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Topic: Cost Systems, Cost Allocation, Planning and Decision Making, Cost Planning for the Product Life Cycle and Operational Performance Measurement

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Objectives

In an intensively competing global market place, without an effective cost accounting system, it is doubtful whether a business could survive. The ability to determine the costs of products using product costing techniques, planning and controlling the enterprise using budgeting techniques and making decisions about the future of the organization using appraisal techniques is paramount. This course is divided into three modules.

Module One dwell on: Cost systems – Job costing, activity based costing, process costing, Cost allocation - departments, joint products and by products. **Module Two** explains the planning and decision making – Cost estimation, short-term profit, cost volume profit (CVP) Analysis, strategy and the master budget, strategy and analysis of capital investments while **Module Three** gives an exposition of Cost planning for the product life cycle – target costing, theory of constraints and strategic pricing, Operational level control, Operational performance measurement – cost variances and resources, capacity and management and control quality.

Essential Reading: Pre-reading: Adeniyi, A. Adeniyi (2008): Management Accounting, El – Toda Venture Limited, Lagos

Pre-reading: Pandey, I.M (2003) Essentials of Management Accounting, Vikas Publishing House PVT Ltd, New Delhi

Further Reading: William Pickles (1977): Accountancy Pitman Publishing Limited, London

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MODULE ONE: COST SYSTEMS AND COST ALLOCATION

Cost accounting is extensively used in a wide variety of businesses, including hospitals, local government, retail and manufacturing. The cost accounting system is the basis of an internal information system to assist managers to make business decisions. The type of business decision will vary with the nature of the organization, but this could include:

- Whether to provide a new service
- Whether to make or buy a product
- The extent to which selling prices may be altered
- Whether to manufacture a new type of product
- Whether to increase the levels of service provided

Cost accounting techniques arise because of information requirements by management. This could relate as to how a product could be manufactured or how much service costs to deliver. Cost accounting provides such mechanism to record the cost resources used by an individual product/service line, either by identifying the direct connection (cost allocation) or sharing out the common costs on a fair basis (cost apportionment).

The role of cost accounting, a discipline arising out of the cost and estimating practices in engineering, is vital to the modern business facing increasing competition. Advances in transportation technology have eroded the geographical barriers to competition, while advances in communication technology have increased customers awareness about alternative suppliers and their pricing. Cost account assists in cost management by offering various techniques for

control and reduction of the different types of costs incurred by a business. It also helps in making the best use of the available resources.

It is also important to bring to the fore distinction between cost accounting systems and financial accounting systems. **Cost accounting systems and financial accounting systems** are different. Cost accounting is in effect for internal use. Financial accounting forms the basis of external reporting and is for stewardship purposes. Cost accounting systems provide information to management for planning, control and decision making. Again, financial accounting is concerned with types of expenditure for the purpose of an overall profitability statement and statement of assets and liabilities.

The disciple of **management accounting** emerged as a natural progression from cost accounting as the information requirements of business managers were better understood and increasingly catered for by accountants. Management accounting is more strategic in nature and encompasses various accounting disciplines such as cost accounting, financial accounting, taxation and financial management as well as behavioural psychology, management systems.

BASIC CLASSIFICATION OF COSTS

A crucial method of cost classification is into direct and indirect costs. **Direct Costs** are specific costs that can be identified with a product or service.

Direct labour cost – The wage paid to employees actually engaged in production or providing the service e.g a bank clerk serving customers would be a direct labour cost, whereas the cost of a bank manager would not be a direct cost.

Direct materials cost – The cost of buying in the materials from which the finished product is made e.g all bought in parts and assemblies.

Direct expenses – Those expenses specifically incurred in the production of a unit or the provision of a service e.g a royalty may have to be paid for each unit of production in a factory. This can be traceable to a unit of manufacture.

Indirect costs

Indirect costs are all labour, material and expense costs which cannot be identified with a product or service. Indirect costs are collectively termed overhead. The three principal categories of indirect cost are:

Indirect labour cost – The wages and salaries paid to workers not directly involved in production or service delivery. The cost of workers engaged in supervising such an activity would be an indirect labour cost.

Indirect material cost – The costs of all material not directly used in production. Lubricants for the machinery engaged in the production process would be an indirect material cost others are spare parts for plant and machinery, stationery etc

Indirect expenses – These are expenses not directly incurred in the production of a unit of output or the delivery of a service.

Establishment costs – All the expenses incurred in providing the production or service environment. Example, for manufacturing expenses of providing the structure of the factory and all the services within it. For health care, this would include the expenses of providing the structure of a hospital. Such expenses include rent, rates, insurance and electricity.

Selling and distribution costs – All costs of selling the product or service and delivering it. This includes the salaries and wages of sales personnel and delivery staff, and the cost of transportation. Expenses such as rent, rates, insurance and electricity would also be included in so far as they relate to sales and distribution premises.

Administrative costs – All the cost of directors, managers, administrative staff etc. Again, expenses such as rent, rates, insurance and electricity would also be included in so far as they relate to administration.

Finance costs – All the costs of borrowed capital. This includes loan interest, any expenses incurred in raising the initial loan and commissions paid to third parties for the same.

In view of the above, we can classify cost as follows:

Direct labour cost + Direct material cost = **Prime Cost** + Indirect labour cost + Indirect material costs + Machinery costs + Establishment costs (Factory indirect expenses) = **Cost of production** + Sales and distribution costs + Administrative costs + Financial costs = (**Office cost**) = **Total cost**.

An understanding of the fundamental differences between variable, fixed costs, and semi-variable cost is essential for the application of many aspects of cost accounting.

Fixed costs remain the same irrespective of the level of activity or output. Fixed cost varies with time. There is a linear relationship between fixed cost and time. **A variable cost** is a cost that varies in direct proportion to some measure of activity or output.

Semi-variable costs (sometimes referred to as semi-fixed costs) consist of both a fixed and variable component. Such costs are affected by both time and output (or activity).

An example of a semi-variable cost would be a telephone charge, which has to be paid irrespective of the number of calls made in the period. Other semi-variable cost are electricity costs, water costs, maintenance costs/

What is a System – A system is a set of elements joined together for a common objective.

It is a group of things or parts working together in a regular relation. A sub-system is a part of a larger system. Viewing an organization as a system, it will have the following as sub-systems:

- Divisions
- Department
- Functions
- Sections
- Units
- individuals

ACTIVITY BASED COSTING (ABC)

Activity based costing is a relatively new costing technique that emerged during the late 1980s. Its proponents, Professors Kaplan and Cooper, developed the technique in response to the spread of advanced manufacturing technology (AMT), which arguably rendered traditional absorption costing deficient for product cost information purposes. ABC provides better cost information, by recognizing and relating the overhead costs to the activities that cause or drive overhead.

In recent years, manufacturing has evolved, with the introduction of greater technology and more automation. Companies are now able to produce a wide range of products, with greater product variation, to respond to a more competitive and demanding market place. As a consequence, the cost structure of such companies has also changed, with direct costs now representing a smaller proportion of total cost than in the past, when material and labour costs were dominant production expense.

Traditional absorption costing systems were designed when the majority of companies have a narrow product range and the use of technology and automation as part of the production environment was limited

Activity based costing may be used for the determination of full cost for products or services. The limitations of traditional absorption costing systems are:

- They do not recognize the complex cost environment within which many companies operate.
- They use only a volume related measure for the absorption of overhead into a product or service.
- There is little if any relationship between overhead and the volume related measures for many companies today

Activity based costing recognizes the need to understand the behavior of overhead costs and to identify what activities cause overhead costs to change. These are referred as **Cost drivers**.

All of the costs associated with a particular cost drivers (e.g number of set-ups) would be grouped into a cost pool. Costs are grouped into pools on the basis of activity rather than on a departmental basis.

A short-term variable cost varies with the volume of production. These costs may be traceable to products or services using measures of the volume of activity (e.g machine hours, labour hours)

A long-term variable cost does not vary with the volume of production or service, but does vary with some measure of activity (e.g set-up cost, production scheduling, inspection costs etc)

Support department cost	Possible cost driver
Set-up costs	No. of set-ups
Production scheduling	No. of production runs
Inspection and quality costs	No. of inspections
Purchase costs	No. of purchase orders
Despatch costs	No. of deliveries
Production control	No. of set-up

This cost pools would be subsequently applied to a product line using cost drivers rates.

Practical Example

A company manufactures four products A, B,C, D. Output data for the period is as follows:

	A	B	C	D
No.of production runs	2	3	6	20
No. of set-ups	2	4	6	8
Output (units)	10	20	50	200
Labour hours/unit	1	2	1	2
Machine hours/unit	1	3	2	1

Cost data for the period is as follows:

	A	B	C	D
Material cost/unit	20	40	60	80

Direct labour cost is N5 per hour

Support department overhead costs, together with possible cost drivers, are as follows:

Support department	Naira	Possible cost driver
Set-up costs	20,000	No. of set-ups
Production scheduling	15,500	No. of production runs
Short run variable costs	7,500	Labour hours
Material handling	18,600	No. of production runs
	61,600	

Required: Using an activity based costing approach; determine the total cost per unit for each of the four products. Recalculate this using traditional absorption costing (based upon labour hours).

Workings

(Working 1): Set-up costs: $N20,000/20 \text{ set-ups} = N1,000 \text{ per set-up}$

(Working 2) Production scheduling: $N15,500/31 \text{ production runs} = N500 \text{ per run}$

(Working 3) Short-run variable cost: $N7,500/500 \text{ labour hours} = N15 \text{ per hour}$

(Working 4) Material handling: $N18,000/31 \text{ production runs} = N600 \text{ per run}$

Solution

ABC Approach

	A	B	C	D
Material	200	1,200	2,000	16,000
Labour	50	200	250	2,000
Set-up costs (W1)	2,000	4,000	6,000	8,000
Production Scheduling (W2)	1,000	1,500	3,000	10,000
Short-run variable costs (W3)	150	600	750	6,000
Material handling (W4)	1,200	1,800	3,600	12,000
	4,600	9,300	15,600	54,000
Units produced	10	20	50	200
Cost per unit	460	465	312	270

ABSORPTION COST APPROACH

Working

(W5) Overheads absorbed on the basis of labour hours

N61, 600/500 labour hours = 123.20 per hour

	A	B	C	D
Material	200	1,200	2,000	16,000
Labour	50	200	250	2,000
Overhead (W5)	1,232	4,928	6,160	49,280
	1,482	6,328	8,410	67,280
Units produced	10	20	50	200
Cost per unit	148.20	316.40	168.20	336.40

ABC is applicable to large scale service organization

- Banks and hospitals
- Where a large proportion of overhead cannot be directly assigned.
- Where a wide variety of services are offered.

The framework of ABC is as follows:

- Recognize the major activities of the organization
- Determine the most appropriate cost driver for each major activity
- Group identical cost drivers into cost pools

Comparison and discussion

The ABC approach utilizes a greater and diversity of cost drivers compared with absorption costing, which relies only on a simple and usually single volume based rate.

	A	B	C	D
Activity based costing	460.00	465.00	312.00	270.00
Absorption costing	148.20	316.40	168.20	336.40
Difference	311.80	148.60	143.80	(66,40)

When compared with ABC, traditional absorption costing results in the following:

- It over-allocates overhead to high volume products and under-allocates to low volume products.
- It over-allocates overhead to products that require more hours of work and under-allocates overhead to products that require fewer hours.

ALLOCATION AND APPORTIONMENT OF COST

I try to establish certain standard definition of important terms:

- (a) Cost allocation: is the allotment of whole items of cost to cost centres or cost units
- (b) Cost apportionment – is the allotment of proportion of items of cost centres or cost units.
- (c) Overhead absorption – is the allotment of overheads to cost units. All overhead must however, eventual be absorbed into cost units.

Procedure for Allocation, Apportionment and Absorption

In practice, the principal difficult in arriving at the cost of a unit of output will be determining how the indirect factory overheads are to be computed and absorbed into the unit. While a factory is divided in a number of separate production departments and also many service departments, only the production departments are directly charged to one or more of the production departments and hence absorbed into one unit. The total overhead of a production department has to be charged to the units produced by that department and the factory overhead charge to be attributed to a unit of production must be based on a predetermined rate. The terms used for charging to the unit are called overhead absorption or sometime, overhead recovery.

The procedures for dealing with factory overhead are as follows:

- (a) Allocate cost as far as possible. Many items can be directly charged to a production department e.g the salary of the department's supervisor.

- (b) Others will refer to the factory (or works) as a whole (e.g the salary of the works manager) while some will in the first instance refer to the entire organization e.g rent and rate.

Apportion these costs in the following order:

- (i) Ascertain the appropriate proportion of total organization cost attributed to the factory.
 - (ii) Apportion total factory cost over departments (production or service as appropriate).
 - (iii) Apportion the cost of service departments to the relevant production department.
- (c). Absorb the total cost of a production department by charging the relevant amount to the units produced by that department at a predetermined rate.

COST ALLOCATION AND COST APPORTIONMENT

It is preferable that every incoming cost should be allotted in the first instance to the cost centre responsible for authorization. This allotment of the whole item of cost to a cost centre is known as Cost Allocation. In many cases, the authorizing centre is also the using centre and no further accounting action is needed after the initial allocation.

Cost allocation may apply equally to direct costs and overhead. Where a cost may be clearly identified with a cost centre it may be allocated without division or splitting. For example, electricity could be separately metered to a cost centre where the cost centre is (say) the inspection department. In this case, the entire charge for the metered supply may be allocated to this cost centre without further computation.

COST APPORTIONMENT

The emphasis here is upon fairness in sharing the common cost as it is acknowledged that precisely determining the benefit received would prove very difficult in many cases. For example, office rent could be apportioned on the basis of floor area used by a cost centre. The choice of basis for apportionment may sometimes be subjective.

On the other hand, services specially may be produced which benefit a number or cost centre and the cost of these, after the initial control, will be apportioned between the user cost centre on some basis which gives a reasonable representation of the benefits that obtain.

ILLUSTRATION

Nature of Cost	Cost Centre where Controlled	Possible Bases of Apportionment
Rent and Rates	Company Secretary or Property Manager	Floor space occupied
Lighting and Heating numbers	Plant Engineer or Company Secretary	Cubic capacity of locations or numbers of take-off points metered usage
Worksmen compensation insurance	Insurance Officer, Company Secretary, Chief Accountant	Numbers of employees in the various cost centres or payroll amounts
Insurance & Stocks	Insurance Officers, Company Secretary	Value of stock holdings in various locations.
Advertising for staff	Personnel Manager	Number of vacancies notified or filed

JOB COSTING – This method applies to businesses which carry out individual jobs in works in accordance with customer's special requirement. Each job is a separate cost unit, it is essential, therefore, to segregate the direct costs of jobs from indirect costs of the business. The latter will be collected under cost centres, some of which will be carrying out productive operations and other administrative or service activities. The cost costs of non-productive cost centres will 'apportion' over the productive cost centres. The total cost of each productive cost centre will then be absorbed into the cost of these jobs passing through the cost centre. Where the job is of long duration, a modified form of job costing is known as contract costing.

BATCH COSTING – This is a form of job costing under each “job” in the manufacture of a batch of identical articles, is either for sale or for use within the undertaking. Having established the cost of the batch (the cost unit in the instance) it is of course possible if desired, to compute the average cost per unit within the batch.

CONTRACT COSTING – A contract for this purpose is a job of long durations (perhaps extending over more than one year), often involving some form of constructive activities. Possibly at a site remote from the business premises. As compared with short term job costing:

- (a) There may be a relatively high incidence of direct expenses
- (b) The contract may be controlled by a special term of people constituting a separate cost centre.
- (c) General consideration costs in consequence may be relatively small and may not be absorbed into the contract cost.
- (d) For the purpose of contract cost control, there may be problems in defining the degree of completion of the work from time to time and it may be necessary to break down the main cost unit into various places or stages.

PROCESS COSTING – The simplest form of cost finding occurs when business as a whole is concerned with continuous operations leading to one **standardized product**. A more complex situation arises when the business has several products, each of which is produced by a separate department. An example might be a founding business with separate departments for ferrous and non-ferrous costing.

In such a case costs would have to be identified with cost centres and the cost of each productive cost centre in any period would be spread over the number of cost units it had produced in that period.

There would, however, be certain cost centres carrying out administrative or other functions for the business as a whole. In order to arrive at total unit costs, the cost of those non-productive departments would have to be spread in some ways over the productive departments.

We also have situations where many businesses in which the output of one department becomes the raw material of another department. In other words, the initial input of raw material is

subjected to a sequence or processes before the final product emerges. It is to these types of operations that the term process costing is generally applied.

SERVICE COSTING – This form of operation applies where repetitive services are provided either by the business as a whole or by a particular cost centre within the undertaking. The services offered may not be completely standardized, in which case a cost unit may be defined which gives a broad representation of some common element.

Example -In the case of hospital, for example, one cost unit might be the occupied bed per day and in a transport undertaking, the carriage of one ton of goods for one mile

MODULE TWO PLANNING AND DECISION MAKING

COST ESTIMATION – Cost estimation is a term used to describe the measurement of historical cost with a view to helping in the predication of future costs for management decision making e.g historical information is analysed to provide estimates on which to base future expectation. It is however important to note that cost estimate is premise on the ability of the Accountant to ascertain the activity measure or cost driver that exerts the measure influence on the cost of a particular activity. A cost driver can be defined as any factor whose change causes a change in the total cost of an activity.

Example: Cost drivers include direct labour hours, machine hour unit of output and number of production run-ups

The determination of how cost will react to changes in output of other measurable activity level is of vital importance for decision making, planning and control. The preparation of budget, performance report, standard costing and the provision of relevant cost for pricing and other decisions will all depend on reliable estimates of fixed and variable costs at various level of activity.

Whether a cost is fixed or variable with respect to a particular activity measure is affected by the length of time span under consideration. The longer the time span, the more likely the cot will be

variable. It is therefore instructive to note, that the importance of accurately estimating cost and complexity of cost behaviours means that accountant and decision-maker alike must use increasingly alike must use increasingly sophisticated techniques.

SHORT-TERM DECISIONS

In a multi-product organization, it is possible that not all the entire product line are profitable. Therefore, it is possible for management to be contemplating on whether a particular segment should either be added or eliminated from the existing from the existing product range. A segment consists of a product, type of customer, geographical regions, distribution channel or any other part of a firm that can be considered for expansion or reduction. Segmental profitability analysis is required for strategic decisions such as abandonment or expansion of specific segment.

Example of segmental profitability analysis and customer profitability analysis. In a nutshell, decisions to be made in shutdown or discontinuance are:

- (a) Whether or not to close down a product line, department or activity;
- (b) If the decision is shutdown, whether the closure should be permanent or temporary;
- (c) If there is a choice about the timing of the closure, when should it take place?

It is therefore instructive to note that decision on whether or not to eliminate a segment must not be based on absorption costing technique; instead a marginal costing approach must be applied as follows:

Economic Consideration: This will involve the process of examining the economic viability of the product to be eliminated by preparing the contribution margin statement or income statement showing the level of contribution of each segment. This statement will be used to identify the contribution of the segment to be eliminated towards the recovery of the company general fixed overhead and net profit.

Format

Contribution Margin Statement

N N

Sales		xx
Less: <u>Relevant cost</u>		
Direct Material	xx	
Direct Labour	xx	
Direct Expenses	xx	
Variable Production O/H	xx	
Opportunity Cost	xx	
Relevant/differential fixed costs	xx	<u>(xx)</u>
Contribution		<u>X</u>

Interpretation of the Statement

- (a) If the statement shows a positive contribution then management will be advised not to eliminate the segment. This is because the segment is actually positively towards the recovery of the company, general fixed overheads and net profit.
- (b) In the case of negative contribution, management will be advised to delete the segment. This decision will then increase the total profit of the organization
- (c) Under a zero contribution i.e total benefit equates the total relevant cost then final decision will depend on non-quantitative factors.

QUALITATIVE DECISION

Some of the non-quantifiable factors will include:

- (a) The impact of the closure decision on the company's goodwill.
- (b) The effect of the closure decision on the turnover level of the entire organization especially where the product to be deleted is being jointly demanded with some of the other company's' product.

- (c) The reaction of the company's shareholders to the decision to delete the segment.
- (d) The interpretation of the closure decision by the company's creditors.
- (e) The effect of the closure decision on workers morale vis-à-vis the level of productivity.
- (f) Instead of outright elimination, is it not possible to consider diversification of resources into more profitable product line?

MAKE OR BUY DECISION

In a manufacturing outfit, it is a common phenomenon for top management to be contemplating on whether a particular raw material, sub-assembly or a major component required in the production of the final product should either be manufactured internally or purchased from an outside supplier.

In practice, this may be described as a critical decision especially in an industry where the level of competition is considered to be very high. This type of decision is also strategic as a result of the need to protect the degree of secrecy considered to be adequate for the company's product or to guarantee uninterrupted supply of the component. However, in applying the concept of marginal costing to this type of decision, it will be necessary to analyse the available facts from two different perspectives.

Management will be interested in analyzing whether any of the two option will result into economic savings or deficit to the organization. To achieve this, supplier's quotation will be compared with the relevant cost of producing the component using the following format

Decision Rule

If suppliers quotation > Relevant cost of making = make

If suppliers quotation > Relevant cost of making = buy

If suppliers quotation = Relevant cost of making = qualitative factors

The relevant costs are direct material cost, direct labour cost, direct expenses, variable production overhead, opportunity cost, and incremental fixed cost

Qualitative Factors

Apart from the economic reasons stated above, it is also instructive to point that there are other qualitative factors that must be taken into consideration as follows:

- (i) The degree of secrecy considered adequate for the company's product
- (ii) Do we have a reliable supplier who can supply to specification?
- (iii) Is it possible for the reliable to satisfy our existing capacity level?
- (iv) Do we have the manpower required to manufacture the component in addition to the final product?
- (v) Are we permitted by law to manufacture the component in addition to the final product?
- (vi) Would the work force be willing to work shift hours, and if so, what overtime or shift work premium over their basic pay might they expect to receive?
- (vii) Do extra hour have to be worked just to remain competitive? Banks might decide to open on Saturdays just to match what competitors are doing and so keep customers.
- (viii). Would extra hours result in more sales revenue, or would there merely be a change in the demand pattern.

THE MASTER BUDGET

The Master Budget represents a consolidation of all support budgets and represents the financial effects of the plan for the business as a whole. Each of the parts of the master budget is prepared in the conventional manner except that budget cost, revenues, investments and so are used instead of historical figures.

The Master Budget is usually presented in the form of:

- (a) Budget operating statements
- (b) Budgeted trading profit and loss account
- (c) Budget balance sheet.

CAPITAL INVESTMENT PROCESS

This includes fixed assets such as property, plant equipment and major renovations. Are investments, as they require the outlay of resources now to earn benefits in future? Involve two planning and controlling phases

A major issue in planning capital expenditure is the problem of ensuring that a company has the capacity to produce, required or be able to deliver the goods and services that will be needed to meet its sales and services plans. Major issues in controlling the actual expenditure are consistent with the plans and that fund is available when the expenditure are needed.

Key Issues in Capital Expenditure Budget

- (a) Project orientation
- (b) Time dimension
- (c) Classification
- (d) Major capital addition e.g acquisition of land, new building and land
- (e) Minor capital expenditure e.g recurring replacement

Because of the long time span, major resources commitment major capital expenditure are typically budgeted as separate projects. Each project is unique specific assets group of assets (i.e investment) the amount and sources of its funding and its timing.

The elements of capital expenditure budget are:

- (a) Cash outflow and include the cost of project in terms of cash. Outlay at various times during the life of a project.
- (b) Cash inflow – The expected cash revenues, net of cash operating expenses by time period must be carefully planned.

The capital expenditure budget may extend beyond the one year budget time from the time frame for the strategic plan. This means that a capital expenditure budget must include a strategic

(long-term) budget and a tactical (short-term) budget. Control of capital expenditure is best understood and implemented if the distinction between major project and minor capital expenditures is maintained.

Major capital expenditure involves large amount of funds for simple projects and their economic feasibility normally relates to management strategies.

Minor capital expenditures related to outgoing involving almost all the operating managers

CAPITAL BUDGETING PROCESS

- (a) Identify required projects and alternatives
- (b) Analyze and evaluate all proposals and alternatives, emphasis should be given to validity of underlying data.
- (c) Decide on and select expenditures budget.
- (d) Develop the capital expenditure budget.
- (e) Strategic and tactical plans.
- (f) Establish control of capital expenditures during the budget year by using performance reports by responsibility centre.
- (g) Conduct post completion audit and follow up evaluation of actual versus budgeted expenditure.

CAPITAL EXPENDITURE DECISION

This will entail:

Investments decision – Which of the competing capital expenditure alternatives should be selected, based on the economic worth of the company.

Financial decision

- (a) How should the company source funds needed to pay for the selected alternatives.
- (b) Capital budget decision about the alternatives should be based on an objective evaluation of the investment worth of each alternative. This can be measured using two approach.
- (c) Discounted cash flows method e.g NPV, Internal rate of returns.

BENEFITS OF THE CAPITAL EXPENDITURE BUDGET

- (a) Enables management to plan resources to be invested in additions to satisfy customers' demand and ensure growth.
- (b) Its planning process helps avoid – idle operating capacity, excesses capacity, investment that will earn less than an adequate returns on funds invested.
- (c) The rationing of capital amongst alternative projects.
- (d) Focuses the attention of management on cash flows, critical and often neglected problems.
- (e) Increase co-ordination among responsibility centers.

COST VOLUME PROFIT (CVP)

The cost-volume-profit (CVP) analysis is a device to study the behavior of profit in response to changes in volume, costs and price. The break-even analysis – a popular form of the CVP analysis indicates the level of sales at which revenues equal costs. This equilibrium point is called the break-even point.

In the CVP analysis, costs are separated into fixed costs and variable costs. Variable costs changes in direct proportion to change in volume while fixed costs remain constant. The difference between sales (selling price) and variable costs (variable cost per unit) is called contribution (contribution per unit).

A firm should generate sufficient contribution from the sale of its products to recover fixed costs and leave a reasonable amount of profit. At the break-even sales, profit is defined to be zero; therefore, contribution will be equal to fixed cost. If contribution per unit (selling price minus variable cost per unit) and fixed costs are known, the break-even point in units can be computed as follows:

Break-even point (in units) = Fixed costs/ contribution per unit.

The contribution ratio, also called P/V ratio, is equal to contribution (contribution per unit) divided by sales (selling price). Using contribution, or P/V ratio, the break-even point in naira can be found as follows:

Break-even point (in naira) = Fixed costs/ contribution.

The excess of actual or budgeted sales over the break even sales is called the margin of safety. It indicates the extent to which sales may fall before the firm suffers a loss.

IMPORTANCE OF CVP

The CVP analysis has the following advantages: (a) It is a simple device to understand accounting data (b) It is useful diagnostic tool (c) It provides basic information for further profit improvement studies. (d) It is a useful method for considering the risk implications of alternative actions.

ASSUMPTIONS UNDERLYING CVP ANALYSIS

It should be noted that CVP analysis is based on a number of assumptions which may not be realistic at times. Therefore, it should be used with caution.

- (a) **Cost of segregation** – The total cost can be separated into fixed and variable components
- (b) **Constant Fixed costs** – The total fixed cost remains unchanged with changes in sales volume.
- (c) **Constant unit variable cost** - The variable cost per unit is constant and total variable cost changes in direct proportion to sales volume.
- (d) **Constant selling price** – The selling price per unit remains constant; that is, it does not change with volume or because of other factors.
- (e) **Constant sales mix** – The firm manufactures only one product or if there are multiple products, the sales mix does not change.
- (f) **Synchronized production and sales** – Production and sales are synchronized; that is, inventories remain the same.

LIMITATIONS OF CVP

The use of the CVP analysis may be limited because of the following reasons:

It is difficult to separate costs into fixed and variable costs.

- (a) Fixed costs may not remain constant over the entire range of volume.
- (b) Selling price and variable cost per unit may not remain constant.
- (c) It is difficult to use the CVP analysis for a multi-product firm.
- (d) It is a short-run concept.
- (e) It is a static tool.

MODULE THREE- Target Costing, Theory of Constraint, Life Cycle Costing, Strategic

Pricing, Cost Variances and Operational Performance Measurement, Management Control quality

TARGET COSTING – Target costing involves setting a target cost by subtracting a desired profit margin from a competitive market price. It is a customer-focused management tool used to determine the market price for a new product, in which market research is adopted as a basis for measuring performance needs and setting target selling price. Target costing involves the following stages:

Stage 1: Determine the target price which customers will be prepared to pay for the product.

Stage 2: Deduct the target profit margin from the target price to determine the target cost.

Stage 3: Estimate the actual cost of the product

Stage 4: If the estimated actual cost exceeds the target cost, investigate ways of driving down the actual cost to the target cost

Limitation of target costing – There exist conflicts (organizational conflicts) between designers who try to reduce costs and marketing staff who give away promotional items costing even more.

THEORY OF CONSTRAINT (TOC)

Theory of constraints describes the process of maximizing operating profits when faced with bottleneck and non-bottleneck operations. It can also be describe as an approach to production management, which aims to maximize sales revenue less material and variable overhead cost.

Theory of constraints involves five steps;

- (i.) Identification of the system's bottlenecks.
- ii. Emplore a process to exploit the bottlenecks
- iii. Subordinate every else to the decision in step 2
- iv. Elevate the system bottlenecks
- v. Refer back to step 1, if in the previous steps a bottleneck has been broken.

The aim of TOC is to maximize throughput contribution. The sales less material cost is maximized, while conversion costs and investment costs are minimized. Bottleneck is an activity which has a lower capacity than preceding or subsequent activities, thereby limiting throughput.

Steps adopted in removing bottleneck

- (i.) Procure more equipment to facilitate free flow of production
- (ii.) Provision of additional/extensive training for possible identified slow workers
- (iii.) Change a product design to possibly reduce processing time on a bottleneck activity.
- (iv.) Elimination of idle time at the bottleneck.

Throughput Accounting (TA) is a system of performance measurement and costing which traces costs to through time. TA is a product management system which aims to maximize throughput, and therefore cash generation from sales, rather than profit.

LIFE CYCLE COSTING

Life –cycle costing estimates and accumulates costs over a product's estimate life cycle (life span) in order to determine whether profits earned during its manufacturing phase will be sustained and cover the costs incurred during the pre- and post manufacturing stages.

Life cycle costing can be referred to as “Tero-technology” which can further be explained as “the maintenance of physical asset cost records over the entire asset lines, so that decision concerning the acquisition, use or disposal of the assets can be made in a way that achieves the optimum asset usage at the lowest possible cost to the entity. This term may be applied to the profiting of cost over a product’s life, including pre-production stage (tero-technology) and to both company and industry life cycle.

The component elements of a product’s cost over its cycle include:

- (a) Research and development costs (design, testing and Production process)
- (b) Cost of acquiring technical data
- (c) Marketing costs
- (d) Production costs
- (e) Training costs
- (f) Inventory costs
- (g) Disposal costs

STAGES OF PRODUCT LIFE CYCLE (PLC)

The life-cycle of product can be grouped into five (5) phases:

- (i.) **Development:** This stage entails extensive cost been incurred on research and development on the feasibility and viability of the product.
- (ii.) **Introduction:** The stage entails the introduction of the product to the market, in which potential customers get awareness of the product/service. This is the most delicate stage in the product life cycle.
- (iii.) **Growth:** At this stage, the product starts to gain ground in the market as demand building-up profit tend to increase.
- (iv.) **Maturity:** This stage depicts slow in demand for the product but the sales revenue and profit are sustained. At this stage, the product is expected to be modified or improved, as a means to sustaining its demand in the market.
- (v.) **Decline:** This stage depicts that the market is saturated and the demand for the product tends to drop. At this point the product become a loss-maker and this is the time when the company decides to stop selling the product.

RELEVANT COSTS FOR DECISION-MAKING

- (i.) Cost Data are the most crucial quantitative factors needed for making decisions. A distinction between relevant and irrelevant cost data should be drawn. A cost is relevant if it is pertinent under consideration.
- (ii.) A cost varies as a consequence of the decision is a relevant cost. Variable costs, for example, invariably are the relevant costs since they increase or decrease when a decision is made. Those costs which do not change as a result of decision are irrelevant costs. Fixed costs, for instance, do not change if activity (volume) is expanded within the normal capacity range. They are irrelevant costs in such situation. Variable costs are always relevant costs and fixed costs irrelevant. Fixed costs will become relevant costs if they change when a decision is made. The important criterion is: whether or not cost changes as a consequence of the decision.
- (iii.) Relevant cost includes concepts such as differential cost and marginal cost and contribution approach. Differential cost is the difference of costs of two alternatives, while marginal cost in cost accounting is equal to variable cost.
- (iv.) Firms are sometimes faced with *special pricing situations*, which are of non-recurring nature. For example, price may have to be fixed for special orders when the firm has an idle capacity and the demand for its product is very low. The contribution approach is particular useful in establishing prices for special orders. The contribution approaching to pricing is based on the incremental cost principle. According, the only relevant costs in fixing special prices are those costs that would have to be incurred if the order were accepted. Generally, these are variable costs. Fixed costs, in the short-run, are uncontrollable, therefore they are irrelevant in pricing special order. The contribution approach thus nor require allocation of fixed costs. If some additional fixed costs have to be incurred to fulfill the offer, they would be relevant in fixing prices. A variable cost can be irrelevant if it has not to be incurred to complete the order. The example can be the variable selling cost which may be borne by the buyer of the special order.

- (v.) The notion underlying the contribution approach to pricing is that the firm should aim at maximizing its contribution while fixing prices. The net profits will be maximized (or net loss will be mitigated) when contribution is maximized.

COST VARIANCES

Variance analysis helps in performance evaluation, cost control and management by exception. The prerequisites for the success of a variance analysis system are that accurate standards be set, performance be measured objectively, and responsibility for variance is identified and assigned. A thorough analysis of the causes of variance is needed when it is significant. Variance is the difference between actual costs and standards costs. It can be calculated for each element of cost.

Material, Labour and Overhead.

The material cost of variance is the difference between the actual cost of material and its standard cost. It has two components: **material price variance** and **material quantity variance**.

Material price variance is the difference between standard price and actual price times actual quantity purchased.

Material quantity (usage) variance is obtained as the difference between standard quantity and actual quantity times standard price.

When the manufacturer of a product uses mix variance of materials, the material quantity variance could be sub-divided into materials mix variance and materials yield variance. The material mix variance is equal to the difference between the actual quantities of materials used and the standard quantities of actual inputs used multiplied by the standard price. The difference between the actual output (yield) and the standard output (yield) is multiplied by the unit price of standard output to obtain the material yield variance.

Like material cost variance, labour cost variance is also calculated as the difference between the actual labour cost and the standard labour cost. It is further divided into **labour rate variance** and **labour efficiency variance**.

Overhead variances are difficult to compute because of the fixed nature of overhead costs. The standard rate changes as the volume change. **Thus normal volume is assumed to determine the standard overhead rate. Spending variance, capacity variance and efficiency variance.** The total overhead variance is the difference between absorbed overheads and actual overheads. **Absorbed overheads** are equal to standard quantity times the standard (absorption) overhead rate. **Spending variance** is calculated as the difference between the budget allowance (i.e standard fixed overheads plus actual quantity times standard variable overhead rate) and actual overheads.

Capacity variance (also called idle capacity variance) is equal to the difference between the budgeted overheads for actual quantity and overheads absorbed at actual quantity.

The difference of absorbed overheads at standard quantity and actual quantity gives the **efficiency variance**.

Controllable variance is the difference between budget allowance for standard hours and actual overheads incurred. **Volume variance** is the difference between absorbed overheads at standard hours and budget allowance for standard hours.

Example 1: The standard material and standard cost per kg. of material required for the production of one unit of product A is as follows:

Material 5kg, Standard price N5 per kg.

The actual production and related material data are as follows:

400 units of Product A, Material used 2,200 kg, Price of Material N4.80 per Kg

Calculate: (1) Material cost variance (2) Material usage variance, and (3) Material price variance

Solution

$$(1) \text{ Material cost variance} = (SQ \times SP) - (AQ \times AP)$$

Standard Quantity for actual production is: 5kg x 400 units = 2,000 kg.

$$= (2,000 \times 5) - (2,200 \times 4.80)$$

$$= \text{N}10,000 - \text{N}10,560 = \text{N}560 \text{ (Unfavourable or adverse)}$$

(2) **Material usage variance** = (SQ –AQ) x SP

$$(2,000 - 2,200) \times \text{N}5 = \text{N}1,000 \text{ (Unfavourable or adverse)}$$

(3) **Material price variance** = (SP – AP) x AQ = (5 - 4.80) x 2,200 = N440 (favourable)

Example 2: The standard time and rate for unit component A are given below:

Standard hours =15, Standard rate = N4 per hour

The actual data and related information are as under: Actual production = 1,000 units, Actual hours 15,300, Actual rate N3.90 per hour

Solution

(i). **Labour cost variance** = (SH x SR) – (AH x AR) = (15,000 X 4) – (15,300 x 3.90)

$$\text{N}60,000 - 59,670 = \text{N}330 \text{ (F)}$$

(ii) **Labour efficiency variance** = (AH –SH) x SE = (15,300 -15,000) x N4

$$300 \times 4 = \text{N}1,200 \text{ (A)}$$

(iii). **Labour rate variance** = (SR –AR) x AH = (4 -3.90) x 15,300 = 0.10 x 15,300

$$= 1,530 \text{ (F)}$$

Note: Standard Hours for Actual Production

For 1 unit standard hours =15

1,000 units standard hours = 15 x 1,000 =15,000 hours.

OPERATIONAL PERFORMANCE MEASUREMENT

There are many financial indices of measuring divisional performances but the entire methods can be grouped into three as follows:

- (i.) **Absolute Profit** – This may be described as the profit that arises from divisional operation. The profit achieved would be compared against a budget or target and variances in volume, price and rate of expenditure would be brought under review. For purpose of judging the manager's personal achievement, it is necessary to examine the specific type of profit to use because numerous types of profit exist below:

- (a.) **Controllable Profit** – This is the difference between divisional revenue and costs controllable at the divisional level. Variable revenue and costs which are dependent on divisional management decision e.g sales income, labour costs, material costs, operating expenses etc.

Also is Divisional fixed and variable overheads, so far these costs are specifically incurred by the divisions.

The following are excluded -Depreciation, are fixed assets incurred by the management. Apportioned cost from central management through central administration or cost of facilities used jointly by division. The snag with this method is that divisional managers with adopt a short-run view of objective which the group may find inconsistent with the level of investment.

- (b.) **Net Profit** – This represent the difference between Revenue and controllable divisional costs together with apportioned central administration costs. This method allows divisional management to be aware of all the costs of the division and its net effects on group position. There is usually arbitrariness in apportionment outside the control of management.

- (c.) **Divisional Profit** – This is the profit that arises from division operations which can be calculated without arbitrarily apportioning central management costs. It is also referred to as traceable or direct profit. It represents the equivalent of controllable profit less depreciation on divisional assets and other non-controllable overheads. The problem with this profit is that a number of costs which are identifiable with the division are not controllable by the division.

(ii) Residual income or Profit - This is sales less controllable costs and interest imputed on the divisional investment. Divisional residual income is divisional profit less an imputed interest charge on the net costs employed by the divisions. The imputed interest charge on the amount invested represents the opportunity cost of funds and is normally based on the firm's cost of capital, cost of borrowing or its weighted average cost of capital.

(iii.) Profitability and Efficiency Ratios – Profitability is the ability to sell goods and services above cost and earn reasonable returns on capital. **Return on capital employed (ROCE) or Primary ratio = Net profit/Capital employed x 100.** It indicates the overall profitability and efficiency in the utilization of financial resources. It consists of:

(a) Asset turnover = Sales /capital employed (x times)

(b) Net Profit Margin = Net Profit/Sales x 100

It indicates the ability of an enterprise to withstand negative variations arising from rising costs, falling prices and declining sales.

The main problem of ROCE is that of definition. Capital employed which determines the definition of net profit may be any of the following – Equity, Shareholders fund, Long term fund

MANAGEMENT CONTROL QUALITY

Management usually put in place measures to reduce defect in production. One of such is **Total quality Control** has to be considered at every stage starting with initial product idea. It is not something which is solely the concern of inspectors at the end of the production line. The following are the key points which TQC must operate.

(i.) **Product design** – This is a systematic examination of cost factors in order to devise ways of achieving the specified purpose, most economically, at the required standard of quality and reliability.

- (ii.) **Production Engineering** – This is the process of designing the methods for making a product to the design specification. This also includes the tools and processes to be used, the tolerances and finishes required, assembly sequences and so on.
- (iii.) **Manufacturing** – Operators are expected to maintain their equipment and produce zero defect output.
- (iv.) In addition, there is extensive use of statistical process Control and Control Charts

There is also Just -in -Time systems emphasizes in-process checks rather than waiting until the product is fully completed before it gets a final inspection. There is Just-in-time purchasing and Just-in-time Production. Just in time Purchasing implies that delivery of materials immediately precedes their use. Just-in-Time Production works on demand-pull basis and seeks to eliminate all waste and everything which does not add value to the product. In JIT systems the responsibility for defects has moved away from quality control inspectors to the operatives. Operators are expected to maintain their equipment and produce zero defect output. The following measures should be noted:

- (i.) **Goods inwards** – The quality of output depends on the quality of input materials. This means that quality requirements are also imposed on suppliers to ensure quality.
- (ii.) **Output inspection** – Final inspection is being replaced by in-process checking. Final inspection, based on sampling, does still take place mainly to satisfy management that quality control in production is being maintained.

When TQC is properly applied and the incidence of defects decreases, total manufacturing costs, including warranty and service costs, decrease. This is because if items are made correctly first time money is saved from the avoidance of detection, reworking, scrapping, and repairing in the field and so on.

TOTAL QUALITY MANAGEMENT (TQM)

This is a term used to describe a situation where all business functions are involved in a process of continuous quality improvement, has been adopted by many companies. TQM has broadened, from its early concentration on statistical monitoring of manufacturing processes. Many companies are currently not aware of how much they are spending on quality. A **cost of quality**

report should be prepared to indicate the total cost to the organization of producing products or services that do not conform to quality requirements.

Four categories of costs should be reported.

- (i.) **Prevention costs** – costs incurred in preventing the production of products that do not conform to specification.
- (ii.) **Appraisal costs** – are the costs incurred to ensure that materials and products meet quality conformance standard. They include costs of inspecting purchase parts, work in process and finished goods, quality audits and field tests.
- (iii.) **Internal failure costs** – are the costs associated with materials and products that fail to meet quality standards. They include costs incurred before the product is dispatched to the customer, such as the costs of scrap, repair, downtime etc.
- (iv.) **External failure costs** – are costs incurred when inferior products are delivered to customers. They include costs of handling complaints, warranty replacement, repairs of returned products and the costs arising from a damaged company reputation.