €300,000 per month for the special order are relevant because these additional fixed manufacturing costs will only be incurred if the special order is accepted. All other costs in the value chain will be unaffected if the special order is accepted, so they are irrelevant.

Monthly relevant costs for ETC: the 250,000-case one-offspecial order

Direct materials		(250,000 cases × €7) €1,750,000
Packaging		(250,000 cases × €18) 4,500,000
Direct manufacturing labour		(250,000 cases × €4) 1,000,000
Variable manufacturing overhead		(250,000 × €6) 1,500,000
Fixed manufacturing overhead - Materials procurement - Salaries paid for process changeover Total fixed manufacturing overhead	 €100,000 200,000	 300,000
Total relevant costs		€9,050,000
Per case relevant costs: €9,050,000 ÷ 250,000 cases = €36.20		

Cost data, though key information in ETC's decision on the price to bid, are not the only inputs. ETC must also consider business rivals and their likely bids. For example, if ETC knows that its under-capacity rival plans to bid €39 per case, ETC will bid €38 per case instead of €40 per case.

11.2.2 Costing and Pricing for the Long Run

Long-run pricing decisions have a time horizon of a year or longer and include pricing a product in a market where there is some flexibility/freedom in setting price. Long-run pricing is a strategic decision designed to build long-run relationships with customers based on stable and predictable prices. A stable price reduces the need for continuous monitoring of prices, improves planning, and builds long-run buyer–seller relationships. But to charge a stable price and earn the

target long-run return, a company must, over the long run, know and manage its costs of supplying products to customers. As we will see, relevant costs for long-run pricing decisions include *all* future fixed and variable costs. Companies consider all future variable and fixed costs as relevant and use a market based or a cost-based pricing approach to earn a target return on investment.

The starting point for long term pricing decisions can be:

- **Market-based**

The market-based approach to pricing *starts* by asking: Given what our customers want and how our competitors will react to what we do, what price should we charge? The cost-based approach to pricing *starts* by asking: What does it cost us to make this product, and hence what price should we charge that will recoup our costs and produce a desired profit? Both approaches consider customers, competitors and costs. Only their starting points differ.

In very competitive markets (for example, oil and gas, and airlines) the market based approach is logical. The items produced or services provided by one company are very similar to those produced or provided by others, so companies have no influence over the prices to charge.

11.3. Target costing for target pricing

Market-based pricing starts with a target price. A **target price** is the estimated price for a product or service that potential customers are willing to pay. This estimate is based on an understanding of customers' perceived value for a product or service and how competitors will price competing products or services. This understanding of customers and competitors is becoming increasingly important for three reasons:

1. Competition from lower-cost producers is continually restraining prices.
2. Products are on the market for shorter periods of time, leaving less time and opportunity to recover from pricing mistakes, loss of market share, and loss of profitability.
3. Customers are becoming more knowledgeable and incessantly demanding products of higher and higher quality at lower and lower prices.

Developing target prices and target costs typically entails the following steps:

Step 1: Develop a product that satisfies the needs of potential customers. The first step under the market based approach understands the customer's perceived value. A company's sales and marketing organization, through close contact and interaction with customers, identifies customer needs and perceptions of product value. Companies such as Apple also conduct market research on features that customers want and the prices they are willing to pay for those features for products such as the iPhone and the Macintosh computer.

Step 2: Choose a *target price* based on customers' perceived value for the product and the prices competitors charge, and a *target operating profit per unit.*

Step 3: Derive a *target cost per unit* by subtracting the target operating profit per unit from the target price. Target costs include *all* future costs, variable costs and costs that are fixed in the short run, because in the long run, a company's prices and revenues must recover all its costs if it is to remain in business. Contrast relevant costs for long-run pricing decisions (all variable and fixed costs) with relevant costs for short-run pricing decisions (costs that change in the short run, mostly but not exclusively variable costs).

Step 4: Perform *value engineering* to achieve target costs. **Value engineering** is a systematic evaluation of all aspects of the value-chain business functions, with the objective of reducing costs while satisfying customer needs. Value engineering can result in improvements in product designs, changes in materials specifications or modifications in process methods. Two key concepts in value engineering and in managing value-added and non-value added costs are cost *incurrence* and *locked-in costs*.

Cost incurrence and locked in cost: Cost incurrence occurs when a resource is sacrificed or used up. Costing systems emphasize cost incurrence. They recognize and record costs only when costs are incurred. **Locked-in costs (designed-in costs)** are those costs that have not yet been incurred but that will be incurred in the future on the basis of decisions that have already been made.

In summary, the key steps in value-engineering are as follows:

- Understanding customer requirements, value-added and non-value-added costs
- Anticipating how costs are locked in before they are incurred

- Using cross-functional teams to redesign products and processes to reduce costs while meeting customer needs

Illustration:

Consider the **Astel** Computer Company. **Astel** manufactures two brands of personal computers (PCs): Deskpoint and Provalue. Deskpoint is Astel's top-of-the-range product, a Pentium 4 chip-based PC sold through computer dealers to large organizations and government accounts. Our analysis focuses on pricing Provalue, a less powerful Pentium chip-based machine sold through catalogues and mass merchandisers to individual consumers and small organizations. The company has three overhead cost pools such as material handling of $80 per order, testing and inspection of $2 per testing hour and rework of $100 per unit reworked.

The following information, which indicates the resources used to manufacture Provalue in 2007:

1 Direct materials costs per unit of Provalue are $460.

2 Direct manufacturing labor costs per unit of Provalue are $64.

3 Direct fixed costs of machines used exclusively for the manufacture of Provalue are $11,400,000.

4 Number of orders placed to purchase components required for the manufacture of Provalue is 22,500. (We assume for simplicity that Provalue has 450 components supplied by different suppliers, and that 50 orders are placed for each component to match Provalue's production schedule.)

5 Number of testing-hours used for Provalue is 4,500,000 (150,000 Provalue units are tested for 30 hours per unit).

6 Number of units of Provalue reworked during the year is 12,000 (8% of the 150,000 units manufactured).

7 The R&D, design, marketing, distribution and customer service costs for the 150,000 units of Provalues were $5,400,000, 6 million, 15 million, 3,600,000, 3 million and 33 million respectively.

Astel has no opening or closing inventory of Provalue in 2007 and manufactures and sells

150,000 units at $1,000 per unit. The selling price set by Astel and its competitors in 2007 was the same.

Assume Astel expects its competitors to lower the prices of PCs that compete against Provalue by 15%. Astel's management believes that it must respond aggressively by reducing Provalue's price by 20%. At this lower price, Astel's marketing manager forecasts an increase in annual sales from 150,000 to 200,000 units. Astel's management wants a 10% target operating profit on sales revenues.

Solution:

Step 1: Product planning for Provalue: after getting the product required by customers and the products supplied by competitors, Astel is in the process of planning design modifications for Provalue. Astel is very concerned about severe price competition from several competitors.

Step 2: Target price per unit of Provalue:

Target price = $1,000 – 15% of $1,000 = $800

Step 3: Target cost per unit of Provalue:

Total target sales revenues = $800 × 200,000 units = $160,000,000

Total target operating profit = 10% × $160,000,000 = $16,000,000

Target operating profit per unit = $16,000,000 ÷ 200,000 units = $80 per unit

Target cost per unit = Target price – Target operating profit per unit

= $800 – $80 = $720

Total current costs of Provalue as showen in the table bellow = $135,000,000

Current cost per unit of Provalue = $135,000,000 ÷ 150,000 units = $900 per unit

Computation of existing full product cost during 2007

	Total manufacturing costs for 150,000 units	**Manufacturing cost per unit**
Direct manufacturing costs		
- Direct materials costs (150,000 units × $460)	- $69,000,000	- $460
- Direct manufacturing labor costs (150,000 units × $64)	- 9,600,000	- 64
- Direct machining costs (fixed costs of $11400000)	- 11,400,000	- 76
- Direct manufacturing costs	- 90,000,000	- 600

Manufacturing overhead costs - Ordering and receiving costs (22,500 orders × $80) - Testing and inspection costs (4,500,000 hours × $2) - Rework costs (12,000 units × $100) Manufacturing overhead costs	 - 1,800,000 - 9,000,000 - 1,200,000 - 12,800,000	 - 12 - 60 - 8 - 80
Total manufacturing costs	$102,000,000	$680
Operating costs - R&D costs - Design costs of products and processes - Marketing costs - Distribution costs - Customer-service costs Operating costs	 - 5,400,000 - 6,000,000 - 15,000,000 - 3,600,000 - 3,000,000 - 33,000,000	 - 36 - 40 - 100 - 24 - 20 - 220
Full product costs	$135,000,000	$900

Target costing for target pricing

The target cost per unit of $720 is substantially lower than Provalue's existing unit cost of $900. The goal is to find ways to reduce the cost per unit of Provalue by $180, from $900 to $720. The challenge in step 4 is to achieve the target cost through value engineering.

Step 4: Value engineering for Provalue: An important element of Astel's value engineering is determining the kind of **low-end PC** that will meet the needs of potential customers. For example, the existing Provalue design accommodates various upgrades that can make the PC run faster and perform calculations more quickly. It also comes with special audio features. An essential first step in the value-engineering process is to determine whether potential customers are willing to pay the price for these features. Customer feedback indicates that customers do not value Provalue's extra features.

Astel's costing system, for example, recognizes the direct materials costs of Provalue as each unit of Provalue is assembled and sold. But Provalue's direct materials costs per unit are determined much earlier when designers finalize the components that will go into Provalue. Direct materials costs per unit of Provalue are *locked in* (or *designed in*) at the product-design stage.

- **Cost-based (also called cost-plus).**

Under the cost-plus approach, price is first calculated on the basis of the costs to produce and sell a product. Typically, a mark-up, representing a reasonable return, is added to cost. Often, the price is then modified on the basis of anticipated customer reaction to alternative price levels and the prices charged by competitors for similar products. In short, market forces dictate the eventual size of the mark-up and thus the final price.

Industries, where there is more product differentiation (for example, motor vehicles, management consulting and legal services) firms have some discretion over prices, products and services. Companies choose prices and product and service features on the basis of anticipated customer and competitor reactions. A final decision on price, product and service is made after evaluating these external influences on pricing along with the costs to produce and sell the product. The mark up rate can be depends up on:

Illustration: We illustrate a cost-plus pricing formula for Provalue II assuming Astel uses a 12% markup on the full unit cost of the product when computing the selling price. Suppose Astel's (pretax) target rate of return on investment is 18% and Provalue II's capital investment is $96 million. The target annual operating income for Provalue II is as follows:

Cost base (full unit cost of Provalue II) ……. $720.00
Markup component of 12% (0.12 * $720) ……. 86.40
Prospective selling price ……. $806.40

One way is to choose a markup to earn a *target rate of return on investment*. The **target rate of return on investment** is the target annual operating income divided by invested capital. Invested capital can be defined in many ways. In this chapter, we define it as total assets—that is, long-term assets plus current assets. Suppose Astel's (pretax) target rate of return on investment is 18% and Provalue II's capital investment is $96 million. The target annual operating income for Provalue II is as follows:

Invested capital ……. $96,000,000
Target rate of return on investment …… 18%

Target annual operating income (0.18 * $96,000,000)…… $17,280,000
Target operating income per unit of Provalue II ($17,280,000 ÷ 200,000 units…….. $ 86.40

This calculation indicates that Astel needs to earn a target operating income of $86.40 on each unit of Provalue II. The markup ($86.40) expressed as a percentage of the full unit cost of the product ($720) equals 12% ($86.40 ÷ $720).

Note:

Full recovery of all costs of the product: In the long run, the price of a product must exceed the full cost of the product if a company is to remain in business. Using just the variable cost as a base may tempt managers to cut prices as long as prices are above variable cost and generate a positive contribution margin.

Price stability: Managers believe that using the full cost of the product as the basis for pricing decisions promotes price stability, because it limits the ability and temptations of sales persons to cut prices. Stable prices facilitate more-accurate forecasting and planning.

Simplicity: A full-cost formula for pricing does not require a detailed analysis of cost behavior patterns to separate product costs into fixed and variable components. Variable and fixed cost components are difficult to identify for many costs such as testing, inspection, and setups.

Life-cycle budgeting estimates and life-cycle costing tracks and accumulates the costs (and revenues) attributable to a product from its initial R&D to its final customer service and support. These life-cycle techniques are particularly important when (a) a high percentage of total life-cycle costs are incurred before production begins and revenues are earned over several years, and (b) a high fraction of the life-cycle costs are locked in at the R&D and design stages.

Price discrimination is charging some customers a higher price for a given product or service than other customers. Peak-load pricing is charging a higher price for the same product or service when demand approaches physical-capacity limits. Under price discrimination and peak-load pricing, prices differ among market segments and across time periods even though the cost of providing the product or service is approximately the same.

CHAPTER TWELVE

12. Responsibility accounting

12.1 Organizational structure and responsibility accounting

Organizational structure is an arrangement of lines of responsibility within the entity. To attain the goals described in the master budget, an organization must coordinate the efforts of all its employees – from the top executive through all levels of management to every supervised worker. Coordinating the organization efforts means assigning responsibility to managers who are accountable for their actions in planning and controlling human and physical resources. Management is in essence a human activity. Budgets exist not for their own sake, but to help managers achieve their own pursuits and thereby contribute to meeting those of the organization.

Each manager, regardless of level, is in charge of a responsibility center. A **responsibility center** is a part, segment or subunit of an organization whose manager is accountable for a specified set of activities. The higher the manager's level, the broader the responsibility center he or she manages and, generally, the larger the number of subordinates who report to him or her. **Responsibility accounting** is a system that measures the plans (by budgets) and actions (by actual results) of each responsibility center.

Four major types of responsibility center are:

1 Cost center – manager accountable for costs only.

2 Revenue center – manager accountable for revenues only.

3 Profit center – manager accountable for revenues and costs.

4 Investment center – manager accountable for investments, revenues and costs.

Feedback:

Budgets coupled with responsibility accounting provide systematic help for managers, particularly if managers interpret the feedback carefully. Managers, accountants and students of management accounting sometimes use variances (the difference between the actual results and the budgeted results) appearing in the responsibility accounting system to pinpoint fault for operating problems. In looking at variances, managers should focus on whom they should ask and not on whom they should blame. Variances only suggest questions or direct attention to

persons who should have the relevant information. Nevertheless, variances, properly used, can be helpful in four ways:

- ✓ *Early warning*. Variances alert managers early to events not easily or immediately evident. Managers can then take corrective actions or exploit available opportunities.
- ✓ *Performance valuation*. Variances inform managers about how well the company has performed in implementing its strategies**.**
- ✓ *Evaluating strategy*. Variances sometimes signal to managers that their strategies are ineffective.
- ✓ *Communicating the goals of the organization*. The budget-making exercise and budgeting information are useful in conveying to managers across the organization the goals of subunits and the wider corporate goals.

12.2 Responsibility and controllability

Controllability is the degree of influence that a specific manager has over costs, revenues or other items in question. A **controllable cost** is any cost that is primarily subject to the influence of a given manager of a given responsibility center for a given time span. A responsibility accounting system could either exclude all uncontrollable costs from a manager's performance report or segregate such costs from the controllable costs. For example, a machining supervisor's performance report might be confined to quantities (not costs) of direct materials, direct manufacturing labor, power and supplies.

In practice, controllability is difficult to pinpoint:

1 Few costs are clearly under the sole influence of one manager. For example, costs of direct materials may be influenced by a purchasing manager, but such costs also depend on market conditions beyond the manager's control. Quantities used may be influenced by a production manager, but quantities used also depend on the quality of materials purchased. Moreover, managers often work in teams. How can individual responsibility be evaluated in a team decision?

2 With a long enough time span, all costs will come under somebody's control. However, most performance reports focus on periods of a year or less. A current manager may have inherited problems and inefficiencies from his or her predecessor. For example, present

managers may have to work under undesirable contracts with suppliers or trade unions that were negotiated by their predecessors..

References

Horngren, Foster, & Datar. Cost Accounting: A Managerial Emphasis. 15th Edition, 2015

Review questions

Part I: True/False: say true if the statement is correct and false if incorrect

1. Joint product is a product that is one of two or more products with relatively high sales value but not separately identifiable until the split-off point.
2. An output of a joint production process which has a relatively low sales value is main product
3. Sales method of Byproduct recognition best match periodic revenue with periodic expense
4. Sales value at split off point method to allocate joint costs is applicable when the products are sellable at the point of split.
5. The allocation method that treats both variable and fixed costs based on their behavior is dual rate method
6. The criterion of cost allocation that is based on the benefits received by different beneficiaries is cause and effect
7. Single rate method allocate total cost of an indirect cost pool to cost objects based on budgeted rate and actual usage
8. Cost allocation is the term used to describe the assignment of indirect costs to cost objects
9. Under the demand for or usage allocation base, we can clearly show the fixed cost of unused capacity
10. Every output of a joint production process is considered as product
11. All expected future costs of alternatives are relevant for making decision
12. The first step in operating budget is production budget
13. Hundred percent focus should be given for the quantitative relevant information for decision
14. A product giving the highest contribution margin per a constraining factor should be produced up to the maximum capacity regardless of the demand.
15. The first criterion to accept or reject a special order is the availability of excess capacity to fill the special order
16. If a particular product is expected to provide operating loss, the company managers should immediately drop that product regardless of its impact on the total profitability
17. If a special order give positive operating income and has impact on the regular sale, we should reject the special order
18. If the net cost of in sourcing is greater than the net cost of outsourcing, the decision should be outsourcing
19. For the short term decision both avoidable as well as unavoidable fixed costs are relevant
20. Only expected quantitative information that can create difference is relevant for decision.
21. Cash budget is a schedule presenting the expected cash receipt and disbursement and part of operational budget
22. Direct materials purchase budget is based on the budgeted direct materials usage and target ending inventory.

23. Budgeted depreciation expense is part of manufacturing overhead budget but not require cash disbursement.
24. If the price of our product is too high than the price our customers are willing to pay, we may lose demand for our product
25. A product giving the highest contribution margin per a constraining factor should be produced up to the maximum capacity regardless of the demand.
26. The first criterion to accept or reject a special order is the availability of excess capacity to fill the special order
27. If a special order give positive operating income and has impact on the regular sale, we should reject the special order
28. If the net cost of in sourcing is greater than the net cost of outsourcing, the decision should be outsourcing
29. For the short term decision both avoidable as well as unavoidable fixed costs are relevant
30. Only expected quantitative information that can create difference is relevant for decision
31. If a particular product is expected to provide operating loss, the company managers should immediately drop that product regardless of its impact on the total profitability
32. All value chain business functions costs are relevant for the long term pricing decision
33. For the short term pricing all manufacturing costs are relevant for determining price
34. In the market based approach for pricing only external factors such as customers perceived value and competitors reaction to set price are relevant
35. All expected future costs of alternatives are relevant for making decision
36. The second ranked product in the product mix decision should be produced to some extent if the demand for the first ranked product is higher than the capacity.
37. In a perfectly competitive market customers an d competitors have great impact on pricing
38. In a perfectly competitive market cost data is used to determine the maximum volume of production
39. Operating budget is evolves from operating decision and financial budget evolves from financial decision.

Part II: Multiple Choices

1. Which one of the following is/are **not true** about cost accounting?
   A. Cost accounting is guided by the Fair value principle of IFRS
   B. Cost accounting is used for planning, directing and controlling activities of the management
   C. Cost accounting is providing cost information about cost objects
   D. Cost accounting is an intermediate between managerial and financial accounting
2. If one of the costs incurred for the production of Auto in Auto Assembling company is motor and each auto requires one motor costing birr 15,000 each. Hence which one of the following is/are **not true** about the cost of motor?

A. Direct cost for the auto
B. Period cost for the auto
C. Variable cost
D. Manufacturing cost

3. The term used to describe the assignment of direct costs to cost objects is:
   A. Cost allocation C. Cost tracing
   B. Cost assignment D. Costing system
4. **Hawassa Industrial Park** at the beginning of the year 2018, planned to incur direct material and direct labor costs of birr 100 million and birr 50 million respectively. The total selling, general and administrative costs are birr 8,000,000 and manufacturing overhead cost is 30% of the total non manufacturing costs. Hence, what is the **prime** and **conversion** costs respectively of the company for the year 2014?
   A. Birr 150 million and birr 2.4 million
   B. Birr 150 million and birr 7.4 million
   C. Birr 50 million and birr 8 million
   D. Birr 174 million and birr 8 million
5. Under Q 4, what is the **product** and **period** cost of the company for the year 2014 respectively?
   A. Birr 150 million and birr 8 million
   B. Birr 174 million and birr 2.4 million
   C. Birr 174 million and birr 8 million
   D. Birr 800,000 and birr 150 million
6. All are not true about managerial and financial accounting, except (1 point)
   A. Managerial accounting promote comparability of information over organizations and over time
   B. Managerial accounting cover both financial as well as non financial quantitative information
   C. Managerial accounting do not require precision and reliability
   D. Financial accounting is guided by cost and benefit approach
   E. None of the above
7. Assume **Derba Cement Factory** can get its inputs for production nearby its factory at Wolo with cheap price than its competitors and produce the same quality product with its competitors. Then, the factory can sell its Cement at lower price than its competitors. Hence, which one of the following is/are **not true** about Derba? (1point)
   A. Derba is following product differentiation strategy
   B. Derba is excelling its competitors at cost
   C. Derba is following cost leadership strategy
   D. B and C
8. A costing system applied based on consumers' requirements and specifications is:
   A. Job costing B. Batch costing C. Process costing D. Operation costing

9. The cost of processing beyond the split off point is termed as:
   A. Joint cost
   B. Separable cost
   C. Direct cost
   D. Indirect cost
10. All of the following are true about the purposes of cost allocation, except:
   A. It is used to verify cost reimbursement in the case of government contracts
   B. It is used to measure income and asset for external reporting purpose
   C. It is used to provide total cost information for making decision
   D. It is used to motivate managers and employees at different level
   E. None of the above
11. If the demand for the product giving the highest contribution margin per constraining factor is more than the available capacity of production, which one of the following is true about the volume of production for this product?
   A. Production should be equivalent with demand
   B. Production should be equivalent with the maximum capacity
   C. Production should be less than the capacity
   D. Production should be more than the capacity
12. All are the criterion that should be considered for accepting or rejecting a special order, except:
   A. Expected revenue from the special order
   B. Expected total revenue at the company level if the special order is accepted
   C. Expected cost for the special order
   D. All of the above
13. Which one of the following is/are true about the relevance concept:
   A. Expected future revenue and cost that can create difference between alternatives
   B. All variable costs are relevant and all fixed costs are irrelevant
   C. The decision should be based on unit cost rather than total cost
   D. A and B
   E. None of the above
14. All are true about the issues that should be considered in making or buying decision, except:
   A. All variable and fixed costs of making
   B. Outsourcing cost
   C. The avoidable fixed costs
   D. The opportunity of producing another product with the freed capacity

15. Which one of the following is/are true about volume of production to achieve the target operating income:
    A. It is the break even volume
    B. It is the volume of production beyond the breakeven point and under the practical capacity level
    C. It is the volume of production beyond the breakeven point and above the practical capacity level
    D. It is the volume of production below the breakeven point
16. Which one of the following is/are true about flexible budget?
    A. A budgeted cost that should have been incurred for actual output
    B. A budgeted revenue for the expected output
    C. Use actual revenue and cost data
    D. Usually prepared at beginning of a period
17. Favorable sales volume variance in cost is :
    A. Cost saving due to the decline in actual price than the expected one
    B. Cost saving due to the decline in actual quantity utilized than the expected one
    C. Cost saving due to the decline in actual quantity produced than the expected one
    D. Cost increment due to the decline in actual quantity produced than expected one
18. Which one of the following is not true about unfavorable static budget operating income variance
    A. It might be due to unfavorable revenue and cost variance
    B. It might be due to unfavorable revenue variance outweighing favorable cost variance
    C. It might be due to unfavorable cost variance outweighing favorable revenue variance
    D. It might be due to favorable revenue variance outweighing unfavorable cost variance
19. All are true about the use of variance analysis, except
    A. Promote management by exception
    B. Use for performance evaluation
    C. Use for getting feedback about past performance
    D. It is not important for future planning and budgeting
20. Which one of the following is/are true about the concept of relevance
    F. Expected future revenue and cost that can create difference between alternatives
    G. All variable costs are relevant and all fixed costs are irrelevant
    H. The decision should be based on unit cost rather than total cost
    I. A and B
21. All are the criterion that should be considered for accepting or rejecting a special order, except
    A. The availability of excess capacity
    B. Expected revenue from the special order
    C. Expected total revenue at the company level if the special order is accepted
    D. Expected total cost at the company level if the special order is accepted

E. A and B

22. Assume the available production capacity of Addis Mojo Oil Factory is to produce up to 100,000 liters of oil per week. The current production is only up to 60,000 liters per week. The regular selling price is birr 40 per liter and the Factory is now incurring birr 25 per liter variable cost and birr 3,000 fixed cost per week. The regular customers of the Factory are located in Ethiopia. ABC merchandiser found in Djibouti asked Addis Mojo to supply up to 35,000 liters for the coming month at the special order price of birr 30 per liter. Addis Mojo is not expected to incur any more cost for the facilities to fill the special order.

i. With the available excess capacity how many liters of oil can Addis Mojo supply per week and comparing the excess capacity should the factory accept or reject the special order from ABC?

A. 35,000 liters and accept the special order
B. 40,000 liters and accept the special order
C. 0 liters and reject the special order
D. 85,000 liters and accept the special order

ii. What is the contribution margin from the special order if Addis Mojo accept the special order and according to this result should the Factory accept or reject the special order?

A. Birr 175,000 and accept the special order
B. Birr 173,250 and accept the special order
C. Birr 172,000 and accept the special order
D. -Birr 173,250 and reject the special order

23. XY company is a manufacturer and planned for the year 2013 to produce and sell about 25,000 units and planned to generate birr 1,000,000 operating income. As a result of continued explosive growth on the XY, actual operating income totaled birr 2,556,000.

i. What is the total static-budget variance in operating income?

A. Birr 1,556,000 F
B. Birr 1,556,000 U
C. Birr 2,556,000 F
D. Birr 1,000,000 U

ii. Flexible-budget operating income was birr 2,930,000. Calculate total flexible-budget and total sales-volume variances respectively?

A. Birr 1,556,000 F and 1,930,000 U
B. Birr 374,000 F and 1,930,000 U
C. Birr 374,000 U and 1,930,000 F
D. Birr 1,556,000 U and 347,000 U

24. ABC Candy manufactures candy in different flavor and sugar is one of the materials to be used in production. For January 2014, it budgeted to purchase and use 15,000 pounds of sugar at birr 0.89 per pound. Actual purchase and usage for January 2014 was 16,000 pounds at birr 0.82 per pound. It budgeted for 60,000 Candies. Actual output was 60,800 Candies.

i. What is the flexible- budget variance for the cost of sugar

A. Birr 230 F
B. Birr 4,256 F
C. Birr 40,992 F
D. Birr 408 F

ii. What are the price and efficiency variances for the sugar cost respectively

A. Birr 1,050 F and 890 F
B. Birr 1,120 F and 712 U
C. Birr 4,200 F and 3,970 U
D. Birr 4,200 F and 36,792 F

25. All are true about flexible budget and static budget except
    A. Flexible budget is a hypothetical budget that a company would have been prepared at the beginning of a period if the company had forecast its actual output correctly
    B. The starting point in static budget is production budget
    C. Both flexible and static budget are using budgeted cost and revenue data
    D. Flexible budget is flexed static budget for actual output
26. Among the following is not the cause for favorable price variance for direct materials cost
    A. Good price negotiation by purchasing manger
    B. Purchased larger lot sizes than budgeted, thus obtaining quaintly discount.
    C. Materials price decreased unexpectedly due to say industry oversupply
    D. Change in supplier when lower priced supplier went out of business.
27. Assume ABC Hotel is providing different services such as bar, restaurant, bed room and café at four departments. The hotel manager expect to generate revenue of birr 200,000 and incur variable and fixed costs of birr 140,400 and 60,000 respectively and operating loss of birr 400 from the café division. And considering dropping café service. If the Hotel drop the café service, the Hotel is going to save fixed cost specific to café such as salary to café workers for about birr 40,000.

i. If the Hotel drop the café service, how much revenue will it lose and how much cost will it save respectively?

A. Birr 200,000 and 200,400
B. Birr 200,000 and 40,000
C. Birr 200,000 and 180,400
D. Birr 200,400 and 180,400

ii. If the Hotel decide to drop the café service, what will be the impact on the total profitability and based on the result should the hotel keep or drop the café service

A. increase in operating income by birr 400 and keep the café service
B. Decrease in operating income by birr 19,600 and drop the café service
C. Decrease in operating income by birr 120,000 and drop the café service
D. Increase in operating income by birr 19,600 and keep the café service

28. If the demand for the product giving the highest contribution margin per constraining factor is more than the available capacity of production, which one of the following is true about the volume of production for this product?
    E. Production should be equivalent with demand
    F. Production should be equivalent with the maximum capacity
    G. Production should be less than the capacity

H. Production should be more than the capacity

29. All are true about the issues that should be considered in making or buying decision, except
   E. All variable and fixed costs of making
   F. Outsourcing cost
   G. The avoidable fixed costs
   H. The opportunity of producing another product with the freed capacity
30. Assume direct material price variance and efficiency variance is birr 20,000 F and birr 30,000 U respectively. The sales volume variance is 75% of flexible budget variance F. Hence what is the flexible budget variance and static budget variance respectively?
   A. Birr 10,000 U and birr 2,500 U
   B. Birr 7,500 F and birr 10,000 U
   C. Birr 7,500 F and birr 2,500 U
   D. Birr 2,500 F and birr 10.000 U
31. Efficiency variance of variable overhead costs is:
   A. Actual variable overhead minus budgeted variable overhead allowed for actual output
   B. Favorable if the actual utilization of the cost allocation base less than the budgeted utilization allowed for actual output
   C. Actual cost per allocation base minus budgeted cost per allocation base for actual allocation base
   D. All except C
32. **Addis Mojo Oil Company** produces two joint products, cooking oil and soup oil, from a single vegetable oil refining process. In September 2006, the costs of this process were birr 24,000,000. Separable processing costs beyond the split-off point were cooking oil, birr 30,000,000; and soup oil, birr 7,500,000. Cooking oil sells for birr 50 per liter. Soup oil sells for birr 25 per liter. Addis Mojo produced and sold 1,000,000 liters of cooking oil and 500,000 liters of soup oil. There is no beginning and ending inventories of cooking oil or soup oil.
   i. What is gross margin of cooking oil and soup oil according to the constants **gross margin percentage method** respectively?
   A. Birr 50,000,000 and 12,500,000
   B. Birr 1,000,000 and 500,000
   C. Birr 800,000 and 200,000
   D. Birr 19,200,000 and 4,800,000
   ii. What is the joint cost allocated to cooking oil and soup oil according to the **constant gross margin percentage method** respectively?
   A. Birr 49,200,000 and 12,300,000
   B. Birr 800,000 and 200,000
   C. Birr 20,000,000 and 5,000,000
   D. Birr 19,200,000 and 4,800,000
   E. None of the above

iii. What is the joint cost allocated to cooking oil and soup oil according to the **net realizable value at the split of point method** respectively?

A. Birr 20,000,000 and 4,000,000
B. Birr 15,000,000 and 9,000,000
C. Birr 19,200,000 and 4,800,000
D. Birr 19,000,000 and 5,000,000

33. Cost of byproduct is recognized as reduction in the cost of main product on the book of accounts during the time of production is under:

A. Sales method
B. Sales value of Byproduct at spilt-off point
C. Net realizable value of Byproduct at spilt-off method
D. Production method

34. **MOHA Soft Drinks Company** produces its products (Mirinda, Pepsi and Mirinda Apple) under single production facilities. The budgeted fixed manufacturing overhead was birr 30,000,000 within the relevant range of 10,000 to 20,000 machine hours. The budgeted variable cost rate per machine hour within the relevant range was birr 250 per hour. The following table summarizes the demand for and supply of overhead facilities for the year 2013.

	Practical capacity level (in machine hours)	Budgeted usage (in machine hours)	Actual usage (in machine hours)
Mirinda	100,000	70,000	73,000
Pepsi	60,000	50,000	50,000
Mirinda Apple	40,000	40,000	40,000
Total	200,000	160,000	163,000

i. What is the total overhead cost allocated to Mirinda, Pepsi and Mirinda Apple respectively under the **single rate method** assuming the allocation base is the practical capacity level?

A. Birr 10,500,000; 7,500,000 and 6,000,000
B. Birr 28,000,000; 20,000,000 and 16,000,000
C. Birr 16,000,000; 28,750,000 and 20,000,000
D. Birr 29,200,000; 20,000,000 and 16,000,000

ii. What is the fixed cost of **unused capacity** for the manufacturing overhead assuming the single rate method and practical capacity level as an allocation base?

A. Birr 200,000
B. Birr 5,550,000
C. Birr 37,000
D. Birr 163,000

iii. What is the total overhead cost allocated to Mirinda, Pepsi, and Mirinda Apple respectively under the **dual rate method** assuming the demand for/ usage as an allocation base?

A. Birr 31,375,000; 21,875,000 and 17,500,000
B. Birr 13,125,000; 9,375,000 and 7,500,000

C. Birr 18,250,000; 12,500,000 and 10,000,000
D. Birr 21,875,000; 9,375,000 and 12,500,000

iv. What is the fixed cost of **unused capacity** for the manufacturing overhead assuming the dual rate method and practical capacity level as an allocation base?

A. Birr 3,700,000
B. Birr 4,000,000
C. Birr 37,000
D. Birr 6,000,000

35. Which one of the following is/are **not true** about the cost allocation base
    A. It is a variable that systematically link an indirect cost pool with cost objects
    B. It is a cost driver for variable costs within a relevant range
    C. It is an indirect cost pool
    D. A and B
36. For which cost allocation criterion we give first priority
    A. Benefits received
    B. Cause and effect
    C. Ability to bear
    D. Fairness/ equity
37. The usually applicable allocation rate to allocate indirect costs to cost objects is:
    A. Actual rate
    B. Practical capacity level
    C. Budgeted rate
    D. Demand for/usage
38. The cost of processing beyond the split off point is termed as:
    B. Joint cost
    C. Separable cost
    D. Direct cost
    E. Indirect cost
39. All of the following are true about the purposes of cost allocation, except
    A. It is used to provide total cost information for making decision
    B. It is used to motivate managers and employees at different level
    C. It is used to verify cost reimbursement in the case of government contracts
    D. It is used to measure income and asset for external reporting purpose
40. Physical measurement unit approach of joint cost allocation is used if (1 pt)
    A. There is byproduct in the joint production process
    B. If products are sellable at split off point
    C. If joint products have common physical measurement unit
    D. B and C
41. All of the following joint cost allocation methods can be used if joint products are not sellable at the point of split, except (1 pt)
    A. Net realizable value at split off point method
    B. Constant gross margin method
    C. Sales value at split off method
    D. A and B
42. All are the criterion that should be considered for accepting or rejecting a special order, except (1 pt)
    A. Expected revenue from the special order
    B. Expected total revenue at the company level if the special order is accepted

C. Expected cost for the special order
D. A and B

43. Assume the available production capacity of Addis Mojo Oil Factory is to produce up to 100,000 liters of oil per week. The current production is only up to 60,000 liters per week. The regular selling price is birr 40 per liter and the Factory is now incurring birr 25 per liter variable cost and birr 3,000 fixed cost per week. The regular customers of the Factory are located in Ethiopia. ABC merchandiser found in Djibouti asked Addis Mojo to supply up to 35,000 liters for the coming month at the special order price of birr 30 per liter. Addis Mojo is not expected to incur any more cost for the facilities to fill the special order.

i. With the available excess capacity how many liters of oil can Addis Mojo supply per week and comparing the excess capacity should the factory accept or reject the special order from ABC? (2 pts)

A. 35,000 liters and accept the special order
B. 0 liters and reject the special order
C. 85,000 liters and accept the special order
D. 40,000 liters and accept the special order

iii. What is the contribution margin from the special order if Addis Mojo accept the special order and according to this result should the Factory accept or reject the special order? (2.5 pts)

A. Birr 173,250 and accept the special order
B. Birr 175,000 and accept the special order
C. Birr 172,000 and accept the special order
D. -Birr 173,250 and reject the special order

44. Assume ABC Hotel is providing different services such as bar, restaurant, bed room and café at four departments. The hotel manager expect to generate revenue of birr 200,000 and incur variable and fixed costs of birr 140,400 and 60,000 respectively and operating loss of birr 400 from the café division. And considering dropping café service. If the Hotel drop the café service, the Hotel is going to save fixed cost specific to café such as salary to café workers for about birr 40,000.

i. If the Hotel drop the café service, how many revenue will it lose and how many cost will it save respectively?

A. Birr 200,000 and 180,400
B. Birr 200,000 and 200,400
C. Birr 200,000 and 40,000
D. Birr 200,400 and 180,400

iii. If the Hotel decide to drop the café service, what will be the impact on the total profitability and based on the result should the hotel keep or drop the café service

A. increase in operating income by birr 400 and keep the café service
B. Decrease in operating income by birr 19,600 and drop the café service
C. Decrease in operating income by birr 120,000 and drop the café service

D. Decrease in operating income by birr 19,600 and keep the café service

45. If the demand for the product giving the highest contribution margin per constraining factor is more than the available capacity of production, which one of the following is true about the volume of production for this product?
   A. Production should be equivalent with demand
   B. Production should be equivalent with the maximum capacity
   C. Production should be less than the capacity
   D. Production should be more than the capacity

46. For keeping or replacing old equipment , which one of the following information is irrelevant
   A. The current disposable value of old equipment
   B. The expected operating costs of the old and new equipment
   C. The book value of old equipment
   D. Expected periodic depreciation expense up on the new equipment

47. Which one of the following is/are true about the relevance concept
   A. Expected future revenue and cost that can create difference between alternatives
   B. All variable costs are relevant and all fixed costs are irrelevant
   C. The decision should be based on unit cost rather than total cost
   D. A and B

48. All are true about the issues that should be considered in making or buying decision, except
   A. All variable and fixed costs of making
   B. Outsourcing cost
   C. The avoidable fixed costs
   D. The opportunity of producing another product with the freed capacity

49. Assume Derba Cement Factory during the year 2013 has been selling its product at birr 200 per quintal. For the coming period Derba assumed its competitors such Muger Cement Factory will reduce their price by 3%. The Factory expects to reduce price by 3.5% and wants to earn 30% operating income up on each unit sale. Hence what is the target price and target costs per quintal for Derba for the coming period respectively? (2.5 pts)
   A. Birr 194 and 135.8
   B. Birr 200 and 140
   C. Birr 206 and 144.2
   D. Birr 193 and 135.1

50. All are true about the cost plus long term pricing approach, except (1 pt)
   A. It is applicable for companies participating in a competitive market
   B. The base for price is cost
   C. Mark up determination is based on customers and competitors reaction
   D. The total price is the sum of cost and mark up

51. In the market base long term pricing if the actual cost is greater than the target cost: (1.5 pt)
   A. The company should undertake value engineering to rise cost
   B. The company should undertake value engineering to reduce actual cost
   C. The company should produce without making value engineering
   D. B and C

52. Pricing for special order in a competitive way considers the following issues except (1.5 pt)

A. Costs per unit of the special order is all variable costs plus additional fixed costs divided by the special order units
B. The price should be in between of customers perceived value and expected price to be set by competitors
C. The price should be in between of cost and expected price to be set by competitors
D. A and C