NATIONAL OPEN UNIVERSITY OF NIGERIA

SCHOOL OF MANAGEMENT SCIENCES

COURSE CODE: ENT 822

COURSE TITLE: PROJECT FINANCE AND BUDGETING

COURSE GUIDE

ENT 822
PROJECT FINANCE AND BUDGETING

Course Team Dr. T.A.G. Oladimeji & Dr. G.B. Aremu (Course Developers/Writers)
Asst. Prof. Adeyanju Lade Joel (Course Editor) - OAU
Dr. A. Alhassan (Programme Leader) - NOUN
Mrs. H. I. Johnson (Course Co-ordinator) - NOUN

NATIONAL OPEN UNIVERSITY OF NIGERIA

National Open University of Nigeria
Headquarters
14/16 Ahmadu Bello Way
Victoria Island, Lagos

Abuja Office
5 Dar es Salaam Street
Off Aminu Kano Crescent
Wuse II, Abuja

e-mail: centralinfo@nou.edu.ng
URL: www.nou.edu.ng

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CONTENTS **PAGE**

INTRODUCTION

Project financing as a discipline teaches the rationale for project financing, how to prepare the financial plan, assess the risks, design the financing mix, and raise the funds. In addition, one must understand the cogent analyses of why some project financing plans have succeeded while others have failed. A knowledge-base is required regarding the design of contractual arrangements to support project financing; issues for the host government legislative provisions, public/private infrastructure partnerships, public/private financing structures; credit requirements of lenders, and how to determine the project's borrowing capacity; how to prepare cash flow projections and use them to measure expected rates of return; tax and accounting considerations; and analytical techniques to validate the project's feasibility.

WHAT YOU WILL LEARN IN THE COURSE

In this course, you will be learning about the meaning of project, ingredients and determinants of a project, project cycle (with emphasis on the financial and economic feasibility); projects and economic growth and development, financing of project- objectives of financial analysis, sources and uses of funds, cash flow statements, financial cost and benefits analysis, evolving of financial plan (budgeting), techniques and tools of analysis – financial statement and ratios, breakeven analysis, budgeting techniques, working capital management, project planning and control, project management tools/ techniques and computer application.

COURSE AIM

The aim of this course is to expose you to various tools, methods and techniques of project financing and budgeting.

COURSE OBJECTIVES

At the end of this course, you should be able to:

- define project financing
- conduct projects analysis
- identify various sources of project financing
- evaluate the roles of project financing in economic growth and development
- enumerate how to efficiently source and use funds
- explain financial cost/ benefit

- apply the knowledge of information and communication technology in project finance and budgeting.

WORKING THROUGH THIS COURSE

For you to complete this course successfully, you are required to read the study units, reference books, and other resources that are related to the unit. Each unit of the course contains tutor-marked assignment.

The Tutor-Marked Assignment (TMA) is to be done immediately and submitted to your tutorial lecturer/course facilitator for assessment.

The medium to be used and the time to submit the TMA will be specified to you later. This course is a two-credit course. As such you are expected to spend a minimum of two hours every week studying the course. You are expected to complete the entire course outline within a period of 18-25 weeks.

ASSESSMENT

As stated before, every unit of this course has an assignment attached to it. You are required to keep an assignment file. After every unit the assignment should be done. At the end of the course, the evaluation shall be as follows:

Assignment – 30 %
Examination – 70%
Total =100%

Out of all the assignments you will do; the best three will counts for 30% of course marks.
The examination at the end of the course shall cover all aspect of the course.

STUDY UNITS

In this course - Project Financing and Budgeting - you shall acquire some skills to deal with project investigation for profitability or loss. Also, techniques that could be helpful to you as potential financial analyst and project consultant shall be considered under different topics. Based on this, the following units have been designed for the course.

Module 1

Unit 1	Introduction to Project Finance: Meaning of Project, Ingredients and Determinants of a Project
Unit 2	Project Cycle
Unit 3	Projects and Economic Growth and Development
Unit 4	Financing of Project- Objectives of Financial Analysis
Unit 5	Sources and Uses of Funds

Module 2

Unit 1	Cash Flow Statements
Unit 2	Financial Cost and Benefits Analysis
Unit 3	Evolving of Financial Plan (Budgeting)
Unit 4	Techniques and Tools of Analysis –Financial Statement and Ratios
Unit 5	Break-Even Analysis

Module 3

Unit 1	Budgeting Techniques
Unit 2	Working Capital Management
Unit 3	Project Planning and Control
Unit 4	Project Management Tools
Unit 5	Computer Applications

These units must be treated sequentially; as a logical link exists in the arrangement. Every previous unit lays a foundation for subsequent ones. A maximum period of one week is required for every unit.

TEXTBOOKS AND REFERENCES

As was earlier mentioned, materials relevant to the course include not only the ones below but also others that you can lay your hand on. But for now, the following references are recommended.

Black, H. A., John, E. C. & Brown, R.. G. (1967). *Accounting in Business Decisions: Theory, Method and Use.* Englewood Clif, N. J.: Prentice Hall Incorporated.

Lawson, G. H. & Windle, D. W. (1967). *Capital Budgeting and Use of DCF Criteria in the Corporation Tax Regime.* London: Oliver and Boyd,

Odufalu, O. (2000). *The Principle and Techniques of Project Analysis and Evaluation*. Lagos, Nigeria: Y2K Academy Ltd.

PRESENTATION SCHEDULE

Specific dates for particular activities, such as submission of assignment, tutorial schedules and examination dates shall be made available to you on a later date. This will enable you plan your activities in the same line. The method of submitting your assignment and receiving other course materials shall be agreed upon on a later date. You should endeavour not to be falling behind the schedule whenever it is given.

CONCLUSION

By the time you exhaust this course, you will find it useful not only in project financing and budgeting but also your day to day business plans and investment problems.

MAIN COURSE

CONTENTS **PAGE**

MODULE 1

UNIT 1 INTRODUCTION TO PROJECT FINANCE: MEANING OF PROJECT, INGREDIENTS AND DETERMINANTS OF A PROJECT

CONTENTS

1.0 INTRODUCTION

Project financing is an innovative and timely financing technique that has been used on many high-profile corporate projects. Employing a carefully engineered financing mix, it has long been used to fund large scale natural resources projects, from pipelines and refineries to electric-generating facilities and hydro-electric projects. Increasingly, project financing is emerging as the preferred alternative to conventional methods of financing infrastructure and other large-scale projects worldwide.

Project financing discipline includes understanding the rationale for project financing, how to prepare the financial plan, assess the risks, design the financing mix, and raise the funds. In addition, one must

understand the cogent analyses of why some project financing plans have succeeded while others have failed. A knowledge-base is required regarding the design of contractual arrangements to support project financing; issues for the host government legislative provisions, public/private infrastructure partnerships, public/private financing structures; credit requirements of lenders, and how to determine the project's borrowing capacity; how to prepare cash flow projections and use them to measure expected rates of return; tax and accounting considerations; and analytical techniques to validate the project's feasibility.

Project finance is finance for a particular project, such as a mine, toll road, railway, pipeline, power station, ship, hospital or prison, which is repaid from the cash-flow of that project. Project finance is different from traditional forms of finance because the financier principally looks to the assets and revenue of the project in order to secure and service the loan. In contrast to an ordinary borrowing situation, in a project financing the financier usually has little or no recourse to the non-project assets of the borrower or the sponsors of the project. In this situation, the credit risk associated with the borrower is not as important as in an ordinary loan transaction; what is most important is the identification, analysis, allocation and management of every risk associated with the project.

2.0 OBJECTIVES

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

- identify various determinants of project
- describe the main advantages of project finance
- describe the technical requirement of project
- state economic factors and requirements of the project.

3.0 MAIN CONTENT

3.1 Ingredient and Determinants of a Project

The economist summarises the technical aspects of a production process by the production function which is a technical relationship between the combination of capital, labour, and natural resources, and the resulting output.

The economist, in his theoretical construct, assumes that the firm is technically efficient, that is, that the greatest amount of output is produced from any given combination of inputs. Thus, the economist, in his analysis of production and cost, is not immediately concerned with

the problems of management and organisation. Although there are different kinds of labour, natural resources and capital equipment used by the firm, the economist assumes that there is only one kind of each of these inputs in order to isolate the essential aspect of production theory.

In the practical situation of project analysis, reality replaces the theoretical idealisation and the assumptions of the theoretical economic analysis are relaxed.

Bryce (1960) splits the investigation of the technical aspects of a project into two parts viz. the technical requirement study (TRS), and the technical feasibility.

3.1.1 The Technical Requirement Study

The technical requirements study is aimed at obtaining exhaustive and authoritative information on all the various inputs required by the project. For every proposed plant size, the study should:

i. enumerate the various items of the capital cost in both local currency and foreign exchange requirements
ii. report the requirements of the project with regard to the quantity, quality and specification of each kind of raw materials, labour, supplies, fuel, power, water, transportation, and other inputs, and waste disposal
iii. provide a comprehensive environmental impact assessment of the production activity
iv. report the estimated production and overhead costs for operating the proposed plant in detail.

Alternative technical processes that may result in reduced capital or production costs and more favourable environmental impact should be studied and reported. For example, in the production of cement, there are two technical alternatives – the wet and the dry processes, similarly, in power generation, there are the hydro and the thermal processes.

No engineering study is required at this stage. The study should be carried out by engineers with wide experience and high competence in the particular industry. Engineers or corporate consultants who might have vested financial interest in the projects for example, those who might be involved in the sale of machinery or construction services, should be avoided.

3.1.2 The Technical Feasibility Study

The technical feasibility study aims at determining:

i. how well the technical requirements of the project can be met
ii. which location would be most advantageous
iii. what would be optimum size of plant.

It therefore requires the study, item by item, of the availability, quality, accessibility and cost of all the goods and services required for the project with particular reference to (a) alternative location and (b) alternative plant sizes.

1. Determination of optimum location

Technical feasibility depends largely on location, for substantial differences usually do exist in the availability, accessibility, quality and cost of various factor inputs at different locations. The selection of the best location must be guided by the objectives of the entity for which the analysis is being undertaken, that is maximum profit rate from the viewpoint of the firm or equity shareholder or the lowest unit cost or the highest economic and social profitability from the national viewpoint.

Location study according to Hoover (1963) consists of analysing location forces which include:

a. The sum of the total transportation costs of the inputs (raw materials) required by the project and the physical distribution costs of the output produced by the project, which must be minimum.
b. The availability and relative costs of resource inputs which must yield minimum production or processing costs.
c. favourable environment with regard to the availability of land and buildings, taxes and regulations, general living conditions, climate, administrative facilities, centralisation or decentralisation policies of the government, environmental impact policies such as elimination of effluent, and offensive odours, waste disposal and so on.

The best location is that in which the resultant of these forces produces the maximum profit or minimum cost. These forces are now discussed in turns.

a. Influence of transportation cost on choice of location

An analysis of the transportation costs of the requisite raw materials to the project's site, that is, the procurement costs), and those of the resulting outputs to the market (that is, the distribution costs), usually referred to as transfer costs point to three possible locations:

i. near the source of raw materials
ii. near the market, and
iii. at an intermediate point

The best location is that which gives the lowest total transport costs, that is, the sum of both procurement and distribution costs.

i. Factors influencing location near source of raw material

Projects are located near the source of raw material if:

a. They have the characteristics of considerable weight loss at the production stage, for example, the initial processing crude material such as crushing of sugar cane or smelting of ores and so on.

b. They involve large requirements of fuel. Such project usually involves a high proportion of weigh loss since the weight of the fuel used does not enter into that of the final product. Most of the industries using large amounts of fuel are those engaged in early stages of processing; for example metallurgy, manufacturing of cement, glass, calcium carbide and synthetic nitrates and so on.

c. The relative weights of materials and finished products are the same, but the procurement cost per kilogram, for example, ginning and baling of cotton, food-preserving industries, and so on.

ii. Factors influencing location near the market

Projects are located near the market if:

a. They are characterised by the considerable weight gain at the production stage. The production process of such projects involves the incorporation of large quantities of "ubiquitous" material like water. Such material is found virtually everywhere and does not involve any transfer cost, but adds to the weight of the final product; for example, soft drinks, beer and ice-blocks.

b. The production process are in the intermediate and last stages of production and are therefore more perishable, more valuable and involve more distribution cost per kilogram. Therefore, they are located closed to the final consumers.

iii. Factors influencing location at an intermediate point

Transportation costs may also influence the location of a project at a point between the source of raw materials and the market. This phenomenon usually occurs where two modes of transportation meet; for example, the railway and the water route between the source of raw material and the market. If (i) both the raw material and the finished product are cheap and bulky, (ii) the transportation costs of raw material and finished product are the same and (iii) expanses of trans-ship is great, then it is best to locate at the intermediate point. Trans-shipment cost may involve among other things the provision of warehouses and strong security outfit.

b. Influence of production or processing costs on location

In some line of business, transportation costs vary very little with location, that is, they are not important factors in location, when compared with production or processing costs, for example, in the manufacture of type-writers, alarm clocks and so on. Processing cost include direct labour costs, raw materials, cost of administration, electric power, interest, rents, water, fuel, royalties and others. The cost may differ from location to location. The best location is where the combination of productive services necessary to make the product is available and can be obtained at minimum cost per unit of output.

c. Influence of government decentralisation policy on location

Transportation and processing costs are the two most important factors in location, but other factors such as the decentralisation policy of government, living conditions, administrative, housing and social infrastructural facilities, and others should not be ignored. The government may adopt a deliberate policy to disperse industries to some depressed areas by providing generous direct incentives to enterprises wishing to comply. For example, credit facilities, fiscal incentives and infrastructural facilities that may reduce overhead and processing costs may be provided. These factors should be studied and reported in the determination of the best location.

2. Determination of optimum

The determination of the optimum size of the plant is governed by technical-economic considerations. Conflicts often do arise between the size of the plant suitable for a small market, and the size that would yield the competitive lowest unit production cost. The following illustrates cost-volume relationship in the company XYZ**.**

Table 1: Cost Volume Relationship (Company XYZ)

	A	**B**	**C**
Volume (Units)	100,000	200,000	400,000
Total Fixed Investment	100	140	240
Unit Cost (Index):			
Material	100	96	92
Labour	100	92	76
Fixed Overhead	100	70	60
Total Unit Cost	100	92	87
Unit Factory Cost (Total Cost Less Materials)	100	85	76

The table indicates the size C produces the lowest unit cost. Should the project therefore choose size C? The problem involved in the choice of the right size calls for exhaustive examination.

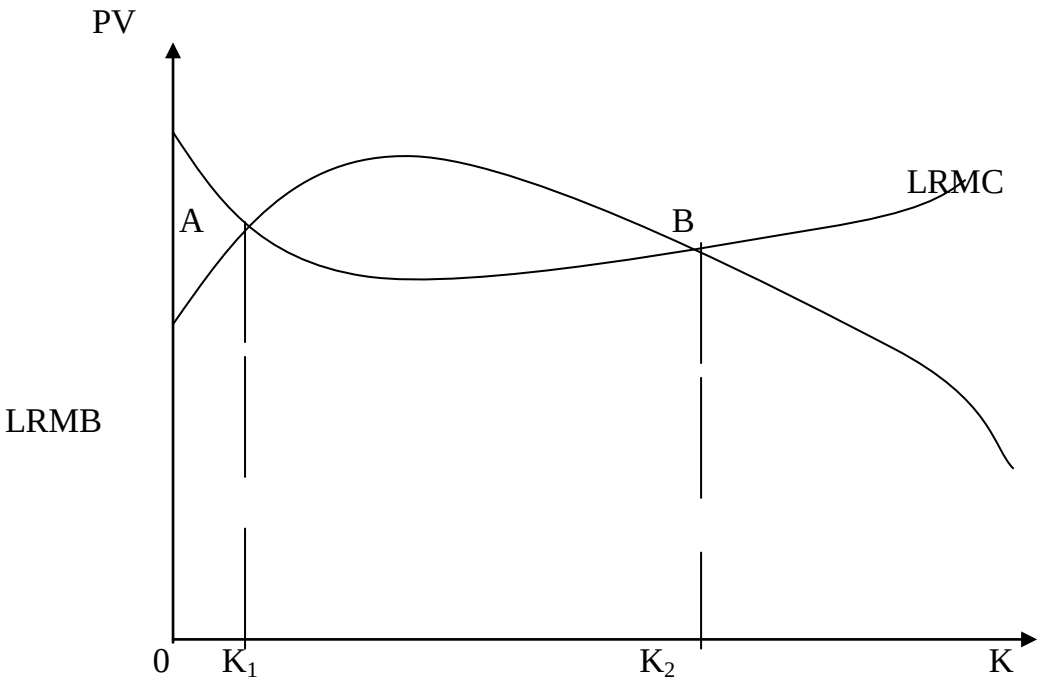
In economic theory, the optimum size depends on the objective function and the constraints. If in project analysis the objective is to maximise the discounted net benefits, then the problem may be expressed as follows:

Max. N = B(k) – C(K), where
N = discounted net benefit
B = discounted benefit as a function of size K
C = discounted costs as a function of size K

dN/dK = dB/dK – dC/dK = 0

Therefore, dB/dK=dC/dK, where

dB/dK and dC/dK are respectively long-run marginal benefit (LRMB) and long-run marginal cost (LRMC). Thus, optimal scale is reached where LRMB equals LRMC. That is, the unconstrained optimum size is reached where the marginal benefit cost ratio is equal to one. This is however the first order condition, for it is possible to have this condition satisfied and yet not to have the optimal scale as illustrated in figure 1.1.



Plant Size (K)

Fig. 1: Determination of Optimum Scale

The optimal condition is satisfied at A and B, but both of them cannot be optimal, for it still pays the project to increase scale and output beyond point A as additions to benefit are greater than additions to cost. Therefore, there is a second order condition which stated that:

$dN^2/dK^2 = d^2B/dK^2 - d^2C/dK^2 < 0$

Therefore, $d^2B/dK^2 < d^2C/dK^2$ or $d^2C/dK^2 = d^2B/dK^2$

Thus, the second order condition states that at the point where the long-run marginal benefit curve intersects the long-run marginal cost curve, the slope of the long-run marginal cost curve must be greater the slope of the long-run marginal benefit curve. Thus, OK_2 is the unconstrained optimum size.

Thus, if the choice is concerned with unconstrained optimum size, figure 1.1 indicates that the marginal benefit (ΔB) and the marginal cost (ΔC) of each size alternative should be calculated and plotted against plant size (or plant capacity), the point of the intersection of the ΔB and ΔC curves corresponding with the larger or largest plant size indicates the unconstrained optimum size. Alternatively, the $\Delta B/\Delta C$ ratio of each size alternative should be calculated, the larger or largest size that yields a ratio of one indicates the unconstrained optimum size.

It is obvious in the above analysis that economic theory makes at least four implicit assumptions: (i) that the market (demand) is very large and it imposes no limitation on the quantity of the product that can be sold; (ii) that distribution costs is zero; (iii) that there is an efficient and adequate administrative capacity to operate the optimum plant size; (iv) that the facility produces only one type of product (that is, it is not a multi-product undertaking). The real situation where some of these assumptions do not hold is now examined.

Size of project and the market

The size of the market gives the guide to the feasible range of alternatives of project size. There are four possible situations:

i. the volume of demand (D) is smaller than the minimum possible size (M) of the project; that is D<M
ii. the volume of demand (D) is equal to the minimum possible size (M); that is D=M
iii. the volume of demand is (D) is larger the possible minimum size or any intermediate size, but less than the largest possible (L); that is M<D<L
iv. the volume of demand is so large that it does not place any limitation on the scale of production, that is D>L

In situation (i), the project is premature and there is no justification for its execution. In situation (ii) there is only one size alternative; and that is the minimum size. In situation (iii) and (iv), there are many alternatives and a project analyst is confronted with problem of choice.
When the market size presents many alternatives for the size of the project, some elimination can take place on the basis of (a) administrative capacity; (b) techniques of production; (c) location (distribution cost).

Project size and administrative capacity

Certain large projects may call for high levels of operation, which require both efficient and adequate administrative capacity. If this is lacking, it may be advisable to operate on a small scale at first, and then expand later as experience is gained. Thus, administrative capacity may constrain or limit the optimum size of a project.

Project size and technique of production

Some production techniques require a minimum scale of operation below which costs would be so high that it would be unreasonable to

operate at low capacity. Size alternatives that would necessitate operation at low capacity would thus be eliminated.

Project size and location (distribution costs)

The size of a project and location are related from two angles: (i) from the geographical distribution of the market, and (ii) from the influence of location on costs and on the evaluation coefficients. Considerations of economies of large scale may incline one to install a big plant that can serve the largest possible market area. However, as the geographical areas to be served increase, distribution costs from a single location would rise as a result of higher freights; and a point is reached where the advantages of the bigger scale might be overweighed. Therefore, instead of installing one big plant in one location to cover a wide geographically dispersed market area, two or more medium-size plants may be installed at different locations in the market area. Thus, distribution costs may impose some limitations on the choice of the optimum size of the project (Odufalu, 2000).

3.2 Principal Advantages and Disadvantages of Project Financing

Advantages

1. **Non-recourse:** A typical project financing involves a loan to enable the sponsor to construct a project where the loan is completely "non-recourse" to the sponsor, i.e., the sponsor has no obligation to make payments on the project loan if revenues generated by the project are insufficient to cover the principal and interest payments on the loan. In order to minimise the risks associated with a non-recourse loan, a lender typically will require indirect credit supports in the form of guarantees, warranties and other covenants from the sponsor, its affiliates and other third parties involved with the project.

2. **Maximise leverage:** In a project financing, the sponsor typically seeks to finance the costs of development and construction of the project on a highly leveraged basis. Frequently, such costs are financed using 80 to 100 percent debt. High leverage in a non-recourse project financing permits a sponsor to put less in funds at risk, permits a sponsor to finance the project without diluting its equity investment in the project and, in certain circumstances, also may permit reductions in the cost of capital by substituting lower-cost, tax-deductible interest for higher-cost, taxable returns on equity.

3. **Off-balance-sheet treatment:** Depending upon the structure of a project financing, the project sponsor may not be required to report any of the project debt on its balance sheet because such debt is non-recourse or of limited recourse to the sponsor. Off-balance-sheet treatment can have the added practical benefit of helping the sponsor comply with covenants and restrictions relating to borrowing funds contained in other indentures and credit agreements to which the sponsor is a party.

4. **Maximise tax benefits:** Project financings should be structured to maximise tax benefits and to assure that all available tax benefits are used by the sponsor or transferred, to the extent permissible, to another party through a partnership, lease or other vehicle.

Disadvantages

Project financing is extremely complex. It may take a much longer period of time to structure, negotiate and document a project financing than a traditional financing, and the legal fees and related costs associated with a project financing can be very high. Because the risks assumed by lenders may be greater in a non-recourse project financing than in a more traditional financing, the cost of capital may be greater than with a traditional financing.

3.3 Obstacle to Good Project Development in Nigeria

According to Odufalu (2000), the following are identified as some of the obstacles to good project development in Nigeria.

i. **Lack of pre-investment studies:** Many projects are commenced without adequate pre-investment studies. Where such studies are available, they may be lacking in sufficient detail. Some studies are merely financial projections without detailed analysis of the market and other technical aspects of the projects.

ii. **Wrong location of project:** Optimum location is an important consideration in project studies. However, this is often ignored especially in government projects. Political considerations are often allowed to override all economies dictates with the result that projects become distressed even from the early stages of their implementation.

iii. **Over-ambitious projects:** Some of the projects taken on by the government are sometimes technically over-ambitious for the level of development of the country. The result is that the general

proposals and targets embodied in the project become generally unattainable because constraints such as inadequate executive capacity, raw materials, working capital and so on set in early in the project's life to stultify the efforts of the project's sponsors.

iv. **Manpower constraints:** One of the major problems bedeviling industrialisation in developing countries is the lack of executive capacity. This was recognised and clearly alluded to in one of Nigeria's development plans, where it was categorically stated that 60% of the targeted proposals could not be realised for lack of executive capacity. Many projects, both in the public and private sectors have floundered on the mire of lack of executive capacity virtually at all stages of project cycle from pre-investment analysis to the implementation. This has meant unnecessary delays both in starting off and in implementation of projects. There has been a general dependence on foreign consultancy services with resultant additional costs.

v. **Financial constraints:** This may take different forms such as shortage of funds, to finance both fixed and working capital, lack of credit facilities and shortage of specialised finance institutions.

vi. **Raw materials problems:** The manufacturing sector of the economy is highly import-dependent for basic raw materials and spare parts. The average capacity utilisation has been hovering a little over 33% for a long time as a result of the constraint imposed on raw materials import due to scarcity of foreign exchange. Uncompetitive prices of final products, traceable to high costs of production, are the ultimate reflection of the prohibitive costs of raw materials.

vii. **Inadequate infrastructure:** Lack of infrastructural facilities plaque the development efforts of both private and public enterprises. Intermittent supply of electricity, lack of good portable water both for industrial purposes and industrial work force, lack of access roads and transportation facilities for produce evacuation, poor telecommunication facilities, and inadequate housing for workers characterised the industrial landscape. Many states of the federation do not deem it worthwhile to create industrial area where the necessary infrastructure could be provided to enhance the siting of industries.

viii. **Lack of political stability:** Peace is a pre-condition for investment and growth of the economy. In an atmosphere that is overcast by wars and rumours of war, it would be difficult to

maintain a consistent policy on development, which would attract investors and sustain investment.

ix. **Institutional impediments:** In the southern areas of the Federation in particular, the land tenure system makes optimal location of projects very difficult especially private sector projects. Several problems of multiple ownership of land are still encountered in spite of the land use decree. In addition, there are cases of religious interference in the siting of projects. In some local areas, the natives believe that if a certain local industry is mechanised, the raw materials would disappear from their area. Similarly, certain animals are held to be sacred or unholy, and it would be kicking against the belief of the people to site projects involving these animals in such areas. Such projects could be sabotaged.

4.0 CONCLUSION

In the course of our study in this unit we were able to examine among others the two major ingredients and determinants of projects namely: technical requirement study and technical feasibility. It is therefore important that any major technological development taking place in the industry which may affect the technical soundness or the competitiveness of the project should be reported.

5.0 SUMMARY

In summary, project technical requirement study reflects the following: enumerate the various items of the capital cost in both local currency and foreign exchange requirements, report the requirements of the project with regard to the quantity, quality and specification of each kind of raw materials, labour, supplies, fuel, power, water, transportation, and other inputs, and waste disposal, provide a comprehensive environmental impact assessment of the production activity report the estimated production and overhead costs for operating the proposed plant in detail. While the technical feasibility study aim at determining how well the technical requirements of the project can be met, which location would be most advantageous, and what size of plant would be optimum. It therefore requires the study, item by item, of the availability, quality, accessibility and cost of all the goods and services required for the project with particular reference to (a) alternative location and (b) alternative plant sizes.

6.0 TUTOR-MARKED ASSIGNMENT

i. What do you understand by technical requirement study and technical feasibility?
ii. Discuss the ingredients and determinants of a project?
iii. State and discuss both the merits and demerits of project financing?

7.0 REFERENCES/FURTHER READING

Bryce, M. D. (1960). *Industrial Development: A Guide to Accelerating Economic Growth*. USA: McGraw Hill.

Odufalu, O. (2000). *The Principle and Techniques of Project Analysis and Evaluation.* Lagos, Nigeria: Y2K Academy Ltd.

UNIT 2 PROJECT CYCLE (EMPHASIS ON FINANCIAL AND ECONOMIC FEASIBILITY)

CONTENTS

1.0 INTRODUCTION

The World Bank defines project as "a proposal for capital investment to develop facilities to provide goods and services'. It is a technically coherent production undertaking which can be carried out independently of other projects by a private or public agency. It is the smallest unit of investment activity for producing goods and services.

The United Nations (1958) on its part defines a project as 'the compilation of data which will enable an appraisal to be made of the economic advantages and disadvantages attendant upon the allocation of a country's resources to the production of specific goods and services".

Projects may be conceived and prepared for all types of activities contained in the International Standard Industrial Classification, and may vary from a simple car-wash undertaking or an arable-crop farm to produce maize or beans, through a more complex manufacturing outfit such as aluminum cooking pots, to a more generalised investment involving many facilities and activities such as the automobile, the Kainji Dam, the iron and steel complex, the petroleum refinery, and the construction of the railways. A project may be an investment to build something entirely new for example the BRT road constructing by Lagos State government or for the expansion, improvement, rehabilitation, replacement or modernisation of an existing facility.

A project may be distinguished from a programme. A programme is defined by Odufalu (2000), as a coordinated set of projects within the same country, state, local government areas or city. For example a rice project may require for its success, access road and transportation facilities for the evacuation of the products, and water supply for

parboiling rice to prevent the germination of the harvested rice. The road and transportation facilities, the water supply and the rice project may be regarded as a programme if they have to be simultaneously implemented to ensure the success of the rice project.

The World Bank, according to Odufalu (2000), regards project study as a continuous and self-sustaining cycle of activity which runs through four principal stages viz.: the identification of the project, its preparation, its appraisal, and supervision of the project in its construction and operating stages to make sure that it achieve its objectives.

2.0 OBJECTIVES

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

- explain the process of project cycle management
- process application of project management by World Bank.

3.0 MAIN CONTENT

3.1 Project Cycle Management

The process of planning and managing projects can be drawn as a cycle. Each phase of the project leads to the next.

Identification

To identify what a project will focus on, we need to find out who should benefit and what their needs are. A 'needs assessment' will give an overview of community problems. A 'capacity assessment' will help identify which problem the project should address.

The manner in which the process of project identification proceeds depends on the findings of the preliminary review of the situation and identification of relevant stakeholders. For example, if the constraints exist principally at the macro level, the problem may best be tackled through stakeholders operating at the national level. Stakeholders network vertically as well as horizontally. Thus intermediate level stakeholders can assist with addressing constraints at the community level as well provide linkages from the field to the policy environment.

Design

Once it is decided to go ahead with the project, we can start to think about the detail. This involves carrying out further research into the

people affected by a problem and how they are affected by it. We also need to consider the risks to the project and how we will measure the project's performance.

Implementation

During the implementation of the project it is important to monitor and review the progress of the project and any outside changes that affect it. The project plans should be adjusted where necessary.

Evaluation

Evaluation should be carried out at or after project completion. This could be carried out a few months or years after the project has finished. It will ensure proper assessment of its long-term impact and sustainability.

Lesson learning

While the project cycle is a useful way of outlining the stages of a project, it has one drawback: it makes it look as though one tool follows another. In fact, many of the planning tools can be used at any stage of the project. They should be repeated throughout the project's life to ensure that any changes that might affect project success are accounted for. Findings should also be used for organisational learning and to improve other projects.

3.2 Application of Project Cycle by World Bank

Each year the World Bank lends between $15 and $20 billion for projects in more than 100 countries it works with. Projects range across the economic and social spectrum in these countries from infrastructure, to education, to health, to government financial management. The projects the bank finances are conceived and supervised according to a well-documented project cycle. Documents produced as part of the project cycle can be valuable sources of information for interested stakeholders wanting to keep abreast of the work the Bank is financing and for businesses wishing to participate in projects financed by the bank. Below is a step-by-step guide to the project cycle, the documents that are produced as part of the process, and how to access them.

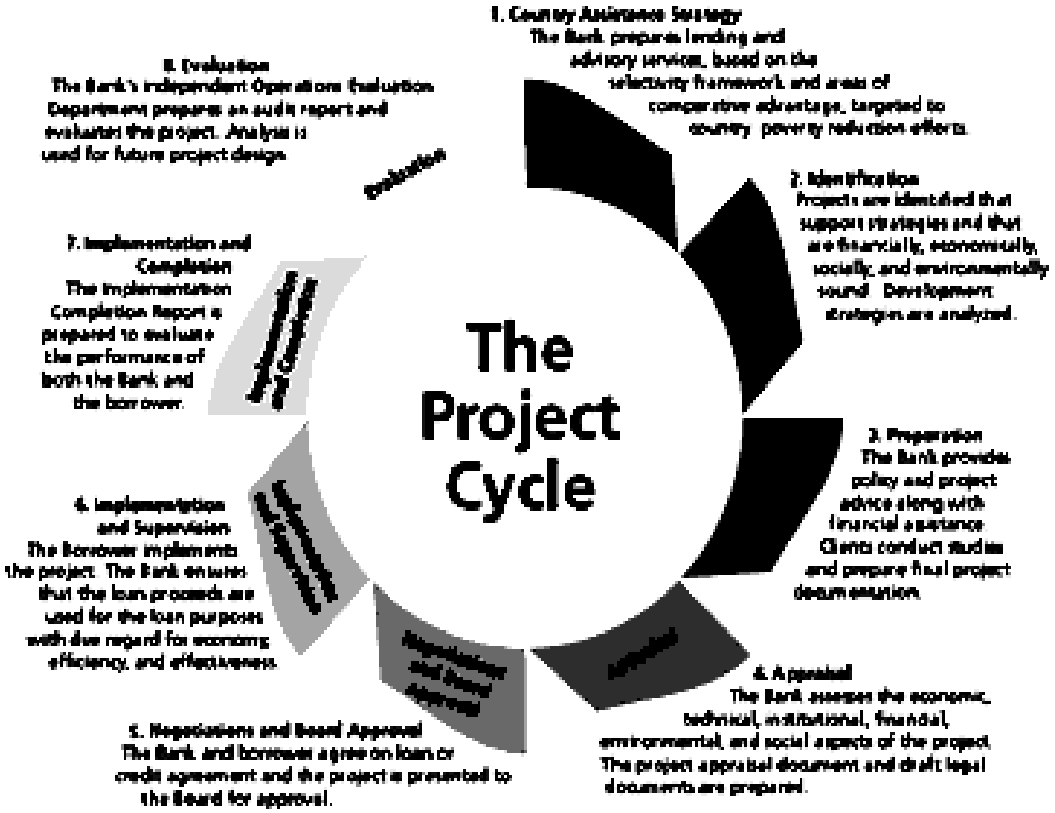


Fig.2: How the Process Begins: Poverty Reduction and Country Assistance Strategies

The bank recognises that many past efforts, including some of its own, failed because the agenda was driven by donors rather than by the governments it was trying to assist. Under its current development policy, the bank helps governments take the lead in preparing and implementing development strategies in the belief that programmes that are owned by the country, with widespread stakeholder support, have a greater chance of success.

In low-income countries, the bank uses the Poverty Reduction Strategy (PRS) approach which involves widespread consultation and consensus building on how to boost development. Under this process, a national poverty reduction strategy is prepared by the country. This creates a framework for donors to better co-ordinate their programmes behind national priorities. The government consults a wide cross-section of local groups and combines this with an extensive analysis of poverty in the country's society and its economic situation. The government determines its own priorities from this process and produces targets for reducing poverty over a three to five year period. These are outlined in a Poverty Reduction Strategy Paper (PRSP). The Bank and other aid agencies then align their assistance efforts with the country's own strategy - a proven way of improving development effectiveness.

The bank's blueprint for its work with a country is based on a Country Assistance Strategy (CAS) which, in the case of low income countries, is derived from the priorities contained in the country's Poverty Reduction Strategy Paper. The CAS is produced in co-operation with the government and interested stakeholders. The preparation of the CAS may draw on analytical work conducted by the bank or other parties on a wide range of economic and social sectors, such as health, education, agriculture, public expenditure and budgeting, fiscal management, or procurement, among others.

The identification phase

The bank's Country Assistance Strategy (CAS) forms the blueprint for its assistance to a country. In low-income countries, the CAS is based on the priorities identified in the country's Poverty Reduction Strategy Paper (as outlined above). The goals outlined in the CAS guide the priorities of the bank's lending programme and are a useful source of information for interested stakeholders and businesses wishing to identify potential future areas of bank lending. During the identification phase, bank teams work with the government to identify projects which can be funded as part of the agreed development objectives. Once a project has been identified, the bank team creates a Project Concept Note (PCN) which is an internal document of four to five pages that outlines the basic elements of the project, its proposed objective, likely risks, alternative scenarios to conducting the project, and a likely timetable for the project approval process.

Useful public documents

The Project Information Document (PID) is prepared after an internal review of the PCN and is released publicly through the Bank's infoshop. It is usually four to five pages long and contains the information mentioned above - the objective, a brief description, etc. It also contains the name of the World Bank task manager or team leader who is supervising the project, a useful contact for companies interested in bidding for work on the project. The PID is an essential resource for tailoring bidding documents to the project concerned.

The Integrated Safeguards Data Sheet (ISDS) is also prepared for the first time after the project's first formal review and made available publicly. It identifies key issues under the World Bank's safeguard policies for environmental and social issues, and provides information about how they will be addressed during project preparation.

The preparation phase

This part of the process is driven by the country that the Bank is working with and can take anything from a few months to three years, depending on the complexity of the project being proposed. The bank plays a supporting role, offering analysis and advice where requested. During this period, the technical, institutional, economic, environmental and financial issues facing the project will be studied and addressed - including whether there are alternative methods for achieving the same objectives. An assessment is required of projects proposed for bank financing to help ensure that they are environmentally sound and sustainable (environmental assessment). The scope of the environmental assessment depends on the scope, scale and potential impact of the project.

Useful public documents

An Environmental Assessment Report (EA) analyses the likely environmental impact of a planned project and steps to mitigate possible harm.

An indigenous peoples development plan identifies potentially adverse effects on the health, productive resources, economies, and cultures of indigenous peoples.

The environmental action plan describes the major environmental concerns of a country, identifies the main causes of problems, and formulates policies and concrete actions to deal with the problems.

The appraisal phase

The bank is responsible for this part of the process. Bank staff reviews the work done during identification and preparation, often spending three to four weeks in the client country. They prepare for bank management either project appraisal documents (investment projects) or program documents (for adjustment operations) and the financial management team assesses the financial aspects of the project. The PID is updated during this phase. These documents are released to the public after the project is approved (see below).

The negotiation and approval phase

After bank staff members have appraised the proposed project, the bank and the country that is seeking to borrow the funds, negotiate on its final shape. Both sides come to an agreement on the terms and conditions of the loan. Then the Project Appraisal Document (PAD) or the

Programme Document (PGD), along with the memorandum of the president and legal documents are submitted to the Bank's Board of Executive Directors for approval. The appropriate documents are also submitted for final clearance by the borrowing government which may involve ratification by a council of ministers or a country's legislature. Following approval by both parties, the loan agreement is formally signed by their representatives. Once this has occurred, the loan or credit is declared effective, or ready for disbursement, after the relevant conditions are met, and the agreement is made available to the public.

Useful public documents

The Project Appraisal Document (PAD) presents all the information the Board needs to approve bank financing of the proposal. Before 1999, this document was called the Staff Appraisal Report. The Programme Document (PGD) describes adjustment lending operations, and sets out the bank's appraisal and assessment of the feasibility and justification for the program.

The Technical Annex supplements a memorandum and recommendation of the president for freestanding technical assistance loans, which do not require project appraisal documents.

The Implementation and supervision phase

The implementation of the project is the responsibility of the borrowing country, while the bank is responsible for supervision. Once the loan is approved, the borrowing government, with technical assistance from the bank, prepares the specifications and evaluates bids for the procurement of goods and services for the project. The bank reviews this activity to ensure that its procurement guidelines have been followed. If they have, the funds will be disbursed. The bank's financial management team maintains an oversight of the financial management of the project including periodically requiring audited financial statements.

Useful public document

Report on the status of projects in execution provides a very brief summary of all projects that were active during the previous fiscal year. Previously an internal communication to the Board of Executive Directors, the SOPE Report now is available to the public. Projects that closed during the fiscal year are no longer included in the SOPE Report, since their implementation completion reports are also publicly disclosed.

The Implementation completion report

At the end of the loan disbursement period (anywhere from one to 10 years), a completion report identifying accomplishments, problems, and lessons learned is submitted to the Bank Board of Executive Directors for information purposes.

Useful Public Document

Implementation completion reports review the results and assess an operation on completion of each loan financed by the bank. The self-evaluations for every completed project are prepared by operational staff.

The evaluation phase

Following the completion of a project, the bank's operations evaluation department conducts an audit to measure its outcome against the original objectives. The audit entails a review of the project completion report and preparation of a separate report. Both reports are then submitted to the executive directors and the borrower. They are not released to the public.

Useful public documents

Project Performance Assessment Reports rate project outcomes (taking into account relevance, efficacy, and efficiency), sustainability of results, and the institutional development impact. One in four completed projects (or about 70 a year) is chosen for a project performance assessment report, which takes operations and evaluation department staff about six weeks to produce and normally includes a visit to the project in the borrowing country.

Impact evaluation reports assess the economic worth of projects and the long-term effects on people and the environment. These "second looks" at projects are performed five to eight years after the close of loan disbursements.

Inspection panel reports review claims by affected parties that the bank failed to follow its operational policies and procedures with respect to the design, appraisal and/or implementation of a bank-financed operation.

Projects may be dropped at any point in the project cycle from preparation to approval. For these projects, which never achieve active

status, project information documents, described above, are effectively the final documents.

3.3 Financial and Economic Feasibility

What is feasibility report?

A feasibility report tells you whether a business plan will succeed or fail. In other word, the report concerns itself with determining whether the business you plan to do will be profitable. If the report indicates that the business cannot succeed then you must think of another plan.

Such a report, no matter how elementary, is very important and should be prepared by anybody who wants to start a new business or expand an existing one. If you happen to go to any bank or any other institution giving loans to businessmen, you will probably hear the loan officer telling you to go and bring a feasibility report or business plan which will show him whether there is a market for your product, whether you can manage the business and the financial implications of the proposal and whether or not the business proposal will be profitable. The formality, detail and complexity of the plan can vary with the size of the business. But irrespective of the size, the feasibility report should include at least a market forecast, a marketing plan, cash-flow budget and pro forma income statement.

A feasibility report has many advantages. It helps you not only to make a decision whether to invest or not; but also it helps you to raise capital for your business. It is doubtful if you can raise much capital without it. It is on the basis of your bankers evaluation of your business plan or feasibility report that he can decide whether your business has a chance of success and therefore the ability to repay the loan as and when due.

A feasibility report also serves as a basis for measuring the performance of your new business. For example, if in your feasibility report it was estimated you will make N100,000 sales of your product or service a month, you should compare your sales with the estimated sales of N100,000 to ascertain whether you are performing below or above forecast. Whenever there is a significant difference between the actual performance and estimate, you should find out why and take corrective action.

Critical aspects of a feasibility report

No two feasibility reports are the same but there are certain aspects of a feasibility report which every good report should have. Among these critical aspects are:

a. Size of the market for your product or service.
b. The management team for the business i.e. who are going to run the business and what is their background and experience.
c. Financial requirements of the new business.
d. A marketing plan i.e. how you will sell the product or service to be produced.
e. Determination of profitability. You must be able to ascertain after some analysis how much profit to be expected from the business. If there is no adequate profit, the proposal should be dropped. Similarly, of course, if the analysis shows that the business will make losses it will not be wise to invest your scarce capital in it.

4.0 CONCLUSION

In the course of our study in this unit, we were able to examine the process of project management cycle. The project cycle process discussed the project identification, design, implementation, and evaluation. While the application of the project cycle by World Bank followed the same processes. Therefore, it is very important to use the foregoing mentioned sequence of events in designing project cycle for both private and public projects.

5.0 SUMMARY

In summary, project cycle entailed those sequence of events needed to follow in order to complete a project. It usually involves the project identification where people needs and capacity assessments are conducted. Project, involves carrying out further research into the people affected by a problem and how they are affected by it. During the implementation of the project it is important to monitor and review the progress of the project and any outside changes that affect it.

6.0 TUTOR-MARKED ASSIGNMENT

Enumerate the process of project cycle and relate it with a particular project.

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UNIT 3 PROJECTS AND ECONOMIC GROWTH AND DEVELOPMENT

CONTENTS

1.0 INTRODUCTION

Since the 1950s the development agenda has been characterised by projects and programmes aimed at improving the quality of life of beneficiary communities, be it in physical or qualitative terms. Despite significant inputs of human and financial resources, many fell short of expectations. Projects failed to meet the priority needs of communities; stated outputs were not achieved or, if achieved, not sustained; target groups did not benefit in the manner intended; project costs escalated and implementation dates slipped; and adverse outcomes were not anticipated.

These failures were attributed in part to poor project management. These are lack of adequate opportunities for potential beneficiaries to participate in project identification, weak financial management, inadequate monitoring during implementation, poor linkages between project activities and project purpose, and insufficient attention to the external environment during project design. It was also recognised that projects were more likely to succeed when account was taken of the socio-economic context in which they operated. The rationale for addressing socio-economic and gender issues in project cycle management is the wish to achieve **sustainable developmen**t. Projects should identify and understand the different roles and entitlements between women and men in target communities, and the special challenges faced by disadvantaged groups. For example, if there are imbalances between those who do the work and those who control the

benefits, such initiatives will prove unsustainable in the long run. This holds true at household, community and national levels.

In recent decades, many tools have been developed to strengthen the project management such as project cycle management, the logical framework and rapid appraisal techniques. Similarly, a body of knowledge and expertise has been established which facilitate the consideration of socio-economic issues in the development context. This guide draws together these two areas of expertise by focusing on the integration of gender and socio-economic issues into project management.

2.0 OBJECTIVES

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

- differentiate between growth and development
- measure development and growth
- discuss the impact of project on economic development
- identify various impacts of project on economic growth
- state the environmental implication on projects.

3.0 MAIN CONTENT

3.1 Overview of Economic Development and Growth

The aftermath of the WWII geared up the interest of economists to the study of economic development. However, the need on the part of many nations to address the slogans that “poverty anywhere is a threat to prosperity everywhere” further strengthened the interest on the subject matter (Jhingan, 2001).

Todaro (1977) argues that development is not purely an economic phenomenon because it encapsulates more than material and financial side of people’s lives. Further, he stressed that development is multidimensional process involving re-organisation and re-orientation of entire economic and social system.

Development by definition basically implies both quantitative and qualitative changes that contribute to improve the quality and standard of living of the people. Thus industrialisation would play a potential and critical role in economic development and enhance economic welfare of the population. In reality, however, the role of industry as the ‘engine’ of development in least developed countries (LDCs) has been minimal and since the last decade, the pace of industrialisation in the LDCs has retrogressed considerably (UNIDO, 2000).

Bakare (1999) perceives development as the process of optimising the resources of a nation to meet the needs of the people and their enlightened aspiration and endowing them with the capacity to sustain their achievement.

Fashola (1998) argues that economic growth is an aspect of economics that deals with national income objectives; whereas development incorporate other objectives such as equitable welfare distribution, national self reliance, balance sectorial development, balanced regional development, ecological balance, social and environmental stability, among others.

The economics of development refers to the problems of the economic development of underdeveloped countries. Though the study of economic development has attracted the attention of economists, from Adam Smith down to Marx and Keynes, yet they were mainly interested in the problems which were essentially static in nature and largely related to a Western European framework of social and cultural institutions.

Industrialisation is an indispensable part of general socio-economic growth and development. Industry is capable of producing a wide range of consumer goods and a range of intermediate and capital goods for the other sectors and branches of the economy such as agriculture, services, mining, construction and utilities, as well as the equipment needed for various manufacturing industries themselves. Directly and indirectly, industry is also capable of generating substantial employment, and is the most dynamic sector of the economy in generating and disseminating the technological change. A shift of labour and other resources from the low-productivity primary sector to high-productivity manufacturing (thus providing and increasing personal income and creating effective demand for manufactures, services etc.) and the creation and fostering of linkages between manufacturing, agriculture, mining etc., are part of the conditions to achieving adequate living standards through a dynamic growth process. However, industrialisation obviously does not have the same potential in all LDCs and developing nations. The potential is determined inter-alia by market size and access, natural and human resources and LDCs differ in these. The overall potential of industrial development can only be realised through specific national strategies and policies varying in scale, scope and timing.

Manufacturing production in most LDCs is characterised by a dominance of consumer goods (for example food product, beverages, tobacco etc.), which account for more than half of total manufactured output.

The manufacturing base in LDCs is very small, even, smaller than that of developing countries as a group.

According to Jhingan (2001), economics development is measured in four ways and these are Gross National Products (GNP), GNP per capita Welfare and Social Indicators.

Ceppal and Salkever (1972) stated that economic development took different forms in different parts of Africa. Everywhere however, it involved either the activation of unused resources or the transfer of resources out of subsistence agriculture into money-earning activity.

3.2 Measures of Economic Development

According to Jhinghan (2001), over the past 50 years, development economics has undergone many changes. The emphasis has shifted from growth in GNP per capita to the creation of employment, to redistribution of income, to basic human needs, to structural adjustment and sustainable development.

GNP Per Capita:

In 1950s, economic development had been identified with the growth of GNP/GNP per capita. The United Nations in a resolution set target rate of five per cent in GNP of LDCs (less developed countries) for the development decade of the 1960s. To achieve the targeted growth rate, economists in the LDCs suggested rapid industrialisation alongside with urbanisation. Thus it was believed that the gains from the growth of GNP per capita would automatically 'trickle down' to the poor in the form of increased employment and income opportunities. But the growth of GNP per capita failed to solve the problems of poverty, unemployment and inequalities.

Employment creation

During the 1950s and 1960s, the LDCs had high rate of growth of industrial production and of economic growth, but these rates failed to create enough employment.

Employment became a major policy issue of the LDCs and international agencies since the 1970s. The emphasis shifted from output or growth approach to income or poverty approach to the employment problem which laid emphasis on the quality rather than on the quantity of employment. Industrial development having failed to provide larger employment opportunities, increasing attention was paid on the adoption

of employment generating schemes specifically directed towards the urban and rural poor so as to increase their productivity and incomes.

Income inequality

According to Kuznets, it was believed that a high degree of inequality in the distribution of income had favourable effect on the economic growth in the early stage of development and as development gained momentum its benefits would automatically 'trickle down' to the lower income groups over the long-run. So, this development approach emphasised the maximisation of the growth rate of the economy by building up capital, infrastructure and productive capacity of the economy and leaving the distribution of income untouched.

Basic human needs

The basic human needs strategy laid emphasis on providing basic material needs in terms of health, education, water, food, clothing and shelter. The basic needs strategy had three components. First, it aimed at raising productivity and incomes of the rural and urban poor in labour surplus LDCs through labour-intensive production techniques by providing them basic needs. Second, it emphasised the removal of poverty by providing such public services as education, drinking water and health. Third, the government financed such public services. But in reality, the focus was only on the second item- the delivery of the basic public services. As a result, the basic strategy was criticised as a prescription of "count, cost, and deliver", i.e. count the poor, cost the number of public services and deliver them to the poor. It was thus regarded as state action from top to bottom. Fourth, it was criticised for not providing the poor with productive assets and capital.

Stabilisation and structural adjustment

Many countries embarked on programmes of stabilisation and structural adjustments. Initially, stabilisation measures, supported by the IMF and World Bank, aimed at reducing inflation, both budget and trade deficits, cutting public spending, reducing wages and raising interest rates. But these measures often led to recession in some countries. Moreover, these were short-term measures. Goaded by the World Bank and IMF, many developing countries switched to long-term structural adjustment programme. It is a domestically designed programme of reforms by following the policies of liberalisation, adjustment, and privatisation. These "involve reducing the role of the state, removing subsidies, liberalising prices and opening economies to flows of international trade and finance." These often include measures to reduce the fiscal deficit. The majority of the LDCs are still pursuing structural adjustment

programmes. But these have led to reduction in government spending on social services like health and education. Poverty and unemployment have increased and the concern for the poor has been pushed into the background.

Human capabilities

According to Amartya Sen (1989), "at the core of human well-being is freedom of choice by enhancing people's capabilities for attaining higher standards of health, knowledge, self-respect and the ability to participate actively in community life. GNP per capita and the supply of particular goods should not judge the standard of living of a society but by people capabilities i.e. what a person can or cannot do, can or cannot be. It is entitlements i.e. – the set of alternative commodity bundles that a person can command in society – that generate these capabilities. The relevant capabilities are: being free from starvation, from hunger, from under-nourishment; participation in communal life; being adequately sheltered and so on. The expansion of these capabilities implies freedom of choices – political, social, economical and cultural freedom.

Human development

The UNDP incorporated Sen's view in its first human development report in 1990. According to it, human development goes beyond income and growth to cover all human capabilities – needs, aspirations and choice of the people. It defines human development as "a process of enlarging people's choices" that are created by expanding human capabilities. Income is one of the choices, not the only choice. Rise in income is not the same thing as increase in human capabilities. Besides higher income, poor people put a high value on adequate nutrition, access to safe drinking water, better medical facilities and school for their children, affordable transport, adequate shelter, secure livelihood and productive and satisfying jobs.

Sustainable development

In 1987, the World Commission on Environment and Development (Brundtland Commission) used a new concept of 'sustainable development'. It defined the term sustainable development' as "meeting the needs of the present generation without compromising the needs of the future generation". Economic development must be sustainable, which means that it should "keep going". The World Development Report 1999-2000 emphasises the creation of sustainable improvement in the quality of life for all people as the principal goal of development policy. According to it, sustainable development has many objectives. Besides increasing economic growth and meeting basic needs, the aim

of lifting living standards include a number of more specific goals: "better people's health and education opportunities, giving everyone the chance to participate in public life, helping to ensure a clean environment, promoting inter-generational equity, and much more." Thus meeting the needs of the people in the present generation is essential in order to sustain the needs of future generations.

3.3 Analysis of Project's Environmental Technological Externality

The private firm is not immediately financially concerned with cost items (or benefits) that do not enter into its profit and loss account or with prices that are not observed or negotiable under market forces of supply and demand. The economist makes use of this observable phenomenon as part of assumptions underlying his theoretical explanation of allocative efficiency. Thus, it is assumed that there is perfect independence among producers and consumers and between these two groups of agents. That is, the production possibility curve of one producer is not affected by that of another; the indifference curve of one consumer is affected by that of another; and production possibility of one producer does not affect the indifference curve of any consumer. A violation of any aspect of these assumptions is referred to as technological externality. Externalities are costs or benefits imposed on other producers, consumers, or both in the course of one's production or consumption activity, for which they pay or receive nothing in return. Externalities are costs or benefits imposed on other producers, consumers or both in the course of one's production or consumption activity, for which they pay or receive nothing in return. Externalities are also referred to as spillovers.

Externalities may be technological or pecuniary. It is technological if it involves physical effects on others. That is, if the marginal productivity or marginal utility of one is affected by the production or consumption activity of another. While pecuniary externality involves financial effects on others arising from changes in the supplies of the things they sell.

Externality occurs when an economic agent makes uncompensated use of an environmental factor that is shared with others, for example air, water, forest, and soil.

In recent years, environmental pollution and degradation by the production and consumption activities of man have reached such alarming proportions that the ozone layer has been significantly depleted endangering human health and existence. Moreover excessive carbon

dioxide is being generated resulting in green house effect and causing global warming and altering weather patterns.

3.4 Economics Analysis of Project

Despite the difficulty in assigning economic value to certain environmental or human factors, economists and analysts nonetheless can provide decision makers with what might be called second-best or practical cost benefit analysis. Economist John Krutilla summarised the role of economics as follows: "economic analysis of benefits and costs of long-term investments involve as much art as science. There is a need to project the relevant course of events within the area of project influence over a very long period of time, and getting to understand human responses to changes in the social and physical environment does not come easily."

Several items must be considered before beginning an analysis of any water project, investment, or spending decision. For example, construction of a public flood-control project or a reservoir often does not consider the effect on fish, wildlife, wetlands, or surrounding watersheds. Or, the evaluation of a water conservation project may not include the effects on the recreational use of a lake or reservoir. Consequently, the fully informed decision maker must first determine the scope of the costs and benefits to be taken into account. This way, managers can assure the public that the major relevant factors were considered before taking a decision.

Another question concerns the entity to be maximised: returns to the system? return rate payer benefits? eturn to water use? Environmental concerns? Whether a project is a net benefit to the system, the community, or the environment will depend on the objective that is being sought.

Third, analysts must know the investment criteria. Whether one project is chosen over another or no investment is made depends on the criteria for ranking projects.

Fourth is the relevant timeframe for the project. A period of analysis must be chosen. For example, how long is a reservoir to last? The analyst must also remember that different projects have different cash flows over time; some have early returns, others more distant returns.

4.0 CONCLUSION

In the course of our study in this unit we were able to discuss economic development and growth; measures of economic development; analysis

of project environmental technological externality and finally, economic analysis of project. Thus, there is no growth without development and therefore in order to have a sustainable development there must be adequate implementation of the foregoing mentioned factors for any successful project.

5.0 SUMMARY

In summary, this unit discussed measure of economic development with emphasis shifted from growth in GNP per capita to the creation of employment, to redistribution of income, to basic human needs, to structural adjustment and sustainable development while externalities may be technological or pecuniary. It is technological if it involves physical effects on others; that is, if the marginal productivity or marginal utility of one is affected by the production or consumption activity of another. While pecuniary externality involves financial effects on others arising from changes in the supplies of the things they sell.

6.0 TUTOR-MARKED ASSIGNMENT

i. a. What do you understand by externality?
   b. How does externality affect project financing?
ii. a. Differentiate between growth and development.
   b. Discuss measures of development.

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UNIT 4 FINANCING OF PROJECT-OBJECTIVES OF FINANCIAL ANALYSIS

CONTENTS

1.0 INTRODUCTION

Financial statement analysis is the analysis of the borrower's financial statement as it relates to the project and the amount asked for. The first establishes the end and need for the loan as well as the repayment ability while the second will establish how much is required, for how long, when require, and whether the loan demand conforms to the existing directives guidelines both of head office and of the Central Bank.

2.0 OBJECTIVES

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

- apply the principle of financial analysis
- identify the roles of credit officers
- investigate loan requirement of a project
- use ratio analysis as financial tools.

3.0 MAIN CONTENT

3.1 Principle and Components of Financial Analysis

One is the analysis of borrower's financial statement as it relates to the project and as relates to the amount asked for. The first establishes the end and need for the loan as well as the repayment ability while the second will establish how much required, for how long, when required and whether the loan demand conforms to the existing directives and guideline both of head office and of the Central Bank.

In analysing the end use, the banker should endeavour to establish whether all reasonable estimated costs are allowed for, and whether the estimates are realistic. He should also attempts to establish whether the sources of finance contemplated by the sponsors will be adequate and whether they would, in fact be forthcoming. Otherwise the banker will be stuck with his own lending. Finally, he would attempt to ascertain the likely impact of the project on the level of production, sales, net earnings, borrowings etc. of the borrower, and when the project is expected to break-even and start yielding profit.

Having established the above, the banker then turns to analysing the amount of the loan asked. An up-to-date audited balance sheet or the appropriate financial statement normally gives some clues. Generally, the capital employed including any undistributed profits is one guide to how much the customer can borrow; while the figures for creditors of all kinds, of stock and work-in-progress and of trade debtor show the liquid position of the business and may indicate the difficulty with which credit can be paid regularly. All in all the objective must be to determine that the amount demanded is neither too much nor too small but is just adequate, and that magnitude of the available surplus or profits, including any other cash accruals will be adequate to service the loan effectively through repayment of principal and interest plus a margin for incidentals. The point to emphasis is that there should be a proper perspective of the financial position of the concern. For this purpose, a single year's performance as revealed in the profit and loss account and the balance sheet will not be adequate. A dynamic view has to be taken of the organisation both in prospect and retrospect (Nwankwo, 1991).

3.2 Ratio Analysis

Ratio analysis is a useful tool in financial statement and project analysis. It is used in the initial stages to reduce the large number of individual items in the financial statements to a fewer number of meaningful ratios that assist the lending officer to analyse the borrowers' current position. It helps also to identify critical areas for further detailed examination. The basic commonly used ratios relate to liquidity, management efficiency, leverage or debt, and profitability. The ratios are not universally applicable to all situations. Inventory turnover, for instance is not relevant and meaningful in the analysis of service firms but very relevant and important in the analysis of retail or manufacturing firms. The table below shows the key ratios commonly used by analysts.

Table 2: Commonly Used Ratios in Financial Analysis of Project

Types of Ratio	Name	Function	How Measured
(1) Liquidity	a) Current Ratio	Indicate the extent to which claims of short-term creditors are covered by assets that can be readily converted into cash without loss. High values suggest high safety margins for short-term creditors but does not consider quality of receivables and inventories.	Current Asset (CA) / Current Liabilities (CL)
	b) Quick (Acid test)ratio	A more reliable measure of liquidity than the current ratio. Purges the current ratio of lack of concern for the quality of receivables and inventories. NB: a and b, each measures the ability of the firm to generate cash to meet short-term obligation	CA - Inventories. / Current liabilities
(2) Profitability	a) Net Profit Margin or Return on Sale (ROS)	Measures profitability of the firm relative to sales.	Net Income / Sale
	b) Return on Equity (ROE)	Measures profitability of the firm relative to net worth or owner's equity in the firm.	Net Income / Total Equity or Net worth
	Return on Asset (ROA)	Measure profitability of the firm in relation to assets employed.	Net Income / Total Assets
(3) Leverage	a) Debt to Asset	Measures the amount of debt employed by the firm in relation to the total assets of the firm. The bigger the debt the more volatile the earnings because of the fixed charged.	Total Debt / Total Assets
	b) Debt to Equity	Measure the amount of debt employed by the firm in relation to total equity or net worth.	Long Term Debt / Total Equity (Net Worth)
	c) Times Interest or Financial Charges coverage	Measure the coverage of interest payment in the debt.	Earning before Interest + Taxes / Annual Interest Expense

	d) Account Payable Turnover	Measures account payable in relation to purchases.	Average accounts Payable / Av. Purch. Per Day
(4) Activity or Management Efficiency	a) Collection Period	Measures the degree of efficiency with which management collects receivables.	Average Account Receivables / Sales per Day
	b) Total Assets Turnover	Measures the degree of efficiency with which management utilizes assets in relation to sales.	Sales / Total Assets
	c) Inventory Turnover	Measures management efficiency in turning over inventories to generate profit i.e. inventory control.	Sales / Av. Inventory
	d) Fixed Asset Turnover	Measures net sales over net fixed assets.	Sales / Net Fixed Assets
	e) Receivables Turnover	Measures sales over receivables.	Credit Sales / Account Receivables

For better results, common size ratios should be obtained by expressing each balance sheet item as a percentage of total revenue and each expense item as percentage of total expenses. The ratios should also not be analysed in isolation as there are no absolute standard for them. They can be analysed cross sectorally by comparing the firms ratios with the ratios of peer firms in the industry or at a point in time. Another way is time series. This deals with historical trends in the ratios, in effect measuring the firm against itself at different time periods. This helps to detect looming problems before they occur. A firm experiencing rapid sales but steadily declining profit margin because of rising costs may find, through time series analysis, that the rapid growth may have masked the dangerous slide in profit margins and would then try to do something about it – get away from the euphoria of rapid growth and correct deficiencies in costing matrix and therefore in profit margins.

It is also usually advisable not to rely on a single ratio but on combination of ratios. Return on equity, for instance can be broken down to its constituents such as leverage, profit margin, activity and common size ratios. This enables analyst to simultaneously view the key relationships governing the business enterprises.

4.0 CONCLUSION

In the course of our study in this unit we were able to discuss principle and components of financial analysis as well as use financial ratios as financial tools in analysing and assessing the financial capability of the borrowers of funds. Thus, the foregoing is very important in order to safeguard any future defaults in loan repayment.

5.0 SUMMARY

Summarily, in analysing the end use, the banker should endeavour to establish whether all reasonable estimated costs are allowed for, and whether the estimates are realistic. He should also attempts to establish whether the sources of finance contemplated by the sponsors will be adequate and whether they would, in fact be forthcoming. Otherwise the banker will be stuck with his own lending. Finally, he would attempt to ascertain the likely impact of the project on the level of production, sales, net earnings, borrowings etc. of the borrower, and when the project is expected to break-even and start yielding profit.

6.0 TUTOR-MARKED ASSIGNMENT

State and discuss how a loan requirement of a project could be investigated.

7.0 REFERENCES/FURTHER READING

Nwankwo, G. O. (1980). *The Nigerian Financial System*.

CBN Briefs: Research Dept. Series No. 95/03, June 1995 – Monetary Policy in Nigeria.

Odozi, V. A. *The Imperative of Economic Growth in Nigeria* – The Nigerian Banker (Jan-June 2002).

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UNIT 5 SOURCES AND USES OF FUNDS

CONTENTS

1.0 INTRODUCTION

The profit and loss account provides details of financial performance resulting in the net profit figure; the balance sheet is an explanation of the financial status of the enterprise in the form of a listing of its assets and liabilities at the close of the accounting period.

Accounting flows may be classified into three distinct types – profit flows, funds flows and cash flows. Therefore, funds flow and cash flow statements are needed to obtain a complete picture of accounting flows in respect of accounting period.

The fund flow statement provides reconciliation between the opening and closing balance sheets for a given accounting period through an explanation of the changes which have occurred. This explanation is in the form of an analysis of the sources of additional funds available to the enterprise during the accounting period, as well as an analysis of the manner in which they have been utilised. Consequently, the funds flow statement covers both the funds internally generated and additional funds obtained by the enterprise during the accounting period. The funds statement deals with the changes which have occurred in the size of the business, as well as changes in the structure assets, liabilities, and invested capital. For all enterprises of a stipulated size, SSAP10 ‘Statement of Source and Application of Funds’ imposes a disclosure of a periodic funds flow statement, in addition to the traditional profit and loss account and balance sheet. In this unit we shall examine various aspect of sources and uses of funds.

2.0 OBJECTIVES

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

- prepare fund flow statement;
- compute fund flow statement;
- apply fund flow statement
- analyse sources and uses of funds in an organisation.

3.0 MAIN CONTENT

3.1 Sources and Uses of Cash

Those activities that bring in cash are called sources of cash. Those activities that involve spending cash are called uses or application of cash. What we need to do is to trace the changes in the firm's balance sheet to see how the firm obtained its cash and how the firm spent its cash during a period of time. To get started, considered the balance sheet for the ABC Nig. Plc. in Table 6.1. Notice that we have calculated the change in each of the items on the balance sheets. Looking over the balance sheet for the ABC Nig. Plc, we see that quite a few things changed during the year. For example ABC increased its net assets by N149 million and its inventory by N29 million. Where did the money come from? To answer this and related questions, we need to first identify those changes that used up cash (uses) and those that brought in cash (sources).

Table 3: Balance Sheets of ABC Nigeria Plc as of December 31, 2001 and 2002 (N in million)

	2001	**2002**	**Changes**
	Assets		
	N	**N**	**N**
Current assets:			
Cash	84	98	+14
Account receivables	165	188	+23
Inventory	393	422	+29
Total	642	708	66
Fixed assets:			
Net plant and equipment	2,731	2,880	+149
Total assets	3,373	3,588	+215

Liabilities and Owners' Equities			
Current liabilities:			
Account payable	312	344	+32
Notes payable	231	196	-35
Total	543	540	-3
Long term debt	531	457	-74
Owners' equity:			
Common stock and paid in surplus	500	550	+50
Retained earnings	1,799	2,041	+242
Total	2,299	2,591	+292
Total liabilities and owners' equity	3,373	3,588	+215

A little common sense is useful here. A firm uses cash by either buying assets or making payments. So, loosely speaking, an increase in an assets account means the firm, on a net basis, bought some assets, a use of cash. If an asset account went down, then on a net basis, the firm sold some assets. This would be net source. Similarly, if a liability account goes down, the firm has made net payment, a use of cash.

Looking again at balance sheet of ABC Plc, we see that inventory rose by N29 million. This is a net use because ABC Plc. effectively paid out N29 million to increase inventories. Accounts payable rose by N32 million. This is a source of cash because ABC effectively has borrowed an additional N32 million payable at the end of the year. Note payable, on the other hand went down by N35 million, so ABC effectively paid off N35million worth of short-term debt – a use of cash.

Based on our discussion we can summarise the sources and uses from the balance sheet as follows:

Source of Cash:	**₦'Million**
Increase in account payable	32
Increase in common stock	50
Increase in retained earnings	242
Total sources	324
Uses of Cash:	
Increase in account receivables	23
Increase in inventory	29
Decrease in notes payable	35
Decrease in long-term debt	74
Net fixed asset acquisition	149
Total uses	310
Net additional cash	14

The net addition to cash is just the difference between sources and uses, and our N14 million result here agrees with N1 million changes shown on the balance sheet.

To further trace the flow of cash through the firm during the year, we need an income statement. For ABC Plc., the results for the year are shown in Table 3.2.

Notice here that the N242 additional to retained earnings we calculated from the balance sheet is just the difference between the net income of N363 and the dividends of N121.

Table 4: 2002 Income Statement of ABC Nig. Plc (₦' million)

Sales	2,311
Cost of goods sold	1,344
Depreciation	276
Earnings before interest and taxes	691
Interest paid	141
Taxable income	550
Taxes (30%)	165
Net income	385
Dividends	121
Addition to retained earnings	242

3.2 The Statement of Cash Flows

There is flexibility in summarising the sources and uses of cash in the form of a financial statement. However, it is presented the result is called statement of cash flows. Historically, this statement was called the statement of changes in financial position and it was presented in terms of the changes in net working capital rather than cash flows. We will work with the newer cash format.

We present a particular format for this statement in Table 3.1 the idea is to group all the changes into three categories: operating activities, financing activities, and investment activities. The exact form differs from one preparer to another.
Don't be surprised if you come across different arrangement. The types of information presented will be very similar; the exact order can be differ. The key thing to remember in this case is that we started out with N84 million in cash and ended up with N98 million, for a net increase of N14 million. We are just trying to see what event led to this change.

Interest paid should really go under financing activities, but unfortunately that is not the way the accounting is handled. The reason, you may recall, is that interest is deducted as an expense when net income is computed. Also, notice that the net purchase of fixed assets was N149 million. Because ABC Nig Plc. wrote off N276 million worth of assets (the depreciation), it must have actually spent a total of N149 + N276 = N425 million on fixed assets.

Once we have this statement, it might seem appropriate to express the in cash on a per-share basis, much as we did for net income.

Table 5: 2002 Statement of Cash Flows of ABC Nig. Plc
(₦ million)

Cash, beginning of year	84
Operating activity:	
Net income	385
Plus:	
Depreciation	276
Increase in account payable	32
Less:	
Increase in account receivables	- 23
Increase in inventory	- 29
	641
Investment activity:	
Fixed asset acquisitions	- 425
Net cash from operating activity	-425
Financing activity:	
Decrease in notes payable	- 35
Decrease in long term debt	- 74
Dividend paid	- 121
Increase in common stock	50
Net cash from financing activity	- 180
Net increase in cash	14
Cash end of the year	120

Ironically, despite the interest we might have in some measure of cash flow per share, standard accounting practice expressly prohibits

reporting this information. The reason is that accountants feel that cash flow (or some component of cash flow) is not an alternative to accounting income, so only earnings per share are to be reported.

As shown in Table 3.4 it is sometimes useful to present the same information a bit differently. We will call this "the sources and uses of cash statement."

Table 6: 2002 Sources and Uses of Cash of ABC Nig. Plc (N' million)

Cash, beginning of year	84
Sources of cash	
Operations:	
Net income	385
Depreciation	276
	661
Working capital:	
Increase in account payable	32
Long term financing:	
Increase in common stock	50
Total sources of cash	743
Uses of cash	
Working capital:	
Increase in account receivables	23
Increase in inventory	29
Decrease in notes payable	35
Long term financing:	
Decrease in long term debt	74
Fixed asset acquisitions	425
Dividend paid	121
Total uses of cash	707
Net addition to cash	14
Cash end of the year	120

4.0 CONCLUSION

In the course of our study in this unit we were able to discuss sources and uses of funds. Those activities that involve spending cash are called uses or application of cash while those activities that involve accumulation of cash are called sourcing for funds. Therefore ability to balance the two activities or making the sourcing for funds greater than use and application of funds constitute a good leverage for any company.

5.0 SUMMARY

In summary, this unit emphasised sources and uses of cash, statement of cash flows and its computation.

6.0 TUTOR-MARKED ASSIGNMENT

Compare and contrast between profitability and liquidity ratio.

7.0 REFERENCES/FURTHER READING

Nwankwo, G. O. (1980). *The Nigerian Financial System*.

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Odozi, V. A. (2002). *The Imperative of Economic Growth in Nigeria* – The Nigerian Banker (Jan-June 2002).

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MODULE 2

UNIT 1 CASH FLOW STATEMENTS

CONTENTS

1.0 INTRODUCTION

Cash flow simply means the difference between number of Naira that came in and the number that went out. For example if you were the owner of a business, you might be very interested in how much cash you actually took out of your business in a given year. How to determine this amount is one of the things we shall discuss in this part of our study.

At the most fundamental level, firms do two different things: they generate cash and spend it. Cash is generated by selling a product, an asset or a security. Selling a security involves either borrowing or selling an equity interest (i.e. shares of stock) in the firm. Cash is spent in paying for materials and labour to produce a product and in purchasing assets. Payments to creditors and owners also require the spending of cash. The cash flow identity summarises the total cash result of all transactions a firm engages during the year.

In long-run analysis, the focus is on annual net cash flows. In short-run analysis, a key issue is how the current year's net cash flows are expected to take shape on a daily or weekly basis. The expected short-term behaviour of net cash flows involves a company in developing strategies to avoid financial distress and bankruptcy, especially if the company anticipates sustained periods over which cash outflows will exceed cash inflows.

2.0 OBJECTIVES

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

- prepare cash flow statement
- analyse various changes over a period of time on any balance sheet
- prepare income statement
- interprets element in working capital: the management of cash flows
- describe basic principles involved in modeling the components of working capital
- state the working capital policy
- enumerate various strategy involved in application of working capital.

3.0 MAIN CONTENT

3.1 Cash Flow

Cash flow is an accounting term that refers to the amounts of cash being received and spent by a business during a definite period of time, sometimes tied to a specific project. Measurement of cash flow can be used to:

i. Evaluate the a business or project
ii. Determine liquidity (being profitable does not necessarily mean being liquid; a company can fail because of a shortage of cash, even while profitable).
iii. Generate projected rate of returns. The time of cash flows into and out of projects are used as inputs to financial models such as internal rate of return, and net present value.
iv. Examine income or growth of a business when it is believed that accrual accounting concepts do not represent economic realities. Alternately, cash flow can be used to 'validate' the net income generated by accrual accounting.

Cash flow as a generic term may be used differently depending on context, and certain cash flow definitions may be adapted by analysts and users for their own uses. Common terms (with relatively standardised definitions) include operating cash flow and free cash flow.

Classification

Cash flows can be classified into:

1. Operational cash flows: Cash received or expended as a result of the company's core business activities.
2. Investment cash flows: Cash received or expended through capital expenditure, investments or acquisitions.
3. Financing cash flows: Cash received or expended as a result of financial activities, such as receiving or paying loans, issuing or repurchasing stock, and paying dividends.

All three together are necessary to reconcile the beginning cash balance to the ending cash balance.

3.2 Benefits from Using Cash Flow

The cash flow statement is one of the four main financial statements of a company. The cash flow statement can be examined to determine the short-term sustainability of a company. If cash is increasing (and operational cash flow is positive), then a company will often be deemed to be healthy in the short-term. Increasing or stable cash balances suggest that a company is able to meet its cash needs, and remain solvent. This information cannot always be seen in the income statement or the balance sheet of a company. For instance, a company may be generating profit, but still has difficulty in remaining solvent.

The cash flow statement breaks the sources of cash generation into three sections: operational cash flows, investing and financing. This breakdown allows the user of financial statements to determine where the company is deriving its cash for operations. For example, a company may be notionally profitable but generating little operational cash (as may be the case for a company that barters its products rather than sells for cash). In such a case, the company may be deriving additional operating cash by issuing shares, or raising additional debt finance.

Companies that have announced significant write-downs of assets, particularly goodwill, may have substantially higher cash flows than the announced earnings would indicate. For example, telecoms firms that paid substantial sums for 3G licenses or for acquisitions have subsequently had to write-off goodwill, that is, indicate that these

investments were now worth much less. These write-downs have frequently resulted in large announced annual losses, such as Vodafone's announcement in May 2006 that it had lost £21.9 billion due to a write-down of its German acquisition, Mannesmann, one of the largest annual losses in European history. Despite this large "loss", which represented a sunk cost, Vodafone's operating cash flow was solid: "Strong cash flow is one of the most attractive aspects of the cell-phone business, allowing operators like Vodafone to return money to shareholders even as they rake in huge paper losses."

In certain cases, cash flow statements may allow careful analysts to detect problems that would not be evident from the other financial statements alone. For example, WorldCom committed an accounting fraud that was discovered in 2002; the fraud consisted primarily of treating ongoing expenses as capital investments, thereby fraudulently boosting net income. Use of one measure of cash flow (free cash flow) would potentially have detected that there was no change in overall cash flow (including capital investments).

3.3 Managing Short-Term Net Cash Flows

In the short term, how net cash flow takes shape on a daily or weekly basis has an important bearing on value.

Cash outflows

Over a year cash outflows will consist of regular payments to meet wages and salaries, and bills furnished by suppliers. Cash outflows will also occur in respect of tax-demands, interest payments and fees which can be expected at specific times during the year and in respect of the purchase of plant and machinery for long-term capital investment. These constitute what is referred to as the transactions motive for holding cash.

There may also be unanticipated events over a year which requires a company to have immediate access to cash resources. This constitutes the precautionary motive for holding cash. A speculative motive can exist to enable a company to take advantage of undervalued inputs or equipment which comes up for sale due, for example, to a competitor going bankrupt. There is a fourth reason for holding cash known as a compensating balance motive. Here a company’s bank may require it to hold minimum balances in its current account in order to indirectly cover the bank’s costs of administration. If a company receives no interest on its current account, its bank receives all of the income earned on the company’s balances through the bank’s own investment strategies. Recently there has been a tendency to move away from compensating balances, with companies negotiating transactions fees

with banks and receiving current account interest payments, or investing their surplus cash elsewhere.

Cash inflows

Where cash inflows are concerned, these can be expected to occur at regular intervals over the year largely as a result of the pattern of sales. This pattern can, however, be uneven if sales are seasonal. For example, in the cases of toy manufacturers, and department stores the majority of sales, and hence cash inflows, can be expected to occur in the months around Christmas. In the case of a clothing manufacturer a significant proportion of orders can be expected during the weeks in which this industry has its national and international fashion shows.

In addition, anticipated cash inflows may be disrupted due to sudden and unexpected change in the economy. If, for example, there is an unanticipated rise in interest rates, short-term trade debtors who also have high levels of bank debt may respond by delaying settlement of their debts, using their own cash inflows to meet higher bank interest charges. Further, a major customer of a company may fail leaving significant amounts of unpaid debts.

Net cash flow policy

Given the opportunity costs of cash, in terms of borrowing and lending rates, it is in the interests of a company to:

i. Delay its expected cash outflows as long as possible, subject to minimising the risks of jeopardising input supplies
ii. Maximise, at a current point in time, its expected cash inflows, subject to minimising the risk of jeopardising customer good will
iii. Avoid significant periods when excess cash balances earning on interest are likely to increase as a result of cash inflows exceeding cash outflows
iv. Avoid incurring costs associated with using short-term bank loans or overdrafts to cover significant periods when cash outflows exceed cash inflows.

In the short-term in order to cope with periods when net cash flows are expected to be negative and to avoid, at other times, holding excessive amounts of idle cash balances, a company can invest in a portfolio of marketable securities which earns interest. Investment in this portfolio is increased when short-term net cash flows are positive. When cash outflows exceed incoming cash receipts, some of the short-term marketable securities are sold to meet the deficit.

There are problems of capital or interest rate, risk involved in holding a portfolio of marketable securities. Consequently companies, in seeking to avoid financial distress, tend to invest surplus cash balances in short-term marketable securities whose long-term prices, in response to a given interest rate change, vary less than those of long-term marketable. This minimises interest rate risk but entails a cost since, with the term structure of interest rates sloping upwards for most periods of time; short-term marketable securities earn a lower rate of return than long-term marketable securities.

In general the optimal level of cash and marketable securities will be determined in a much wider risk-return trade-off context, where the risk of not being able to meet short-term cash outflows is set against the opportunity costs of foregoing investments in long-term physical assets. On average, returns on the latter exceed the returns which companies can earn on both short-term and long-term financial assets.

3.4 Liquidity Management

Liquidity is defined as the ability to realise value in cash. It has two components:

i. The convention time of an asset, that is, the time lag between deciding to sell an asset and receiving payment for it; and
ii. Its convention price.

Cash has zero conversion time and no conversion price risk. Marketable securities, provided they are actively traded, have zero conversion time but have significant conversion price risk associated with interest rate risk.

The optimal level of liquidity, a level not too low to produce significant probabilities of financial distress and bankruptcy, and not too high to reduce the rate of return on long-term investment, is difficult to determine. As a rough guide a number of short-term financial ratios can be examined to determine if an optimal liquidity policy is being pursued. Beginning with cash and marketable securities ratios, these are:

$$\frac{\textbf{Cash + Marketable Securities}}{\text{Current Assets}}$$

and

$$\frac{\textbf{Cash + Marketable Securities}}{\text{Current Liabilities}}$$

Reasonably, large values of the former indicate that cash and marketable securities can provide substantial sources of funds to finance any increases in current assets which might occur with increased sales. Reasonably, high levels of the latter, measure the ability to meet current liabilities without the need to liquidate other current assets, for example inventory, or without recourse to external sources of finance.

It would be wrong, however, to determine the liquidity position of a company purely in cash ratio terms. As indicated, inventory can be sold directly for cash, but it may have a relatively long conversion time and have a conversion price which is significantly less than the inventory's intrinsic value. The latter will occur especially if it is known that inventory is being offered for sale in a situation of financial distress.

Banks and financial institutions provide factoring services in respect of inventory and invoice discounting in respect of accounts receivable so as to eliminate conversion time. Here, a part or a whole of a company's inventory and/or its accounts receivable are purchased by a factoring company which, consequently, provides an immediate infusion of cash. Again, however, the conversion price will be below the intrinsic value of the current asset being purchased since factors earn their returns from obtaining assets at significant discounts and then reselling them or, in the case of accounts receivable, collecting payments due.

Two, more broadly based liquidity, measures take some of the above points into account. The first is the current ratio defined as:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

This encompasses net working capital (current assets less current liabilities) and is a measure of a company's capacity to meet its liabilities due within one year, out of current assets. Because a substantial proportion of current assets includes inventory which, assuming factoring services are not used, has a positive conversion time and significant conversion price risk, a desirable level for this ratio is taken, on average, to be 2:1. The second liquidity measure is referred to as the Acid Test or Quick ratio. This ratio nets out the effect of inventory and is defined as:

$$\text{Quick Ratio} = \frac{\text{Cash Assets -Inventory}}{\text{Current Liabilities}}$$

On average, its optimal level is considered to be 1: 1.

These cash, current and quick ratios are unlikely to give a full picture of a company's liquidity position. Back-up lines of credit which may not be explicitly observable can be important, for example, a bank's willingness to provide additional short-term loans at short notice. These factors will help to determine a company's financing flexibility which, as explained in unit 2, partly depends on the levels of short-term and long-term tangible assets already pledged in existing loan contracts. Indeed the ability of a company to provide a near-term cash flow forecast, and the variability surrounding near-term cash flows, also play a part in determining the effect of liquidity on a company's market value.

The above introduces a dynamic aspect to liquidity which is not normally picked up in static (at a point in time) short-term financial ratios. The dynamic aspect involves the speed with which a company can alter its short-term position to avoid a crisis. It has been argued that one possible way of accommodating this is by considering a ratio based on a company's earnings power, that is, the ratio of:

$$\frac{\text{Cash Liabilities - Quick Assets} \times 365}{\text{Operating Funds Expected to be Generated over a Year}}$$

This ratio gives the number of days required to pay off net current debt, that is, current debt not covered by liquid or quick assets. If, for example, this ratio exceeds 365 a company will be unable to meet its net current obligations out of its current year's expected earnings. Alternatively, if the ratio is significantly below 365 and short-term difficulties arise. The indication may be that additional short-term finance will be obtainable since banks would view such funding as entailing low risk. Expected earnings over the current year are however, a substitute for a short-term cash flow forecast which provides better evidence of the ability to repay net current debt.

3.5 Managing Inventory

Cash and marketable securities are a form of inventory; therefore, when considering inventory in the wider context of raw materials, finished goods and spare parts, the basic principles used in cash management are applied. Indeed the Economic Order Quantity Model was developed originally with physical inventory in mind. Here for example, the optimal level of raw materials over an inventory holding periods is determined in relation to the demand for a company's product and the holding and ordering costs of stock. Holding costs include the opportunity costs of financing inventory and of warehousing space together with any insurance costs.

As in the case of running out of cash, there are costs involved in running out of raw materials spare parts in terms of potential disruptions to production runs and sales patterns. Additional physical inventory costs can include the danger of deterioration in the quality of inventory if it is held for too long; obsolescence, especially if the inventory is of a technical nature, and lead time variations, that is, the time lag between ordering and receiving new inventory. An important potential benefit from holding inventory is associated with possible price discounts on bulk purchases. Moving beyond the Economic Order Quantity Model, optimal control theory can be used to take account of unpredictability in product demand patterns.

A recent approach to inventory management in companies with repetitive manufacturing systems has involved near elimination of stock holdings. This just-in-time inventory system requires suppliers to provide that relevant inputs, in their relevant quantities, at the precise points in time when they are needed in a manufacturing operation. There are costs in attempting to ensure that the just-in-time system works. These involve developing co-coordinating and monitoring operating plans between a company and its suppliers.

$$\text{Inventory Turnover} = \frac{\text{Costs of Goods Sold}}{\text{Inventory}}$$

A relatively high inventory turnover ratio may suggest that a company is managing this current asset relatively efficiently. It could suggest, for example, that excessive amounts of stock, which would incur a significant probability of obsolescence and high warehousing costs, are not being held. On the other hand a relatively high ratio could indicate that not enough stocks are being held to support future potential sales growth. In effect a company's inventory turnover ratio should be judged in relation to the nature of the stock being held and in respect of a base point, such as the average inventory turnover ratio for the industry in which the company is located.

3.6 Managing Accounts Receivable

A company which grants trade credit to its customers creates current assets in the form of accounts receivable or trade debtors. It also influences its average collection period, that is, the average time lag between supplying customers and receiving cash payments in settlement of invoices. As explained, granting trade credit can have an important effect in stimulating a company's sales and thus, given its average collection period, its sales revenue.

The average collection period is important in an opportunity cost sense since it involves a company in foregoing interest on cash which could have been invested in marketable securities. An important additional factor in offering trade credit is the probability of incurring bad debt that is, selling to customers who significantly delay or even default on their payments. Granting trade credit can be analysed in terms of NPV.

As an investment decision, while the factors influencing the trade credit decision are complex, two simple examples are presented below to illustrate the basic principles.

This is followed by a brief discussion of consumer credit evaluation.

The average collection period

Looking at the average collection period, one way of reducing this is by changing or introducing, if not already in existence, discounts on the list price of goods sold, only being available to customers who settle their accounts within a specified period. (Such a policy can also influence sales). While a reduction in the average collection period has a benefit in that it reduces interest foregone on accounts receivable, it has a cost to the extent that discounts are taken up by customers and, consequently, profits from increased sales are reduced.

To illustrate these concepts, consider a company which has monthly sales of N2m and annual sales of N24m. Its average collection period is 30 days, indicating that there is approximately one month between supplying its products and receiving payments for them. The company has therefore, an average investment in accounts receivable of N2m. In terms of its annual sales the company has an accounts receivable turnover ratio thus:

$$\text{Receivables Turnover} = \frac{\text{Annual Sales}}{\text{Average Receivables Balance}} = \frac{\text{N24m}}{\text{N2m}} = 12$$

Note that the ratio for the average collection period is formally defined on 365 days in the year, as:

$$\text{Average Collection Period} = \frac{\text{Accounts Receivable X 365}}{\text{Sales}}$$

In the present example this ratio is (365)(N2m)/(N24m) = 30.4 days. Normally in accounting terms this would be rounded to 31 days.

3.7 The Cash Operating Cycle

Having introduced some of the ratios associated with current asset and liability management, it is useful to return to cash management and consider the cash operating cycle. This indicates the net time interval between cash inflows from goods sold and cash outflows for the purchase of resources. It is a measure of the length of time a company has funds tied up in working capital, an increase (decrease) in the cycle indicating an increase (decrease) in working capital needs.

A company's cash operating cycle is equal to:

i. The average number of days a given inventory is held, measuring the length of time required to purchase and sell its product: plus
ii. The average collection period on its account receivable, measuring the length of time required to collect sales revenue; minus

Table 7: The Cash Operating Cycle

Annual Cost of Goods Sold	NI00.000 N40.000				
	Balance		Ratios		
Inventory	5000	Inventory			8
			Cost of Goods	**N40.000**	
			Inventory	5000	
Accounts	10,000			100.000	10
Receivable		**Receivable**	**Sales**	10.000	
		Turnover	Receivables		
Account	5000			100.000	10
Payable		**Debtor**	**Sales**	10.000	
		Turnover	Account Payable		

- The average period of its accounts payable, measuring the length of time payments can be deferred on its purchase of resources.

That is, the cash operating cycle is equal to:

$$365 \left[\frac{1}{\text{Inventory Turnover Ratio}} + \frac{1}{\text{Receivables turnover Ratio}} - \frac{1}{\text{Debtor Turnover Ratio}}\right]$$

Since each of these ratio measures, respectively, the number of times in a year that inventory, accounts receivable and accounts payable are 'turned over', dividing each ratio into the number of days in a year measures the average number of days each of these components of working capital is held.

To illustrate, consider a company which has average annual sales of NI00,000 at an average annual cost of goods sold of N40,000. Given the average balances in its inventory, accounts receivable and accounts payable and the relevant ratios, as indicated in table 11.1 the cash operating cycle is:

3651 + 1 - 1
8 10 10 = 365 [0.125 + 0.1 -0.1] = 45.6 days

If for example, the company reduces its investment in accounts receivable there would be all other things being equal, an improvement in liquidity as measured by the cash operating cycle. Assuming accounts receivable are reduced to E6000, the receivable turnover ratio falls to NI00,000/N6000 = 16.7. Thus the cash operating cycles reduced from 45.6 days to 31 days: that is, in the latter case:

365 1 + 1 - 1
8 16.7 10 = 365 [0.125 + 0.06 -0.1] = 365[0.085] 31days

Overall working capital policy

To bring this unit to a close it is important to consider the overall policy which a company might adopt in respect of its working capital. There are two aspects of this, one involving the investment decision and the other involving the financing decision. The former is examined first.

Current asset policy

In an earlier part of this unit, when discussing cash and marketable securities, the importance of the risk-return relationship was identified. It was argued that the benefits of liquidity, in terms of producing low risk but low returns, should be weighed against relatively higher returns but higher risk produced by investing in long-term physical or fixed assets.

This risk-return principle applies to a company's investment decision in respect of its overall current assets. In this context there are three alternative strategies which can be adopted. They involve average, conservative and aggressive approaches to risk management. Under the conservative strategy, relative to the average, there is a relatively high

proportion of investment in current assets. This produces below average risk and below average total return. Under the aggressive strategy, relative to the average, there is a relatively low proportion of investment in current assets, producing above average risk and above average total returns.

The choice of strategy varies from industry to industry depending on the nature of the product and/or service being supplied and, among other factors on sales variation and the degree of operating leverage. Sales variation and operating leverage determine business risk and hence the variation in net cash flows. The overriding objective should be to determine the ratio of current assets to total assets which maximises the total market value of a company.

Current and long-term liability policy

Once the investment decision has been made, strategies for financing current assets must be addressed. This strategies involve choosing the term structure of liabilities appropriate to a given term structure of assets. The analysis is aided by considering a company's cumulative capital requirement at a given point in time, that is, the total capital necessary to fund a company's total investment. The cumulative capital requirement is determined by fixed, or long-term, assets, permanent assets; and fluctuating current assets.

The division of current assets into permanent spontaneous components arises to the extent that a company can predicts its long-term trend in sales. To the extent that it can do this, the proportions of its current assets necessary to support this trend can be considered to be long term and, therefore, effectively permanently. The remaining proportions of current asset investments (in cash and marketable securities, inventories and accounts receivable) are spontaneous. They are spontaneous in that these current assets fluctuate to facilitate unanticipated changes in sales and as a result of the innate variation in the current asset components themselves. The cumulative capital requirement is illustrated in figure 3.

There are three alternative financing strategies which involve average, aggressive and conservative hedging approaches to financial risk management.

The average hedging approach consists of marching the maturity structure of assets

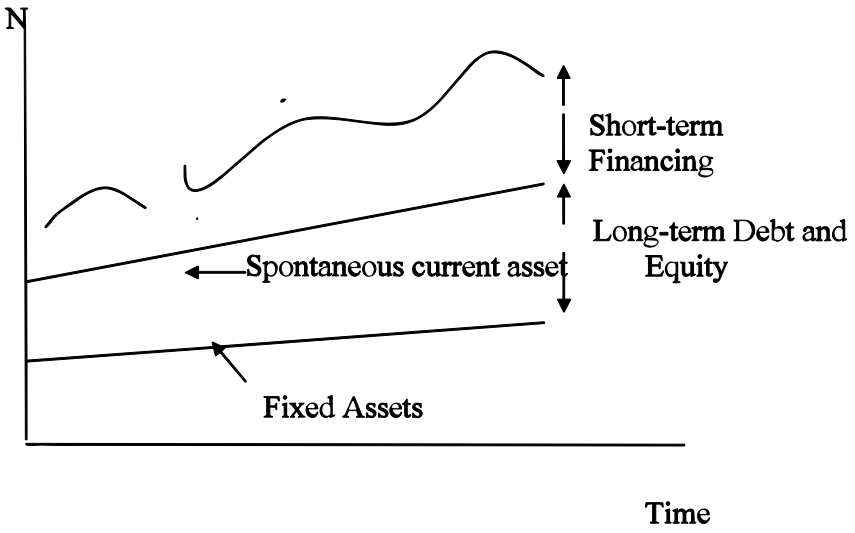

Fig. 3: The Cumulative Capital Requirement and Average Hedging

and liabilities, on the assumption that permanent current assets can be treated as long-term investments. Here, all fixed and permanent current assets are funded by long-term debt and equity, with spontaneous current assets being financed by short-term debt and accounts payable. This approach exposes a company to 'average' risk with 'average' expected returns.

3.8 Forecasting Working Capital

Company may occasionally require a forecast of the amount of working capital needed to finance an increase in output or introduction of a new product. In preparing a working capital forecast, the factors to be considered include anticipated production level and production costs, length of production cycle, planned stock levels and credit terms.

Illustration

The following information relates to XYZ Plc.

Turnover	N3million
Cost as a percentage of turnover:	
Direct material	30%
Direct labour	25%
Variable overhead	10%
Fixed overhead	15%
Selling and distribution overhead	5%

Note: On average, debtors take 2 1/2 months before payment. Raw materials are in stock for 3 months. Work-in-progress represents 2 months half produced goods. Finished goods represent one month production.

Credit is taken as follows:

Direct material	2 months
Direct labour	1 week
Variable overheads	1 month
Fixed overheads	1 month
Selling and distribution overheads	$^1/_2$ a month

Work in progress and finished goods are valued at material, labour and variable expense cost.

You are required to compute the working capital requirement of XYZ plc (assume 50 working weeks in a year).

Hint. Estimate the total amount of debtors and creditors.

SOLUTION

i. Debtors = $2^{½}/12$ x N3m = N625,000

ii. Direct materials cost = 30% x N3m = N900,000

iii. Stock of raw materials = 3/12 N900,000 = N225,000

iv. Valuation of Work- in-progress:

Raw material = 2/12 x N900,000	= N150,000
Direct labour = 2/12 x N750,000	= N62,000
Variable overhead = 2/12 x 0.5 x N300,000	= N25.000
Total	N237.500

v. Valuation of finished goods:

Raw materials = 1/12 x N900,000	= N75,000
Direct labour = 1/12 x N75,000	= N62,500
Variable overhead = 1/12 N300,000	= N 25.000
Total	N162.500

Total Stock = N(225,000 + 237,500 + 162,500) = N625,000

vi. Creditors:

Direct materials = 2/12 x N900,000	= N150,000
Direct labour = 1/50 x N750,000	= N15,000
Variable overhead = 1/12 N300, 000	= N25,000
Fixed overhead = 1/12 x 450,000	= N37,500
Selling and distribution = $^1/_2$ /12 x N150,000	= N6.250
	N 233.750

Therefore working capital required = Stock + Debtors – Creditors

W.C. = N(625,000 + 625,000 – 233,750)

= N1,016,250

4.0 CONCLUSION

In conclusion, this session critically discussed cash flow statements, income statement source and uses of cash, working capital management in terms of cash management, inventory management and how to forecast working capital for an organisation.

5.0 SUMMARY

In summary, cash flows can be classified into: operational cash flows: cash received or expended as a result of the company's core business activities. Investment cash flows: cash received or expended through capital expenditure, investments or acquisitions. Financing cash flows: cash received or expended as a result of financial activities, such as receiving or paying loans, issuing or repurchasing stock, and paying dividends. All three together are necessary to reconcile the beginning cash balance to the ending cash balance.

6.0 TUTOR-MARKED ASSIGNMENT

i. Differentiate between cash inflows and outflows.
ii. Discuss the benefits derived from cash flow analysis.

7.0 REFERENCES/FURTHER READING

Ayano, D. A. (2004). *Credit and Risk Management*. A Lecture Note Prepared for Undergraduate Students of Lagos State University, Jibowu Campus.

Ross, S. A., Westerfield, R. W. & Jordan, B. D. (2003). *Fundamental of Corporate Finance*. USA: McGraw-Hill Irwin.

UNIT 2 FINANCIAL COSTS AND BENEFITS ANALYSIS

CONTENTS

1.0 INTRODUCTION

Cost-benefit analysis (CBA or COBA) is a major tool employed to evaluate projects. It provides the researcher with a set of values that are useful to determine the feasibility of a project from an economic standpoint. Conceptually simple, its results are easy for decision makers to comprehend, and therefore enjoys a great deal of favour in project assessments. The end product of the procedure is a benefit/cost ratio that compares the total expected benefits to the total predicted costs. In practice CBA is quite complex, because it raises a number of assumptions about the scope of the assessment, the time frame, as well as technical issues involved in measuring the benefits and costs.

Before any meaningful analysis can be pursued, it is essential that an appropriate framework be specified. An extremely important issue is to define the spatial scope of the assessment. Transport projects tend to have negative impacts over short distances from the site, and broader benefits over wider areas. Thus extending a runway may impact severely on local residents through noise generation, and if the evaluation is based on such a narrowly defined area, the costs could easily outweigh any benefits. On the other hand defining an area that is too broad could lead to spurious benefits. “The aim of the study area definition should be to include all parts of the transport network which are likely to include significant changes in flow, cost or time as a result of the project” (UN 2003, 17).

Because transport projects have long term effects, and because the analysis is carried out on a real term basis, the benefits and costs must be

assessed using specific and pre-determined parameters. For example: when is the project start date, when will it be completed, over what period of time will the appraisal runs, and what discount rate will be used to depreciate the value of the costs and benefits over the appraisal period? These and other parameters must be agreed upon. Costs and benefits are presented in nominal values, i.e. monetary values of the start year and discounted for inflation over the project period. Because most transport projects are assessed for a 30 year period employing different discount rates may influence greatly the outcomes.

Costs associated with the project are usually easier to define and measure than benefits. They include both investment and operating costs. Investment costs include the planning costs incurred in the design and planning, the land and property costs in acquiring the site(s) for the project, and construction costs, including materials, labour, etc. Operating costs typically involve the annual maintenance costs of the project, but may include additional operating costs incurred, as for example the costs of operating a new light rail system.

Benefits are much more difficult to measure, particularly for transport projects, since they are likely to be diffuse and extensive. Safety is a benefit that needs to be assessed, and while there are complex issues involved, many CBA studies use standard measures of property savings per accident avoided, financial implications for reductions in bodily injury or deaths for accidents involving people. For example, Transport Canada uses $1.5 million in 1991 dollars for each fatality saved. One of the most important set of benefit is efficiency gains as a result of the project. These gains might be assessed by estimating the time savings or increased.

Many other elements relating to social impacts, aesthetics, health and the environment are more difficult to assess. The latter, in particular, is a major factor in contemporary project assessment, and usually separate environmental impact analyses are required. Where possible these factors must be considered in CBA, and a variety of measures are used as surrogates for environmental benefits and costs. For example, the commercial losses of habitat destruction and property damage can be estimated. For example, the difference in the values of properties adjacent to airports and those further away are used to assess the costs of noise.

2.0 OBJECTIVES

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

- differentiate between costs and benefits of a project
- explain the theory of costs and benefits
- describe the importance of costs and benefits
- state the application of costs and benefits
- identify various methods of estimating costs.

3.0 MAIN CONTENT

3.1 Theory of Cost Benefit Analysis

Cost-Benefit Analysis is an economic tool to aid social decision-making, and is typically used by governments to evaluate the desirability of a given intervention in markets. The aim is to gauge the efficiency of the intervention relative to the status quo. The costs and benefits of the impacts of an intervention are evaluated in terms of the public's willingness to pay for them (benefits) or willingness to pay to avoid them (costs). Inputs are typically measured in terms of opportunity costs - the value in their best alternative use. The guiding principle is to list all of the parties affected by an intervention, and place a monetary value of the effect it has on their welfare as it would be valued by them.

The process involves monetary value of initial and ongoing expenses vs. expected return. Constructing plausible measures of the costs and benefits of specific actions is often very difficult. In practice, analysts try to estimate costs and benefits either by using survey methods or by drawing inferences from market behaviour. For example, a product manager may compare manufacturing and marketing expenses to projected sales for a proposed product, and only decide to produce it if he expects the revenues to eventually recoup the costs. Cost-benefit analysis attempts to put all relevant costs and benefits on a common temporal footing. A discount rate is chosen, which is then used to compute all relevant future costs and benefits in present-value terms. Most commonly, the discount rate used for present-value calculations is an interest rate taken from financial markets. This can be very controversial - for example, a high discount rate implies a very low value on the welfare of future generations, which may have a huge impact on the desirability of interventions to help the environment, and so on. Empirical studies have suggested that in reality, peoples' discount rates do decline over time. Because CBA aims to measure the public's true willingness to pay, this feature is typically built into studies.

During cost-benefit analysis, monetary values may also be assigned to less tangible effects such as the various risks which could contribute to partial or total project failure; loss of reputation, market penetration, long-term enterprise strategy alignments, etc. This is especially true when governments use the technique, for instance to decide whether to introduce business regulation, build a new road or offer a new drug on the state healthcare. In this case, a value must be put on human life or the environment, often causing great controversy. The cost-benefit principle says, for example, that we should install a guardrail on a dangerous stretch of mountain road if the dollar cost of doing so is less than the implicit dollar value of the injuries, deaths, and property damage thus prevented (R.H. Frank 2000).

Cost-benefit calculations typically involve using time value of money formula. This is usually done by converting the future expected streams of costs and benefits to a present value amount.

3.2 Importance of Cost Benefit Analysis

Cost-benefit analysis is used for determining which alternative is likely to provide the greatest return for a proposed investment. Sometimes referred to as cost-effectiveness analysis, it is relevant to businesses as well as to non-profit entities and governmental units.
A business might find it helpful to use cost-benefit analysis to determine if additional funds should be invested in a facility in the home country or in another country. A community non-profit organisation that provides a variety of programmes for children might use cost-benefit analysis to assist management in determining which activities will provide the most services for the costs specified. A federal governmental agency might use cost-benefit analysis to determine which of several projects planned for the national parks is likely to be most used, given the costs, by interested citizens.

Because resources such as money and time are limited, an organisation usually cannot undertake every project proposed. To decide whether to undertake a project, decision makers weigh the benefits from the project against the cost of the resources it requires, normally approving a project when its benefits exceed its costs. Cost-benefit analysis provides the structure and support for making such decisions.

Benefits increase the welfare of the organisation. Some benefits are monetary benefits, such as the dollar amount of cash inflows from additional sales of a product or the saving in cash outflows that a project enables. Other benefits are important but harder to quantify. For example, a project may increase customer satisfaction; increased

customer satisfaction may increase future sales, but the exact relationship between sales and satisfaction is often hard to specify.

Costs are the outlays or expenditures made in order to obtain a benefit. Many costs are measured monetarily, such as the cost of buying a new machine or of hiring an additional employee.

3.3 Applications of Cost Benefit Analysis

Cost-benefit analysis in business

A cost-benefit analysis is straightforward when all costs and benefits are measurable in monetary terms. Assume that Company A must decide whether to rent an ice cream machine for the summer for $900. The ice cream machine will produce additional cash inflows of $1,000 during the summer. The benefit of additional cash in-flows ($1,000) exceeds the additional cost ($900), so the project should be undertaken. Not all cost-benefit analyses are this simple, however. If the benefits and costs occur in different time periods, it may be necessary to discount the future cash flows to their equivalent worth today.

In another example, cost savings is a benefit. Assume that Company B makes about 100,000 photocopies a year. Company B does not have its own copy machine and currently pays 4 cents per copy, or $4,000 a year, to Copycat Copiers. Company B can lease a copy machine for $2,500 a year. It must also pay 2 cents per page for paper for the leased machine, or $2,000. In this example, the cost of leasing the machine and buying paper ($2,500 $2,000 $4,500) exceeds the benefit of saving the $4,000 normally paid to Copycat Copiers. Company B should continue to use Copycat Copiers for its photocopies. However, Company B must have a pretty good estimate of the number of copies it needs to be comfortable with its decision. If Company B needs 150,000 copies this year instead of 100,000, the cost of the leasing the machine and buying paper ($2,500 $3,000 $5,500) is cheaper than the $6,000 (150,000 $0.04) savings in fees to Copycat Copiers.

A third example involves a project with benefits that are difficult to quantify. Assume that Company C is deciding whether to give a picnic costing $50,000 for its employees. Company C would receive the benefit of increased employee morale from the picnic. Better employee morale might cause employees to work harder, increasing profits. However, the link between increased morale and increased monetary profits is tenuous. The decision maker must use his or her judgment to compare the non-monetary benefit to the monetary cost, possibly deciding that increased employee morale is worth the $50,000 cost but would not be worth a $100,000 cost.

In the preceding examples, cost-benefit analysis provided a framework for decision making. The range of objectivity related to measurement of the factors is typical. Techniques used in business as a basis for determining costs and benefits, such as return on investment, are generally quantifiable and thus appear to be objective. However, it is not uncommon for qualitative factors to enter into the decision-making process. For example, providing a product that individuals with limited incomes will be able to purchase may not provide the highest monetary return on investment in the short run, but might prove to be a successful long-term investment. Careful decision makers attempt to deal with a difficult-to-quantify factor in as objective a manner as possible. However, cost-benefit analysis in most situations continues to introduce measurement problems.

Cost-benefit analysis in non-business entities

Cost-benefit analyses are also common in non-business entities. Boards of not-for-profit organisations establish priorities for their programmes, and such priorities often specify desired programme outputs. For example, assume a not-for-profit organisation is interested in reducing the level of illiteracy among the citizens of a rural community in a state that has one of the lowest per- capita incomes in the United States. As alternative programmes for those who need to learn to read are considered, there will be cost-benefit analyses that focus on a number of factors, including the extent to which a particular programme can attract those who are illiterate. A programme in the downtown area of a small town might be considered because a facility is available there at low cost and that low cost is appealing. Focus on cost is not sufficient, however. When benefits are considered, it might become clear that those who are eager for such a programme do not have cars and that there is no public transportation from where they reside to the centre of the small town. Further consideration of relevant factors and of alternatives, undertaken in good faith, should result in cost-benefit analyses that provide valuable information as the agency makes decisions.

At all levels of government in the United States, cost-benefit analyses are used as a basis for allocating resources for the public good to those programmes, projects, and services that will meet the expectations of citizens. For example, decision makers at the federal level who have policy responsibility for environmental standards, air-quality rules, or services to the elderly often find information from cost-benefit analyses to be critical to the decision-making task.

3.4 Methods of Estimating Cost

There are four principal methods of estimating cost:

i. Reference to similar projects

Reference to any similar project previously carried out by the project sponsors or by enterprises in the same industry is the simplest method of costing; the only basic condition being that the project be comparable in every respect to the previous one. This method has the advantage that it provides a realistic basis for costing as it allows an exhaustive checklist of all the ancillary equipment and facilities which previous experience has shown to be important.

When using this method it is important to ensure that the costs indicated are still valid. Changes which may be due to currency depreciation or/and inflation must be noted.

It happens, quite often that the capacity of the new project, differs from that of the comparable earlier project. The problem of extrapolation then arises. A very rough and ready estimate indicating the orders or magnitude may be made by applying the "six-tenth factor" (OECD, 1968).

If S_A and S_B are the capacities of two plants A and B and K_A and K_B their respective investment costs, then

$K_A / K_B = (S_A / S_B)^X$ where $x < 1$

The coefficient 'x' represents economies of scale. For chemical engineering it was suggested that the value of x should be 0.6. It is emphasised that the rule should be applied with caution. There are many kinds of industrial machinery that will not exhibit this relationship between area (cost) and volume (capacity).

ii. Enquiry from possible suppliers

Enquiries from possible suppliers are the safest way of obtaining the latest price of equipment. The only draw-back is that the prices indicated do not include cost of related facilities, transport and assembly with the result that the initial price has to be doubled in order to arrive at a figure for equipment erected or installed on site and in working order. For this reason, prices indicated should always be qualified by specific delivery terms, and conditions relating to erection or installation, and also the conditions of guarantee during the initial operating period should be specified. A similar approach should be used with regard to suppliers of raw materials required for operating the project.

iii. Use of published tariffs, surveys and official regulations

Some costs may be laid down in official regulations or public tariffs e.g. water and electricity rates, guaranteed minimum wages and salaries, etc. Surveys, whether connected with the project or not may provide information about the real level of wages and salaries and other expenditure items such as average building costs, prices of certain raw materials etc.

iv. Use of technical experts

Technical experts may have to be called in to provide the possible solution. The nature of their work puts them in a better position than anybody else for assessing prices which depend on characteristics of materials and equipment.

3.5 Measuring Benefits and Costs

1. Marketed benefits and costs
2. Non-marketed direct benefits and costs
3. Non-marketed indirect benefits and costs

A properly constructed cost-benefit analysis will attempt to measure the change in economic welfare associated with all costs and all benefits uniquely generated by a project. In general, these will fit into one of three categories: (1) marketed (direct) benefits and costs, (2) non-marketed direct benefits and costs, and (3) non-marketed indirect benefits and costs. For benefits, we attempt to measure the willingness to pay by all affected consumers for the relevant project benefits. The rationale for doing so derives from applied economic welfare analysis. This approach argues that economic welfare derives from preference satisfaction and that preference satisfaction is reflected by the consumer's willingness to pay.

More specifically, economists infer willingness to pay for direct benefits and costs by observing choices made in markets or by observing other choices to spend dollars to facilitate direct consumption of the resource. This is said to measure preferences revealed by choices, or simply to measure revealed preferences. For non-marketed, indirect benefits and costs, stated preference estimates derived from survey research are employed. For costs, we attempt to measure the opportunities foregone (opportunity costs) due using the economic resources (land, labour, materials, etc.) in the project rather than in some other use. For direct private costs, market prices of resources are used. Non-marketed costs, tend to be treated as benefits foregone, and are estimated exactly as are benefits. For a more detailed discussion of benefits and costs, in non-

technical terms, the reader is referred to the Resources for the Future publication "Cost-Benefit Primer."

1. Marketed benefits and costs

Marketed benefits, also referred to as private benefits, are measured as the sum of willingness to pay by consumers for the new quantity of product produced by the project being evaluated. For example, assume that the construction of a marina produces 10,000 days of new available dockage. The question then becomes how to value this dockage.

In the private sector, the firm would simply measure a price times quantity dollar value, but because public sector decision making seeks to take into account changes in welfare, rather than changes in revenues, a somewhat different approach is taken. The accepted approach for measuring the willingness to pay for the new dockage (and for other privately marketed goods) is to measure the market demand curve for dockage and to calculate the incremental price that consumers' would be willing to pay for the dockage. In general, this would not be a constant price, but rather it would be higher for the first units and decrease thereafter until the point at which a market-clearing (or marginal) price is reached, a price that would on average rent out all available dock space. Thus, while all renters may pay the same market clearing price, some might have been willing to pay a higher price than others, but were not required to do so. In fact, each renter may have been willing to rent at a different price, but the marina may not have been able to charge each a different price. Observing the price paid tells the analyst a lower bound for benefits; that is, if the consumer did not receive benefits at least equal to the price paid, he or she would not have purchased the good. Adding back an amount the consumer would have been willing to pay adjusts the total revenue measure obtained from multiplying the total quantity rented by the price to affect more accurately the increase in economic welfare as a result of the marina. This concept is referred to as consumer’s surplus within the economics literature. It is used to value all benefits when a demand curve can be estimated. This same approach is used for estimating welfare for non-marketed direct and indirect benefits.

The private costs associated with the project, unlike the benefits, are typically measured at market prices. This reflects the fact that factor inputs, like land, labour and materials tend to be much more substitutable and therefore supplied at roughly constant prices. Few projects are by themselves large enough to cause changes in prices through project activities, and, hence, the assumption of constant prices is reasonable.

The issue of underutilised resources is a bit more problematic, however. Local administrators are typically enthusiastic about new jobs created economic developed, private or public. National administrators, on the other hand recognise that the benefits are not unique to the project, because they would occur anywhere a project was undertaken, and would likely be similar for quite different projects or roughly equal magnitude. The only question to a national decision maker would be whether special weight would be given to economic development in particular areas as a matter of policy. For those local administrators interested in exploring ways to measure new jobs created by a project, the Department of Commerce, Office of Business and Economic Research provides multipliers and other tools of analysis.

2. Non-marketed direct benefits and costs

A large number of natural and environmental resources are consumed directly, but are not purchased in markets. Examples include fishing in a mountain stream, enjoying a panoramic view, living in a community or neighborhood with clean (or dirty) air, or working in an occupation that provides opportunities to enjoy increased (decreased health). We note that environmental "dis-amenities" as well as amenities can come into play.

As it turns out, individuals who consume these amenities and dis-amenities often leave behavioural "footprints" from which revealed preferences can be recovered using statistical methods. For example, some individuals work in highly desirable occupations, like forest rangers, and as a consequence receive lower wages than they would otherwise receive. Symmetrically, workers in very undesirable occupations often received wage premium. A statistical tool called hedonic analysis can be used to estimate these wage differentials. In simple terms, a forecasting model is developed for various occupations, such that the impacts of job attributes such as skills, education, as well as desirable and undesirable job features on wages can be estimated. Hedonic models are also often used to measure the impacts of favourable or unfavourable environmental conditions on property values. For example, the impacts of a view could be isolated statistically, by controlling for size of house, size of lot, construction, and other features. In other cases, a travel cost approach is used to infer willingness to pay for an environmental amenity. For example, costs incurred by fishers can be observed and related to stream attributes, such as beauty, isolation, average catch, average size catch, and the like. By isolating other affects statistically, it is possible to infer the willingness to pay for attributes of many natural attractions, like national parks, seashores, lakes and mountains.

These approaches are referred to as revealed preference measures because they infer willingness to pay as revealed by consumer choices. From them, demand schedules can be estimated and consumer surplus measured.

3. Non-marketed indirect benefits and costs

Non-marketed indirect benefits and costs arise not because of direct use of a resource, but rather because individuals place value on the "existence" of the resources. For example, many people have never seen the redwood forests, but have willingness to pay to see them preserved. Likewise, people who will never encounter a baby seal outside of a zoo may have strong feelings, backed by willingness to pay, concerning their harvest for use as furs. These values are appropriate costs and benefits. The challenge lies in measuring these values in meaningful scientific ways, that is, ways that can be validated and replicated.

In general, because there are no behavioural footprints from which to infer value survey based approaches are used to derive indirect values. The most commonly applied approach is called contingent valuation analysis wherein a hypothetical, or “contingent,” choice is made that is designed to reveal an individual's willingness to pay. Typically, these analyses present detailed scenarios to respondents that include information about the programme under consideration, what it hopes to accomplish, how it will be paid for, and over what time period actions will take place. Various formats are then employed to obtain a contingent value that is an estimator of actual willingness to pay. Some analysts use a family of approaches termed conjoint analysis to seek similar information. These are termed stated preference measures because respondents are asked to state their willingness to pay.

Stated preference measures have been criticised for a large number of reasons, some quite esoteric and others quite practical. Some question, for example, if individuals actually have preferences for a diverse and nearly limitless set of resources that can be estimated in this way. Others question the sensitivity to the quality of the programme being purchased. Still others concern themselves, that respondents, sensing that their answers may affect policy, respond strategically with very large or with zero responses. Analysts are making some headway on overcoming these problems. A good review of these issues can be found in a book by NCEDR researchers Bjornstad and Kahn.

These approaches have also been criticised by those who question whether or not preference satisfaction is a useful approach to making environmental decisions. These critics suggest that environmental decision making is essentially an ethical process that should be removed

from economic considerations. At the extreme, these observers might argue that a clean environment is a "right" and that no expense should be spared in this pursuit. The difficulty with such criticism is that it flies in the face of scare resources and the need to make hard decisions. Ultimately, some mechanism must provide guidance as to priorities, proportions and overall costs of programmes that must compete with other activities for funding. In addition to cost benefit analysis approaches such as citizen juries, focus groups, decision analysis, risk analysis, and many other approaches have been proposed to help decide these difficult issues.

A more pragmatic concern, however, is just whose preferences should count when the sub-national decision maker confronts an issue. Certainly it is informative that other citizens in far away regions value the actions of others in other regions, but they are unlikely to support these activities financially. A good rule of thumb is that the citizens in the jurisdiction that will make economic sacrifices for the project should be included.

4.0 CONCLUSION

In the course of our study in this unit we were able to differentiate between costs and benefits of a project, identified the theory of costs and benefits, examined the importance of costs and benefits, state the application of costs and benefits and finally enumerated various methods of estimating costs. Thus, cost-benefit analysis is a major tool employed to evaluate projects. It provides the researcher with a set of values that are useful to determine the feasibility of a project from an economic standpoint. Conceptually simple, its results are easy for decision makers to comprehend, and therefore enjoys a great deal of favour in project assessments.

5.0 SUMMARY

In summary, this unit discussed theory of cost-benefit analysis, importance of cost-benefit analysis, application of cost-benefit analysis in business, non-business entities, and finally methods of estimating/ measuring costs and benefits.

6.0 TUTOR-MARKED ASSIGNMENT

i. What do you understand by cost-benefit analysis of a project? Discuss the importance of cost benefit analysis.
ii. State and discuss four methods of estimating costs in a proposed project.

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UNIT 3 EVOLVING OF FINANCIAL PLAN (BUDGETING)

CONTENTS

1.0 INTRODUCTION

The purpose of the financial plan among other things is to determine the financing of the enterprise. It examines the internal sources of finance namely: forecast of net profit after tax, depreciation and sale of used equipment; and attempt to balance these against financing requirements such as investments, expected increase in working capital, and allowance for unforeseen requirements.

2.0 OBJECTIVES

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

- estimate sales revenue from the proposed project
- estimate operating and maintenance costs
- estimate project financial profitability.

3.0 MAIN CONTENT

3.1 Estimating Sales Revenue

After considering the total investment requirements of the project, the next thing is to prepare a budget of income and expenditure by which the worthwhileness of the project can be assessed. The income or earning of the project depends on the difference between the sales revenue and the operating costs. The sales revenue in turn depends on the volume of sales and the price which can be obtained for the product. Therefore it is important to determine the volume of output and sales.

The physical volume of sales depends on the:

i. production capacities of the plant
ii. quality of the product
iii. potential size of the market
iv. state of competition
v. price being asked for the product.

Therefore, estimating sales revenue is not a simple matter of multiplying full capacity output by the existing price. From many variables, it is necessary to construct alternative output-revenue models from which one is selected by judgment each year after production commences.

The volume of output is limited by the physical capacity of the plant. However, rated capacity should not be taken without question. The following considerations are important:

i. It may be possible and practicable to operate the plant in two or three shifts. Therefore, the maximum possible output may be twice or thrice greater than rated capacity.

ii. Capacity figures may not take into account the number of days the plant may be shut down e.g. for maintenance, public holidays etc.

iii. Experience has shown that plants cannot be operated at full capacity from the beginning because of technical or teething problems. It may sometimes take up to three to five years to solve all problems which keep plants working below capacity. It is therefore realistic to assume that plant may achieve 50% capacity output in the first year, 75% in the second year and 90% in the third year.

Of course it is impossible to make any sound judgment as to the volume of the product which can be sold without taking price into account. The price elasticity of demand may provide information on the extent to which sales revenue will be affected by lowering or increasing prices. In the market analysis for the product of the project the size of the estimated market was that which apparently existed at the going price for the product.

In estimating sales revenue the prospective sales volume can be built up by counting on selling at a price lower than the going price. However, if there is no reason to doubt the ability of the enterprise to sell all it can produce at the existing price, there will be no point in lowering the price. Some judicious price cutting may be second way of introducing a new

brand name, or a new product, or overcoming initial resistance to a product due to quality differences. The revenue estimates should be broken down into local and foreign currency.

3.2 Estimating Operating and Maintenance Costs

Just as the estimates of sales revenue provide one side of the income forecast, the estimates of the operating costs provide the other. Each item of cost should be systematically analysed on the basis of the sales volume previously arrived at as reasonable for each year.
As with the revenue estimates, the cost estimates should be broken down into local and foreign currency.

Raw materials

The major cost item for most manufacturing enterprises is raw material. The quantity of raw material required for a given volume of production is not difficult to estimate. For many manufacturing processes there is fairly well fixed percentage relationship between input and output quantity. So many tons of cotton give so many tons of yarn or so many tons of wheat give so many tons of flour.

Operating labour

Operating labour costs are usually important in amount, use standards in advanced industrialised countries. It is obvious that this may not be safe because of lack of industrial culture, poor training and lack of experience. It is impossible to establish a good measure of the number of workers a pioneer plant should have. On the basis of experience, it can observed that a first plant in a developing country will do well if it does not have more than twice or thrice the number of workers of a comparable plant in Europe or America. Having forecast the number and specification of workers, the average yearly labour cost must be forecast as well.

Depreciation

Depreciation represents an attempt to spread the cost of an asset over its useful operating life. Over the years that the cost of an asset is usable, the accumulation of the credits to the depreciation allowance should exactly equal the original cost of the asset, less any residual scrap value when it goes out of service. The problem with depreciation is to estimate the useful life of the asset.

Amortisation of expenditures

Similar to depreciation is amortisation of expenditures for advance expenditures, intangibles and preliminary expenses.

Interest payments

For the purpose of making realistic estimates or financial profitability, it is necessary to include the cost of interest on borrowed funds. To do this an estimate must be made as the amount or debt the project will have. It is well to assume that about half the project's total cost will be financed by long-term debt, and to allow in the cost estimates for interest payments on the amount of loan so indicated.

Management cost

Adequate management personnel must be allowed and appropriate cost estimate made for them. Usually the minimum complement of key managerial people in a medium sized plant will include the general manager, the production manager, the maintenance engineer, a production superintendent for each shift and probably for each major department, a chief accountant, a personnel officer, a sales manager. Salary rates must be realistic.

Administrative and sales costs

These should be provided for on a basis which takes into account the costs of setting up adequate accounting and administrative systems, and a sufficiently strong sales organisation to develop the market for the product.

Taxes

These can be calculated quite accurately on the basis of established rates and estimated net profits before taxes.

Contingency

As in the case of capital cost estimates, an allowance of 10% should be made for unforeseen expenses.

3.3 Estimating Project's Financial Profitability

Having prepared the revenue estimates based on sales volumes for the different years, and having drawn up complete and cautious operating and maintenance cost forecasts, all that remains is to bring the two

estimates together as a budget of income and expenditure in order to arrive at a forecast of net profits for each year.

Table 8: Format of Operating Budget of Income and Expenditure

Production % of capacity	**First Year (50%)**	**Second Year 75%**	**Third Year 90%**
Revenue: Gross sales Less discounts Net sales			
Operation Costs: Direct Labour Supervision Direct Material Supplies Power and fuel Maintenance Rent Insurance Interest on Debt depreciation			
Gross Profit: Less selling and distribution R & D General Administration			
Net profit before tax Less tax			
Net Profit after Tax			

4.0 CONCLUSION

In the course of our study in this unit we were able to explain budget as a document that expresses financial plan of proposed project in terms of estimating sales revenue, operating and maintenance cost and finally estimating project's financial profitability.

5.0 SUMMARY

In summary, this unit discussed project's budget by estimating sales revenue which depend on the production capacities of the plant; the quality of the product, the potential size of the market; the state of competition, and finally the price of the product. While estimating operating and maintenance costs could be broken down to both foreign and local currency as raw materials, operating labour, depreciation,

amortisation of expenditures, interest payments, management costs, administrative and sales costs, taxes and finally contingency. Also, estimates of project financial profitability is computed from net revenue over costs.

6.0 TUTOR-MARKED ASSIGNMENT

i. State and discuss factors to be considered for estimating operating and maintenance costs.
ii. What is a budget? Discuss factors upon which sales depends.

7.0 REFERENCES/FURTHER READING

Black, H. A., John, E. C. & Gene, R. B. (1967). *Accounting in Business Decisions: Theory, Method and Us*e. Englewood Cliff, N. J.: Prentice Hall Incorporated.

Lawson, G. H. & Windle, D. W. (1967). Capital Budgeting and Use of DCF Criteria in the Corporation Tax Regime. London: Oliver and Boyd.

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UNIT 4 TECHNIQUES AND TOOLS OF PROJECT ANALYSIS

CONTENTS

1.0 INTRODUCTION

Project analysis may be defined in several ways. Square and Van der Tak (1975) define it as "…one method of evaluating alternatives… assessing the benefits and costs of a project and reducing them to a common yardstick". Project analysis refers to the study carried out during any part of the project cycle, which is intended to clarify one or several aspects covered by the terms costs, benefits and visibility. Project analysis may be defined as the compilation, processing, and critical examination of a variety of economic, financial and technical data in respect of a proposed capital investment with a view to determining whether its economic advantages and disadvantages justify the commitment or allocation of scarce resources. Project analysis is thus an investigative study carried out by or for a prospective investor to determine the worthwhileness of the investment and enable a decision to be taken whether or not to go ahead with the investment. The importance of project analysis lies in the fact that it enables scarce resources to be put into the most profitable or efficient uses by ensuring that (a) the project is technically sound, (b) it will provide a reasonable economic and or financial return, and (c) its objectives cannot be achieved by a less costly alternative. Project analysis thus covers investigations that are often referred to as technical and economic feasibility studies.

2.0 OBJECTIVES

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

- describe project analysis and its objectives
- explain various techniques/tools of project analysis
- evaluate the superiority of one technique over the other
- write for acceptance or rejection a project proposal.

3.0 MAIN CONTENT

3.1 Purpose of Project Analysis

The objective of project analysis depends on the point of view of the entity the analysis is undertaken. Project analysis may be carried out from the point of view of four entities:

i. The private firm
ii. The equity shareholders
iii. The debenture holders
iv. The nation or the economy as a whole.

The over-riding objective of the firm is to maximise profit: that is, to use the optimum volume and combination of resources such that the difference between the discounted stream of economic value created by the project and the discounted stream of the value of resources is maximally. It is simply a measure of the efficiency in the use of resources. The flows of both the output and the resources are valued at market prices that is, the firm is concerned with the prices it can obtain for its products, and those it must pay for its labour, raw materials, finance, machinery and equipment, spare parts, power supplies, and others. It is little concerned with the benefits and costs it may cause for the economy as a whole, which do not enter into its profit and loss account. Thus, a firm is concerned only with the financial analysis and financial profitability of the project.

The shareholders are the owners of the business. They are the residual recipient of any profit made by the enterprise after settling all debt obligations. For this reason, they bear most of the risks associated with the project. The objective of the shareholders is therefore to maximise the financial return on their equities with all costs and benefits measured in financial terms, using market prices. Thus, like the firm the shareholder is concerned only with financial profitability of the project and the return on equities.

Like the shareholders, the debenture holders are interested in the financial soundness and profitability of the project and its ability to pay its debts when due.

In the case of the nation, the objective of the economy as a whole is the maximisation of the welfare of its citizens. Welfare maximisation is translated into a number of operational objectives, three of which being (i) maximisation of aggregate real output, this is usually referred to as the economic efficiency objective; (ii) a more equitable distribution of income and (iii) self-sufficiency objective which may be interpreted as autarky, or balance of international payments. These last two objectives are often referred to as social objectives.

The benefits and costs of a public sector project are defined and measured in relation to these objectives, and are valued by the use of shadow or accounting prices which are not generally observed. The benefits from these multiple objectives are then made commensurable and together with the costs, are summarised into the economic and social profitability index of the project. This analysis is commonly referred to as economic and social cost-benefit analysis. Thus, the objective of project analysis from the nation's point of view may be regarded as the maximisation of economic and social profitability.

However, the starting point of the economic and social analysis in the financial analysis is very important. Financial profitability analysis is an essential part of economic and social cost-benefit analysis because a financially unprofitable project which is socially profitable would have to be subsidised if executed, or made financially profitable by protection. This would raise important issues involving the fiscal authorities. Without the financial analysis, the wide fiscal implications would not be known. Furthermore, foreign lenders usually insist on a financial profitability analysis as it offers some assurance of the security of their loan, even though they know that this is more affected by the soundness of government policies and the balance of payments position of the country.

3.2 Techniques/Tools of Project Analysis

3.2.1 NPV and IRR

Turning to the main appraisal techniques, the analysis begins by considering the NPV and IRR approaches, both of which are based on the discounting principles developed in unit 2 on the time value of money.

Obtaining the NPV of a project involves estimating its future net cash flows; discounting these at the appropriate opportunity cost of capital to obtain their present value; and subtracting the initial capital cost, or net investment outlay, at the beginning of the project. The formula is written thus;

$$NPV = \sum_{t=1}^{n} \frac{NCF_t}{(1+r)^t} - I_o$$

Where,

NCF is the net cash flow received at the end of each year or period t, t = 1, 2, ….,n.
r is the project's opportunity cost of capital.
I_o is the net investment outlay in time zero

Expressing the above formula in terms of present value interest factors:

$$NPV = \sum_{t=1}^{n} (NCF_t/PVF_{tr}) - I_o$$

The IRR on a project is based on the NPV concept and is found by solving for the discount rate which makes the NPV on a project equal to zero. In a more formal sense the IRR is the discount rate which, if applied to the future NCF series, equates the present value of that series to the initial or net investment outlay.

$$NPV = \sum_{t=1}^{n} \frac{(NCF_t)}{(1+ IRR)^1} - I_o = 0$$

or

$$NPV = \sum_{t=1}^{n} \frac{(NCF_t)}{(1+ IRR)^1} = I_o$$

A conventional NPV schedule

To obtain a clearer understanding of these two methods it is useful to consider the NPV schedule, defined in relation to a standard or conventional project. A conventional project is one which always generates positive future NCFs, subject to the usual initial negative net investment outlay.

Consider project B, detailed in Table 9, which has an initial net investment outlay of N700 and which produces a series of NCFs over a subsequent five – year period. Given r, the NPV for this project is:

$$NPV = \frac{200}{1+r} + \frac{50}{(1-r)^2} + \frac{200}{(1+r)^3} + \frac{200}{(1+r)} + \frac{600}{(1+r)^5} - 700$$

Table 9: Net Investment outlays and NCFs for three independent projects

		Projects		
	A	**B**	**C**	
Year	**Ns**	**Ns**	**Ns**	
0	-200	Net Investment Outlay		PVIFs @ r = 8
		-700	-700	1.00
1	200			
2	500			
3	400			
4	600			
5	500			
NPV @	-N287 30	N327.91	N598.25	
8% IRR	294%	21 29%	30.09%	

As an illustration of the relationship between NPV and r, the following four discount rates are applied to project B: 0.00%, 10%, 20% and 25%. If the discount rate is zero the NPV is simply the sum of the future NCFs minus the initial net investment outlay, that is NPV = N650. At r = 10% the NPV = N265.20; at r = 20% the NPV N24.15, and at r = 25% the NPV = - N63.07. Thus for this project, and its standard type, the NPV is inversely related to the discount rate: the higher the discount rate the lower the NPV.

From the NPV schedule in Table 9, the IRR is clearly illustrated. Since the IRR is determined as the discount rate which makes the NPV of a project zero, the IRR always occurs where the NPV schedule of a conventional project crosses the horizontal axis. In the case of project B, this point is achieved at a discount rate of 21.29%.

3.3 Selecting Independent Investments

Under the NPV investment selection rule, all independent projects are acceptable provided that, for each project I, NPV $\geq$ 0.

That is, all independent projects which at the chosen discount rate have positive, or at minimum zero NPV should be accepted. A project with a negative NPV is automatically rejected. In the specific example of

project B above, providing the opportunity cost of capital, or discount rate, is not in excess of approximately 21%, a positive NPV would occur and the project would be accepted.

The reasoning behind the NPV is straightforward. It measures the extent to which outflows and, therefore, the extent to which shareholder wealth will be increased if the project is accepted. A company is indifferent to a project with a zero NPV since the funds that a zero NPV projects generates are just capable of covering the project's net investment outlay and meeting the company's required rate of return. Zero NPV projects do not, however, make a net contribution to wealth. Projects with negative NPVs would reduce value, if accepted.

In general, under the IRR investment selection rule, all independent projects are acceptable provided that, for each project

$$IRR_j \geq r$$

That is, only independent projects whose IRRs exceed, or at minimum are equal to, the cost of capital would be acceptable. In the specific example of project B, if the cost of capital is greater than 21.29%, the project would be automatically rejected. If the cost of capital is equal to, or below, this cost of capital the project would be acceptable. Since the IRR is determined from the NPV schedule, its accept/reject decision rule has implication for wealth creation similar to NPV. There are, however, some problems with applying the IRR rule which are discussed in the next section.

To illustrate the above two investment appraisal rules, consider all three independent projects in Table 9 and assume an opportunity cost of capital of 8%. The PVIFs at r = 8% are given in the final column of the table. The NPVs of projects B and C are positive and both would be accepted; however, with a negative NPV, project A would be rejected. Similarly, projects B and C would be accepted using the IRR decision rule since each one's IRR exceeds the cost of capital of 8%. Project A would be rejected, however, since its IRR is less than 8%.

Table 10: Mutually exclusive projects are incremental cash flows

	Mutually Exclusive Projects		Incremental project
	D	**E**	**Z**
	Ns	**Ns**	**Ns**
		Net Investment Outlay	
0	-800	-800	0.00
		Net Cash Flows	
1	100	400	-300.00
2	200	300	-100.00
3	300	100	100.00
4	400	400	0.00
5	1000	500	500.00
NPV	N597.42	N541.26	N56.16
@ 8% IRR	25.08%	30.35%	12.69%

One of the advantages of using NPV is that it conforms to what is referred to as the value additivity principle, since the overall NPV of a set of independent projects is simply the sum of the individual project NPVs. In the present example the overall NPV of accepting projects B and C is: N327.91 + N587.25 = N915.16.

3.4 The Technical Superiority of NPV

For technical reasons the NPV investment selection rule is superior to the IRR rule, especially in a situation where a choice has to be made between a set of mutually exclusive projects.

In the mutually exclusive case, when using NPV, the project with the highest positive NPV is chosen. Under the IRR method the project with the highest is chosen, providing the project's IRR is at least equal to the opportunity cost of capital. If, for example, the projects in Table 6.1 were mutually exclusive, instead of independent, project C would be selected by both methods. In the case of mutually exclusive projects, however, a straight application of the IRR method can produce an incorrect project choice.

This is exemplified in Table 10, where the net investment outlays and future NCFs are recorded for two mutually exclusive projects: D and E. The discount rate is 8% which, assuming certainty and perfect capital markets, is the market determined opportunity cost of borrowing and lending.

If the two projects in Table 10 had been independent there would be no ambiguity, since both projects would have been acceptable using either

NPV or IRR. Both projects have positive NPVs and each project's IRR exceeds the opportunity cost of capital. Since the two projects are mutually exclusive, however, there is an obvious problem. Under the NPV rule, project D with its higher NPV would be chosen in preference to project E. Using the IRR rule, project E with its higher IRR would be chosen in preference to project D. The correct choice is made on the basis of NPV.

If the opportunity cost of capital had been above 12.69%, the NPV method would have yielded the same project choice as the IRR method. The opportunity cost of capital of 8% is below this, giving rise to alternate choices under each selection method. The problem is that, while NPV changes as the opportunity cost of capital changes, the IRR is constant and independent of the cost of capital.

Non -discounting appraisal method

There are two other prominently used methods of investment appraisal, the Payback (PB) and the Accounting Rate of Return (ARR). These methods, which do not take the time value of money into account, are examined next.

Payback

The PB method of appraisal is based on the number of periods taken for the future NCFs on a project to payback the initial net investment outlay. Normally, in formulating PB decision rules a maximum payback period, PB^{max}, is specified.

All independent projects under consideration are acceptable providing that, for each project i,

$$PB \leq PB^{max}$$

To illustrate, consider the four projects specified in Table 11. If these are independent, and PB^{max} has been set at four years, project F will be rejected, and the other projects accepted. Under the NPV decision rule, however, with a discount rate of 10%, project I would be rejected but project F accepted. If, alternatively, the four projects are assumed to be mutually exclusive, project H, with the smallest PB of three years, would be the preferred option. Under the NPV decision rule, however, project F would be preferred.

The PB method is defective on a number of counts. First, by not considering the time value of money, it gives equal weight to all future NCFs over each project's PB period. Consider the case in respect of projects G and I which have equal PBs of four years. The PB selection

method is incapable of recognising that, in early years, the large NCFs on project G, relative to project I, are more valuable than the latter's. Second, once the PB period on a project has been determined, subsequent NCFs which occur beyond this period are ignored in their entirety. This is particularly important in project I's case where the NCFs in the last two years are negative. Third, there is no objective criterion for determining PB^{max}. Fourth, there is ambiguity in respect of defining the initial period of net investment outlays. If, for example, net investment outlays on one project occurred only in year zero, but on another project over the first three years of its life, there is no guidance on the point in time at which counting the number of PB periods should begin.

Table 11: Investment Appraisal

	Project				**Discounted NCFs**
Year	**F Ns**	**G Ns**	**H Ns**	**I Ns**	**Project G @ 10%**
	Net Investment Outlay				
0	-1000	-1500	-2000	-1500	-1500
1	200	1000	500	100	909
2	400	400	400	400	330
3	100	50	1100	500	38
4	200	50	300	700	34
5	100	150	500	-50	93
6	2000	200	100	-100	113
Standard pay back	5yrs	4yrs	3yrs	4yrs	
NPV @ 10%	N915.17	N17.42	N183.38	-N477.53	5.85yrs

Some attempt has been made to partially accommodate the time value of money in the PB appraisal method, with the suggestion that discounted PB should be used. Here the PB on a project is based on its discounted future NCFs; however, this simply reduces the amount of future NCFs which are ignored, subsequent to the discounted PB period. As an example the NCFs for project G are discounted at 10% and presented in the final column of Table 11. The discounted PB for project G is 5.85 years compared to its standard PB of four years.

Accounting Rate of Return (ARR)

The ARR is based on a definition of the average annual accounting profits from a project divided by a definition of the annual average investment outlays over a project's life. The ARR is then compared to some hurdle rate arbitrarily set by the company. The ARR, as a non –

discounting method, is subject to the same types of criticism as the PB, although the ARR does give consideration to all the accounting profits over the life of a project.

There is a serious additional problem with the ARR, arising from the possibility that the use of accounting numbers may give a misleading view of the NCFs generated by a project. This partly arises because depreciation of the initial capital costs over the future life of a project is treated as explicit cash costs. Further, the accounting definition of profit and the accounting treatment of investment outlays will depend on the accounting convention operated within individual companies and on the accounting standards which happen to be in force at the time when particular project appraisals are being made. These issues are more fully discussed below, when the factors which should be taken into account in formulating a project's NCF profile are specified. Before considering these factors, however, it is useful to reflect on the general superiority of NPV as an investment appraisal method.

The general superiority of NPV

The NPV approach to investment appraisal has been shown, in a technical sense, to be superior to the IRR approach and now, in a general sense, to be superior to the other commonly used approaches of PB and the ARR. The merit of the principle of NPV is that it measure the net wealth – creating potential of capital projects, and investments in general, by considering all of a project's NCFs and discounting these at the project's opportunity cost of capital. Even in the presence of risk and imperfect capital markets, the most appropriate investment choices are made using investment appraisal techniques which are founded on the NPV principle. Some of these are discussed in the next chapter.

Despite the theoretical superiority of NPV, surveys which have investigated the appraisal techniques used in practice indicate that all four methods appeal to corporate executive. Looking across a wide range of these surveys, there is even the suggestion that, on balance, the PB approach is most favoured. The PB is followed in order of preference, by the ARR, the IRR and finally the NPV. The preference ordering does however, appear to vary with the size of company, with very large companies undertaking highly sophisticated investment appraisals based on NPV; although even here the other techniques might have a supplementary usage.

One argument in favour of using the IRR is that as a percentage rate of return it is conceptually more familiar than NPV which, an absolute measure, is somewhat abstract. The rate of return concept combined

with management's familiarity with accounting numbers can explain use of the ARR.

In the case of PB it may be used as a convenient screening device to make an initial selection of projects which would then become subject to detailed formal appraisal using NPV. In addition, since capital projects are medium to long term, full appraisal involve forecasting all future NCFs. Forecasting, even in the short term, can be problematical. (Just consider the difficulties in using macro-economic models to forecast short–term behaviour in the UK economy).

Consequently, in those situations where management believe that a very low level of confidence can be placed in forecasting revenues and costs which occur in eight, nine or ten years' time, there may be a rationale for using PB (or better still, discounted PB). If a project can payback the net investment outlay over the early years of its operation, when NCFs can be measured with a reasonable level of confidence, the project is acceptable. By monitoring the project once it is operational and gaining more information as time passes, on the likely future NCFs beyond the initial PB period, abandonment or continuation decision can be made at a later date.

Fervent supporters of NPV might well view this as heresy. The argument would be that NPV should always be used, if necessary in combination with simulation and sensitivity analysis. Here, probabilities are assigned to future outcomes and changes in a project's NPV analysed as assumptions about the future are varied. Such an argument is correct, provided decision makers are operating in an environment of risk where, as Knight (1921) argues, probabilities can be measured objectively or subjectively. Using Knight's distinction between risk and uncertainty, this is not possible in the latter situation since, by definition, uncertainty exists where numerical probabilities (either objective or subjective) cannot be assigned to future outcomes.

3.5 Project Analysis and other Techniques of Optimising Behaviour

It is obvious from the foregoing discussion that project analysis involves two techniques of optimising behaviour:

(i) The classical theory of the firm in the case of private sector projects
(ii) Economic and social benefit-cost analysis for public sector projects.

In the classical theory of the firm, the business firm is represented as maximising profits; that is, the difference between the discounted stream of revenue and the discounted stream of costs, both revenue and costs being measured in financial terms. The revenue includes only the value of those benefits which the firm can market and costs include only those that the firm bears.

The benefit-cost analysis of public investment resembles the analysis of profit maximising firm. The difference between the two lies in the identification and measurement of benefits and costs, the problem of incorporating the multiple objectives of the public sector in the analysis, the determination of social discount rate and shadow or accounting prices where market prices do not reflect the true value of the good or service to the economy.

Both the financial and the benefit-cost analyses are optimising techniques because (i) they consider alternative projects that will satisfy the same objectives before choosing the best, and (ii) for the chosen project, they consider alternative sizes and locations before choosing the best that satisfy the stipulated objectives. Thus, there is no known alternative that can yield a better result. The long-run average cost curve and equilibrium analysis of the firm exemplifies this optimising technique.

Project analysis may be contrasted with two other techniques of maximising behaviour; cost-effectiveness analysis, and classical operations analysis. Cost-effectiveness analysis is specifically directed to problems in which the output cannot be evaluated in market prices, but where the inputs are substitutable at exchange relationships developed in the market. It addresses itself to maximising effectiveness subject to a generalised resource constraint measured in financial terms (Odufalu, 2000).

Cost-effectiveness analysis is appropriate in situations where there is no market evaluation of alternative outputs; as in defence sector, and where the resource inputs can be appropriately evaluated at market prices.

Classical operations analysis is addressed to problems of maximising effectiveness, subject to a set of specific resource constraints which are measured in the amount of the several types of resources available. The analysis can be conducted entirely in physical and other non-monetary terms. Such analysis is appropriate where there is no market evaluation of either input or output, for example, as in the scheduling of production with a given set of production resources.

4.0 CONCLUSION

In the course of our study in this unit we were able to discuss the objective of techniques or tools for analysing proposed project, enumerate the use of various techniques such discounted cash flow methods and non-discounted cash flow methods. Thus, Net present value method was found to be most useful because it considered time value of money. However, it is very important for analysts to make use of the foregoing mentioned method for effective and efficient analysis of any proposed project.

5.0 SUMMARY

In summary, this unit discussed project's tools and techniques of analysis among which are payback period, accounting rate of return, profitability index, net present value, and internal rate of returns.

6.0 TUTOR-MARKED ASSIGNMENT

i. Discuss the superiority of NPV over all other tools of project analysis.
ii. What is project analysis technique? Differentiate between discounted cash flow and non-discounted cash flow techniques.

7.0 REFERENCES/FURTHER READING

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UNIT 5 BREAK-EVEN ANALYSIS

CONTENTS

1.0 INTRODUCTION

Break-even analysis is a technique widely used by production management and management accountants. It is based on categorising production costs between those which are "variable" (costs that change when the production output changes) and those that are "fixed" (costs not directly related to the volume of production).

Total variable and fixed costs are compared with sales revenue in order to determine the level of sales volume, sales value or production at which the business makes neither a profit nor a loss (the "break-even point").

2.0 OBJECTIVES

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

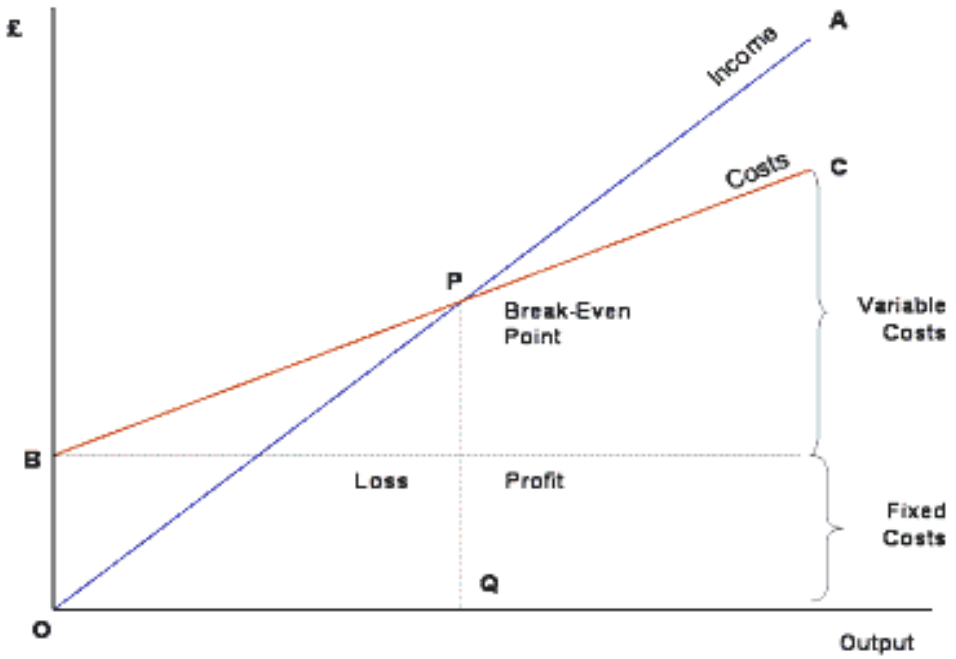
- identify when an investment will generate a positive return
- state the relationship between fixed costs and the level of production
- plot a chart of the variable costs and volume of output
- show the relationship between fixed costs and the level of production.

3.0 MAIN CONTENT

3.1 The Break-Even Chart

In its simplest form, the break-even chart is a graphical representation of costs at various levels of activity shown on the same chart as the variation of income (or sales, revenue) with the same variation in

activity. The point at which neither profit nor loss is made is known as the "break-even point" and is represented on the chart below by the



intersection of the two lines:

Fig. 4: Break –Even Chart

In the diagram above, the line OA represents the variation of income at varying levels of production activity ("output"). OB represents the total fixed costs in the business. As output increases, variable costs are incurred, meaning that total costs (fixed + variable) also increase. At low levels of output, costs are greater than income. At the point of intersection, P, costs are exactly equal to income, and hence neither profit nor loss is made.

Fixed costs

Fixed costs are those business costs that are not directly related to the level of production or output. In other words, even if the business has a zero output or high output, the level of fixed costs will remain broadly the same. In the long term fixed costs can alter - perhaps as a result of investment in production capacity (e.g. adding a new factory unit) or through the growth in overheads required to support a larger, more complex business.

Examples of fixed costs

- Rent and rate
- Depreciation

- Research and development
- Marketing costs (non- revenue related)
- Administration costs

Variable costs

Variable costs are those costs which vary directly with the level of output. They represent payment output-related inputs such as raw materials, direct labour, fuel and revenue-related costs such as commission.

A distinction is often made between **"Direct"** variable costs and **"Indirect"** variable costs.

Direct variable costs are those which can be directly attributable to the production of a particular product or service and allocated to a particular cost centre. Raw materials and the wages those working on the production line are good examples.

Indirect variable costs cannot be directly attributable to production but they do vary with output. These include depreciation (where it is calculated related to output - e.g. machine hours), maintenance and certain labour costs.

Semi-variable costs

Whilst the distinction between fixed and variable costs is a convenient way of categorising business costs, in reality there are some costs which are fixed in nature but which increase when output reaches certain levels. These are largely related to the overall "scale" and/or complexity of the business. For example, when a business has relatively low levels of output or sales, it may not require costs associated with functions such as human resource management or a fully-resourced finance department. However, as the scale of the business grows (e.g. output, number people employed, number and complexity of transactions) then more resources are required. If production rises suddenly then some short-term increase in warehousing and/or transport may be required. In these circumstances, we say that part of the cost is variable and part fixed.

3.2 Break-Even Method of Investment Analysis

Break-even analysis is a useful tool to study the relationship between fixed costs, variable costs and returns. A break-even point indicates when an investment will generate a positive return and can be determined graphically or with simple mathematics. Break-even analysis

computes the volume of production at a given price necessary to cover all costs. Break-even price analysis computes the price necessary at a given level of production to cover all costs. To explain how break-even analysis works, it is necessary to define the cost items.
Fixed costs incurred after the decision to enter into a business activity is made, are not directly related to the level of production. Fixed costs include, but are not limited to, depreciation on equipment, interest costs, taxes and general overhead expenses. Total fixed costs are the sum of the fixed costs.

Variable costs change in direct relation to volume of output. They may include cost of goods sold or production expenses such as labour and power costs, feed, fuel, veterinary, irrigation and other expenses directly related to the production of a commodity or investment in a capital asset. Total variable costs (TVC) are the sum of the variable costs for the specified level of production or output. Average variable costs are the variable costs per unit of output or TVC divided by units of output.

Total fixed costs are shown in Figure 5 by the broken horizontal line. Total fixed costs do not change as the level of production increases. Total variable costs of production are indicated by the broken line sloping upward, which illustrates that total variable costs increase directly as production increases.

The total cost line is the sum of the total fixed costs and total variable costs. The total cost line parallels the total variable cost line, but it begins at the level of the total fixed cost line.
The total income line is the gross value of the output. This is shown as a dotted line, starting at the lower left of the graph and slanting upward. At any point, the total income line is equivalent to the number of units produced multiplied by the price per unit.

The key point (break-even point) is the intersection of the total cost line and the total income line (Point P). A vertical line down from this point shows the level of production necessary to cover all costs. Production greater than this level generates positive revenue; losses are incurred at lower levels of production.

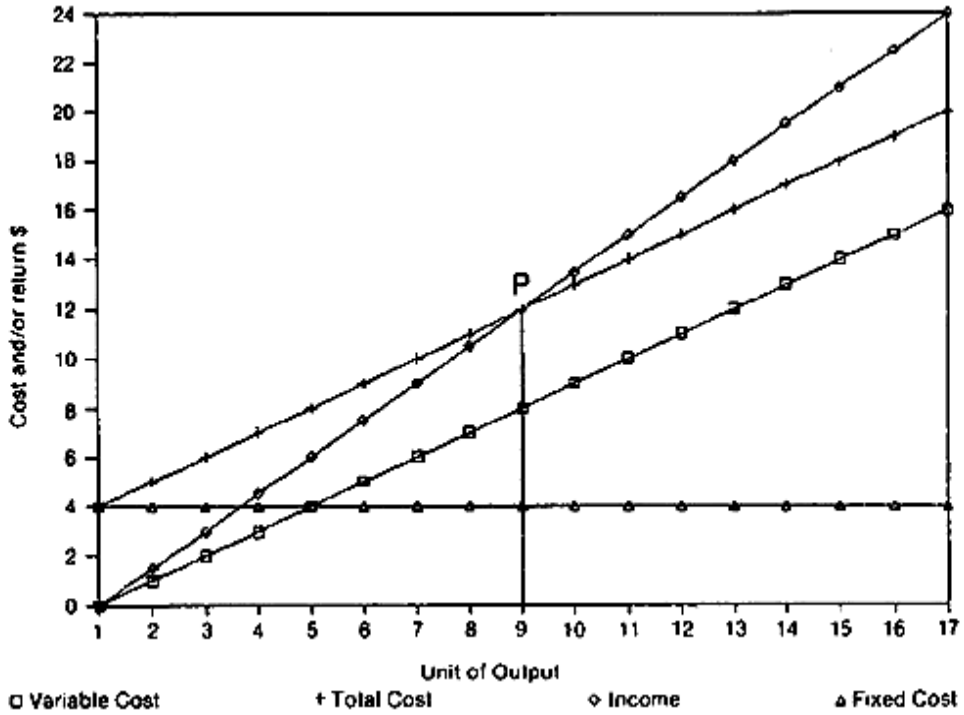


Fig. 5: Graph form of break-even analysis

Mathematical explanation

The graphic method of analysis helps the reader understand the concept of the **break-even point**. However, graphing the cost and income lines is laborious. The break-even point is found faster and more accurately with the following formula:

B-E = F / (S - V)

where:

B-E = break-even point (units of production),

F = total fixed costs,

V = variable costs per unit of production,

S = savings or additional returns per unit of production, and

The mathematical approach is best presented using examples.

Example 1

A farmer wants to buy a new combine rather than hire a custom harvester. The total fixed costs for the desired combine are $21,270 per year. The variable costs (not counting the operator's labour) are $8.75

per hour. The farmer can harvest 5 acres per hour. The custom harvester charges $16.00 per acre. How many acres must be harvested per year to break-even?

Fixed costs (F) = $21,270

Savings (S) = $16/A

Variable costs (V) = $8.75/hr / 5 A/hr = $1.75/A

B-E = $21,270 / ($16/A - $1.75/A) = $21,270 / $14.25/A = 1,493 acres.

Example 2

Break-even analysis can be easily extended to consider other changes. If the farm operator can save two additional bushels of wheat per acre more than the custom harvester, what would be the break-even point if wheat is worth $4/bushel?

Additional income = $4/bu x 2 bu/A = $8/A

B-E = $21,270 / ($16/A + $8/A - $1.75/A)

= $21,270 / $22.25/A = 956 acres

Example 3

A farmer raising 1,200 acres of wheat per year considers purchasing a combine. How much additional return (to land, capital labour, management and risk) would result?

Additional return = (savings or additional income) - (fixed costs + variable costs)

Additional profit = [$16/ac + ($4/bu x 2 bu/ac)] x 1200 A = $21,270 + [($8.75/hr / 5 A/hr) x 1200 A] = $28,800-$23,370 = $5,430

Thus, the farmer would generate another $5,430 in additional return by purchasing the combine. A farmer harvesting only 900 acres would probably choose not to buy the combine because the acreage is below the break-even point of 956 acres. The farmer may want to evaluate the purchase of a smaller or used combine.

Additional situations

Two additional situations are presented as follows:

Problem 1

If the fixed costs for the combine are $12,000 per year, no additional yield is expected, variable costs are $7 per hour and the farmer can combine 4 acres per hour, what is the new break-even point?

Problem 2

If 900 acres are harvested, what is the effect on the farmer's profits?

Solutions

Fixed costs = $12,000

Savings = $16/A

Variable costs = $7/hr / 4 A/hr = $1.75/A

Problem 1

B-E = $12,000 / ($16/A - $1.75/A) = $12,000 / $14.25/A = 842 Acres
Problem 2:

Additional profit = ($16/A x 900 A) - [$12,000 + ($7/hr / 4 A/hr x 900 A = $14,000 - $13,575 = $825 increase.

3.3 Appraisal of Break-Even Analysis

The main advantage of break-even analysis is that it points out the relationship between cost, production volume and returns. It can be extended to show how changes in fixed cost-variable cost relationships, in commodity prices, or in revenues, will affect profit levels and break-even points. Limitations of break-even analysis include:

i. It is best suited for the analysis of one product at a time.
ii. It may be difficult to classify a cost as all variable or all fixed.
iii. There may be a tendency to continue to use a break-even analysis after the cost and income functions have changed.

Break-even analysis is most useful when used with partial budgeting or capital budgeting techniques. The major benefit to using break-even

analysis is that it indicates the lowest amount of business activity necessary to prevent losses.

Break-even analysis

This type of report is not one that is automatically generated by most accounting software, nor is it one that is normally produced by your accountant, but it is an important analysis for you to have and understand. For any new business, you should predict what gross sales volume level you will have to achieve before you reach the break-even point and then, of course, build to make a profit. For early-stage businesses, you should be able to assess your early prediction and determine how accurate they were, and monitor whether you are actually on track to make the profits you need. Even the mature business would be wise to look at their current break-even point and perhaps find ways to lower that benchmark to increase profits. The recent massive layoffs at large corporations are directed at this goal, lowering the break-even point and increasing profits.

Break-even is the volume where all fixed expenses are covered

You will start a break-even analysis by establishing all the fixed (overhead) expenses of your business. Since most of these are done on a monthly basis, don't forget to include the estimated monthly amount of line items that are normally paid on a quarterly or annual basis such as payroll, taxes or insurance. For example, if your annual insurance charge is $9,000, use 1/12 of that, or $750 as part of your monthly budget. With the semivariable expense (such as phone charges, travel, and marketing), use that portion that you expect to spend each and every month.
For the purpose of a model break-even, let's assume that the fixed expenses look as follows:

Administrative salaries	$1,500
Rent	800
Utilities	300
Insurance	150
Taxes	210
Telephone	240
Auto expense	400
Supplies	100
Sales and marketing	300
Interest	100
Miscellaneous	400
Total	$4,500

These are the expenses that must be covered by your gross profit. Assuming that the gross profit margin is 30%, what volume must you have to cover this expense? The answer in this case is 15,000—30% of that amount is $4,500, which is your target number.
The two critical numbers in these calculations are the total of the fixed expense and the percentage of gross profit margin. If your fixed expense is $10,000 and your gross profit margin is 25%, your break-even volume must be $40,000.

This is not a static number

You may do a break-even analysis before you even begin your business and determine that your gross margin will come in at a certain percentage and your fixed expense budget will be set at a certain level. You will then be able to establish that your business will break even (and then go on to a profit) at a certain level of sales volume. But your prestart projections and your operating realities may be very different. After three to six months in business, you should compare projections to the real-world results and reassess, if necessary, what volume is required to reach break-even levels.

Along the way, expenses tend to creep up in both the direct and indirect categories, and you may fall below the break-even volume because you think it is lower than it has become. Take your profit and loss statement every six months or so and refigure your break-even target number.

Ways to lower break-even

There are three ways to lower your break-even volume, only two of them involve cost controls (which should always be your goal on an ongoing basis).

1. Lower direct costs, which will raise the gross margin. Be more diligent about purchasing material, controlling inventory, or increasing the productivity of your labour by more cost effective scheduling or adding more efficient technology.

2. Exercise cost controls on your fixed expense, and lower the necessary total dollars. Be careful when cutting expenses that you do so with an overall plan in mind. You can cut too deeply as well as too little and cause distress among workers, or you may pull back marketing efforts at the wrong time, which will give out the wrong signal.

3. Raise prices! Most entrepreneurs are reluctant to raise prices because they think that overall business will fall off. More often

than not that doesn't happen unless you are in a very price-sensitive market, and if you are, you really have already become volume driven.

But if you are in the typical niche-type small business, you can raise your prices four to five percent without much notice of your customers. The effect is startling. For example, the first model we looked at was the following:

Volume	$15,000	
direct cost	10,500	70%
gross profit	4,500	

Raising the prices five percent would result in this change:

Volume	$15,750	
direct cost	10,500	67%
gross profit	5,250	

You will have increased your margin by three percent, so you can lower the total volume you will require to break even.

4.0 CONCLUSION

You are in business to make a profit not just break even, but by knowing where that number is, you can accomplish a good bit.
You can allocate the sales and marketing effort to get you to the point you need to be. Most companies have slow months, so if you project volume below break-even, you can watch expenses to minimise losses. A few really bad months can wipe out a good bit of previous profit. Knowing the elements of break-even allows you to manage the costs to maximise the bottom line. Once you have gotten this far in the knowledge of the elements of your business, you are well on your way to success.

5.0 SUMMARY

In the course of this study various definitions of break-even were identified, while the elements of break-even were examined and finally the analysis of break-even vis-à-vis project financing.

6.0 TUTOR-MARKED ASSIGNMENT

i. What do you understand by break-even analysis? Illustrate break-even point on a graph.
ii. Discuss merit and demerit of break-even analysis in project financing.

7.0 REFERENCES/FURTHER READING

Black, H. A., John, E. C. & Gene, R. B. (1967). *Accounting in Business Decisions: Theory, Method and Use.* Englewood Cliff, N. J.: Prentice Hall Incorporated.

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MODULE 3

UNIT 1 BUDGETING TECHNIQUES

CONTENTS

1.0 INTRODUCTION

Planning for and controlling the use of cash are important task. Failure to properly anticipated cash flow can lead to idle cash balances and lower rate of return on one hand and to cash deficit on the other hand.

Cash budget is a device that all financial managers planned for and control the use of cash. It is a work sheet that shows cash inflows, outflows and cash balances over some budgeted time period. Its importance includes:

- determine operating cash requirements
- anticipate short term finances
- manage money market investment.

The time frame of a cash budget is usually short-maximum one year. Within this time frame the firm will forecast cash inflows, outflows and cash balances typically on a monthly or weekly basis.

2.0 OBJECTIVES

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

- state the purpose of cash budgeting
- identify various types of cash budgeting
- compute cash budget.

3.0 MAIN CONTENT

3.1 Purposes of Cash Budgeting

Proper preparation of your cash budget will show how cash flows in and out of your business. Also, it may then be used in planning your short-term credit needs. In today's financial world, you are required by most financial institutions to prepare cash budgets before making capital expenditures for new assets as well as for expenditures associated with any planned expansion. The cash budget determines your future ability to pay debts as well as expenses. For example, preliminary budget estimates may reveal that your disbursements are lumped together and that, with more careful planning, you can spread your payments to creditors more evenly throughout the entire year. As a result, less bank credit will be needed and interest costs will be lower. Banks and other credit-granting institutions are more inclined to grant you loans under favourable terms if your loan request is supported by a methodical cash plan. Similarly, businesses that operate on a casual day-to-day basis are more likely to borrow funds at inopportune times and in excessive amounts. Without planning, there is no certainty that you will be able to repay your loans on schedule. However, once you've carefully mapped out a cash budget, you will be able to compare it to the actual cash inflows and outflows of your business. You will find that this comparison will go a long way in assisting you during future cash budget preparation. Also, a monthly cash budget helps pinpoint estimated cash balances at the end of each month, which may foresee short-term cash shortfalls.

3.2 Consistent Budgets

Cash budgeting is a continuous process that can be checked for consistency and accuracy by comparing budgeted amounts with amounts that can be expected from using typical ratios or financial statement relationships. For example, your treasurer will estimate the payments made to your suppliers of merchandise or materials, the payments to employees for wages and salaries, and the other payments that you are obligated to make. These payments can be scheduled by dates so that all discounts will be taken, and so that no obligation will be overlooked

when it comes due. Cash collections from customers can also be estimated and scheduled by dates along with other expected cash receipts. With careful cash planning, you should be able to maintain a sufficient cash balance for your needs and not put yourself in the position of holding excessive balances of non-productive cash. In the normal course of operations in a merchandising business, for example, merchandise is purchased and sold to customers who eventually pay for the merchandise sold to them. Usually there is a time lag in business operations. It may be necessary to pay the suppliers for merchandise before the merchandise is sold to the customers. Before and during a busy selling season the demand for cash may be higher than the inflow of cash from operations. In this case it may be necessary to arrange short-term loans. When the selling season is over, cash collections from customers will be relatively large and the loans can be paid off.

Other types of budget

1) Recurrent budget and capital budgets
2) Fixed and flexible budgets
3) Ad-hoc and periodic budgets
4) Specific and general budgets
5) Quantitative and financial budgets
6) Expenses and revenue budgets
7) Operating and supplementary budgets

3.3 Computation of Cash Budgeting

Format of cash budget

A. Estimated cash inflow

	Jan.	**Feb.**	**March**	**April**	**May**	**June**
Cash Sales	XX	XX	XX	XX	XX	XX
Receivable Collection	XX	XX	XX	XX	XX	XX
Sales of Marketable Securities	XX	XX	XX	XX	XX	XX
Other Cash Receipts	XX	XX	XX	XX	XX	XX
Total cash inflow (A)	___	___	___	___	___	___

B. Estimated cash outflow

Cash Purchase	XX	XX	XX	XX	XX	XX
Payment of loan	XX	XX	XX	XX	XX	XX
Interest on loan	XX	XX	XX	XX	XX	XX
Taxation and dividend paid	XX	XX	XX	XX	XX	XX
Payable payment	XX	XX	XX	XX	XX	XX
Other payments	XX	XX	XX	XX	XX	XX
Total cash Outflow (B)	___	___	___	___	___	___

C. Net Cash Flow

(A-B)	XX	XX	XX	XX	XX	XX
Opening cash balances	XX	XX	XX	XX	XX	XX
Closing Cash Balances	XX	XX	XX	XX	XX	XX
Less: Min. Closing Balance	(XX)	(XX)	(XX)	(XX)	(XX)	(XX)
Cash Surplus / Deficit	XX	XX	XX	XX	XX	XX

Example 1

The expected sales and purchases figure of Great Atlantic Ltd. from November 1995 to June 1996 are as follows:

Month	**Sales**	**Purchases**
	N	**N**
Nov. '95	3,000	2,000
Dec. '95	3,500	1,000
Jan. '96	2,500	800
Feb. '96	2,000	1,000
Mar. '96	2,500	1,200
April '96	3,000	1,400
May'96	3,500	1,500
June '96	3,800	1,500

The company has established a sale policy of 20% cash and 80% credit, 40% and 60% of credit sales are collectable in the first and second month after sales respectively. The company suppliers granted credit

purchases of 1 month. All company's purchases were on credit. The company has budgeted for a capital expenditure of N1500 and N300 for the month of March 1996 and April '96 respectively. Dividend of N1200 is to be paid in three installments starting from April '96. An outstanding tax liability of N250 is planned to be paid in May '96. The company has an opening cash balance of N100 and intends to maintain a minimum cash balance of N1500 each month. Salary for each month will amount to N500.

Required

Determine the cash position of the company from Jan. '96. Also indicate how much the company has to withdraw from his saving account every month or how much the company must save every month?

Solution

A. Estimated Cash Inflow

		Jan.	**Feb.**	**March**	**April**	**May**	**June**
		N	**N**	**N**	**N**	**N**	**N**
Cash Sales (Note 1)		500	400	500	600	700	760
Receivables (Note 2)		2560	2480	1840	1760	2160	2560
Total cash inflow	(A)	3060	2880	2340	2360	2860	3320

B. Estimated Cash Outflow

Creditors		1000	800	1000	1200	1400	1500
Capital Expenditure		-	-	150	300	-	-
Dividend paid		-	-	-	400	400	400
Tax liability		-	-	-	-	250	-
Salary		500	500	500	500	500	500
Total cash Outflow	(B)	1500	1300	3000	2400	2500	2400

C. Net Cash Flow

(A-B)		1560	1580	(660)	(40)	310	920
Opening cash balances		100	1660	3240	2580	2540	2850
Closing Cash Balances		1660	3240	2580	2540	2850	3770

Less: Min. Closing Balance	(1500)	(1500)	(1500)	(1500)	(1500)	(1500)
Cash Surplus / Deficit	160	740	1080	1040	1350	2270

Workings

Note 1- Expected sale

Month	Total Sale	Cash Sale (20%)	Credit Sale (80%)	Sales' Payment 40% = a month after 60% = 2 months after
Nov 95	3000	600	2400	-
Dec.	3500	700	2800	960
Jan '96	2500	500	2000	1440 + 1120 = 2560
Feb.	2000	400	1600	1680 + 800 = 2480
March	2500	500	2000	1200 + 640 = 1840
April	3000	600	2400	960 + 800 = 1760
May	3500	700	2800	1200 + 960 = 2160
June	3800	760	3040	1440 + 1120 = 2560
July	-	-	-	1680 + 1216 = 2560
August	-	-	-	1824

Note 2 - Expected Purchase

Month	Total Purchase	Cash Purchase	Credit Purchase Payment
Nov 95	2000	-	-
Dec.	1000	-	2000
Jan '96	800	-	1000
Feb.	1000	-	800
March	1200	-	1000
April	1400	-	1200
May	1500	-	1400

June	1500	-	1500
July	-	-	1500

4.0 CONCLUSION

In the course of our study in this unit we were able to discuss purpose of cash budgeting, various types and forms of cash budgets, format of cash budget and computation of cash budget. Thus cash budget is a financial plan that considered both future income with expenditures and should be given adequate attention.

5.0 SUMMARY

In summary, this unit examined purposes of cash budget and also gives a format of computing as well as an illustration of cash budgeting.

6.0 TUTOR-MARKED ASSIGNMENT

i. What is cash budgeting? State and discuss purposes of cash budgeting.

ii. The expected sales and purchases figure of Great Atlantic Ltd. from November 2007 to June 2008 are as follows:

Month	**Sales**	**Purchases**
	N	**N**
Nov. '07	3,000	2,000
Dec. '07	3,500	1,000
Jan. '08	2,500	800
Feb. '08	2,000	1,000
Mar. '08	2,500	1,200
April '08	3,000	1,400
May' 08	3,500	1,500
June '08	3,800	1,500

The company has established a sale policy of 40% cash and 60% credit, 30% and 70% of credit sales are collectable in the first and second month after sales respectively. The company suppliers granted credit purchases of 1 month. All company's purchases were on credit. The company has budgeted for a capital expenditure of N1600 and N400 for the month of March 1996 and April '96 respectively. Dividend of N1200 is to be paid in three installments starting from April '08. An outstanding tax liability of N300 is planned to be paid in May '08. The company has an opening cash balance of N200 and intends to maintain a

minimum cash balance of N2000 in each month. Salary for each month will amount to N500.

Required

Determine the cash position of the company from Jan. '08. Also indicate how much the company has to withdraw from its saving account every month or how much the company must save every month?

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UNIT 2 WORKING CAPITAL MANAGEMENT

CONTENTS

1.0 INTRODUCTION

In the short term, a considerable amount of managerial resource is devoted to day-to-day decision making in respect of working capital. Working capital, which also has an effect on a company's total market value, consists of short-term (current) assets and short-term (current) liabilities which, by definition, have less than one year maturity. Current assets can be funded wholly or in part on a short-term basis, with net working capital measured as current assets less current liabilities.

This begins by defining the main components of current assets and current liabilities and by describing the role of working capital in a company's operations.

Attention is then turned to the core element in working capital: the management of cash flows. Following this, some of the basic principles involved in modeling the components of working capital are described. These relate to the management of cash and marketable securities, inventory and account receivable (or trade debtors). In terms of current liabilities, there are two main components: accounts payable (or trade creditors) and short-term debt financing.

Finally, overall working capital policy is examined in terms of a company's overall level of investment in current asset and in respect of the strategy the company adopts in matching the maturity structure of its assets and liabilities.

2.0 OBJECTIVES

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

- highlight the core elements in working capital
- explain to manage cash flows
- enumerate the basic principles involved in modeling the components of working capital
- analyse the working capital policy
- list the factors that determine the volume of working capital of a business
- mention the elements of inefficient working capital management
- describe various strategies involved in application of working capita.l

3.0 MAIN CONTENT

3.1 Liquidity Management

Liquidity is defined as the ability to realise value in cash. It has two components:

1) The conversion time of an asset, that is, the time lag between deciding to sell an asset and receiving payment for it; and
2) Its conversion price.

Cash has zero conversion time and no conversion price risk. Marketable securities, providing they are actively traded, have zero conversion time but have significant conversion price risk associated with interest rate risk.

The optimal level of liquidity, that is, a level which is not too low so as to produce significant probabilities of financial distress and bankruptcy, and not too high so as to reduce the rate of return on long-term investment is difficult to determine. As a rough guide a number of short-term financial ratios can be examined to determine if an optimal liquidity policy is being pursued. Beginning with cash and marketable securities ratios, these are:

Cash + Marketable Securities

Current Assets

and

Cash + Marketable Securities

Current Liabilities

Reasonably large values of the former indicate that cash and marketable securities can provide substantial sources of funds to finance any increases in current assets which might occur with increased sales. Reasonably high levels of the latter measure the ability to meet current liabilities without the need to liquidate other current assets for example inventory, or recourse to external sources of finance.

It would be wrong, however, to determine the liquidity position of a company purely in cash ratio terms. As indicated, inventory can be sold directly for cash, but it may have a relatively long conversion time and have a conversion price which is significantly less than the inventory's intrinsic value. The latter will occur especially if it is known that inventory is being offered for sale in a situation of financial distress.

Banks and financial institutions provide factoring services in respect of inventory and invoice discounting in respect of accounts receivable so as to eliminate conversion time. Here, a part or a whole of a company's inventory and/or its accounts receivable are purchased by a factoring company which, consequently, provides an immediate infusion of cash. Again, however, the conversion price will be below the intrinsic value of the current asset being purchased since factors earn their returns from obtaining assets at significant discounts and then reselling them or, in the case of accounts receivable, collecting payments due.

Two, more broadly based liquidity, measures take some of the above points into account. The first is the current ratio defined as:

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

This encompasses net working capital (current assets less current liabilities) and is a measure of a company's capacity to meet its liabilities, due within one year, out of current assets. Because a substantial proportion of current assets includes inventory which, assuming factoring services are not used, has a positive conversion time and significant conversion price risk, a desirable level for this ratio is taken, on average, to be 2.1. The second liquidity measure is referred to as the Acid Test or Quick Ratio. This ratio nets out the effect of inventory and is defined as:

$$\text{Quick Ratio} = \frac{\text{Cash Assets - Inventory}}{\text{Current Liabilities}}$$

On average, its optimal level is considered to be 1:1.

These cash, current and quick ratios are unlikely to give a full picture of a company's liquidity position. Back-up lines of credit which may not be explicitly observable can be important, for example, a bank's willingness to provide additional short-term loans at short notice. These factors will help to determine a company's financing flexibility which, as explained in unit 2, partly depends on the levels of short-term and long-term tangible assets already pledged in existing loan contracts. Indeed the ability of a company to provide a near-term cash flow forecast, and the variability surrounding near-term cash flows, also play a part in determining the effect of liquidity on a company's market value.

The above introduces a dynamic aspect to liquidity which is not normally picked up in static (at a point in time) short-term financial ratios. The dynamic aspect involves the speed with which a company can alter its short-term position to avoid a crisis. It has been argued that one possible way of accommodating this is by considering a ratio based on a company's earnings power, that is, the ratio of:

$$\frac{\text{Cash Liabilities} - \text{Quick Assets} \times 365}{\text{Operating Funds Expected to be Generated over a Year}}$$

This ratio gives the number of days required to pay off net current debt, that is, current debt not covered by liquid or quick assets. If, for example, this ratio exceeds 365 a company will be unable to meet its net current obligations out of its current year's expected earnings. Alternatively, if the ratio is significantly below 365 and short-term difficulties arise, the indication may be that additional short-term finance will be obtainable since banks would view such funding as entailing low risk. Expected earnings over the current year are not however, a substitute for a short-term cash flow forecast which provides better evidence of the ability to repay net current debt.

3.2 Managing Inventory

Cash and marketable securities are a form of inventory; therefore, when considering inventory in the wider context of raw materials, finished goods and spare parts, the basic principles used in cash management are applied. Indeed the Economic Order Quantity Model was developed originally with physical inventory in mind. Here for example, the optimal level of raw materials over an inventory holding periods is

determined in relation to the demand for a company's product and the holding and ordering costs of stock. Holding costs include the opportunity costs of financing inventory and of warehousing space together with any insurance costs.

As in the case of running out of cash, costs are involved in running out of raw materials in terms of potential disruptions to production runs and sales patterns. Additional physical inventory costs can include the danger of deterioration in the quality of inventory if it is held for too long; obsolescence, especially if the inventory is of a technical nature, and lead time variations, that is, the time lag between ordering and receiving new inventory. An important potential benefit from holding inventory is associated with possible price discounts on bulk purchases. Moving beyond the Economic Order Quantity Model, optimal control theory can be used to take account of unpredictability in product demand patterns.

A recent approach to inventory management in companies with repetitive manufacturing systems has produced near elimination of stock holdings. This just-in-time inventory system requires suppliers to provide that relevant inputs, in their relevant quantities, at the precise points in time when they are needed in a manufacturing operation. There are costs in attempting to ensure that the just-in-time system works. These involve developing co-coordinating and monitoring operating plans between a company and its suppliers.

$$\text{Inventory Turnover} = \frac{\text{Costs of Goods Sold}}{\text{Inventory}}$$

A relatively high inventory turnover ratio may suggest that a company is managing this current asset relatively efficiently. It could suggest, for example, that excessive amounts of stock, which would incur a significant probability of obsolescence and high warehousing costs, are not being held. On the other hand, a relatively high ratio could indicate that not enough stocks are being held to support future potential sales growth. In effect a company's inventory turnover ratio should be judged in relation to the nature of the stock being held and in respect of a base point, such as the average inventory turnover ratio for the industry in which the company is located.

3.3 Managing Accounts Receivable

A company which grants trade credit to its customers creates current assets in the form of accounts receivable or trade debtors. It also influences its average collection period, that is, the average time lag between supplying customers and receiving cash payments in settlement

of invoices. As explained, granting trade credit can have an important effect in stimulating a company's sales and thus, given its average collection period its sales revenue.

The average collection period is important in an opportunity cost sense since it involves a company in foregoing interest on cash which could have been invested in marketable securities. An important additional factor in offering trade credit is the probability of incurring bad debt that is, selling to customers who significantly delay or even default on their payments. Granting trade credit can be analyzed in terms of NPV.

As an investment decision, while the factors influencing the trade credit decision are complex, two simple examples are presented below to illustrate the basic principles. This is followed by a brief discussion of consumer credit evaluation.

The average collection period: Looking at the average collection period, one way of reducing this is by changing or introducing, if not already in existence, discounts on the price of goods sold; the discounts only being available to customers who settle their accounts within a specified period. (Such a policy can also influence sales). While a reduction in the average collection period has a benefit in that it reduces interest foregone on accounts receivable, it has a cost to the extent that discounts are taken up by customers and, consequently, profits from increased sales are reduced.

To illustrate these concepts, consider a company which has monthly sales of N2m and annual sales of N24m. Its average collection period is 30 days, indicating that there is approximately one month between it supplying its products and receiving payments for them. The company has therefore, an average investment in accounts receivable of N2m. In terms of its annual sales the company has an accounts receivable turnover ratio of 12.

$$\text{Receivables Turnover} = \frac{\text{Annual Sales}}{\text{Average Receivable Balance}} = \frac{\text{N24m}}{\text{N2m}} = 12$$

Note that the ratio for the average collection period is formally defined on 365 days in the year, as:

$$\text{Average Collection Period} = \frac{\text{Accounts Receivable X 365}}{\text{Sales}}$$

In the present example this ratio is (365)(N2m)/(N24m) = 30.4 days. Normally in accounting terms this would be rounded to 31 days.

3.4 The Cash Operating Cycle

Having introduced some of the ratios associated with current asset and liability management, it is useful to return to cash management and consider the cash operating cycle. This indicates the net time interval between cash inflows from goods sold and cash outflows for the purchase of resources. It is a measure of the length of time a company has funds tied up in working capital, an increase (decrease) in the cycle indicating an increase (decrease) in working capital needs.

A company's cash operating cycle is equal to:

i. The average number of days a given inventory is held, measuring the length of time required to purchase and sell its product; plus

ii. The average collection period on its account receivable, measuring the length of time required to collect sales revenue; minus

iii. The average period of its accounts payable, measuring the length of time payments can be deferred on its purchase of resources.

Table 12: The Cash Operating Cycle

Annual Cost of goods sold		N100.000 N40.000			
	Balance		Ratios		
Inventory	5000	Inventory	**Cost of Goods** Inventory	**N40.000** 5000	8
Accounts Receivable	10,000	**Receivable** Turnover	***Sales*** Receivables	100.000 10.000	10
Account Payable	5000	**Debtor** Turnover	**Sales** Account Payable	100.000 10.000	10

This cash operating cycle is equal to:

$$365 \frac{1}{[\text{Inventory Turnover Ratio}} + \frac{1}{\text{Receivables Turnover Ratio}} - \frac{1}{\text{Debtor Turnover Ratio}]}$$

Since each of these ratio measures, the number of times in a year that inventory, accounts receivable and accounts payable are 'turned over', dividing each ratio into the number of days in a year measures the average number of days each of these components of working capital is held.

As an illustration, consider a company which has average annual sales of N100,000 at an average annual cost of goods sold of N40,000. Given the average balances in its inventory, accounts receivable and accounts payable and the relevant ratios, as indicated in Table 12 the cash operating cycle is:

365 1 + 1 - 1

If for example, the company reduced its investment in accounts receivable there would be, other things being equal, an improvement in liquidity as measured by the cash operating cycle. Assuming accounts receivable are reduced to N6000, the receivable turnover ratio falls to N100,000/N6000 = 16.7. Thus the cash operating cycles reduced from 45.6 days to 31 days: that is, in the latter case:

365 1 + 1 - 1
8 16.7 10 = 365 [0.125 + 0.06 - 0.1] = 365[0.085] 31days

Overall working capital policy

To bring this unit to a close it is important to consider the overall policy which a company might adopt in respect of its working capital. There are two aspects of this, one involving the investment decision and the other involving the financing decision. The former is examined first.

Current asset policy

In an earlier part of this unit, when discussing cash and marketable securities, the importance of the risk-return relationship was identified. It was argued that the benefits of liquidity, in terms of producing low risk but low returns, should be weighed against relatively higher returns but higher risk produced by investing in long-term physical or fixed assets.

This risk-return principle applies to a company's investment decision in respect of its overall current assets. In this context, there are three alternative strategies which can be adopted. They involve average, conservative and aggressive approaches to risk management. Under the conservative strategy, relative to the average, there is a relatively high proportion of investment in current assets. This produces below average risk and below average total return. Under the aggressive strategy, relative to the average, there is a relatively low proportion of investment in current assets, producing above average risk and above average total returns.

The choice of strategy varies from industry to industry depending on the nature of the product and/or service being supplied and, among other factors on sales variation and the degree of operating leverage. Sales variation and operating leverage determine business risk and hence the variation in net cash flows. The overriding objective should be to determine the ratio of current assets to total assets which maximizes the total market value of a company.

Current and long-term liability policy

Once the investment decision has been made, strategies for financing current assets must be addressed. This strategies involve choosing the term structure of liabilities appropriate to a given term structure of assets. The analysis is aided by considering a company's cumulative capital requirement at a given point in time, that is, the total capital necessary to fund a company's total investment. The cumulative capital requirement is determined by fixed, or long-term, assets, permanent assets; and spontaneous or fluctuating current assets.

The division of current assets into permanent spontaneous components arises to the extent that a company can predicts its long-term trend in sales. To the extent that it can do this, the proportions of its current assets necessary to support this trend can be considered to be long term and, therefore, effectively permanently. The remaining proportions of current asset investments (in cash and marketable securities, inventories and accounts receivable) are spontaneous. They are spontaneous in that these current assets fluctuate to facilitate unanticipated changes in sales and as a result of the innate variation in the current asset components themselves. The cumulative capital requirement is illustrated in figure 6.

There are three alternative financing strategies which involve average, aggressive and conservative hedging approaches to financial risk management.

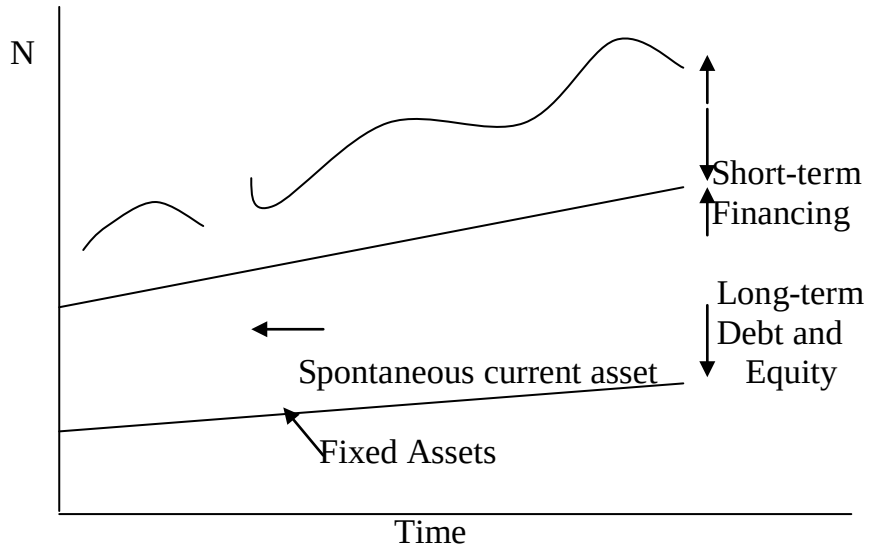


Fig. 6: The Cumulative Capital Requirement and Average Hedging

The average hedging approach consists of marching the maturity structure of assets and liabilities on the assumption that permanent current assets can be treated as long-term investments. Here all fixed and permanent current assets are funded by long-term debt and equity, with spontaneous current assets being financed by short-term debt and accounts payable. This approach exposes a company to 'average' risk with 'average' risk expected returns.

3.5 Factors That Determine the Volume of Working Capital of a Business

The following factors have been established to determine the volume of working capital of any business:

1. Nature and size of a business: Money is needed in large volume for the establishment and running of some businesses either for the provision of services or creation of products, especially big manufacturing companies.

2. Business fluctuations: Business that has cyclical or seasonal demand for its product requires large volume of current assets (stock and cash) at a particular point during the financial year.

3. Inflation: When prices are high, the business will require more working capital to finance stock and other current assets.

4. Business growth: The aim of all business stakeholders is for their business to grow and expand. Thus, when a business is growing, more investment is needed and more working capital will be needed also.

5. The firm's credit policy: A business that has a generous credit policy will require more investment in working capital to finance a large volume of debtors.

6. Availability of credit from supplier: this can also determine the volume of working capital. If the creditors (suppliers) have a tight credit policy, it means the firm will need more funds to acquire stock.

3.6 Inefficient Working Capital Management

This refers to over-capitalisation. Over-capitalisation occurs if a business manages its working capital inefficiently so that it has excessive stock and debtors and very few creditors. Idle current assets earn no returns so it is advisable that these excess current assets should be invested to earn returns in high profitable projects. This may result in not meeting up the expectations of the shareholders.

Symptoms of over-capitalisation

1. When the current and quick ratios are getting very high such business is heading towards over-capitalisation.

2. Excessive turnover rate i.e. excessive stock turnover, debtor turnover etc.

3. Over-trading – when a business tries to do too much, too quickly with little long-term capital resources at its disposal, it is said to be over-trading or under capitalised. Over-trading businesses may make sufficient profits but will soon be faced with problem of solvency when the short-term maturing obligations become due.

Symptoms of overtrading

1. High volume of sales.
2. Very high investment in fixed and current assets.
3. Current and quick ratios become worsen - very low.
4. Excessive credit period taken from suppliers.
5. The bank overdraft will always be at the limit for the firm or even might have exceeded the limit.
6. The debt ratio will be getting very high.
7. The retained profit/earning will be low too.

3.7 Forecasting Working Capital

Company may occasionally require a forecast of the amount of working capital needed to finance an increase in output or introduction of a new product. In preparing a working capital forecast, the factors to be considered include anticipated production level and production costs, length of production cycle, planned stock levels and credit terms.

Illustration

The following information relates to XYZ Plc.

Turnover	N3million

Cost as a percentage of turnover:

Direct material	30%
Direct labour	25%
Variable overhead	10%
Fixed overhead	15%
Selling and distribution overhead	5%

Note: On average, debtors take two and half months before payment. Raw materials are in stock for three months. Work-in-progress represents two months half produced goods. Finished goods represent one month production.

Credit is taken as follows:

Direct material	two months
Direct labour	one week
Variable overheads	one month
Fixed overheads	one month
Selling and distribution overheads	half a month

Work in progress and finished goods are valued at material, labour and variable expense cost.

You are required to compute the working capital requirement of XYZ plc (assume 50 working weeks in a year)

Hint: Estimate the total amount of debtors and creditors.

Solution

i.	Debtors	= $2^{1/}_{2}$/12 x N3m	= 625,000
ii.	Direct materials cost	= 30% x N3m	= N 900,000
iii.	Stock of raw materials	= 3/12 N900,000	= N 225,000

iv. Valuation of Work-in-progress:

Raw material = 2/12 x N900,000	=	N150,000
Direct labour = 2/12 x N750,000	=	N 62,000
Variable overhead = 2/12 x 0.5 x N300,000	=	N 25,000
Total		N237,500

v. Valuation of Finished Goods:

Raw materials = 1/12 x N900,000	=	N 75,000
Direct labour = 1/12 x N75,000	=	N 62,500
Variable overhead = 1/12 N300,000	=	N 25,000
Total		N162,500

Total Stock = N(225,000 + 237,500 + 162,500) = N 625,000

vi. Creditors:

Direct materials = 2/12 x N900,000	= N 150,000
Direct labour = 1/50 x N750,000	= N 15,000
Variable overhead = 1/12 N300, 000	= N 25,000
Fixed overhead = 1/12 x 450,000	= N 37,500
Selling and distribution = $^{1/}_{2}$ /12 x N150,000	= N 6,250
	N 233,750

Therefore working capital required = stock + Debtors – Creditors
W.C. = N(625,000 + 625,000 – 233,750) = N1,016,250

4.0 CONCLUSION

In conclusion, this session critically discussed working capital management in terms of cash/liquidity management, inventory management and how to forecast working capital for an organisation.

5.0 SUMMARY

In this unit, you have learnt the core element in working capital: the management of cash flows; understood the basic principles involved in modeling the components of working capital; and known the working capital policy. We also learnt the factors that determine the volume of working capital of a business; elements of inefficient working capital management; and various strategies involved in management of working capital.

6.0 TUTOR-MARKED ASSIGNMENT

i. Discuss various factors that determine the volume of working capital of a business.
ii. With appropriate illustration discuss cash operating cycle.

7.0 REFERENCES/FURTHER READING

Ayano, D. A. (2004). *Credit and Risk Management*. A Lecture Note Prepared for Undergraduate Students of Lagos State University, Jibowu Campus.

Ross, S. A., Westerfield, R. W. & Jordan, B. D. (2003). *Fundamental of Corporate* Finance. USA: McGraw-Hill Irwin.

UNIT 3 PROJECT PLANNING AND CONTROL

CONTENTS

1.0 INTRODUCTION

Engineers and engineering teams vary greatly in how they carry out their projects, in the university and in business. Their performance varies from smooth easy productivity, to complete chaos ending in failure. Variations are expected, because of the inherent differences in the difficulties in the projects. This alone is not sufficient to explain all the differences in performance. On close examination, the variation can usually be attributed to the lack of proper planning and control. High performing engineers and engineering teams always have their project under control. When faced with an impossible task they find out quickly, face it, and reorient themselves. They overcome the difficulty and then get on with the next problem.

The basic elements of any project are the same. The differences can be attributed to the difficulties and details of basic elements. A typical project would consist of the following elements:

i. Defining the objectives of the project
ii. Defining the constraints; physical, financial, manpower, and time
iii. Gathering information
iv. Generating alternate methods of solution
v. Evaluating alternative solutions
vi. Selecting the best solution
vii. Carrying out solution
viii. Evaluating against objectives
ix. Generalising and extending the results
x. Iterate
xi. Report results.

Recognising that these things have to be done is not planning. All projects are composed of planning which means identifying element of

specific task to be accomplished. **What** must be done, by **whom**, and **when**.

Unfortunately most projects do not permit the use of infinite time or money. Usually the time and/or money are established at the start. They represent a constraint of the project. The question is no longer, how the technical requirements are optimised. Rather, how to accomplish the technical requirements with the time and money available. Therefore the technical goals and schedules are based upon the time and money available. With the cost and delivery fixed as cornerstones, the technical effort must be made to fit.

Good project planning means identifying, early and continuously, the specific tasks that must be achieved; considering the resources in money, personnel, facilities, and time available. This means that where more than one person is needed, specific tasks are assigned to the individuals by name. They must commit themselves to accomplishing the task by a fixed time. And, there should be no duplication of effort. The interfaces between tasks must be recognised and the responsibility for resolving the differences assigned.

Beyond the responsibility for the performance of their own specific tasks, every engineer on the team must accept the responsibility for the success of the whole project. An excellent engineering task that is part of an unsuccessful project is wasted.

From experience and many examples it is apparent that:

i. Good technical work is often obscured and even negated by poor administrative control.
ii. Good technical work cannot by itself control a project, and a project cannot control itself. Engineers must consciously work at controlling their projects.
iii. As the work on a project progresses the plans and schedules must change.
   Many engineers erroneously believe that technical work cannot be controlled. This in itself becomes a self-fulfilling prophesy.
iv. Management expects and demands that technical work be administered and controlled effectively.

2.0 OBJECTIVES

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

- identify a project management discipline that is applicable to most projects
- explain the various stages of a successful project
- describe the scheduling of project tasks
- estimate project costs, resources and time
- analyse special methods, tools and techniques of control projects
- assess and improve your current project management process
- apply project management principles.

3.0 MAIN CONTENT

3.1 Project Planning

The project management triangle

Project management control can only be achieved when cost, schedule, and technical objectives are clearly documented, realistically derived, and managed deliberately.

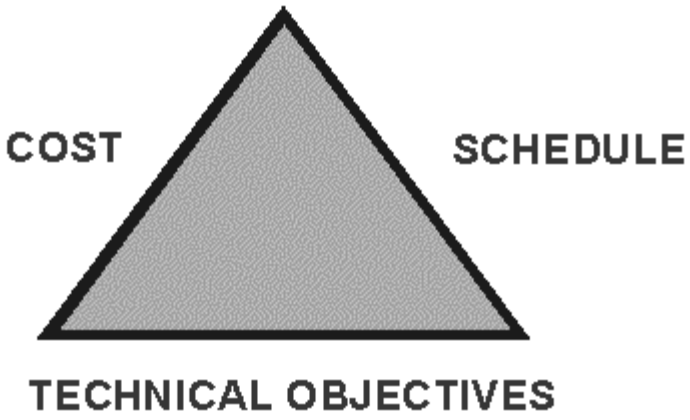


Fig. 7: **Project Management Triangle**

The planning process should result in major parties to the project having a clear sense of the cost, schedule, and technical objectives. The establishment of these three should attempt to define the possible. The project's technical objectives should be derived from a clear understanding of the business requirements. Project costs should be realistic and affordable. The schedule should be achievable and appropriate for the business needs.

Trade-off studies balancing technical performance, schedule, and costs may be used to adjust project parameters to fit with organisational priorities. The realism inherent in determining these three project parameters can largely affect the perceived success or failure of the project.

Efforts to accelerate project schedules will usually increase project risks. Innovative techniques must be used to achieve orderly schedule compression without creating unacceptable risks and quality impacts. Without reducing project scope or attempting radical development methodologies, a project schedule can often be compressed up to 20% by increasing concurrency of tasks and adding additional staffing. A typical project environment will usually involve pressures to add scope, accelerate schedule, and decrease costs. Nevertheless, changes to project scope and schedule accelerations will tend to make cost the dependent variable, causing cost to expand as if one were squeezing a balloon.

Planning and establishing the project baseline

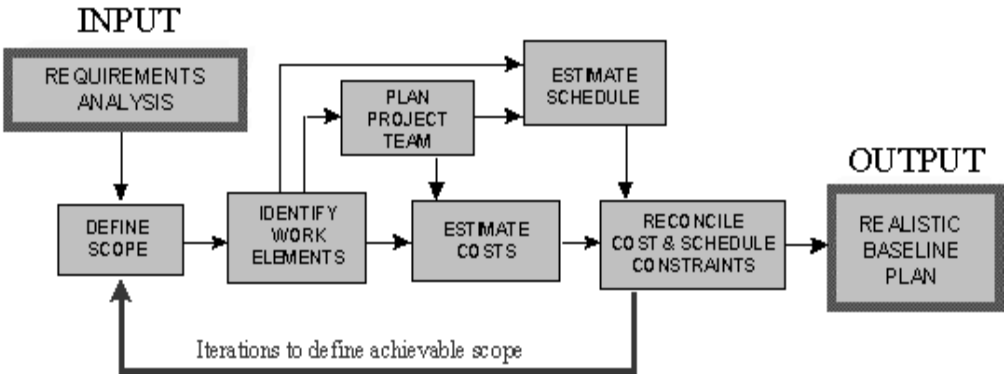


Fig. 8: An Iterative Process

Project baseline definition begins with understanding the user or customer requirements. Understanding requirements involves making judgments about what the organisation, technologies, and markets will be like in the time-frame after project completion. Sometimes a requirements analysis will have to penetrate beyond a mere synthesis of what user's think they need. The project requirement may be part of a larger need to improve vital business processes.

After the requirements analysis has resulted in definition of the project's technical scope, the cost and schedule estimates can be refined. Project costs and schedules can be estimated with no greater certainty than that inherent in the definition of technical scope. Cost and schedule estimates will require assumptions about labour categories, availabilities, and rates

- knowing who will do the work - so assumptions and commitments about organisational involvements are needed. When cost, schedule, and requirements definition are acceptable to the organisation, a project planning baseline must be established.

Very often, establishing the project baseline will be an iterative process involving a number of successive approximations before a baseline is established. The first pass may result in a project that is too costly and will take too long. This can happen if the requirements analysis is done well. If the requirements analysis is done incompletely, the project plan may look affordable and achievable, but further emerging requirements may drive the project over budget and prolong the schedule.

A rigorous requirements analysis and a realistic cost and schedule estimate are necessary to establish a project baseline plan that provides a practical map for project success.

Manage your project as a closed-system

The only way to really control a project is to treat it as a closed system. That means you put the project "in a box" and then control what goes into the box and what comes out. The closed system must address each element of the project management triangle. Each element must be established as a BASELINE, and then changes tracked and managed methodically. You will never be able to stop changes on a project, but if you don't manage them methodically, your project will go out of control. Don't be surprised if establishing and maintaining control of the schedule, cost, and scope baselines is a continual struggle.

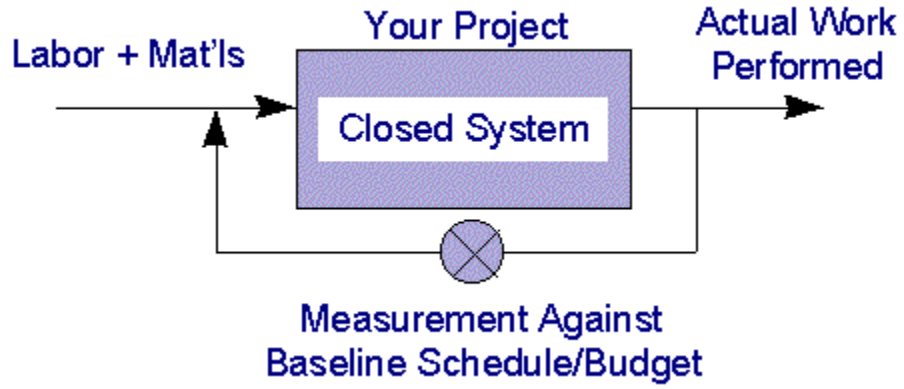


Fig. 9: Closed- System Approach of Project Management

Most project environments are so turbulent that you will have to work hard to control the project as a closed system. This means you need to manage the scope, cost, and schedule in such a way that you understand and can generally quantify anything that changes as the project

progresses. The primary way to do this is by various forms of "baseline controls."

The project scope needs to be defined clearly in a scope document or specification, and then any changes to that document need to be incorporated into the project plan very carefully. The cost estimates, project budgets, and project schedule (with associated commitments of work hours and resources) need to be baseline in order to have a useful standard against which to measure.
You need to be able to measure the work that goes into a project in dollars and work hours and the productivity that comes out of the project, in percent completions and tasks accomplished. Without a stable baseline and measurement of input and output, the project cannot be measureable and in control.

On modest sized projects and in informal project management environments you will need to develop innovative ways to set up a performance measurement baseline and keep that baseline stable enough to be able to track project progress. In some cases, scope changes will be small enough so your baseline can still be useful for project tracking. For larger changes in project scope, the baseline will have to be updated. This is a judgment call for the project manager and for those involved with the project control function. You just need to have a sense that your baseline is useful for tracking schedule progress and for measuring project team productivity.

3.2 Project Control

Project control is making sure that the technical objectives of a project are achieved within the time and money constraints. Time and money scheduling is not separated from the technical activity. Technical decisions by their very nature affect time and money considerations.

Engineers must take responsibility for the control of their projects. If they do not, management will assign others to the control. Then the engineer will not have all of the factors under his jurisdiction. If others have control of time and money, rational trade-offs cannot be made. **Control** comprises of those administrative measures that need to be taken to get and keep a project on schedule with respect to time and money.

The three parts of control are:

- ***Scheduling***
- ***Monitoring***
- ***Controlling***

Scheduling

Scheduling is the planning and recording part of control.

To schedule, the engineer must identify and list the tasks that must be accomplished, and the activities required. The level of detail will depend on the purpose of the schedule and who will use it. Including too little detail, not enough planning takes place to anticipate major problems.

Including too much detail, obscures the important tasks and milestones in trivia and reduces flexibility. The level of detail should reflect the size and importance of the project. The preparation of a schedule generates a check list to be sure that nothing is forgotten at the planning stage.

On large projects, it is sometimes convenient to produce a relatively un-detailed schedule covering the entire project. This is supplementing periodically with more detailed schedules showing decisions and assignments over short intervals between events in the overall schedule. These supplementary schedules can be produced as the project moves into different phases of the work.

It is essential to make and maintain schedules. Where more than one individual is concerned, the schedule must be produced and distributed in a form that is easy to understand. The people using it and responsible for the work should easily see where they stand and appreciate what is expected of them. Each individual should perceive exactly what he is responsible for, and how their effort fits into the overall schedule.

Although actual names do not normally appear on the schedule, the items on the schedule should appear in a form that the responsibility can be identified with a single individual.

SCHEDULING

Schedule the whole project at the beginning.

Identify the critical items early.

Seek the best time and cost estimates.

Modify and update the schedule.

Bring all the contributors into the scheduling process.

Often tasks overlap in time on a schedule. This may show the interdependency between tasks or resources. It is therefore valuable to find, list, and show the milestones that signal start or completion of a tasks. Milestones should indicate when resources or information from one task must be available for use in another task. Thus the schedule will indicate when a task is completed and what must be available to perform or start additional tasks.

Sometimes, there may be a cost schedule associated with the time schedule that shows the relative intensity of activity on the project. The cost schedule acts as warning if the costs are out of control. It ensures there is a reasonable balance between costs and time, and that time/cost trade-offs are made deliberately.

Schedules provide a common meeting place between engineers, co-workers, and management during its construction and its subsequent updating. If everyone contributes to its construction and agreeing to its validity, then everyone will make every effort to keep to it. Where necessary and when circumstances dictate changes, they can be made without recriminations.

Monitoring

Monitoring means; the progress of the project must be continuously measured against the established schedule.

No matter how good the schedules are, if they are not used for monitoring they serve very little purpose other than recording expectations. Monitoring does not require holding to the schedule rigidly. Circumstances change and as the project develops new information becomes available that may require a change in plans. The schedules serve as a yardstick against which to measure progress, to show where and how plans must change. The schedule is a tool to keep attention on the final objective and goal.

The project's progress must be continually monitored with respect to the schedule. The engineer uses the schedule to see where he stands and to ensure that commitments are met as planned. If they cannot be met, then those whose work depends on them can be forewarned. Resources can be diverted, reallocated, and the schedule revised so the overall project objective is achieved.

The checking of progress against schedules is never interesting and the temptation is to avoid it. Therefore, it should be a mandatory routine.

The most useful way to do monitoring is to combine it with the regular project technical reviews. Thus once technical progress is reviewed and established, the project's status is checked against the schedule.
Most projects do not always run smoothly, unexpected difficulties do occur. Monitoring is the only way that resources can be reallocated effectively and judiciously.

Controlling

Controlling is the adjustment of the work when needed so the overall time and money commitments are maintained or at least optimised. Thus controlling means taking the appropriate action in the light of the information gained from monitoring. The whole purpose of scheduling and monitoring is to permit intelligent control.

Scheduling and monitoring by themselves are not control. Control must be deliberately exercised. The engineer must, with help if necessary, decide what action must be taken to keep the project on schedule. Once the controlling action has been decided on it must be implemented.

The most common error in project control is not acting soon enough. Action is delayed either because of poor monitoring or more often because of unwillingness to face the facts. The solution to a problem is assumed to be just around the corner or will yield on completion of the next test. The true facts cannot work against a project, but erroneous assumptions can. When it becomes reasonably clear that a certain line of investigation or approach is not going to work, stop it. Redirect the effort in a more fruitful direction. Delay wastes time and money.

It is often a mistaken assumption that delays or difficulties can be overcome by working harder. Engineers should always be working hard. This will rarely solve the problem. Delays can only be overcome by adding extra time or extra resources. Expert help can be sought, tests can be run concurrently, overtime can be put in, or the approach can be changed to one that is more likely to yield result. Control is exercised by a definite, specific action.

One of the major blocks to effective control is a common error in the engineer's view of the project. When engineers are given a task they tend to identify with it, and feel that its success is their success. The more effort they put into it the stronger they feel that way. This is good because it means commitment. Unfortunately, they often begin to see their solution or approach as the only correct one. Controlling actions threaten this image and engineers often resent and resist them. Engineers must learn to identify with success of the whole project. The controlling

actions are for the good of the whole project. Individual success comes from being identified with successful projects.

4.0 CONCLUSION

In the course of our discussion in this unit, we were able to conclude that project planning and control could be achieved through proper establishment of project baseline and project management triangle which comprises of costs, schedule and technical objectives. Also, we established that planning control comprises of three major parts which are scheduling, monitoring and controlling. Thus, any successful project officer must be articulate enough to effect the foregoing in their current and future projects.

5.0 SUMMARY

Proper project management means excellence in the technical, cost, and delivery aspects of the project. This requires proper attention being paid to the administrative aspects of the project scheduling, monitoring, and control.

For good project planning and control, the following has to be observed:

- schedule the whole project at the beginning
- recognise interdependence of the parts
- identify the critical items early
- seek the best time and cost estimates
- modify and update the schedule
- bring all contributors into the scheduling process
- follow and monitor on a regular basis
- include all contributors in the monitoring process
- plan general alternatives for each contingency
- keep the goals and alternatives in mind
- take early corrective action when needed
- balance project effort
- look for where effort can be reduced
- make changes early rather than late
- take early corrective action when needed
- balance project effort
- look for where effort can be reduced
- make changes early rather than late.

6.0 TUTOR-MARKED ASSIGNMENT

i. Discuss project control with particular reference to scheduling, monitoring and controlling.
ii. Compare and contrast between project planning and control.

7.0 REFERENCES/FURTHER READING

Deiter, G. “Engineering Design”, Chapter 10.

Roadstrum, W. H. “Being Successful As an Engineer”, Chapter 4.

UNIT 4 PROJECT MANAGEMENT TOOLS

CONTENTS

1.0 INTRODUCTION

Project management tools include methods and techniques that could be employed to manage project activities to a conclusive and successful end. Among these techniques and methods are: Gantt chart, Project Evaluation and Review Technique (PERT) and Critical Path Method.

2.0 OBJECTIVES

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

- list project management tools
- manage project time
- identify the critical path of any project
- apply Project Evaluation Review Technique
- apply Gantt Chart.

3.0 MAIN CONTENT

3.1 Project Evaluation Review Technique (PERT)

The Program Evaluation and Review Technique or Project Evaluation and Review Technique commonly abbreviated PERT is a model for project management to analyse and represent the tasks involved in completing a given project.

PERT is basically a method to analyse the tasks involved in completing a given project, especially the time needed to complete each task, and identifying the minimum time needed to complete the total project.

This model was invented by Booz Allen Hamilton, Inc. under contract to the United States Department of Defence's US Navy Special Projects Office in 1958 as part of the Polaris mobile submarine-launched ballistic missile project. This project was a direct response to the Sputnik crisis. Some US government contracts required that PERT be used as part of management supervision.

PERT was developed in the 1950's primarily to simplify the planning and scheduling of large and complex projects. It was able to incorporate uncertainty by making it possible to schedule a project not knowing precisely the details and durations of all the activities. It is more of an event-oriented technique rather than start- and completion-oriented, and is used more in research and development-type projects where not cost but time is a major factor.

This project model was the first of its kind, a revival for scientific management, founded in Fordism and Taylorism. Though every company now has its own "project model" of some kind, they all resemble PERT in some respect. Only DuPont Corporation's critical path method was invented at roughly the same time as PERT.

The most famous part of PERT is the "PERT Networks", charts of timelines that interconnect. PERT is intended for very large-scale, one-time, complex, non-routine projects.

PERT terminology and conventions

Conventions

i. A PERT chart is a tool that facilitates decision making: The first draft of a PERT chart will number its events sequentially in 10s (10, 20, 30, etc.) to allow the later insertion of additional events.
ii. Two consecutive events in a PERT chart are linked by activities, which are conventionally represented as arrows.
iii. The events are presented in a logical sequence and no activity can commence until its immediately preceding event is completed.
iv. The planner decides which milestones should be PERT events and also decides their "proper" sequence.
v. A PERT chart may have multiple pages with many sub-tasks.
vi. PERT Charts are one of the tools used in the Earned Value Management Technique EVMT, used by many corporations today to track earned value.

Terminology

- A PERT event: is a point that marks the start or completion of one or more tasks. It consumes no time, and uses no resources. It marks the completion of one or more tasks, and is not "reached" until all of the activities leading to that event have been completed.
- A predecessor event: an event (or events) that immediately precedes some other event without any other events intervening. It may be the consequence of more than one activity.
- A successor event: an event (or events) that immediately follows some other event without any other events intervening. It may be the consequence of more than one activity.
- A *PERT* activity: is the actual performance of a task. It consumes time, it requires resources (such as labour, materials, space, machinery), and it can be understood as representing the time, effort, and resources required to move from one event to another. A PERT activity cannot be completed until the event preceding it has occurred.
- Optimistic time (O): the minimum possible time required to accomplish a task, assuming everything proceeds better than is normally expected.
- Pessimistic time (P): the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).
- *Most likely time* (**M**): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal.
- Expected time ($\mathbf{T_E}$): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal (the implication being that the expected time is the average time the task would require if the task were repeated on a number of occasions over an extended period of time).

$$\mathbf{T_E} = (\mathbf{O} + \mathbf{4M} + \mathbf{P}) \div \mathbf{6}$$

- Critical Path: the longest possible continuous pathway taken from the initial event to the terminal event. It determines the total calendar time required for the project; and, therefore, any time delays along the critical path will delay the reaching of the terminal event by at least the same amount.
- Lead time: the time by which a predecessor event must be completed in order to allow sufficient time for the activities that must elapse before a specific PERT event is reached to be completed.
- Lag time: the earliest time by which a successor event can follow a specific PERT event.

- Slack: the slack of an event is a measure of the excess time and resources available in achieving this event. **Positive slack (+)** would indicate ahead of schedule; **negative slack** would indicate behind schedule; and **zero slack** would indicate on schedule.

Implementing PERT

The first step to scheduling the project is to determine the tasks that the project requires and the order in which they must be completed. The order may be easy to record for some tasks (*e.g.* when building a house, the land must be graded before the foundation can be laid) while difficult for others (There are two areas that need to be graded, but there are only enough bulldozers to do one). Additionally, the time estimates usually reflect the normal, non-rushed time. Many times, the time required to execute the task can be reduced for an additional cost or a reduction in the quality.

In the following example there are seven tasks, labeled *a* through *g*. Some tasks can be done concurrently (a and b) while others cannot be done until their predecessor task is complete (*c* cannot begin until *a* is complete). Additionally, each task has three time estimates: the optimistic time estimate (a), the most likely or normal time estimate (m), and the pessimistic time estimate (b). The expected time (T_E) is computed using the formula (a + 4m + b)/6.

Activity	**Predecessor**	**Opt. a**	**Norm. m**	**Pess. b**	**T_E (a + 4m + b)/6**
A	--	2	4	6	4.00
B	--	3	5	9	5.33
C	a	4	5	7	5.17
D	a	4	6	10	6.33
E	b, c	4	5	7	5.17
F	d	3	4	8	4.50
G	e	3	5	8	5.17

Note*:* All times listed are in work days (Mon - Fri, 8 $_{A.M.}$ to 5 $_{P.M.}$ with a one hour lunch break).

3.2 Gantt Chart

Once this step is complete, one can draw a Gantt Chart or a network diagram (project management).

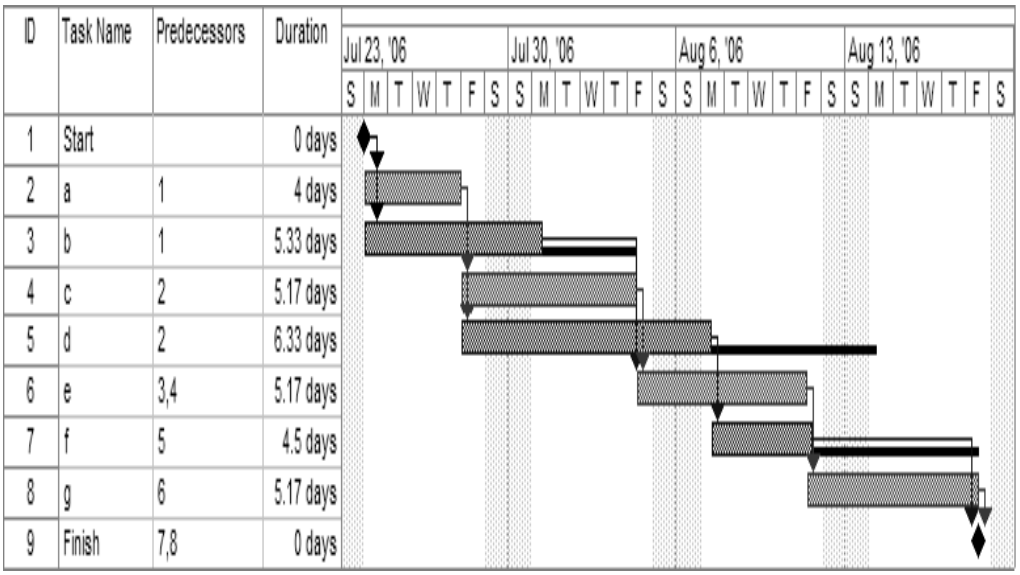


Fig. 10: A Gantt Chart Using Microsoft Project (MSP)

Note (1) the critical path is in red, (2) the slack is the black lines connected to non-critical activities, (3) when using MSP, you must use the task ID when labeling predecessor activities, and (4) since Saturday and Sunday are not work days (as described above) some bars on the Gantt chart are longer if they cut through a weekend.

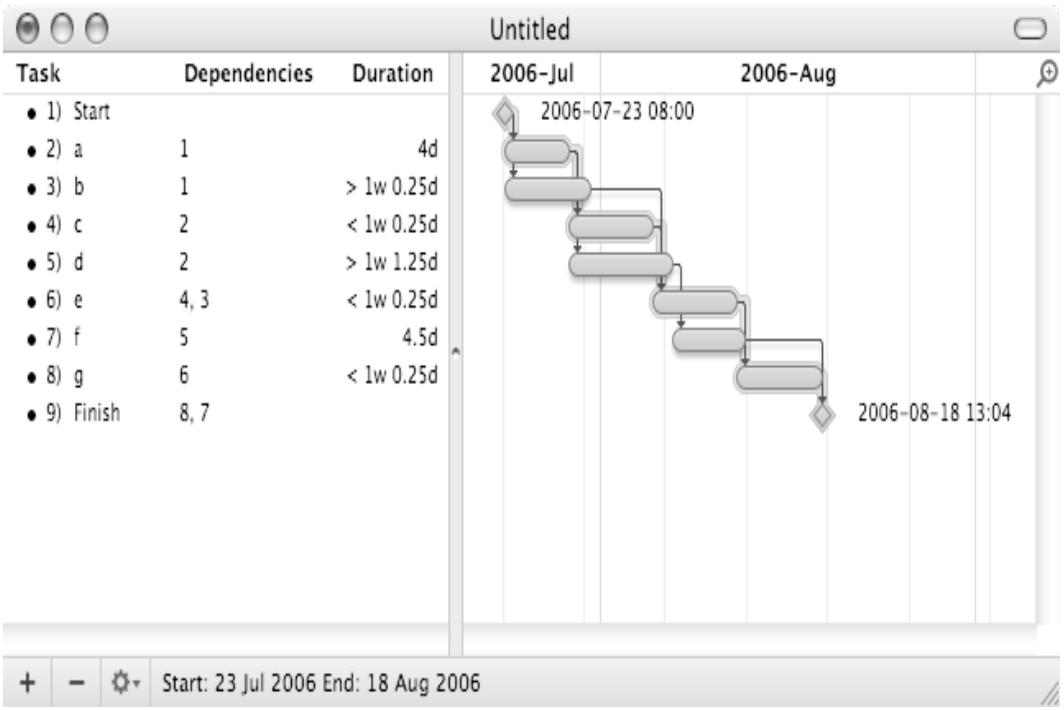


Fig. 11: A Gantt Chart Using OmniPlan

Note (1) the critical path is highlighted, (2) the slack is not specifically indicated on task 5 (d), though it can be observed on tasks 3 and 7 (b and

f), (3) when using OmniPlan, you may use the GUI to easily link dependencies, or you may enter them by reference to task ID, and (4) since weekends are indicated by a thin vertical line, and take up no additional space on the work calendar, bars on the Gantt Chart are not longer or shorter when they do or don't carry over a weekend.

A network diagram can be created by hand or by using software such as Microsoft project. There are two types of network diagrams, activity on arrow (AOA) and activity on node (AON). Activity on mode diagram is generally easier to create and interpret. To create an AON diagram, it is recommended (but not necessary) to start with a node named start. This "activity" has duration of zero (0). Then you draw each activity that does not have a predecessor activity (*a* and *b* in this example) and connect them with an arrow. Next, since both *c* and *d* list *a* as a predecessor activity, their nodes are drawn with arrows coming from *a*. Activity *e* is listed with *b* and *c* as predecessor activities, so node *e* is drawn with arrows coming from both *b* and *c*, signifying that *e* cannot begin until both *b* and *c* have been completed. Activity *f* has *d* as a predecessor activity, so an arrow is drawn connecting the activities. Likewise, and arrow is drawn from *e* to *g*. Since there are no activities that come after *f* or *g*, it is recommended (but again not necessary) to connect them to a node labeled *finish*.

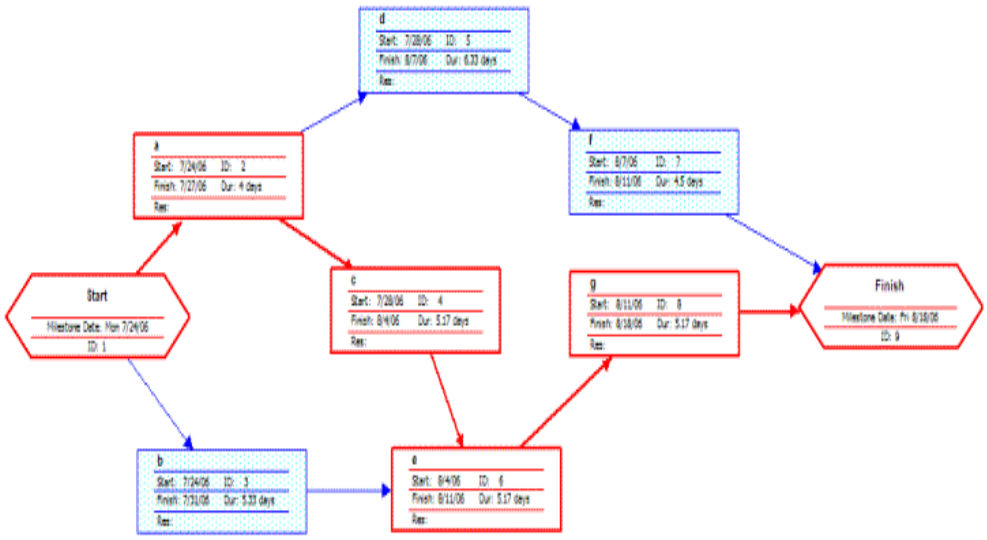
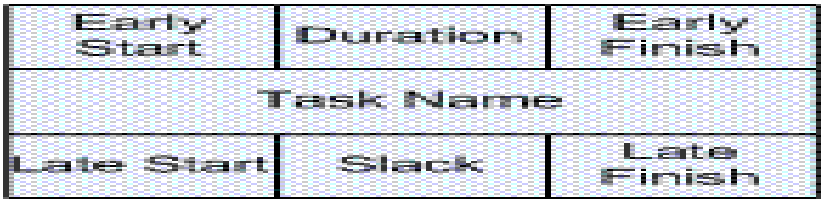


Fig. 12: A network diagram created using Microsoft Project (MSP)
(Note the critical path is in red**)**



A node like this one (from Microsoft Visio) can be used to display the activity name, duration, ES, EF, LS, LF, and slack.
By itself, the network diagram pictured above does not give much more information than a Gantt chart; however, it can be expanded to display more information. The most common information shown is:

1. The activity name
2. The normal duration time
3. The early start time (ES)
4. The early finish time (EF)
5. The late start time (LS)
6. The late finish time (LF)
7. The slack

In order to determine this information it is assumed that the activities and normal duration times are given. The first step is to determine the ES and EF. The ES is defined as the maximum EF of all predecessor activities, unless the activity in question is the first activity, which the ES is zero (0). The EF is the ES plus the task duration (EF = ES + duration).

- The ES for *start* is zero since it is the first activity. Since the duration is zero, the EF is also zero. This EF is used as the ES for *a* and *b*.
- The ES for *a* is zero. The duration (4 work days) is added to the ES to get an EF of four. This EF is used as the ES for *c* and *d*.
- The ES for *b* is zero. The duration (5.33 work days) is added to the ES to get an EF of 5.33.
- The ES for *c* is four. The duration (5.17 work days) is added to the ES to get an EF of 9.17.
- The ES for *d* is four. The duration (6.33 work days) is added to the ES to get an EF of 10.33. This EF is used as the ES for *f*.
- The ES for *e* is the greatest EF of its predecessor activities (*b* and *c*). Since *b* has an EF of 5.33 and *c* has an EF of 9.17, the ES of *e* is 9.17. The duration (5.17 work days) is added to the ES to get an EF of 14.34. This EF is used as the ES for *g*.
- The ES for *f* is 10.33. The duration (4.5 work days) is added to the ES to get an EF of 14.83.

- The ES for *g* is 14.34. The duration (5.17 work days) is added to the ES to get an EF of 19.51.
- The ES for *finish* is the greatest EF of its predecessor activities (*f* and *g*). Since *f* has an EF of 14.83 and *g* has an EF of 19.51, the ES of *finish* is 19.51. *Finish* is a milestone (and therefore has a duration of zero), so the EF is also 19.51.

Barring any unforeseen events, the project should take 19.51 work days to complete. The next step is to determine the late start (LS) and late finish (LF) of each activity. This will eventually show if there are activities that have slack. The LF is defined as the minimum LS of all successor activities, unless the activity is the last activity, for which the LF equals the EF. The LS is the LF minus the task duration (LS = LF - duration).

- The LF for *finish* is equal to the EF (19.51 work days) since it is the last activity in the project. Since the duration is zero, the LS is also 19.51 work days. This will be used as the LF for *f* and *g*.
- The LF for *g* is 19.51 work days. The duration (5.17 work days) is subtracted from the LF to get a LS of 14.34 work days. This will be used as the LF for *e*.
- The LF for *f* is 19.51 work days. The duration (4.5 work days) is subtracted from the LF to get a LS of 15.01 work days. This will be used as the LF for *d*.
- The LF for *e* is 14.34 work days. The duration (5.17 work days) is subtracted from the LF to get a LS of 9.17 work days. This will be used as the LF for *b* and *c*.
- The LF for *d* is 15.01 work days. The duration (6.33 work days) is subtracted from the LF to get a LS of 8.68 work days.
- The LF for *c* is 9.17 work days. The duration (5.17 work days) is subtracted from the LF to get a LS of 4 work days.
- The LF for *b* is 9.17 work days. The duration (5.33 work days) is subtracted from the LF to get a LS of 3.84 work days.
- The LF for *a* is the minimum LS of its successor activities. Since *c* has a LS of 4 work days and *d* has a LS of 8.68 work days, the LF for *a* is 4 work days. The duration (4 work days) is subtracted from the LF to get a LS of 0 work days.
- The LF for *start* is the minimum LS of its successor activities. Since *a* has a LS of 0 work days and *b* has a LS of 3.84 work days, the LS is 0 work days.

The next step is to determine the critical path and if any activities have slack. The critical path is the path that takes the **longest** to complete. To determine the path times, add the task durations for all available paths. Activities that have slack can be delayed without changing the overall time of the project. Slack is computed in one of two ways, slack = LF -

EF *or* slack = LS - ES. Activities that are on the critical path have a slack of zero (0).

- The duration of path *a,d,f* is 14.83 work days.
- The duration of path *a ,c,e,g* is 19.51 work days.
- The duration of path *b,e,g* is 15.67 work days.

The critical path is *a,c,e,g* and the critical time is 19.51 work days. It is important to note that there can be more than one critical path (in a project more complex than this example) or the critical path can change. For example, let's say that activities *d* and *f* take their pessimistic (b) times to complete instead of their expected (T_E) times. The critical path is now *a,d,f* and the critical time is 22 work days. On the other hand, if activity *c* can be crashed to one work day, the path time for *a,c,e,g* is reduced to 15.34 work days, which is slightly less than the time of the new critical path, *b,e,g* (15.67 work days).

Assuming these scenarios do not happen, the slack for each activity can now be determined.

Start and *finish* are milestones and by definition have no duration, therefore they can have no slack (0 work days).

The activities on the critical path by definition have a slack of zero; however, it is always a good idea to check the path anyway when drawing by hand.

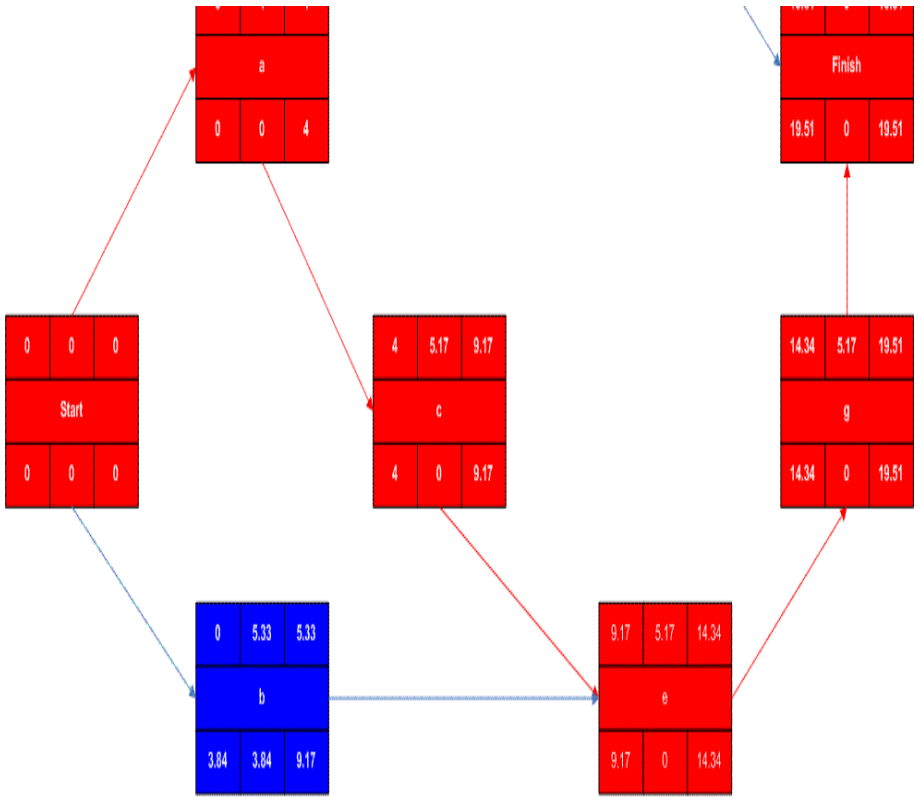
$LF_a - EF_a = 4 - 4 = 0$
$LF_c - EF_c = 9.17 - 9.17 = 0$
$LF_e - EF_e = 14.34 - 14.34 = 0$
$LF_g - EF_g = 19.51 - 19.51 = 0$

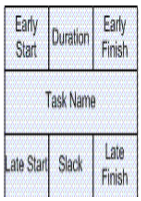
Activity *b* has a LF of 9.17 and a EF of 5.33, so the slack is 3.84 work days.

Activity *d* has a LF of 15.01 and a EF of 10.33, so the slack is 4.68 work days.

Activity *f* has a LF of 19.51 and a EF of 14.83, so the slack is 3.84 work days.

Therefore, activity *b* can be delayed almost 4 work days without delaying the project. Likewise, activity *d* **or** activity *f* can be delayed 4.68 work days without delaying the project (alternatively, *d* and *f* can be delayed 2.3 and 4work days each).





4.0 CONCLUSION

In the course of this study, we were able to examine some selected project tools or techniques among which are Project Evaluation and Review Technique (PERT) and Critical Path Method as well as Gantt chart. Thus, project timing and accuracy with precision could be achieved if and only if the foregoing tools are well managed by the project officers and engineers.

5.0 SUMMARY

In summary, A PERT activity is the actual performance of a task. It consumes time, it requires resources (such as labour, materials, space, machinery), and it can be understood as representing the time, effort, and resources required to move from one event to another. A PERT activity cannot be completed until the event preceding it has occurred. Optimistic time (O): the minimum possible time required to accomplish a task, assuming everything proceeds better than is normally expected Pessimistic time (P): the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes). Most likely time (M): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal. Expected time (T_E): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal (the implication being that the expected time is the average time the task would require if the task were repeated on a number of occasions over an extended period of time). While the critical path takes the **longest** to complete. To determine the path times, add the task durations for all available paths. Activities that have slack can be delayed without changing the overall time of the project. Slack is computed in one of two ways, slack = LF - EF *or* slack = LS - ES. Activities that are on the critical path have a slack of zero (0).

6.0 TUTOR-MARKED ASSIGNMENT

i. Compare and contrast between Critical Path Method and Project Review and Evaluation Techniques (PERT).
ii. The following table gives the activities in a Federal Government construction project and other relevant information.

Activity	1-2	1-4	1-5	2-3	4-7	4-6	5-6	3-8	7-8	6-9	8-9
Duration	3	2	2	4	4	7	4	2	5	6	3

Required:

Draw the network for the project?
Find the critical path?

7.0 REFERENCES/FURTHER READINGS

Deiter, G. “Engineering Design”, Chapter 11.

Roadstrum, W. H. “Being Successful as an Engineer” Chapter 14.

UNIT 5 COMPUTER APPLICATION

CONTENTS

1.0 INTRODUCTION

A computer is an electronic device designed to follow instruction automatically. It stores and manipulates data by breaking the tasks into logical operations based on the logical instruction supplied by the user. The computer cannot think on its own. A computer is a combination of physical component (hardware) and abstract components (software).

2.0 OBJECTIVES

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

- outline uses of computer in project financing
- enumerate some methodologies that are computer inclined
- analyse the iterative process of balancing the required finance with the available finance
- apply feasible software as tool for project financing and budgeting.

3.0 MAIN CONTENT

3.1 Methodology and Feasible Computer Model

Environmental Financing Strategies (EFS) provide a bridge between general environmental programmes and everyday decisions about how to use the next year budget for supporting individual infrastructure projects. EFS should typically be prepared together with implementation programmes as a way of testing whether they are financially viable and affordable to the treasury and households. Scenario analysis, conducted as part of the financing strategy, can be used to correct the implementation programmes, if they appear unrealistic.

Relevant authorities can subsequently use the financing strategy to identify specific projects or project types that would require government support. EFS is a powerful though not always sufficient tool to effectively support project proposals presented by relevant ministers at Budget Committees. In this role, the long-term strategy needs to be supplemented by a rolling two to four-year pipeline of priority investment projects for co-financing from the public budget. In some countries, such a pipeline management mechanism is called Public Investment Programme (PIP). PIP is a mechanism through which funding from the state budget is allocated to public sector investment projects in the short to medium term. A financing strategy offers a long-term, sustainable underpinning for successful PIPs. Both tools, applied together, are intended to streamline limited domestic and international resources and allocate them as efficiently as possible in order to maximise economic and social benefits and to support the government's long-term environment and development strategies. At the end of this process, the planned government commitments are incorporated into annual budgets.

The EFS methodology was tested and applied in a number of countries. It includes a computer model (decision support tool) to stimulate in quantitative terms the consequences of different policy choices. The financing strategies **sensu stricto** are put together through a series of iterative model runs with different assumptions describing environmental or service level targets and policies to mobilise additional finance. The model assesses the investment, maintenance and operational expenditure that would be required to achieve specific targets. These expenditure requirements are subsequently compared with current levels and sources of finance and the model calculates the resultant "financing gaps". The model has proven useful for dialogue between environment ministries, health ministries, ministries responsible for urban infrastructure and the ministries of finance and economy. The EFS methodology, developed by the EAP Task Force, with support from the Danish Ministry of Environment and Energy, was welcomed by the Ministers of Finance, Economy and Environment at the Ministerial Consultation on Water Management and Investments in Almaty, Kazakhstan in October 2000. Further, environment ministers at the fifth “Environment for Europe” ministerial conference, held in Kiev, Ukraine, in May 2003, emphasised the need for preparing realistic environmental investment and financing strategies and plans at national and local levels as an essential prerequisite for making better use of public resources in financing investment-heavy public infrastructure.

Consulting Engineers and Planners (COWI) have built the software under the methodological guidance of the EAP Task Force Secretariat and applied it through demonstration projects in several EECCA, with

support of local specialists. COWI hosts a special web page dedicated to this project: http://www.cowi.ru/almaty/ Expert work has been monitored by advisory groups composed of senior officials and policy makers from the ministries of finance, economy, environment and other relevant government agencies. The role of these groups was also to discuss and approve all assumptions and targets used in modeling as well as the policy implications of the modeling results. This makes the strategies relevant to, and "owned" by the key stakeholders in the countries. The work on EFS has been supported by a number of donors, including the Danish Ministry of Environment and Energy (as the most significant contributor), the EU Tacis, Germany, Japan, Australia. Overall substantive guidance and methodological support has been provided by the EAP Task Force Secretariat.

FEASIBLE is a software tool developed to support the preparation of environmental financing strategies for water, wastewater and municipal solid waste services. The name FEASIBLE stands for: **Financing for Environmental, Affordable and Strategic Investments that Bring on Large-scale Expenditure**. The first version of FEASIBLE, a spreadsheet based version for water and wastewater, was released in 2001. FEASIBLE Version 2 is a stand-alone application based on a database. The FEASIBLE model is freeware and can be obtained through the web pages of the OECD, DEPA/DANCEE and COWI. FEASIBLE can be used to facilitate the iterative process of balancing the required finance with the available finance. It provides a systematic, consistent and quantitative framework for analysing feasibility of financing environmental targets. Being a computerised model, FEASIBLE may be used to analyse “what if” a certain policy is changed and to document its financial impacts in a systematic and transparent manner. The chart attached provides a schematic overview of the iterative process of the FEASIBLE methodology.

FEASIBLE requires specific, technical city-by-city data on the present size and state of infrastructure. It also requires that policy makers reach consensus and specify their objectives in terms of specific, measurable and time-bound targets. FEASIBLE calculates investment, maintenance and operational expenditure that would be required to reach specific targets determined by local policy makers. The calculation of the expenditure need is based on a number of generic expenditure functions which are incorporated into FEASIBLE. These expenditure functions allow an easy estimation of the costs of alternative service and environmental targets with a limited data collection effort. They cover a number of technical measures within each sector. The expenditure requirements are subsequently compared with forecast levels and sources of finance. All sources of finance (public, private, domestic, foreign, etc.) and all financial products can be simulated. FEASIBLE

compares the expenditure needs with the supply of finance on a year-by-year basis and computes cash-flow forecasts, i.e. financing deficits or surpluses, both annual and accumulated. But it is not only the magnitude of total cash-flow deficits/surpluses that is presented. The structure of the financing gaps is also shown, e.g. coverage of capital investment expenditure by various funding sources that can be used to finance fixed assets, cover operation and maintenance costs, etc. These results help policy makers understand where the main bottlenecks are as well as where, when and what additional policy interventions are needed to facilitate effective financing of infrastructure development programmes.

FEASIBLE Version 2 enables analysis of the following sectors:

1) Water supply and treatment
2) Wastewater collection and treatment
3) Municipal solid waste management.

A new module on rural water supply and sanitation (WSS) has been developed by COWI AS under the methodological guidance of the OECD/EAP Task Force. A comprehensive database on WSS technologies applicable in rural areas in EECCA and beyond with relevant cost functions was also developed in the framework of the project.

3.2 Financing Technology

Elections technology can range from being relatively inexpensive to very expensive. As a result, financing technology can become a crucial part of the implementation process.

In the long-term, the use of technology is likely to reduce costs and increase the efficiency and productivity of electoral administration. In the short term, however, acquiring and implementing technology are likely to lead to significant cost increases. In particular, costs can increase substantially when new systems or hardware have to be developed and purchased and when a new system is introduced in tandem with an old one.

Securing the funds necessary to implement new technology or upgrade existing technology is an essential component of any technology implementation plan. Secure and ongoing finance must be acquired before technology acquisition can proceed beyond the planning stage.
There are several steps involved in securing the funds necessary for acquiring technology.

Affordability

Before committing to implement a new or upgraded technology, election management bodies (EMBs) must determine its affordability.

Indicative costing quotes of the proposed technology needs to be obtained to assess whether the estimated expenditure is realistic given the particular circumstances. Where several new technologies are being considered, it may be necessary to prioritise the available options and if necessary, discard those that are not affordable given the funding restraints.

How easily a quote can be obtained depends on the complexity of the technology. If the technology is a readily available off-the-shelf product, such as standard software or computer equipment, prices are usually easily obtained from local suppliers. Comparing quotes from a number of different suppliers—if possible, at least three suppliers—is a good practice.

Obtaining quotes for specialised or customised technology can be more difficult. There are a number of different strategies that can be used in this instance. For example, it may be possible to find other EMBs or organisations that use the same or a similar kind of technology to the one being considered. These other organisations may be willing to provide the cost of the systems they use.

Another method is to approach possible vendors and ask them to provide a quote based on a draft of the specifications for the proposed system. Care needs to be taken to ensure that the proposed system is described in sufficient detail to enable a quote to be relatively accurate.

A request for proposal (RFP) is a more formalised approach to seeking quotes and is not as binding as a tender process. This process involves issuing a set of specifications similar to, but not as detailed, as tender specifications and asking for cost proposals from suppliers that meet the project specifications. RFPs not only supply quotes for budgeting purposes but may also help refine the specifications for the technology being considered.

When determining whether a proposed technology is affordable, the cost of the technology over its whole life needs to be calculated. In most cases, this will include not only the purchase or lease cost but also maintenance costs, peripherals, consumables, software development, communications, upgrade costs and disposal costs.

Budgeting

After deciding that a particular technology is affordable, the next step is to prepare a detailed budget that takes account of both the immediate and the ongoing costs associated with the chosen technology.

There are four components to a technology budget: the list of goods and services to be purchased, the cost of each item, the schedule of payments, and any expected savings related to the new technology. Except in the case of items that are only to be used on one occasion and then disposed of, most items of technology will require ongoing funding for maintenance. Funds will also need to be secured for the life of the technology.

Funds acquisition

Once a detailed budget has been prepared, the next step is to acquire funds from the appropriate government or non-government source. The success of this process depends on preparing a strong business case with clearly identified benefits and a thorough budget.

Therefore a business case needs to justify the need for new technology to the funding authorities. If there are increased costs with the use of a new technology, the non-material benefits, such as increases in accuracy, speed and efficiency, need to be stressed. Other circumstances may be easier to justify, for example, when a less expensive technology replaces a costly manual process. However, it is important to ensure that all costs are properly factored in the budget.

It may be possible, in some situations, to use innovative funding mechanisms, such as joint ventures or leaseback arrangements provided there is no perception, justified or not, that the EMB is behaving unethically.
Once agreement has been obtained to provide funds, funding will need to be available in time for adequate development, testing and implementation of the new technology.

International funding

Depending on the circumstances, international funding may be available. This usually applies where external funding is an option, particularly where aid is being provided by other governments or by non-governmental organisations (NGOs). In these cases special issues may arise, such as foreign exchange issues, uncertainty of funding availability, or the potential for conflicts or impositions regarding, for example, sourcing of suppliers.

Depreciation and amortisation policies

When calculating budgets for the life of a project or a technology, depreciation and amortisation policies will impact on the calculations of costs and benefits, particularly in future years.

At the end of the life cycle of a technology item, the question arises as to whether it is more economical to use or dispose of obsolete equipment. As improvement in computer technology accelerates, this issue can emerge within a year or two of purchase. In cases where the technology continues to perform satisfactorily, notwithstanding that it is obsolete, it may be worth retaining. In other cases, it may be desirable to upgrade the technology and resell the old equipment while it retains some value.

The issue of when to upgrade obsolete equipment must be taken into account in a budget, since it will impact on the cost of the technology in the long-term.

4.0 CONCLUSION

Having examined various techniques and computer models for implementing project financing and budgeting, one can conclude that the use of computer models and software such as FEASIBLE facilitates the rate of processing project financing and budgeting. It is therefore very important for any project analyst to acquire the necessary skills towards the application of some useful software in order to hasten their computation for the project analysis.

5.0 SUMMARY

In summary, this unit was able to examine Environmental Financing Strategies: Methodology and FEASIBLE Computer Model. Environmental financing strategies (EFS) provide a bridge between general environmental programmes and everyday decisions about how to use the next year budget for supporting individual infrastructure projects. FEASIBLE is a software tool developed to support the preparation of environmental financing strategies for water, wastewater and municipal solid waste services. The name FEASIBLE stands for: Financing for Environmental, Affordable and Strategic Investments that Bring on Large-scale Expenditure. The first version of FEASIBLE, a spreadsheet based version for water and wastewater, was released in 2001. FEASIBLE Version 2 is a stand-alone application based on a database. Securing the funds necessary to implement new technology or upgrade existing technology is an essential component of any technology implementation plan. Secure and ongoing finance must be

acquired before technology acquisition can proceed beyond the planning stage.

6.0 TUTOR-MARKED ASSESSMENT

i. Discuss the application of FEASIBLE software to project financing and budgeting.
ii. State and discuss steps involved in securing the funds necessary for acquiring technology.

7.0 REFERENCES/FURTHER READING

Alexander MARTUSEVICH from the OECD/EAP Task Force Secretariat alexandre.Martoussevitch@oecd.org.