

COURSE GUIDE

ENT 403 PROJECT MANAGEMENT

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INTRODUCTION

ENT403 – Project Management is a semester course work of two-credit units. It is available to all students taking B.Sc Entrepreneurship programme in the Faculty of Management Sciences.

The course consists of 15 units covering the entire facets of project management. The course involves visits to organisations, mostly government parastatals. The idea is to enable you have first-hand knowledge of how project management is carried out in practice.

The course guide tells you what the course ENT403 is all about, the materials you will need and how to make use of the materials to ensure good study. Other information contained in the course guide includes information on Tutor-Marked Assignment. There will be tutorial classes.

COURSE CONTENTS

The course deals with the nature and purpose of Project Management, Project Management Organisation, Cost Estimation, Project Planning and Project Implementation.

COURSE AIMS

The aim of this course is to expose you to the knowledge of project management. It also aims to enrich your skills in the management of various projects. The aims will be achieved by:

- explaining the nature of project management
- identifying the key functions in project management
- describing the key processes in project management
- explaining project implementation
- visits to organisations to have practical experience.

COURSE OBJECTIVES

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

- explain the nature and purpose of project management
- discuss the key functions in project management
- explain the project management process
- explain project implementation processes.

COURSE MATERIALS

- Course guide
- Study units

STUDY UNITS

There are three modules consisting of 16 units in this course which should be studied carefully.

Module 1

Unit 1 Project Concept and Planning
Unit 2 Team Based Structure
Unit 3 Cost Estimate
Unit 4 Monitoring and Evaluation
Unit 5 Project implementation strategy

Module 2

Unit 1 Project Definition
Unit 2 Project Planning and Scheduling
Unit 3 Types of Planning and Sustainable Business Success
Unit 4 Project Management
Unit 5 Replacement Model

Module 3

Unit 1: Projected Income Statement
Unit 2: Projected Cash Flow Statements
Unit 3: Projected Balance Sheets
Unit 4: Project Evaluation Criteria
Unit 5: Introduction to Economic Analyses

Each study unit will take you at least two hours and it includes the Introduction, Objectives, Main Content, Self-Assessment Exercise, Conclusion, Summary, Tutor-Marked Assignment, and References.

There are textbooks and other suggested reading materials under References/Further Reading. These materials are to give you additional information as you study. Attempt the questions under Self-Assessment Exercise and Tutor-Marked Assignment for greater understanding.

TUTOR-MARKED ASSIGNMENT

You are expected to do all the Tutor-Marked Assignments in this course. In answering the Tutor-Marked Assignments, you are expected to apply all that you have learnt in this course. The assignments constitute 30% of the total score.

FINAL EXAMINATION AND GRADING

At the end of the course, you will write the final examination. It will account for the remaining 70%. This makes the total score to be 100%.

SUMMARY

ENT403 will expose you to key project management skills. On the successful completion of this course, you would have been armed with the necessary knowledge for managing projects.

MODULE 1 PROJECT CONCEPT AND PLANNING (USAGE OF VARIOUS CHARTS)

Unit 1	Project Concept and Planning
Unit 2	Team Based Structure
Unit 3	Cost Estimate
Unit 4	Monitoring and Evaluation
Unit 5	Project implementation strategy

UNIT 1 PROJECT CONCEPT AND PLANNING (USAGE OF VARIOUS CHARTS)

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1.0 INTRODUCTION

Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment.

Initially, the project scope is defined and the appropriate methods for completing the project are determined. Following this step, the durations for the various tasks necessary to complete the work are listed and grouped into a work breakdown structure. Project planning is often used to organize different areas of a project, including project plans, workloads and the management of teams and individuals. The logical dependencies between tasks are defined using an activity network diagram that enables identification of the critical path. Project planning is inherently uncertain as it

must be done before the project is actually started. Therefore the duration of the tasks is often estimated through a weighted average of optimistic, normal, and pessimistic cases. The critical chain method adds "buffers" in the planning to anticipate potential delays in project execution. Float or slack time in the schedule can be calculated using project management software. Then the necessary resources can be estimated and costs for each activity can be allocated to each resource, giving the total project cost. At this stage, the project schedule may be optimized to achieve the appropriate balance between resource usage and project duration to comply with the project objectives. Once established and agreed, the project schedule becomes what is known as the baseline schedule. Progress will be measured against the baseline schedule throughout the life of the project. Analyzing progress compared to the baseline schedule is known as earned value management.

The inputs of the project planning phase 2 include the project charter and the concept proposal. The outputs of the project planning phase include the project requirements, the project schedule, and the project management plan.

Project planning can be done manually, but project management software is often used.

2.0 OBJECTIVES

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

- Define and explain the nature of project management
- Describe the purpose of project management.

3.0 MAIN CONTENT

3.1 Definition of Project

Project management has evolved because of the need to manage complex public and private sector activities. But before we go into our discussions on project management, we need to understand the subject matter. We also need to understand our operating terminology.

Project has been defined in various ways. Some authorities see projects as mere activities while others see them as programmes of action. Longman Dictionary of Contemporary English defines a project as “an important and carefully planned piece of work that is intended to build or produce something new, or to deal with a problem.”

From this simple definition, we can see that a project, apart from being important, should be carefully planned so as to produce something.

Some of the things that a project seeks to produce may be tangible or intangible. A motorcycle is a tangible product but conducting a census is not a tangible product.

The following are examples of projects:

- a. construction of a 50-bed hospital at Ikeja by the Lagos State government.
- b. dualisation of the Lekki-Epe, Lagos highway by the Lagos Ministry of Works.
- c. sinking of 10 water boreholes at Ikorodu town by the local government council.

From whatever angle we see these projects, some of their features are that they will require the commitment and deployment of scarce resources. Also, the products will not manage themselves. They will be managed.

3.2 Meaning of Project Management

If we define a project as an important piece of work, project management is the planning, organising, directing and controlling of resources for a relatively short-term objective that has been earlier established to complete specific goals. For example, the construction of a 50-bed hospital at Ikeja by the Lagos State government will require a lot of resources: financial, material and labour.

There will be need for procurement of land. There will also be need for architects to design the hospital. There will be need for structural engineers, civil and building engineers and electrical engineers. Different types of equipment will be sourced for e.g. X-ray machines, laboratory equipment, etc. to equip the hospital.

There should be a way in which all these resources should be coordinated and managed for effective and time management. In situations like these, project management comes in handy to provide much needed expertise.

3.3 Purpose of Project Management

From the onset, it will be necessary to stress that many projects are very complex in nature. The complexities may be introduced by the nature of technology required to execute the project. For example, a census project is one of the most difficult and complex projects that public sector managers may face. Also, managing the 2007 election in Nigeria was another complex project.

Most projects such as we have mentioned may require elements of critical risks and uncertainty. For example, how do we predict what will happen next year? Even if we could predict the political future with a measure of certainty, predicting the movement of prices and costs of materials in Nigeria involves a lot of risks and uncertainty.

In all cases therefore, we would say that the purpose of project management is to foresee the future and associated problems and therefore, plan, organise and control key activities so that projects are completed successfully and on time too.

If we see project management from that perspective, it follows logically that project management starts even before financial resources are committed and lasts until the completion of the project.

SELF-ASSESSMENT EXERCISE 1

Explain the meaning and purpose of project management.

3.4 Types of Projects

We have discussed the meaning of project management and also the purpose. Let us go further and discuss the various types of projects that we might encounter in our different organisations as managers. Some of the types include:

3.4.1 Tangible Projects

Tangible projects are those projects whose output are tangible and can be seen with the naked eye. They may include the following:

- a civil engineering project
- a hospital building project
- a water borehole project
- an aircraft manufacturing plant
- a milk manufacturing plant
- an urban play ground.

3.4.2 Intangible Projects

Intangible projects are those that require commitment of resources but whose output cannot be seen with the naked eye. In most cases, they are social projects and in some cases they may be political projects. Examples of intangible project in Nigeria include the 2007 elections and the national census.

SELF-ASSESSMENT EXERCISE 2

Discuss five tangible projects you may find in a new and emerging city.

3.5 Projects Objectives

Projects must have objectives. It is one of the important tasks of project managers to see that the projects they manage meet their objectives. Let us now discuss the objectives of projects.

3.5.1 Completion Time

Most projects, when formulated, have completion times. A normal football match lasts for about 90 minutes. It is the duty of the referee to ensure that the football match is completed within the set time. Most public sector projects even at the time they are awarded or initiated always have a time frame attached to them. For example, the rehabilitation of the Lagos-Benin expressway may be projected to be completed in 24 months. That is the projected duration of the project. Any contractor who is given the contract for such a job should ensure that the road is completed on time.

Another point to note about completion time of projects is that late completion or delivery of an agreed project will not please the sponsor of a project. Consider, for example, that the Federal Ministry of Works awards a contract for the dualisation of the Owerri-Onitsha road to Julius Berger and the road is to be completed in 24 months under the terms of the underlying contract. If Julius Berger, the contractor, fails to complete the road project in 24 months, the Ministry of Works will not be pleased with it. Besides, time is money and if a contractor fails to operate within a time frame, inflation may set in and delay the project completion or increase the cost.

3.5.2 Performance

All projects have objectives which they set out to achieve. For example, a public hospital project should have the objective of providing safe and affordable healthcare to the community. Also, a private sector fast food project has the objective of manufacturing hamburgers, fish cake, hot dogs, etc. for its customers. This is a performance objective.

Also, apart from the performance objective, most projects have a quality objective. For example, a hospital should have the objective of providing healthcare. This is a performance objective. But the provision of the service should be safe. For example, hospital workers (nurses, doctors, etc.) while treating patients must take adequate care so as not to infect the patients with the HIV through use of unsterilized needle. This is a quality objective.

Most organisations have quality as one of their major objectives. See, for example, what Daimler Benz has done with Mercedes Benz cars.

Sony products are reputed for their amazing quality. Finally, another aspect of performance is reliability. A good product should also be reliable especially in the case of medical testing devices like PH meters.

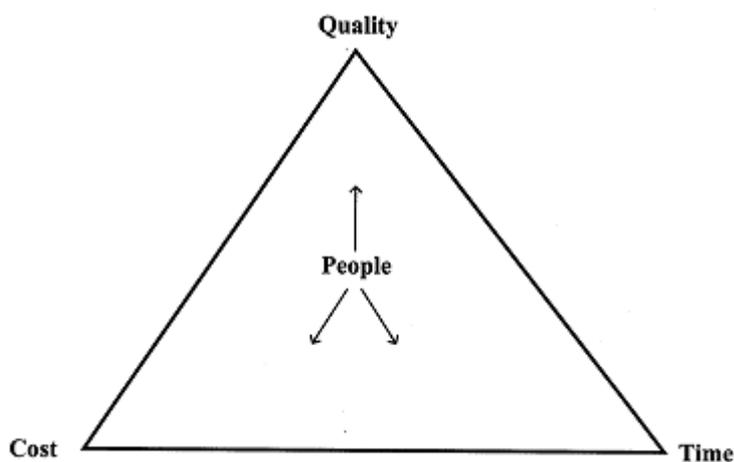
In patient care, an unreliable thermometer may raise a false alarm concerning the health of a patient and lead to wrong diagnosis.

3.5.3 Budget

All projects involve financial outlays. The financial outlays (expenditures) attached to a project are usually controlled by the budget. The budget sets a limit as to the quantity of funds a project can consume. In most organisations, the budget for every project is usually set aside. The reason why a project should be monitored is that failure to do so in some cases may lead to exhaustion of funds and abandonment of the project in question.

We have seen that projects may have three main objectives, namely: time, performance and budget objectives. A major task facing project managers is how to balance these three objectives. What it means is that at all times the focus of managers must be on the three items. To retain our understanding of project objectives, we will go a step further to look at a simple triangle of objectives.

Fig. 1: The Triangle of Objectives



SELF-ASSESSMENT EXERCISE 3

Discuss the objectives of executing a project.

4.0 CONCLUSION

In this unit, we have discussed the nature and purpose of project management. We looked at the definition of a project and also a working definition of project management. We also looked at types of projects and also project objectives.

5.0 SUMMARY

This unit is a foundation unit in our study of project management. It tries to provide a starting point for our discussions on the key aspects of our study of project management.

It discusses the nature of projects and also the purpose of project management. With this background, we will now move ahead with our work.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss the key objectives of project management.

7.0 REFERENCES/FURTHER READING

Belbin, R.M. (1996). *Management Teams: Why They Succeed or Fail*. Oxford: Butterworth-Heinemann.

Morris, P.W.G. (1997). *The Management of Projects*. London: Thomas Telford.

UNIT 2 TEAM BASED STRUCTURE

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3.1.1 Pure Project Teams

3.1.2 Task Force Teams

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3.2 Group Dynamic and Team Building

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3.4.2 Horizontal Communication

3.4.3 External Communication

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3.5.2 Principles of Interpersonal Relations

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Reading

1.0 INTRODUCTION

You will recall that in unit 2, we discussed project management organisation. There we briefly discussed pure project team organisation. Here, we shall fully discuss the project team and discuss other aspects of it which we did not touch when we introduced the matter.

In a pure project team organisation, a special work group or team is created for a special project with a project manager as the head of the team.

As the case may be, the project manager may be given absolute authority over the project team. Our direction in this unit is to take a critical look at the team and discuss ways in which such a team will be made effective so as to be seen as a project team.

2.0 OBJECTIVES

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

- Explain the mechanics of project team building
- Discuss the dynamics of project teams.

3.0 MAIN CONTENT

3.1 Team-Based Structures

In a very large organisation including a multinational, we come across situations where there are many teams within the organisation. The teams may be created for various purposes. Let us briefly discuss some examples of teams in a practical organisation setting. To organise our thoughts we shall define team-based structures as "employee teams". It is a design where work is structured for groups. The groups are then given authority and discretion over matters such as process improvement, service development, quality management or even new product development. Team approach to management was developed mainly by Japanese companies like Toyota, Honda, Mitsubishi, Sony, and a whole lot of others. What we see today are giant Japanese firms which control a large segment of global trade?

Let us briefly discuss some of the team-based structures that are in place in some organisations.

3.1.1 Pure Project Teams

A pure project team is a specially constituted work group formed within the organisation and given a special assignment or task. The assignment could be any of the following:

- a. installation of a new computer system
- b. design of a new product
- c. design of a new service format.

Usually, members of a pure project team are nominated to join the team based on certain criteria. A team leader or manager is usually placed at the head of the team. In most cases, after the assignment has been completed, the team is disbanded.

3.1.2 Task Force Teams

A task force is created by top management to tackle or solve a major problem. In the Nigerian setting, we have witnessed the advent of one task force or the other. There was the task force on ports congestion. Members of a task force are usually drawn from various organisations with a team leader as the head. Usually at the end of the assignment or when the task force loses focus, it is disbanded.

3.1.3 Quality Improvement Teams

Today, quality has become an issue that has taken the front line in business discussions. Most organisations are drawing heavily from the Japanese firms that have long imbibed quality as their watch word.

In Nigeria today, total quality management (TQM) has become an important issue and many firms are setting up internal quality teams specially empowered to address ways to improve quality.

SELF-ASSESSMENT EXERCISE 1

What do you understand by team-based structures?

3.2 Group Dynamics and Team Building

Recall that organisations grow out of the need for people to cooperate for the achievement of set goals. The coming together is based on the fact that different people have different skills. That precisely explains briefly the origin of teams or groups.

Although groups have been variously defined in the literature, our working definition is that a group is a collection of two or more people who perceive themselves as a group, share a common interest, goal, norm and a sense of belonging. They may have a leader.

Invariably, the following can be seen as groups:

- a. a computer steering committee
- b. a product launch committee.

We have just defined a group but we need to go further to examine the group content. In an ideal project team or group, there will be different people from different backgrounds and different skills. When people join a project team or group, they may lose their work identity especially if the group they joined has a work culture or ethics.

Practically, organisations use groups or teams for the following purposes: a. To distribute work along clearly defined lines. In a bank, for instance, you could find the energy group, treasury group, etc. b. To monitor and control work. After a group has been formed, the group needs to be managed and that is why every group or team should have a leader. c. Problem solving. At times, groups are used to solve organisational problems as they arise. Problems facing an organisation are many. They may be major or minor. In most cases, when major problems arise, management can set up a team to look into the problem.

3.3 Team Work

Building project teams is not the end of the task ahead. The most important task is how to build team spirit. Like we said earlier, members of the team may come from various units or departments to join a particular team set up at the head office. The critical task and which is the duty of the team leader is to ensure that the group members see themselves as members of a team and also work like a team.

If members of a team are to perform as team players and work towards team objectives, then certain things should be present in the team. Let us examine those things:

3.3.1 One Unit Goal

It is important that every member of a team perfectly understands the goals and objectives of the team. Every action of each member must be directed towards the set objectives of the team.

3.3.2 Group Cohesiveness and Support

A group is made up of a number of people with different qualities and characteristics. A good group is one in which there is that cohesiveness. This cohesiveness binds the group together and makes them act in one direction and towards the same objectives.

3.3.3 Team Spirit

Individual spirit is not the same as team spirit. Team spirit is based on group affinity and affection amongst members. Team spirit makes an individual member imbibe the spirit of a group and behave like the group.

3.3.4 High Expectations

There must be high expectations amongst the various members of a team. For example, when you form a 15-man football team to represent Nigeria, each team member usually will have high expectations arising from team dynamics and spirit.

3.3.5 Willingness

Team members must be willing to be members of the team. They should not be unwilling members because if they are, they will be frustrated and this will affect the team as a whole.

3.4 Communication within Project Team

We need to now discuss communication within a project team. In a project team, there will be a lot of people who need to communicate with each other.

Communication is the process of exchanging information between one person or another or between one person and a group of persons. Communication also conveys knowledge of or information about a subject matter. Communication is all about sharing information. Generally, in a team situation, there is the need for effective communication amongst the members. The importance of communication is that it is the life blood of any organisation and by implication the team. Communication as a process assists management functions to be accomplished. Communication enables the team leader to communicate with other members of the team and also enables other team members to communicate with the team leader. Communication provides a link between people in a team or organisation.

The real purpose of communication is to effect change in an organisation and influence action towards organisational objectives. Communication organises the human resources in an organisation or team. Let us discuss the lines of communication in a project team.

3.4.1 Vertical Communication

Vertical communication within the project team could be from the team leader to subordinates or from the subordinates to the team leader. Vertical communication assists in passing information on policies and provides feedback mechanism through which staffs respond to communication.

3.4.2 Horizontal Communication

In a project team, communication can flow horizontally across staff at the same level in the project team. It could be communication to all the managers in the team or at the same level.

3.4.3 External Communication

Within a project team, external communication is a situation where the team or group exchanges information with the larger organisation. For example, when a team leader reports progress to the managing director, we regard the information as a form of external communication as it is outside the team.

SELF-ASSESSMENT EXERCISE 2

There is need for communication within a project team. Discuss?

3.5 Building Good Interpersonal Relations within the Team

An organisation may possess enormous capital, good organisational structure, highly trained manpower. But if the staff do not relate properly to one another, then problems may likely occur frequently and retard corporate performance. And so it is with a team. As discussed earlier, a team can be made up of people from different units and backgrounds. It is therefore, very important that at all times, managers should be aware of the need to build and maintain good interpersonal relationship with their subordinates, bosses and peers within the organisation. Put simply, interpersonal relations are the way and manner people get along with one another. It could be the relationship between one person and another or between one group of persons (e.g. staff) and another group of persons. If people are friendly and understanding, then good interpersonal relations develop and everyone performs his or her tasks properly.

3.5.1 Effects of Poor Interpersonal Relations

- a. Tension between staff and other fellow staff
- b. Tension between staff and management
- c. Tension amongst management staff
- d. Unhealthy internal rivalry between all staff
- e. Industrial misery and hostility
- f. Strike
- g. Corruption
- h. General dishonesty
- i. Crime in the work place
- j. Disloyalty to the organisation.

In a situation where there is no good interpersonal relation, obviously productivity is lowered and this gives rise to lower earnings for the organisation.

3.5.2 Principles of Interpersonal Relations

- a. Act like a member of a team. Do not let personal interest affect that of the organisation
- b. Remember that other staff come from different backgrounds and will at times behave differently from your expectations

- c. Learn to be accommodative
- d. Keep your boss informed of your movements at all times
- e. Avoid gossips in the workplace
- f. Display a positive attitude to your job
- g. Be friendly and cooperative
- h. Treat your subordinates with respect
 - i. Stick to the chain of command
- j. Learn to wear a smile on your face always
- k. Show interest in other peoples' problems
- l. Always learn to say "thank you"
- m. Avoid aggressive behaviour
- n. Always learn to apologise when you are wrong
- o. Greet people in the morning, afternoon and evening
- p. Be polite
- q. Be respectful
- r. Be honest
- s. Be responsive
- t. Show good hygiene.

SELF-ASSESSMENT EXERCISE 3

Discuss the effects of poor interpersonal relation within the team.

4.0 CONCLUSION

In this unit, we discussed project team building. We discussed team-based structure, pure project teams and task force teams. We also discussed group dynamics and team building, team, work and interpersonal relations. All these enabled us to properly understand project team building.

5.0 SUMMARY

Understanding team building is a very crucial aspect of our study since most projects practically involve the setting up of project teams. It is necessary that we properly understand how to generate team spirit and cohesiveness within a project team.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss the importance of communication within a project team.

7.0 REFERENCES/FURTHER READING

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Belbin, R.M. (1996). *Management Teams: Why They Succeed or Fail*. Oxford: Butterworth–Heinemann

UNIT 3 COST ESTIMATES

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1.0 INTRODUCTION

Generally in project management, it is very important to accurately estimate the cost of a project. It is even more necessary for management decision and control. Before a project comes on stream, the cost implications must be known well in advance and properly estimated. This serves as a guide to proper project management and control. Proper cost estimation will allow for proper planning of costs, allocation of resources to various units of a project, cost control and most importantly budgetary control.

2.0 OBJECTIVES

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

- Explain the general nature of cost estimates
- Discuss the definitions and principles of cost estimation.

3.0 MAIN CONTENT

3.1 Cost Definitions and Principles

The word “cost” when used in accounting conveys lots of meaning and so must be properly qualified. There are many types of costs and part of our discussion in this unit is to properly discuss various costs and see how they properly fit into the study of project management. It is so because when we mention “cost”, we should clarify the type of cost we are talking about.

Let us discuss the key types of costs that are important for our study.

3.1.1 Direct Costs

Direct costs are those costs which are attributed directly to a job or project. For example, if an engineer spends five hours to design an engineering column, then that time spent by the engineer can be described as a direct labour and the cost can be recorded as a direct cost to be charged directly to the design of the engineering column.

3.1.2 Factory Costs

The concept of factory cost is mainly applicable to manufacturing concerns. Factory cost is the total cost of a job or project before the addition of a mark-up for the purpose of profit. Factory costs will include the following:

- a. direct materials costs
- b. direct labour costs
- c. indirect labour costs
- d. design costs.

3.1.3 Fixed Costs

Fixed costs are those costs which remain virtually unchanged and must continue to be incurred even though the workload might fluctuate between zero and the maximum or installed capacity. Fixed costs will generally include the following:

- a. management salaries
- b. administrative salaries
- c. heating and electricity expenses
- d. insurance
- e. maintenance of building, etc.
- f. business permits.

3.1.4 Indirect Costs

In an ideal setting like a manufacturing facility, the provision of office accommodation, management, welfare services, accounting, heating and lighting all constitute costs that must be incurred in running the manufacturing facility. Others will include salaries and wages.

Generally, all these cost are termed indirect costs or overhead costs.

SELF-ASSESSMENT EXERCISE

- i. What is “cost” in relation to project management?
- ii. Discuss the types of costs.

Table 1: Cost Structure for a Simple Manufacturing Project

ITEM	#
Iron flat sheets	1,000,000
Brass rods	2,000,000
Aluminum profiles	3,000,000
Total cost of direct materials	6,000,000
Direct Labour	
Design – engineering labour	200,000
Manufacture – factory hands	700,000
Total direct labour	900,000
Overheads	1,350,000
Total factory cost	8,250,000
Mark up at 30%	2,475,000
Market selling price	10,725,000

3.1.5 Standard Labour Costs

Labour constitutes a very critical component of project cost. It includes the labour of both junior and senior personnel, engineers, accountants and the rest who are involved in a project. When trying to estimate the labour cost for any project, it would be very difficult to use the different rates of pay to be earned by every individual. There might be two engineers engaged in a project but they may not be earning the same salaries. Generally, in project management, it is advisable to use standard costing to estimate the cost of labour.

For labour costs, it is convenient to classify people according to some convenient rules based on the type of jobs that they do.

For example, engineers in a project may be averaged out to cost N1,000,000 per annum. Therefore, we can estimate that the standard cost for an engineer for a project is N1,000,000 per annum. That is the cost that will be imputed in the cost estimate for engineers.

Also, for accountants involved in a project, there may also be the need to work out the standard cost for an accountant. For example, we might estimate the standard cost for an accountant to be N1, 500,000 per annum.

For all types of labour, we should have estimates of the standard costs. It enables the project to be properly cost.

Table 2: Example of Labour Grade for Standard Costing in a Project Engineering Company

Grade	Those Included	Comments	Salary per annum N
01	Company Director	-	5,000,000
02	Divisional Heads	Rank of general manager	4,000,000
03	Assistant Divisional Heads	Rank of assistant general manager and above	3,000,000
04	Management Cadre	Rank of senior managers and above. Includes senior engineers and architects	2,500,000
05	Engineers	Managers	2,000,000
06	Technologists	Deputy managers	1,500,000
07	Draughtsmen	Assistant managers	1,500,000
08	Administrative	Staff Clerks, Secretaries etc.	1,000,000

3.1.6 Overhead Recovery

In table 1, we saw the cost structure for a simple manufacturing project. We easily computed the cost of direct materials and also direct labour. We also recorded overheads. In practical terms, direct labour costs are not difficult to estimate.

Direct labour cost is equal to time recorded on a job multiplied by the standard hourly rate. So, how can we recover overheads?

An amount can be added that is proportional to labour cost (usually a percentage) to recover a part of a company's indirect overhead costs. In table 1, we saw total direct labour as N900,000. Overheads standing at N1,350,000 is about 150% of total direct labour costs. Generally, the method of recovering overheads as a levy on direct labour costs is called absorption costing.

However, setting the percentage overhead rate is a technical matter requiring professional accounting skills.

3.2 Work Breakdown

Consider a project to build a new university at Ulakwo which is about 20 kilometres from Owerri, the Imo State capital. Even where we have defined the project as a new university, it will be very necessary to consider the total picture of the new university project.

The university project will include the following:

a. access roads b. administrative buildings c. lecture halls d. clinics e. laboratories f. churches and mosques g. students hostels h. university teaching hospital complex.

Breaking the total project into smaller units constitutes what is referred to as a work breakdown. Work breakdown enables the project managers or administrators to break down a large or complex project into smaller and more manageable units.

The ideal thing to do is to break a project into smaller units called subprojects. The sub-project itself could be further divided into much smaller units for effective analysis and design.

When a project is broken down into smaller sub-projects, it becomes very easy to cost each sub-project properly. After costing each subproject properly, then we could then add up the costs of the sub-projects to generate the cost of the total project.

4.0 CONCLUSION

In this unit, we discussed cost estimates: definition and principles. We discussed direct costs, factory costs and fixed costs. We discussed standard labour costs and overhead

recovery. We also discussed the concept of work breakdown. All these have enabled us to understand the basic principles of cost estimates.

5.0 SUMMARY

This unit treats cost estimates: definitions and principles. The definitions and principles enable us to have a general background to the understanding of project costs.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss, using a practical example, the concept of work breakdown.

7.0 REFERENCES/FURTHER READING

Association of Cost Engineers. (1991). Estimating Checklist for Capital Project. (2nd Ed.). London: Spon.

Smith, N.J. (1995). Project Cost Estimating. London: Thomas Telford.

UNIT 4 MONITORING AND EVALUATION

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Planning
 - 3.2 Executing
 - 3.3 Executing process group processes
 - 3.4 Monitoring and controlling
 - 3.5 Monitoring and controlling process group processes
 - 3.6 Monitoring and Controlling Cycle
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

Project Planning, Management, Monitoring and Evaluation concepts and principles of planning, types of planning and plans; strategic planning, participatory planning; the plan of work, the work calendar, stakeholder analysis; the logical framework and its application in project development, monitoring and evaluation; project supervision, leadership and Project administration and management; the concept of monitoring and evaluation, reasons for monitoring and evaluation, methods used in monitoring and evaluation,

2.0 OBJECTIVES

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

- Define the following briefly; Project, Project Planning, Management, Monitoring and Evaluation concepts and principles of planning,
- Identify the stages in planning and execution
- Explain Monitoring and Controlling Cycle
- Discuss explicitly Monitoring and controlling process group processes
- Difference between Monitoring and Evaluation

3.0 MAIN CONTENT

A project is a temporary endeavor designed to produce a unique product, service or result with a defined beginning and end (usually time-constrained, and often constrained by funding or deliverables) undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value. The temporary nature of projects stands in contrast with business as usual (or operations), which are repetitive, permanent, or semi-permanent functional activities to produce products or services. In practice, the management of these two systems is often quite different, and

as such requires the development of distinct technical skills and management strategies.

Projects may be audited or reviewed while the project is in progress. Formal audits are generally risk or compliance-based and management will direct the objectives of the audit. An examination may include a comparison of approved project management processes with how the project is actually being managed. Each project should be assessed for the appropriate level of control needed: too much control is too time consuming, too little control is very risky. If project control is not implemented correctly, the cost to the business should be clarified in terms of errors and fixes.

Monitoring is a deliberate systematic means of collection and analysis of information as a project progresses which intended at adequate efficiency and effectiveness of a project embarked on with thorough use of resources. It facilitates organization to determine whether the resources available are enough and are being utilized satisfactorily. Project monitoring is establishing measure that projects are on targets and indicators to measure advancement and achievement.

Evaluation involves conscious checking into project effects vis-à-vis the agreed slated plans on accomplishment scale. It concern with outcome process of a blueprint which can be done during and after the project. Evaluation is not an end product but a process expected to take place throughout the stages of a project or action. Evaluation is a process used to ascertain what has happened during a given activity, whether a programme or activity is working, and whether the initial commitment has been carried out and achieved In the course of the project it is done to ensure any contingency that can hamper the project is resolved and plans are amended to suit goals of the project. While after project evaluation is aim at understanding success or fail at the same time outline the means, measure and medium for improvement ahead of next implementation of project plan.

The differences between Monitoring and Evaluation

<i>Indices of variation</i>	<i>Monitoring</i>	<i>Evaluation</i>
Timing	Continuous, throughout the project	Periodic review at significant points in the project progress
Scope	Day to day activities, output, indicators of progress and change	Access overall delivery of outputs and progress towards objectives and goals
Main participants	Project staff, project users	External evaluators, facilitators, project users, project staff, sponsors
Process	Regular meetings, interviews, monthly, quarterly reviews	Extraordinary meeting, additional data collection exercise etc
Written output	Regular reports and updates to project users, management and sponsors	Written report with recommendations for changes to project-presented in workshops to

		different stakeholder
Information users	Government agencies, researchers, companies	Stakeholders, top-management team, external facilitator's, staff etc
Intent	translates objectives into performance indicators and set targets	examines implementation process for better significant accomplishment vis-à-vis offers recommendations for improvement on slated project
Activities	activities are linked with resources to aligned with objectives	activities assess specific contribution of project in relations to result

Adapted:from Kepa (1997)

3.1 Planning

After the initiation stage, the project is planned to an appropriate level of the main purpose is to plan time, cost and resources adequately to estimate the work needed and to effectively manage risk during project execution. As with the Initiation process group, a failure to adequately plan greatly reduces the project's chances of successfully accomplishing its goals.

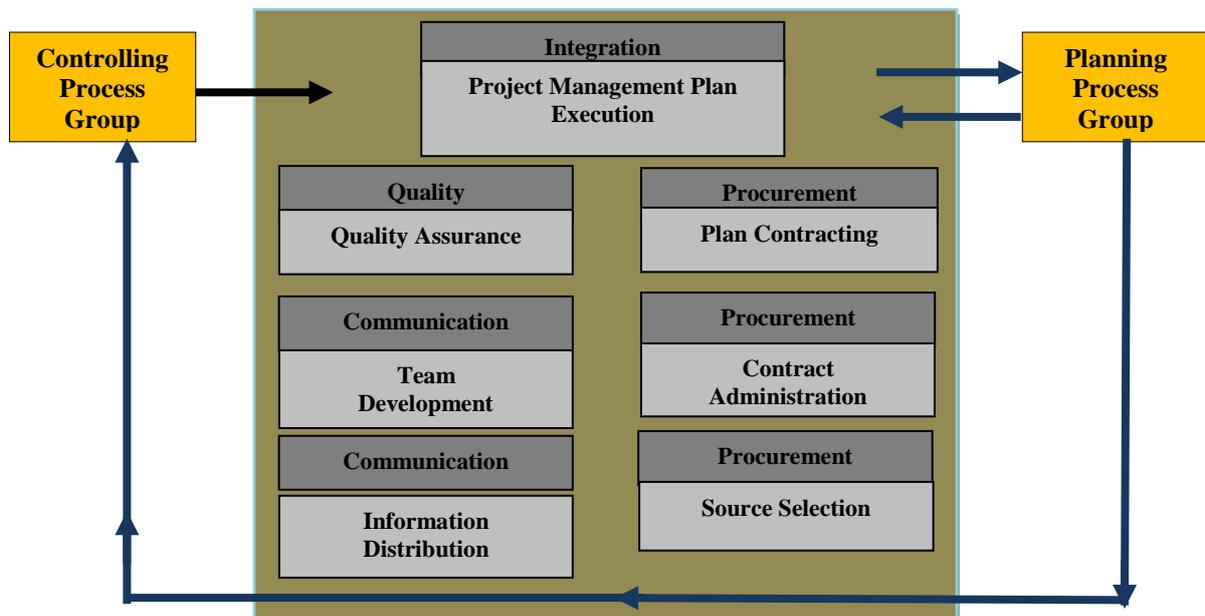
Project planning generally consists of:

- determining how to plan (e.g. by level of detail or Rolling Wave planning);
- developing the scope statement;
- selecting the planning team;
- identifying deliverables and creating the work breakdown structure;
- identifying the activities needed to complete those deliverables and networking the activities in their logical sequence;
- estimating the resource requirements for the activities;
- estimating time and cost for activities;
- developing the schedule;
- developing the budget;
- risk planning;
- gaining formal approval to begin work.

Additional processes, such as planning for communications and for scope management, identifying roles and responsibilities, determining what to purchase for the project and holding a kick-off meeting are also generally advisable.

For new product development projects, conceptual design of the operation of the final product may be performed concurrent with the project planning activities, and may help to inform the planning team when identifying deliverables and planning activities.

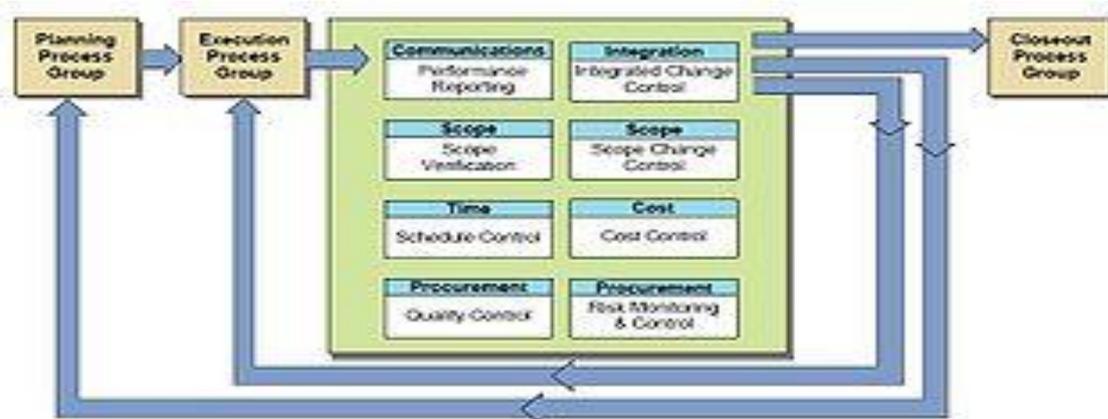
3.2 Executing



3.3 Executing Process Group Processes

The execution/implementation phase ensures that the project management plan's deliverables are executed accordingly. This phase involves proper allocation, coordination and management of human resources and any other resources such as material and budgets. The output of this phase is the project deliverables.

3.4 Monitoring and Controlling



3.5 Monitoring and Controlling Process Group Processes

Monitoring and controlling consists of those processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project. The key benefit is that project performance is observed and measured regularly to identify variances from the project management plan.

Monitoring and controlling includes:

- Measuring the ongoing project activities ('where we are');
- Monitoring the project variables (cost, effort, scope, etc.) against the project management plan and the project performance baseline (*where we should be*);
- Identifying corrective actions to address issues and risks properly (*How can we get on track again*);
- Influencing the factors that could circumvent integrated change control so only approved changes are implemented.

In multi-phase projects, the monitoring and control process also provides feedback between project phases, in order to implement corrective or preventive actions to bring the project into compliance with the project management plan.

Project maintenance is an ongoing process, and it includes:

- Continuing support of end-users
- Correction of errors
- Updates to the product over time



3.6 Monitoring and Controlling Cycle

In this stage, auditors should pay attention to how effectively and quickly user problems are resolved.

Over the course of any construction project, the work scope may change. Change is a normal and expected part of the construction process. Changes can be the result of necessary design modifications, differing site conditions, material availability, contractor-requested changes, value engineering and impacts from third parties, to name a few. Beyond executing the change in the field, the change normally needs to be documented to show what was actually constructed. This is referred to as change management. Hence, the owner usually requires a final record to show all changes or, more specifically, any change that modifies the tangible portions of the finished work. The record is made on the contract documents – usually, but not necessarily limited to, the design drawings. The end product of this effort is what the industry terms as-built drawings, or more simply, "as built." The requirement for providing them is a norm in construction contracts. Construction document management is a highly important task undertaken with the aid an online or desktop software system, or maintained through physical documentation. The increasing legality pertaining to the construction industries maintenance of correct documentation has caused the increase in the need for document management systems.

When changes are introduced to the project, the viability of the project has to be re-assessed. It is important not to lose sight of the initial goals and targets of the projects. When the changes accumulate, the forecasted result may not justify the original proposed investment in the project. Successful project management identifies these components, and tracks and monitors progress so as to stay within time and budget frames already outlined at the commencement of the project.

4.0 CONCLUSION

The discussion in this unit takes us through the understanding of the concept of Project Planning Management, Monitoring and Evaluation from definition to process of planning. Controlling. Monitoring and cycle entailed.

5.0 SUMMARY

In this unit, we treated contextual nature of project, Project Planning Management, Monitoring and Evaluation with consideration to detailed key steps involves in cycle of it. Project is an ongoing process with evaluation to ensure desired outcome is achieved by understanding the target, reexamine it in line with scope of the project and amend necessary correction when need arise to accomplish slated goals.

6.0 TUTOR-MARKED ASSIGNMENT

1. What are the process involved in project Monitoring and controlling
2. Why are changes introduced to a project
3. Write short note on the following:
 - i. Project
 - ii. Management
 - iii. Monitoring and controlling

7.0 REFERENCES/FURTHER READINGS

Aarnoudse-Moens, C.S., Weisglas-Kuperus, N., Van Goudoever, J.B., and Oosterlaan, J (2009). "Meta-analysis of neurobehavioral outcomes in very preterm and/or very low birth weight children".*Pediatrics*.124(2):717–28. doi:10.1542/peds.2008-2816. PMID 19651588.

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Kepa (1997). Summary of Differences between Monitoring and Evaluation (online)

UNIT 5 PROJECT IMPLEMENTATION STRATEGY SKILLS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Project Plan Monitoring and Control
 - 3.2 Communicator
 - 3.3 Leader
 - 3.4 Coordinator
 - 3.5 Motivator
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

The main objective of developing a project plan is to guide the project implementation, a good plan should help produce good outputs, which ultimately lead to good outcomes. A good approach to help the coordination between project planning and project implementation is to have the same people who plan the activities be the people who will implement them. The project team needs to experience and build the skills to develop and implement a plan, the team that implements the plan has a better chance at success if its part of the plan development. Although project managers are responsible for developing the overall project management plan, they must solicit inputs from the project team members for each process area.

Project implementation requires a different set of skills; such as leadership, communication, facilitating and negotiating skills. Project managers must provide leadership to interpret the project plans and the implementation guidelines, project managers must also be able to communicate with the project team and stakeholders to develop and implement good project plans. Project managers and their staff must possess the required expertise for successful project implementation. If they don't, it is the projects manager's job to help develop the necessary skills, or find somebody else who can to the job or alert the organizations management of the problem.

During implementation the best practices and good results from the early activities needs to be documented as to benefit future activities and facilitate improvements to the project plan.

2.0 OBJECTIVES

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

- Understand the skills of a project manager
- Describe project manager as;
 - i. A Communicator

- ii. A Leader
- iii. A Coordinator
- iv. A Motivator

3.0 MAIN CONTENT

3.1 Project Plan Monitoring and Control

Monitoring and controlling the project involves identifying, evaluating and managing changes throughout the project management life cycle, the role of the project manager in this area involves achieving the following objectives:

- Ensure that changes are beneficial and contribute to the project success; this is achieved by influencing the factors that create changes and by making trade-offs among the projects constraints such as scope, schedule, budget and quality.
- Communicate significant changes to management, beneficiaries and donors, especially the ones that will impact the projects constraints.
- Update project plans and record changes.

3.2 Communicator

This is another important role of the project manager, but one that is often overlooked and not properly taken in consideration when assigning a project manager to a new project. Communication is providing relevant, timely information to the right people about the project. Communication is used to inform and educate the project stakeholders about the project objectives, risks, assumptions and constraints.

The communication or informational role is the most critical role for the success of the project. The organization functional managers, project staff, donors and key stakeholders need to make critical decision about the project, and the information they receive must be relevant, on time and accurate. Project managers in the role of communicators take three functions: to gather information from project staff and other people involved with the project; distribute the information to stakeholders, which includes the donor, beneficiaries, and the organizations functional managers; and the last function is to transmit the information to the external environment, such as the general public to gain support to the project.

Project managers spend most of their time communicating. They hold meetings; develop reports (writing as well as orally) to the, donors, beneficiaries or senior management; they listen to issues; solve problems; provide direction and constantly negotiate for resources. Project managers' success depends greatly on their ability to communicate. The project manager uses two forms of communication:

1. Formal communications which include progress reports and presentations to management or the beneficiaries
 2. Informal communications which includes email messages, telephone calls, and team meetings
- The effectiveness with which this role is used is important to the success of the project and the project manager.

3.3 Leader

A project manager is above all a leader; the team needs direction for the life of the project and the project manager is responsible for leading the team to achieve the vision that the project has created, a project manager does this by facilitating, coordinating and motivating the team to achieve the project goals; this is a central role of the project manager and her ability to influence, inspire, direct, communicate will determine her effectiveness as a project manager. Leading is a central role; it involves working with and through others to achieve the objectives of the project. It is through the project manager's ability to lead will determine the success of the project.

The focus on this role is to ensure the project team and the project stakeholders have a clear vision of the objectives the project aims to achieve. During the course of the project is not unusual that the team starts shifting its attention from the final objective; here is where the leadership role is needed and the project manager needs to communicate and motivate the team to the ultimate goal. The leadership role includes the facilitator, coordinator and motivator roles.

Facilitator

In this role the project manager acts as an individual who enables the project team to work more effectively; helps them collaborate and achieve synergy. The project manager is not responsible to do all the tasks of the project, that is the responsibility of the project team, the project manager role is to create the right conditions that enable the project team to carry their duties.

The project manager also contributes by providing the framework to facilitate the interactions among the different groups so that they are able to function effectively. The goal of this role is to support the project team and the beneficiaries so that they can achieve exceptional performance. The project manager encourages full participation from the project team, promotes mutual understanding with the beneficiaries and cultivates shared responsibility among all project stakeholders.

The facilitator role is mostly used when dealing with beneficiaries, since the project manager doesn't have any form of authority over this group he must provide an environment of trust where beneficiaries feel comfortable about contributing ideas and provide input to the project and discover the solutions that can help achieve the projects objectives.

3.4 Coordinator

Coordination means integrating the goals and activities of the people and groups involved with the project. The functional units in the organizations, such as finance, human resources and procurement; and the beneficiaries and the partners involved with the project, need their activities be coordinated in a way that benefit the project. This role demanded of the project managers is needed to ensure all these groups are working towards the same goal. The project managers has to inform each group about what is expected from the by the project, without coordination these groups will loose sight of their role with the project and may pursue their own interest at the cost of the project.

The need for coordination depends on the extent to which they need to be integrated with the activities of other groups; it depends on the degree of interdependence and the nature of communication requirements. A high degree of coordination is needed when factors in the project environment are changing and there exist a high level of interdependence among the activities performed by the different groups. This is a case when one group requires an output coming from another group in order to complete an activity.

Communication is the best tool to achieve an effective coordination, the project manager's role is to ensure that information is received by all groups at the right time; the greater the level of complexity and uncertainty about the project objectives the greater the need for information. The project manager needs to evaluate the best approach to coordinate formal or informal communications. The approach has to match the project's capacity for coordination with its need for coordination; it is important to know if the need for coordination is larger than the ability to coordinate then the project manager increases the resources to help him coordinate.

3.5 Motivator

Development projects are highly complex and demanding on the project staff, this is the reason why the project manager has to act as a motivator to the team in times of difficulty. Working with people is not always easy and the factors that provide them with motivation are different from each other. The project manager's role as a motivator is to identify the factors that serve as an incentive for a project team to take the necessary action to complete a task within the project constraints. The nature of development projects; difficult locations, high security risks, extensive travel, limited accommodations and other factors contribute to the low motivation of the team.

The project team is an integral part of the project, lack of motivation can lead to high turnover and low morale which results in poor performance. Even if the project is able to develop the best plans and has all the resources needed if people are not motivated the project will fail. Project Managers also foster teamwork

among all project participants, they act as catalyst of change to get the beneficiaries, donor, project team and management of the organization to work and meet the project goals.

4.0 CONCLUSION

The need for a project manager to acquire certain expertise which reflects on expediency of project outcome as he/she has to lead, motivate, coordinate and communicate in a manner that would not jeopardized work at hand.

5.0 SUMMARY

In this unit we discussed the skill that a project manager should possess which will promote efficiency and effectiveness in process of articulating project plan and make everyone on the project a team to realize the goals of the organization.

6.0 TUTOR-MARKED ASSIGNMENT

- What are the four skills required by a project manager to make a successful team

Discuss the below;

“Communication is the best tool to achieve an effective coordination”

7.0 REFERENCES/FURTHER READINGS

Aarnoudse-Moens, C.S; Weisglas-Kuperus, N., van Goudoever, J.B., and Oosterlaan, J (2009). "Meta-analysis of neurobehavioral outcomes in very preterm and / or very low birth weight children". *Pediatrics*.124(2):717–28. doi:10.1542/peds.2008-2816. PMID 19651588.

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Kepa (1997). Summary of Differences between Monitoring and Evaluation (online)

MODULE 2 PROJECT DEFINITION

Unit 1 Project Definition

Unit 2 Project Planning and Scheduling

Unit 3 Types of Planning and Sustainable Business Success

Unit 4 Project Management

Unit 5 Replacement Model

UNIT 1 PROJECT DEFINITION

CONTENT

1.0 Introduction

2.0 Objectives

3.0 Main Content

 3.1 Meaning of Project Definition

 3.2 The Project Cycle

 3.2.1 The Project Idea Stage

 3.2.2 Project Identification Stage

 3.2.3 Project Evaluation Stage

 3.2.4 Project Selection Stage

 3.2.5 Project Execution Stage

 3.3 Defining a Project for Financial Appraisal

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Reading

1.0 INTRODUCTION

In this unit, we will discuss project definition which is a very important aspect of our study as it begins to sharpen our focus on the core study of projects. Project definition is very important since it helps us to define a project under discussion.

2.0 OBJECTIVES

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

- explain the project definition process
- discuss a project cycle.

3.0 MAIN CONTENT

3.1 Meaning of Project Definition

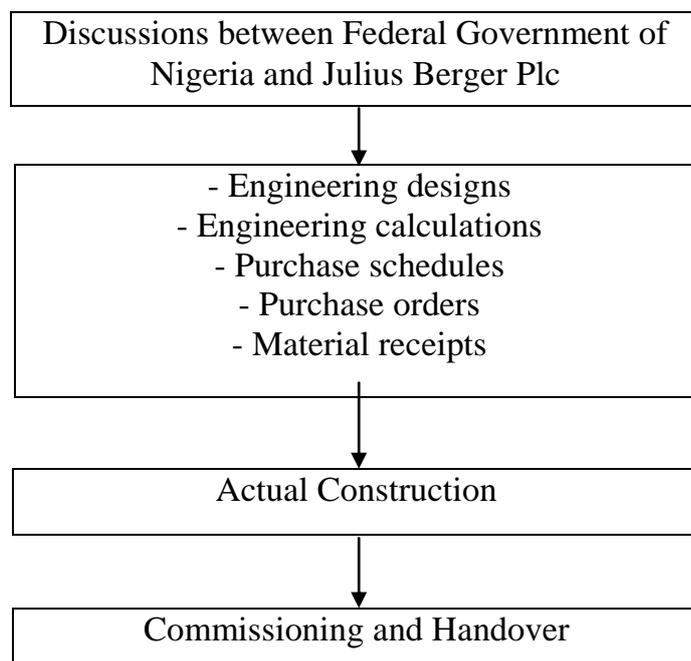
Project definition is a process which seeks to describe a project from the idea stage to the stage when the project has been completed.

All information about the project is usually embodied in the definition of the project. Usually, before a project starts, it must be properly defined so that the parties involved properly understand their clear roles.

Discussion Case: Rehabilitation of Lagos-Ibadan Expressway

Let us use a familiar case as a discussion case. In 2015, the federal government decided to rehabilitate the Lagos-Ibadan expressway which was in a terrible state. The engineering firm of Julius Berger Nigeria PLC was chosen as the competent firm to carry out the rehabilitation work. We can describe the project by considering the various processes involved before the project was commissioned.

Fig. 1: The Process of Project Definition for the Rehabilitation of the Lagos-Ibadan Expressway



We have looked at a simple case of a road rehabilitation project. We will now deepen our knowledge by discussing the project cycle.

SELF-ASSESSMENT EXERCISE 1

Explain project definition?

3.2 The Project Cycle

The project cycle tries to describe the various stages that are involved from the conception of a project idea to when the project is executed or

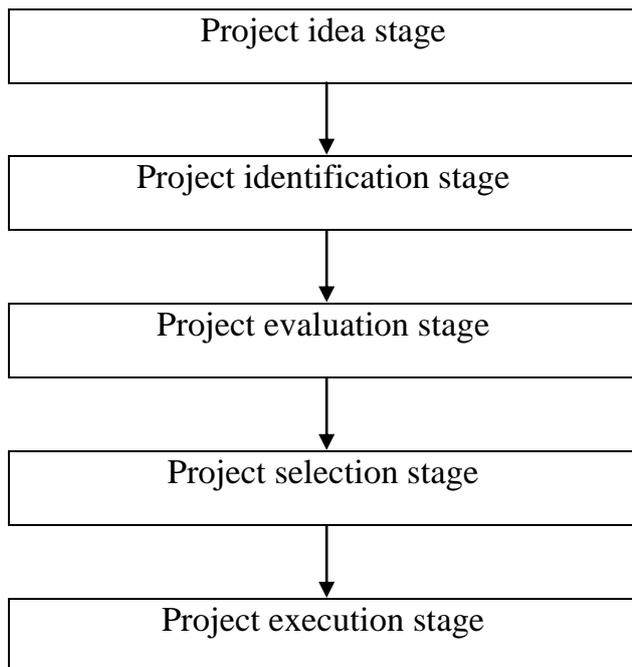
Discussions between Federal Government of Nigeria and Julius Berger Plc

- Engineering designs - Engineering calculations - Purchase schedules - Purchase orders - Material receipts

Actual Construction

Commissioning and Handover actually takes off. Understanding of a project cycle is really very important as it enables us to get the total picture of a project. Let us now examine the various stages of a project cycle.

Fig. 2: The Project Cycle



3.2.1 The Project Idea Stage

The project idea stage is the first stage of a project cycle. The idea about a project arises from a variety of sources within the market place or macroeconomic environment. New project ideas could originate from within an organisation or from outside it. In a public sector organisation, it emanates mainly from the assigned roles of the relevant body. For example, a rural farmers' fertiliser distribution project is

most likely to emanate from a state ministry of agriculture and natural resources. The idea of a rural medical clinic is also likely to emanate from a health ministry.

In the private sector, project ideas could emanate from within an organisation or from outside. From within, it could arise out of contacts between salesmen and customers. It could also arise from outside if customers specifically request for possible bigger or better products.

Project idea stage

Project identification stage

Project evaluation stage

Project selection stage

Project execution stage

New project ideas may fall into any of the following categories:

a. A proposal to build a community health centre in a very remote village in Kwara State. b. A proposal to upgrade a rural medical clinic to a general hospital. c. A proposal to conduct a population census in Nigeria prior to an election. d. A proposal to build a mega railway line that will link the western part of Nigeria with the eastern part.

3.2.2 Project Identification Stage

After the project idea stage, the next stage is the project identification stage. The project identification stage consolidates the project idea stage. Project ideas are not actually useful except if they are clearly identified and put down in a systematic manner for further processing.

A government agency may conceive the idea of poverty alleviation in a particular local government area of Bauchi State. But you will realise that the concept of poverty alleviation covers a very vast area of possible interventions. So apart from simply coming up with the poverty alleviation, the government agency should go ahead to identify the mode of intervention. The poverty alleviation project could be any of the following: a. a rural women kunu making seminar/workshop b. a rural women micro-credit scheme c. a millet planting project.

3.2.3 Project Evaluation Stage

When a project has been identified, the next step is to evaluate the project. Project evaluation involves the estimation of the costs and benefits of a project. Costs and benefits should be measured in terms of cash flows. It will be important here for us to

understand that the estimation of cash flows of a project is a very difficult task. It is difficult in the sense that cash flows which are likely to arise in the future may be difficult to estimate.

In a public sector set up, other factors come into play when evaluating a project. For example, the employment generation potentials of a project may be taken into consideration when estimating the benefits of a project. Besides, political considerations may also come into play.

3.2.4 Project Selection Stage

After the project evaluation stage, the next stage is the project selection stage. Faced with an array of projects with different values and worth, there is need to select which projects will be embarked upon. Besides, budgetary considerations will also come into play since the resources for projects are limited. Project selection is a top management responsibility. In the selection of projects, top management usually considers the financial cost outlays involved and match them with the benefits to be derived from a project. Projects that add positive benefits to the community should be selected.

3.2.5 Project Execution Stage

The project execution stage is the final stage in the project cycle. After a project has been selected, it moves on to the execution stage. In most organisations, the responsibility for execution of projects is vested on a project management team raised by management or government. The function of the project management team is to ensure that the budget for the project is actually spent on the project and that the project is completed on schedule. In an ideal organisation, the project management team usually prepares a monthly or quarterly budget report on projects. This is important for project monitoring and control.

SELF-ASSESSMENT EXERCISE 2

Discuss the project cycle.

3.3 Defining a Project for Financial Appraisal

Virtually all projects involve financial expenditures but at different levels. Some aspects of a project may be ignored but there is no way that we may be able to ignore the financial aspects of a project.

Before a project is embarked upon, all aspects of financial appraisal must be conducted so that the total expenditures and inflows/benefits of the project can be estimated well in advance.

To guide us in defining a project for financial appraisal, let us draw up a checklist.

Table 1: Checklist for Defining a Project for Financial Appraisal

ITEMS	YES OR NO
Cost of land and land acquisition	
Construction of building offices, etc.	
Drainage	
Perimeter fence	
Electrical Power	
Water	
Sewage	
Roads	
Cost of equipments/machinery	
Materials costs	
Skilled labour	
Unskilled labour	
Operating/maintenance costs	
Local government rates and taxes	
Vehicles	
Professional fees	
Communication	
Revenue/benefits	
Projected income statement	
Projected cash flow statement	
Payback period estimation	

4.0 CONCLUSION

In this unit, we have discussed the concept of project definition. We also discussed the concept of the project cycle which runs from the project to the project execution stage.

5.0 SUMMARY

This unit treated project definition. It tried to examine how a project can be defined. In doing this, we used an example of a road rehabilitation project to define a project. We also discussed the project cycle.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss fully the concept of a project cycle.

7.0 REFERENCES/FURTHER READING

Association of Cost Engineers. (1991). Estimating Checklist for Capital Projects. (2nd Ed). London: Spon.

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UNIT 2 PROJECT PLANNING AND SCHEDULING

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- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Factors Affecting Project Planning
 - 3.2 Project Plan and Schedule – Meaning
 - 3.3 The Planning Time Frame
 - 3.3.1 Free Planning Approach
 - 3.3.2 Target-led Planning Approach
 - 3.4 Project Matrix Charts
 - 3.5 Bar Charts
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

All projects involve commitment of resources towards certain pre-set objectives. And in most cases, there is always a time frame or deadline for the implementation of the project. It is therefore, safe to assume that there must be a plan of some sort if the envisaged project will be completed on time. Most projects are complicated in nature and have to be properly planned.

2.0 OBJECTIVES

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

- Explain factors affecting project planning
- Discuss project planning and scheduling.

3.0 MAIN CONTENT

3.1 Factors Affecting Project Planning

A project manager, when appointed, will realise that he/she is confronted with a number of factors within and outside the organisation which influence a project.

We shall divide the factors into two for ease of discussion, and they are external factors and internal working factors.

3.2 Project Plan and Schedule

A project plan is the listing or display that emerges when major project activities have been estimated, subjected to their logical sequences and timed. In an ideal situation, network analysis is usually a preferred method for producing a project plan.

On the other hand, a project schedule is obtained by doing further work on the project plan. The resources needed to execute the plan must have been estimated and then taken into account.

We can therefore, describe a project schedule as a working document that results from matching the organisations available resources to the project plan. From the foregoing, we can say that project plans and scheduling go hand in hand. They are usually linked.

3.3 The Planning Time Frame

Every project to be executed must have a time frame. There are two ways of considering a project time frame, namely: the free planning approach and the target led approach.

3.3.1 Free Planning Approach

Under the free planning approach, a set of physical and financial estimates are obtained and used to produce a project plan that predicts the completion time of the project. This predicted completion time will now be accepted by the project manager or team.

3.3.2 Target-Led Planning Approach

The target-led planning approach appears to be the direct opposite of the free planning approach. In the target-led planning approach, the project target delivery or completion date is determined well in advance. And so the project manager must work with the available resources to meet the target delivery date for the project. For example, if there is going to be an army exhibition on Independence Day (1 October), all the officers involved in the exhibition will take October 1 as the target date for the project delivery and work to meet the deadline.

It should be realised that target-led planning at times leads to project planners having to build overtime into the project just to ensure the completion.

If project plans are made with full consideration of the organisation's available resources, then the execution of the project will not encounter problems along the line.

SELF-ASSESSMENT EXERCISE 1

- i. Give meanings to project plan and project schedule. Is there any relationship between them?
- ii. Distinguished between free planning approach and target-led approach in relation to project time frame.

3.4 Project Matrix Charts

Let us briefly recall that every project consists of people, tasks and resources. These three items are present in every conceivable project. There must be a way or manner in which the three items will be organised to be able to ensure project execution.

Matrix charts list one set of factors at the extreme left-hand side of tabulation and on the right-hand side, factors directly associated with them across columns.

There are many variations of the matrix chart. In project management, matrix charts are very useful for managers who have the responsibility of allocating tasks to different people in a project team. Matrix charts are very useful for planning and controlling projects. The matrix charts can be used to allocate people to tasks, or tasks to people. In some cases, the matrix chart is used to allocate people to machines.

Table 1: Simple Matrix Chart for Planning and Controlling a Book Publishing Project

Book Title	Author	Fee agreed ₦	Due Date	Editing done
Introduction to strategy	C. Okoro	50,000	31/12/2007	NO
Corporate Strategy	A. Abdul	50,000	31/12/2007	NO
Competitive Strategy	P. Oshai	50,000	31/12/2007	NO
People Management	C. Okoro	50,000	31/12/2007	NO
Risk Management	J. Sanni	50,000	31/12/2007	NO
Basic Marketing	C. Okeke	50,000	31/12/2007	NO
Law of Contract	T. Okoro	50,000	31/12/2007	NO
Law of Evidence	T. Okoro	50,000	31/12/2007	Yes
Quality Management	A. Oshodi	50,000	31/12/2007	Yes
Network Management	A. Oshodi	50,000	31/12/2007	Yes
Basic Chemistry	W. Oke	50,000	31/12/2007	Yes
Basic Physics	W. Oke	50,000	31/12/2007	Yes
Bank Management	S. Hassan	50,000	31/12/2007	Yes
Marketing Management	A. Buka	50,000	31/12/2007	Yes

Table 2: Simple Matrix for Assigning Medical Students to Wards in a Medical Training Project

	Monday	Tuesday	Wednesday
A. Sunday	Surgery	Children	Accident
C. Sunday	Accident	Children	Surgery
C. John	Surgery	Children	Accident
A. Kolade	Accident	Children	Surgery
A. Sanni	Surgery	Children	Accident
P. Faruq	Accident	Children	Surgery
S. Emmanuel	Surgery	Children	Accident
A. Solomon	Accident	Children	Surgery
A. Steven	Surgery	Children	Accident
T. Collins	Accident	Children	Surgery
S. Tinubu	Surgery	Children	Accident
T. Oke	Accident	Children	Surgery
S. Amakiri	Surgery	Children	Accident

3.5 Bar Charts

Bar charts are derived from Gantt Charts named after their originator, Henry Gantt. Bar charts are used in planning and scheduling. They are very easy to draw and can be adapted to suit many planning and scheduling jobs.

When properly prepared, bar charts turn out to be very handy planning and scheduling aid to a project planner.

Task	Jan	Feb	March	April	May	June
Engineering design						
Materials purchase						
Manufacture						

Table 3: A Simple Project Bar Chart

In using the bar chart, the project manager will usually identify each task within a project and then go ahead to allocate a time frame for the completion of each task. With this information, the bar chart is then constructed.

SELF-ASSESSMENT EXERCISE 2

Discuss the external factors that affect project planning.

4.0 CONCLUSION

In this unit, we discussed the introduction to project planning and scheduling. We also discussed external and internal factors affecting project planning. We discussed project plans and schedules. We looked into the planning time frame as well as the project matrix charts and bar charts. All these help to improve our understanding of project planning and scheduling.

5.0 SUMMARY

This unit treats project planning and scheduling. It discusses the introductory elements necessary to understand project planning and schedules. It tries to expose how plans and schedules can assist in project execution.

6.0 TUTOR-MARKED ASSIGNMENT

How does a project plan differ from a project schedule?

7.0 REFERENCES/FURTHER READING

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UNIT 3 TYPES OF PLANNING FOR SUSTAINABLE BUSINESS SUCCESS

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Planning Definitions
 - 3.2 Strategic Plan
 - 3.3 Tactical Plan
 - 3.4 Operational Plan
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Readings

1.0 INTRODUCTION

May 6, 2015 in The Great Game of Business Springfield Remanufacturing Corporation (SRC) is well-known for high-involvement business planning structure.

Using this structure, we develop our strategic plans as a collective organization – involving literally *everyone* in the company, from hourly employees to management, in the planning process.

While it might seem extensive, this process proves an integral component of our open-book management structure. Over the years, involving everyone at all levels of the company has also proven repeatedly to generate positive results.

SRC uses four types of key planning that translate directly to our sustainable business success. Let's dig deeper into each of these four key types of planning.

2.0 OBJECTIVES

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

- Elucidate planning in occupation
- Explain five various nature of plan
- Understand the crucial component of strategic planning
- Highlight the characteristics of each of the plan

3.0 MAIN CONTENT

3.1 Planning in Occupation

The nature of planning in occupation varies and is peculiar with goals associated with it, irrespective of public or private occupation seven reasons serve as motives for

planning; namely; finance, strategic, contingency, crucial succession, tactical and operational.

1. Financing Planning: Long-term profit planning aimed at generating greater return on assets, growth in market share, and at solving foreseeable problems. It goes without saying that you must have a tangible financial plan for your business, but with the infinite number of ways you can develop yours, what do you do? When it comes to our financial planning, we've found the strongest results after following this handful of "musts":

- a. The plan must have buy-in from employees at all levels of the organization.
- b. The plan must be clearly communicated.
- c. The plan must be rooted in reality.
- d. The plan must be forward-looking.
- e. The plan must be reviewed formally; progress must be tracked on an ongoing basis.

2. Strategic Planning: A systematic process of envisioning a desired future, and translating this vision into broadly defined goals or objectives and a sequence of steps to achieve them. In addition to having a strong financial outlook, your company also needs a clear strategic vision. (Again, you probably already know this – it isn't rocket science!) We suggest doing a quick online search – you'll find several great templates that will guide you in establishing your strategic vision. The best one? Try the "High Involvement Planning Playbook."

Our simple SRC guidelines to strategic planning are as follows:

- You must have a believable, predictable sales line for the strategy to work.
- You must clearly analyze and address your company's opportunities, threats, strengths and weaknesses.
- You must have a clear intelligence on your competitors.
- You must have a realistic and detailed understanding of the marketplace and the economy.

3. Contingency Planning: A contingency plan is a plan devised for an outcome other than in the usual (expected) plan. It is often used for risk management when an exceptional risk that, though unlikely, would have catastrophic consequences. Contingency plans are often devised by governments or businesses. A study contingency plan is essential to growth and business success. After all, you need a "Plan-B" or a backup plan to launch when the unexpected happens, right? Contingency planning makes you proactive and serves as a source of innovation *and* business growth in and of itself (double win!). In short, a good contingency represents a researched and vetted realistic opportunity. If disaster strikes, activate contingencies in order to fill a void.

4. Succession Planning: Succession planning is a process for identifying and developing internal people with the potential to fill key business leadership positions

in the company. Succession planning increases the availability of experienced and capable employees that are prepared to assume these roles as they become available.

What if your manager or an executive left suddenly? Is your organization prepared to replace a major player on your team? While “missing” them is one thing, making sure your organization continues to grow beyond their departure is crucial to your overall success (obviously!). To make sure you don’t skip more than a beat, you need to beef up your succession planning process.

Succession planning, however, needs to be more than just naming a successor for major company positions. A strong succession plan creates opportunities for managers as well as succession candidates because with a developed successor in place, managers are primed to move into new positions and pursue opportunities when those arise as well. Therefore, succession candidates must be groomed, developed and prepared to step into a new role when the opportunity arises so that the multi-shift can happen simultaneously as needed (not to put off until candidates are “ready”). You won’t experience that lag time trying to figure out who can take over their responsibilities and continue on your path to growth without wasting time or additional resources.

3.2 Strategic Plan

A strategic plan is a high-level overview of the entire business, its vision, objectives, and value. This plan is the foundational basis of the organization and will dictate decisions in the long-term. The scope of the plan can be two, three, five, or even ten years.

Managers at every level will turn to the strategic plan to guide their decisions. It will also influence the culture within an organization and how it interacts with customers and the media. Thus, the strategic plan must be forward looking, robust but flexible, with a keen focus on accommodating future growth.

The crucial components of a strategic plan are:

1. Vision

Where does the organization want to be five years from now? How does it want to influence the world?

These are some of the questions you must ask when you delineate your organization’s vision. It’s okay if this vision is grandiose and idealistic. If there is any room to wax poetic within a plan, it is here. Holding ambitions to “make a dent in the Universe” (Apple/Steve Jobs) is acceptable, as is a more realistic vision to create the most “customer-centric company on Earth” (Amazon).

2. Mission

The mission statement is a more realistic overview of the company's aim and ambitions. Why does the company exist? What does it aim to achieve through its existence? A clothing company might want to "bring high street fashion to the masses", while a non-profit might want to "eradicate polio".

3. Values

"Inspire. Go above & beyond. Innovate. Exude passion. Stay humble. Make it fun"
These aren't fragments from a motivational speech, but Fab.com's values. Like Fab, each organization has its own values. These values will guide managers and influence the kind of employees you hire. There is no template to follow when jotting down the values. You can write a 1,000 page essay, or something as simple as Google's "Don't be Evil" – it's all up to you.

As you can see, there are really no rules to writing the perfect strategic plan. This is an open-ended, living document that grows with the organization. You can write whatever you want in it, as long as it dictates the future of your organization.

For inspiration, just search for the value/mission/vision statement of your favorite companies on Google. Or, consider taking this course on business planning for average people.

3.3 Tactical Plan

The tactical plan describes the tactics the organization plans to use to achieve the ambitions outlined in the strategic plan. It is a short range (i.e. with a scope of less than one year), low-level document that breaks down the broader mission statements into smaller, actionable chunks. If the strategic plan is a response to "What?", the tactical plan responds to "How?".

Creating tactical plans is usually handled by mid-level managers.

The tactical plan is a very flexible document; it can hold anything and everything required to achieve the organization's goals. That said, there are some components shared by most tactical plans:

1. Specific goals with fixed deadlines

Suppose your organization's aim is to become the largest shoe retailer in the city. The tactical plan will break down this broad ambition into smaller, actionable goals. The goal(s) should be highly specific and have fixed deadlines to spur action – expand to two stores within three months, grow at 25% per quarter, or increase revenues to \$1mn within six months, and so on.

2. Budgets

The tactical plan should list budgetary requirements to achieve the aims specified in the strategic plan. This should include the budget for hiring personnel, marketing, sourcing, manufacturing, and running the day-to-day operations of the company. Listing the revenue outflow/inflow is also a recommended practice.

3. Resources

The tactical plan should list all the resources you can muster to achieve the organization's aims. This should include human resources, IP, cash resources, etc. Again, being highly specific is encouraged.

4. Marketing, funding, etc.

Finally, the tactical plan should list the organization's immediate marketing, sourcing, funding, manufacturing, retailing, and PR strategy. Their scope should be aligned with the goals outlined above.

If you're struggling to create a strong tactical plan, this course on drafting great business plans will point you in the right direction.

3.4 Operational Plan

The operational plan describes the day to day running of the company. The operational plan charts out a roadmap to achieve the tactical goals within a realistic timeframe. This plan is highly specific with an emphasis on short-term objectives. "Increase sales to 150 units/day", or "hire 50 new employees" are both examples of operational plan objectives.

Creating the operational plan is the responsibility of low-level managers and supervisors.

Operational plans can be either single use, or ongoing, as described below:

1. Single use plans

These plans are created for events/activities with a single occurrence. This can be a one-time sales program, a marketing campaign, a recruitment drive, etc. Single use plans tend to be highly specific.

2. Ongoing plans

These plans can be used in multiple settings on an ongoing basis. Ongoing plans can be of different types, such as:

- **Policy:** A policy is a general document that dictates how managers should approach a problem. It influences decision making at the micro level. Specific plans on hiring employees, terminating contractors, etc. are examples of policies.
- **Rule:** Rules are specific regulations according to which an organization functions. The rules are meant to be hard coded and should be enforced stringently. “No smoking within premises”, or “Employees must report by 9 a.m.”, are two examples of rules.
- **Procedure:** A procedure describes a step-by-step process to accomplish a particular objective. For example: most organizations have detailed guidelines on hiring and training employees, or sourcing raw materials. These guidelines can be called procedures.

Ongoing plans are created on an ad-hoc basis but can be repeated and changed as required.

Operational plans align the company’s strategic plan with the actual day to day running of the company. This is where the macro meets the micro. Running a successful company requires paying an equal attention to now just the broad objectives, but also how the objectives are being met on an everyday basis, hence the need for such intricate planning

4.0 CONCLUSION

Planning have variance methods either in public or private some core areas which planning approach in job are discussed include; finance, strategic, contingency, crucial succession, tactical and operational. The measure, methods and uniqueness of each has being explained which can aid Project Planning Management, Monitoring and Evaluation

5.0 SUMMARY

The discussion in this unit entails; nature of occupation planning with components and factors associated with it. The need to understand planning, proper utilization through integration of vision, mission and values resources, and budgets e.t.c makes blueprint accomplished.

6.0 TUTOR-MARKED ASSIGNMENT

- List the types of nature of occupation planning and explain five
- Explain the types of operational plan.

7.0 REFERENCES/FURTHER READINGS

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UNIT 4 PROJECT MANAGEMENT

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 What is Project Management?
 - 3.2 International Standards and Guidelines
 - 3.3 Project Management Processes
 - 3.4 Project vs. Product Life Cycles
 - 3.5 What is the Value of Project Management?
 - 3.6 How Project Management Relates to Other Disciplines
 - 3.7 The Project Management Profession
 - 3.8 Project Planning
 - 3.9 Programme Evaluation and Review Technique and Critical Path Method (PERT and CPM)
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor Marked Assignment
- 7.0 References

1.0 INTRODUCTION

This unit is designed to introduce you to the basic concepts and definitions associated with project management. You will learn about the triple constraints of scope, time and cost; the nine functional knowledge areas associated with project management and the four major phases of a project. You will also learn about the skills and tools used to integrate all of the knowledge areas throughout a project's lifecycle. You will also learn how to use the CPM and PERT techniques in solving project related problems.

2.0 OBJECTIVES

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

1. Define project management
2. Identify the "body of knowledge areas" in project management.
3. List and explain the processes involved in project management.
4. Describe the project vs product cycle.
5. Define the value of project management.
6. Discuss the concept of project planning.
7. Solve problems using PERT and CPM techniques.

3.0 MAIN CONTENT

3.1 What is Project Management?

Project Management has been called an accidental profession. In many organisations in the past, project managers typically stumbled or fell into project management responsibilities. The world has since changed and project management is now recognised globally as a formal discipline, with international standards and guidelines

and a growing knowledge base of best practices. Project management is the application of skills and knowledge and the use of tools and techniques applied to activities in a project to complete the project as defined in the scope. Project management is not only the use of a scheduling tool such as Microsoft Project, Scheduler Plus, etc. Many organisations still do not understand that the ability to use a scheduling tool is not enough to successfully manage a project. The use of a tool is only one part of the equation. Project management requires a high level of skill in both the people and technical side of the discipline for successful projects to result. If we consider that the tasks in a project are completed by people, this then sheds an entirely different light to the concept of project management and should make it clear that for successful project management the right combination of skills can impact on success and project outcomes. The world is changing very rapidly with added complexities, increased expectations and constant change. Project Management is an effective process for organisations to address business needs to get products and services to market more quickly and preferably before the competition.

3.2 International Standards and Guidelines

Project Management is a formal discipline with international standards and guidelines developed by the Project Management Institute (PMI). A significant body of knowledge has been accumulated specifically over the past 5 years relating to effective project management practices, tools, techniques and processes across industries. PMI is recognised as the international body providing guidance and direction for the discipline. PMI has developed the “Project Management Body of Knowledge” or “PMBOK” the essential knowledge areas and processes required to effectively manage projects. There are nine “body” of knowledge areas within the standards and guidelines.

- **Integration Management** – Processes to ensure that the elements of the project are effectively coordinated. Integration management involves making decisions throughout the project in terms of objectives and alternative approaches to meet or exceed stakeholder expectations.

- **Scope Management** - processes to ensure that all the work required to complete the project is defined. Defining what is or is not in scope.

- **Time Management** – all processes required to ensure that the project completes on time (defined schedule).

Cost Management – all processes required to ensure the project is completed within the budget approved for the project.

- **Quality Management** – processes to ensure that the project delivers the need for which it was undertaken. Includes all quality processes such as quality policy, objectives, and responsibility and implements these through quality planning, quality assurance, quality control and quality improvement.

- **Risk Management** – all processes involved in identifying, assessing/analysing, responding and controlling project risk.
- **Human Resource Management** – all processes required to make the most effective use of people resources in a project, including sponsor, stakeholders, partners, team etc.
- **Communications Management** – all processes to ensure timely and appropriate distribution of project information, includes providing links between key people in the project, generating, collecting, disseminating, storing and archival of project information.
- **Procurement Management** – processes to acquire goods and services for the project outside of the organisation.

3.3 Project Management Processes

Project Management processes define, organise and complete the work defined for the project. There are five project management process areas that apply to most projects and are defined in the PMBOK:

- **Initiating Processes** – authorising the project or phase.
- **Planning Processes** – defining the project objectives and selecting the most appropriate approach for the project to attain the objectives.
- **Executing Processes** – managing the resources required to carry out the project as defined in the plan.
- **Controlling Processes** – ensuring that project objectives are met as defined by monitoring, measuring progress against plan, identifying variance from plan and taking corrective action.
- **Closing Processes** – formalising acceptance of a phase and or the project and closing all associated activities. Project management is integrative and to effectively manage a project, a project manager uses all of the body of knowledge areas and all of the processes throughout the life cycle of a project.

The following diagram is a sample of a standard four phase project life cycle.

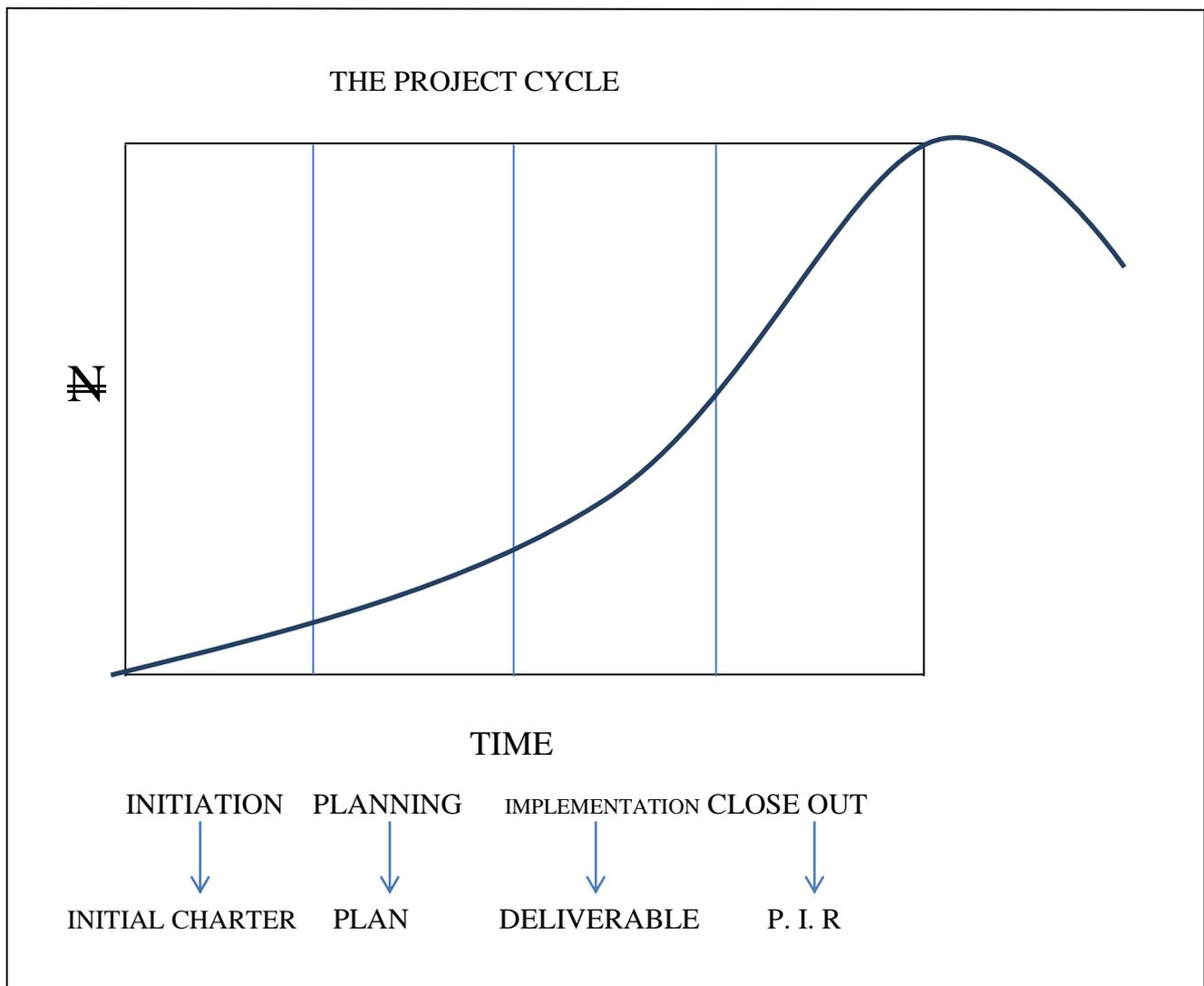


Fig. 12.1: The product cycle

3.4 Project vs. Product Life Cycles

Those of you involved in information technology fields have likely heard of the systems development life cycle (SDLC) – a framework for describing the phases involved in developing and maintaining IT systems. This is an example of a **product** life cycle. The project life cycle applies to all projects (regardless of product produced) whereas a product life cycle varies depending on the nature of the product. Many products (such as large IT systems) are actually developed through a series of several different projects. Large projects are seldom given full funding and approval from the beginning. Usually a project has to successfully pass through each of the project phases before continuing to the next. The practice of ‘progressive resource commitment’ also means you only get the money for the next phase after the prior phase has been completed and there is an opportunity for management review to evaluate progress, probability of success

and continued alignment with organisational strategy. These management points are often called *phase exits, kill points or stage gates*.

3.5 What is the Value of Project Management?

Project Management increases the probability of project success. Project Management is change facilitation, and used effectively with appropriate processes, tools, techniques and skills will:

- Support the Business
- Get the product or service to market effectively, efficiently and to quality standards
- Provide common approach to project management
- Improve service

Project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project.

3.6 How Project Management Relates to Other Disciplines

Project management overlaps with general management knowledge and practice, as well as with the project's application areas, knowledge, and practice. Project managers focus on integrating all the pieces required for project completion. General managers or operational managers tend to focus on a particular discipline or functional area. In this respect, project management tends to be a cross-functional role, often involving people from various business areas and divisions. While project management requires some fundamental understanding of the knowledge area of the project itself, the project manager does not have to be an expert in that field. You don't need to be a certified carpenter, plumber, and electrician in to manage the construction of your house, but you do need to have a least a fundamental understanding of each trade or discipline.

3.7 The Project Management Profession

The Project Management Institute (PMI) provides certification as a project management professional (PMP). The requirements include verification of from 4500 to 7500 hours of project management experience (depending on education level), adherence to a Code of Ethics, and obtaining a score of 70% or higher on a 200-question multiple choice certification exam. For further information see the PMI Internet website at <http://www.PMI.org>.

3.8 Project Planning

We are going to take a quick look at the elements of project planning, starting with the project life cycle and then examine the importance of detailed planning to the overall success of the project. Without a clear definition of the project, it's impossible to discern what should be delivered as a result. If requirements are not clear, your project will be impossible to control, and it will become unmanageable. We will review the fundamentals of planning and then move on to the importance of developing a comprehensive work breakdown structure.

Today's organisations are running at a fast pace. More so than ever, organisations are faced with increasing global competition and as such, want products and services delivered yesterday. Organisations are struggling with multiple projects, tight deadlines and fewer skilled resources available to manage these projects. Project managers are struggling with the concepts of best practices and the reality of life in a corporation.

Often, insufficient time is provided for planning the project appropriately and as a result projects consistently fail to produce the expected results, have cost or time overruns, or just plain fail. In such cases, the project manager can usually look back on his or her experiences and see what went wrong, vowing never to make the same mistake again. Sometimes, however, the cycle continues. Whether you manage a small, medium or large size project, effective planning of the project is the single most critical step to success. Too many project managers either neglect or spend too little time and effort planning. The tendency is to rush to implementation before a clear picture is developed. The project definition must be clear and understood by the stakeholders and the team. Often the directive from the project sponsor is "Just do it" or "We need this in place by next week", "we don't have the luxury to spend time planning, we need to do the project", not allowing the time up front to conduct proper planning activities. Failure to plan, however, usually results in failure to survive. Without a clearly defined scope, the project has no sustainable basis for success.

Building a detailed project plan forces the team and the stakeholders to realistically assess the proposed project. What will the outcome be when the project is finished? What will you have? – product, service? What will the product/service look like? What are the must have, nice to have features of the product/service? What is the current situation? What is the desired outcome? What are the obstacles keeping you from closing the gap? Who are the primary and secondary stakeholders? What is the problem/change? What are the assumptions/constraints and objectives of the project? The planning stage of the project includes setting broad-based goals and designing strategies and action plans to reach these goals. E2 Project Management, Block Two Page 3 of 22 Project planning is a dynamic, "cyclical" process that continues throughout the project life cycle.

Planning must take place to deal with problems, change or risks as they occur in the project. Planning begins with the identified and agreed to requirements in mind. It is critical to the success of the project to understand your destination when you start. You will know where you are going and you will have developed plans to arrive at the goal and complete the project successfully. Project managers must learn how to develop a project strategy and plan regarding how to implement that plan. Your organisation, team and stakeholders *depend* on it. Project planning is a cycle that is repeated on an on-going basis. For the duration of the project, it is never a finished process. Why? Because resources change or move, factors in the organisation may change causing project objectives to change, unknown risks can occur, or technology may change, requiring project managers to continually monitor and manage this process throughout the life of the project.

The following diagram illustrates the “Project Life Cycle” and the cyclical nature of planning activities.

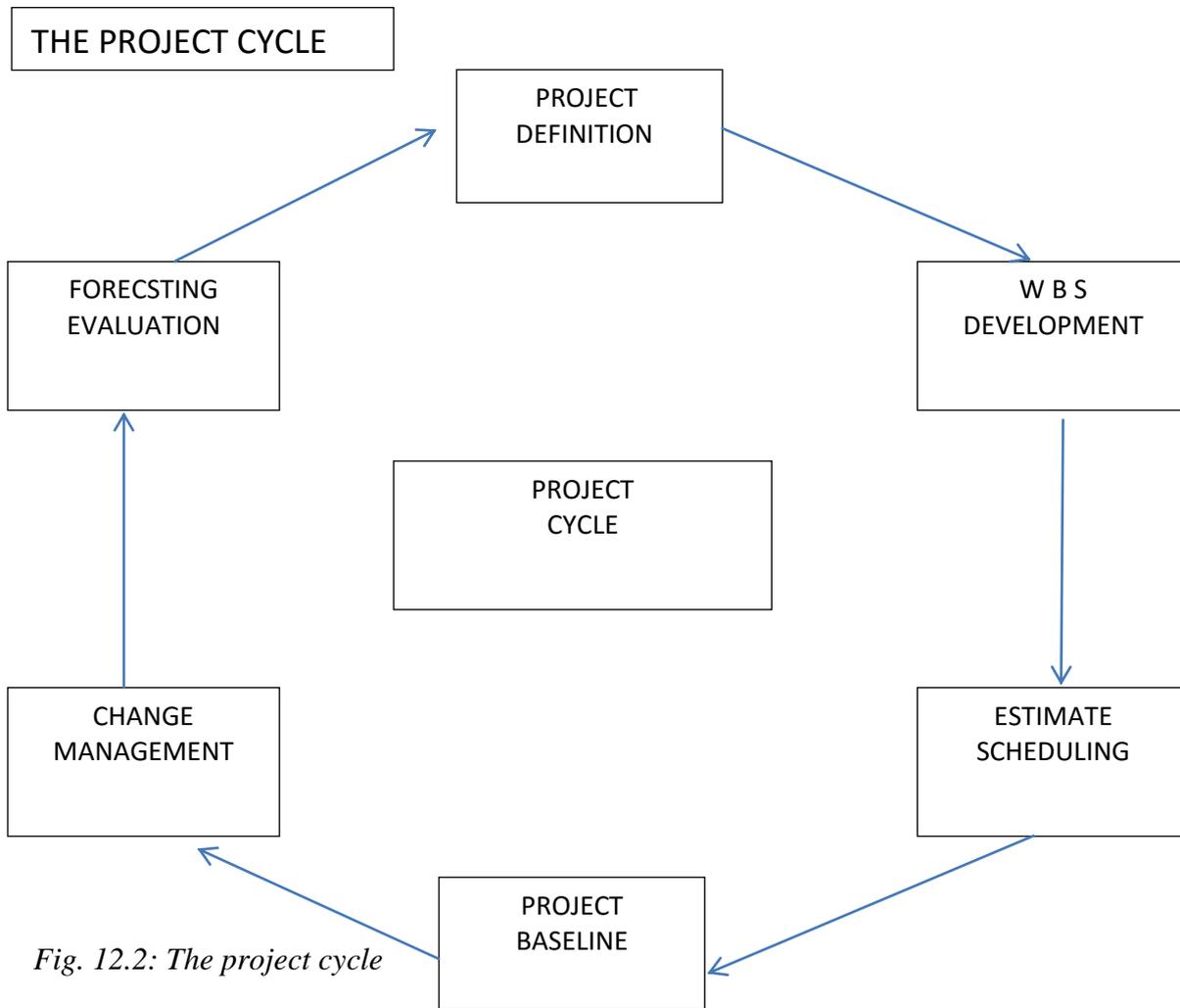


Fig. 12.2: The project cycle

3.9 PROGRAMME EVALUATION AND REVIEW TECHNIQUE AND CRITICAL PATH METHOD (PERT AND CPM)

Programme Evaluation and Review Technique (PERT) and Critical Path Method (CPM) are two techniques that are widely used in planning and scheduling the large projects. A project is a combination of various activities. For example, Construction of a house can be considered as a project. Similarly, conducting a public meeting may also be considered as a project. In the above examples, construction of a house includes various activities such as searching for a suitable site, arranging the finance, purchase of materials, digging the foundation, construction of superstructure etc. Conducting a meeting includes, printing of invitation cards, distribution of cards, arrangement of platform, chairs for audience etc. In planning and scheduling the activities of large sized projects, the two network techniques — PERT and CPM — are used conveniently to estimate and evaluate the project completion time and control there sources to see that the project is completed within the stipulated time and at

minimum possible cost. Many managers, who use the PERT and CPM techniques, have claimed that these techniques drastically reduce the project completion time. But it is wrong to think that network analysis is a solution to all bad management problems. In the present chapter, let us discuss how PERT and CPM are used to schedule the projects. Initially, projects were represented by **milestone chart** and **bar chart**. But they had little use in controlling the project activities. **Bar chart** simply represents each activity by bars of length equal to the time taken on a common time scale as shown in figure 15. 1. This chart does not show interrelationship between activities. It is very difficult to show the progress of work in these charts. An improvement in bar charts is **milestone chart**. In milestone chart, key events of activities are identified and each activity is connected to its preceding and succeeding activities to show the logical relationship between activities. Here each key event is represented by a node (a circle) and arrows instead of bars represent activities, as shown in figure the figures below. The extension of milestone chart is PERT and CPM network methods.

Y

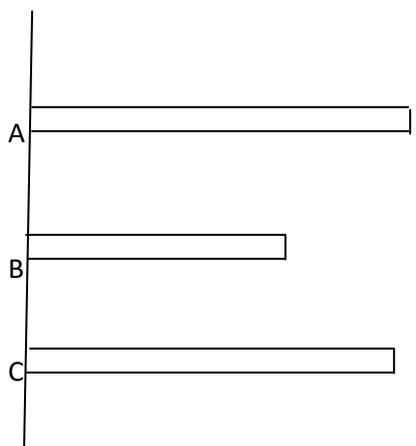


Fig. 12.3a: Bar Chart

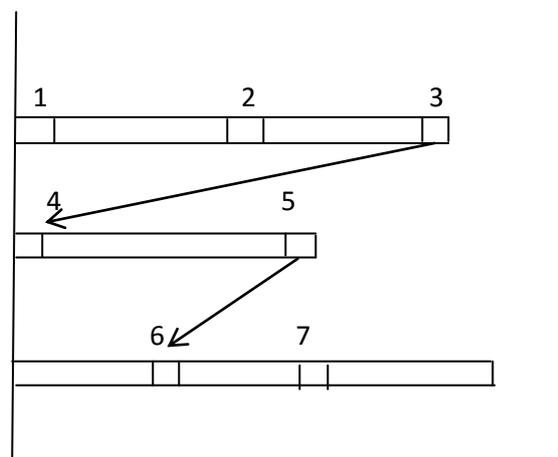


Fig. 4.3b: Milestone Chart.

In PERT and CPM the milestones are represented as *events*. Event or node is either starting of an activity or ending of an activity. Activity is represented by means of an arrow, which is resource consuming. Activity consumes resources like time, money and materials. Event will not consume any resource, but it simply represents either starting or ending of an activity. Event can also be represented by rectangles or triangles. When all activities and events in a project are connected logically and sequentially, they form a *network*, which is the basic document in network-based management. The basic steps for writing a network are:

(a) List out all the activities involved in a project. Say, for example, in building construction, the activities are:

- (i) Site selection,
- (ii) Arrangement of Finance,
- (iii) Preparation of building plan,
- (iv) Approval of plan by municipal authorities,

- (v) Purchase of materials,
- (vi) Digging of foundation,
- (vii) Filling up of foundation,
- (viii) Building superstructure,
- (ix) Fixing up of doorframes and window frames,
- (x) Roofing,
- (xi) Plastering,
- (xii) Flooring,
- (xiii) Electricity and water fittings,
- (xiv) Finishing.

(b) Once the activities are listed, they are arranged in sequential manner and in logical order. For example, foundation digging should come before foundation filling and so on. Programme Evaluation and Review Technique and Critical Path Method (PERT and CPM)

(c) After arranging the activities in a logical sequence, their time is estimated and written against each activity. For example: Foundation digging: 10 days, or 1½ weeks.

(d) Some of the activities do not have any logical relationship, in such cases; we can start those activities simultaneously. For example, foundation digging and purchase of materials do not have any logical relationship. Hence both of them can be started simultaneously. Suppose foundation digging takes 10 days and purchase of materials takes 7 days, both of them can be finished in 10 days. And the successive activity, say foundation filling, which has logical relationship with both of the above, can be started after 10 days. Otherwise, foundation digging and purchase of materials are done one after the other; filling of foundation should be started after 17 days.

(e) Activities are added to the network, depending upon the logical relationship to complete the project network.

Some of the points to be remembered while drawing the network are

- (a) There must be only one beginning and one end for the network, as shown in figures bellow.

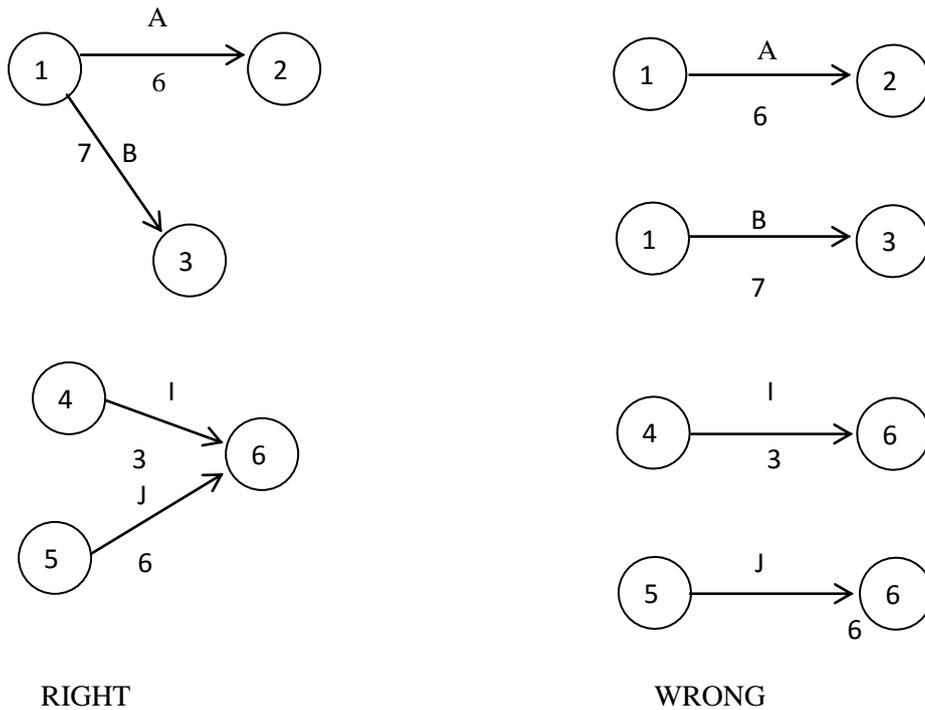


Fig. 12.4: Writing the network.

(b) Event number should be written inside the circle or node (or triangle/square/rectangle etc). Activity name should be capital alphabetical letters and would be written above the arrow. The time required for the activity should be written below the arrow as in the figure below.

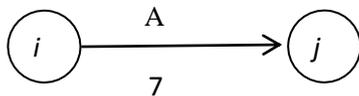
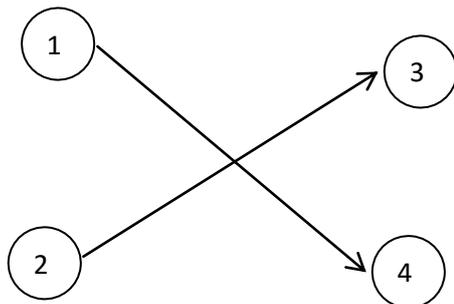


Fig. 12.5: Numbering and naming the activities.

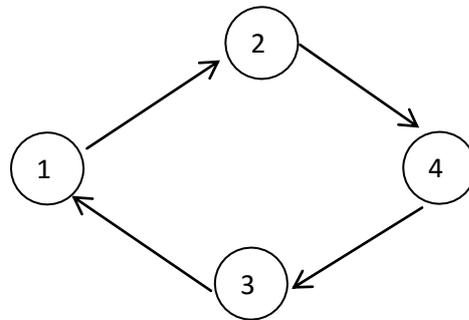
(c) While writing network, see that activities should not cross each other. And arcs or loops as in figures above should not join Activities.



WRONG

Fig .12.6: Crossing of activities not allowed

(d) While writing network, looping should be avoided. This is to say that the network arrows should move in one direction, *i.e.* starting from the beginning should move towards the end, as in figure 15.6.



WRONG

Fig .12.7: Looping is not allowed.

(e) When two activities start at the same event and end at the same event, they should be shown by means of a **dummy activity** as in figure 15.7. Dummy activity is an activity, which simply shows the logical relationship and does not consume any resource. It should be represented by a dotted line as shown. In the figure, activities *C* and *D* start at the event 3 and end at event 4. *C* and *D* are shown in full lines, whereas the dummy activity is shown in dotted line.

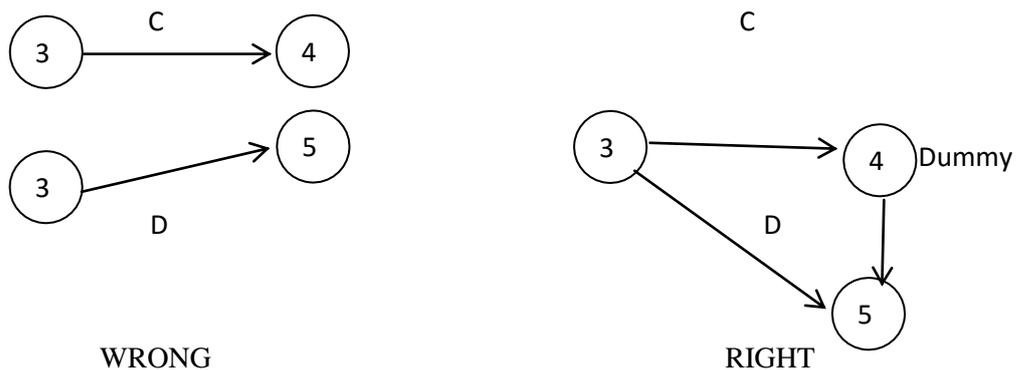


Fig . 12.8: Use of Dummy activity.

(f) When the event is written at the tail end of an arrow, it is known as *tail event*. If event is written on the head side of the arrow it is known as *head event*. A tail event may have any number of arrows (activities) emerging from it. This is to say that an event may be a tail event to any number of activities. Similarly, a head event may be a head event for any number of activities. This is to say that many activities may conclude at one event. This is shown in figure 15.8.

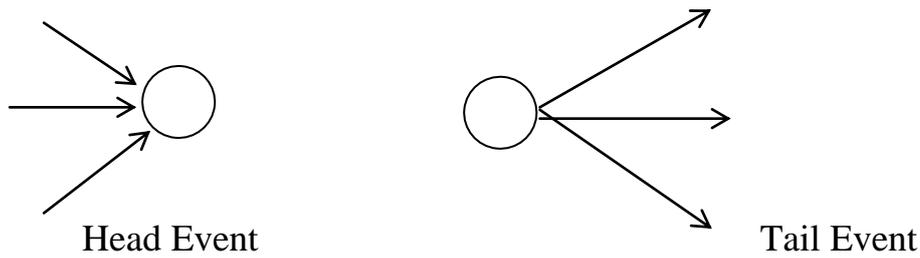


Fig .12.9: Tail event and Head event

The academic differences between PERT network and CPM network are:

(i) PERT is event oriented and CPM is activity oriented. This is to say that while discussing about PERT network, we say that Activity 1-2, Activity 2-3 and so on. Or event 2 occurs after event 1 and event 5 occurs after event 3 and so on. While discussing CPM network, we say that Activity A follows activity B and activity C follows activity B and so on. Referring to the network shown in figure 9, we can discuss as under. PERT way: Event 1 is the predecessor to event 2 or event 2 is the successor to event 1. Events 3 and 4 are successors to event 2 or event 2 is the predecessor to events 3 and 4. CPM way: Activity 1-2 is the predecessor to Activities 2-3 and 2-4 or Activities 2-3 and 2-4 are the successors to activity 1-2.

(ii) PERT activities are probabilistic in nature. The time required to complete the PERT activity cannot be specified correctly. Because of uncertainties in carrying out the activity, the time cannot be specified correctly. Say, for example, if you ask a contractor how much time it takes to construct the house, he may answer you that it may take 5 to 6 months. This is because of his expectation of uncertainty in carrying out each one of the activities in the construction of the house. Another example is if somebody asks you how much time you require to reach railway station from your house, you may say that it may take 1 to 1½ hours. This is because you may think that you may not get a transport facility in time. Or on the way to station, you may come across certain work, which may cause delay in your journey from house to station. Hence PERT network is used when the activity times are probabilistic.

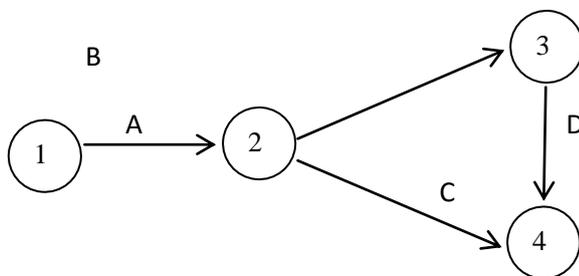


Fig. 12.10. Logical relationship in PERT and CPM

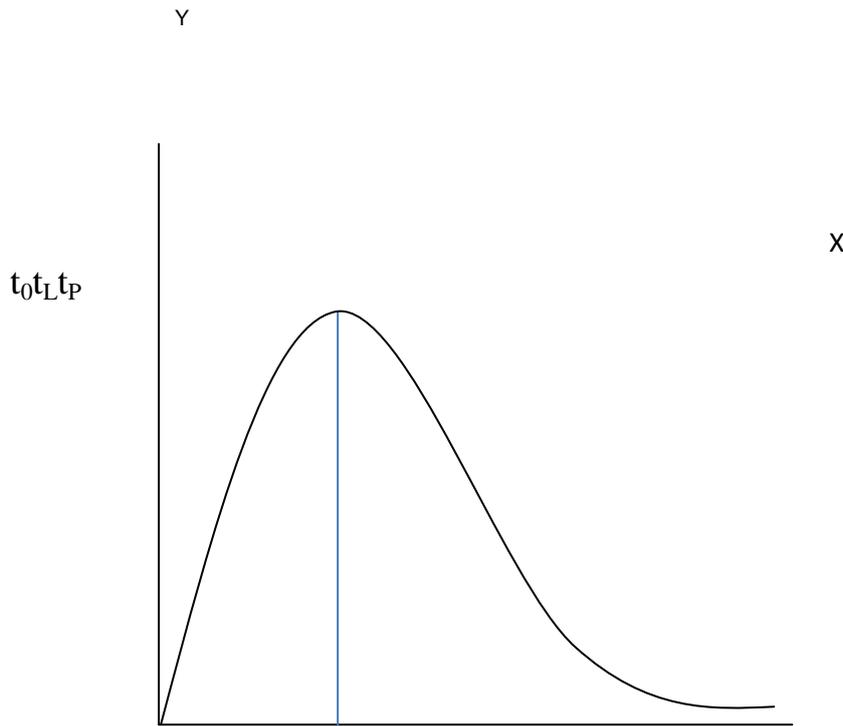


Fig. 12.11: Three Time Estimates

There are three time estimates in PERT, they are:

(a) **OPTIMISTIC TIME:** Optimistic time is represented by t_0 . Here the estimator thinks that everything goes on well and he will not come across any sort of uncertainties and estimates lowest time as far as possible. He is optimistic in his thinking.

(b) **PESSIMISTIC TIME:** This is represented by t_p . Here estimator thinks that everything goes wrong and expects all sorts of uncertainties and estimates highest possible time. He is pessimistic in his thinking.

(c) **LIKELY TIME:** This is represented by t_L . This time is in between optimistic and pessimistic times. Here the estimator expects he may come across some sort of uncertainties and many a time the things will go right. So while estimating the time for a PERT activity, the estimator will give the three time estimates. When these three estimates are plotted on a graph, the probability distribution that we get is closely associated with **Beta Distribution curve**. For a Beta distribution curve as shown in figure 6.10, the characteristics are:

Standard deviation = $(t_P - t_O)/6 = \sigma$, $t_P - t_O$ is known as range.

Variance = $\{(t_P - t_O)/6\}^2 = \sigma^2$

Expected Time or Average Time = $t_E = (t_O + 4t_L + t_P) / 6$

These equations are very important in the calculation of PERT times. Hence the student has to remember these formulae. Now let us see how to deal with the PERT problems.

(d) **Numbering of events:** Once the network is drawn the events are to be numbered. In PERT network, as the activities are given in terms of events, we may not experience difficulty. Best in case of CPM network, as the activities are specified by their name, is we have to number the events. For numbering of events, we use D.R. Fulkerson's rule.

As per this rule: An initial event is an event, which has only outgoing arrows from it and no arrow enters it. Number that event as 1. Delete all arrows coming from event 1. This will create at least one more initial event. Number these initial events as 2, 3 etc. Delete all the outgoing arrows from the numbered element and which will create some more initial events. Number these events as discussed above. Continue this until you reach the last event, which has only incoming arrows and no outgoing arrows. While numbering, one should not use negative numbers and the initial event should not be assigned 'zero'. When the project is considerably large, at the time of execution of the project, the project manager may come to know that some of the activities have been forgotten and they are to be shown in the current network. In such cases, if we use **skip numbering**, it will be helpful. Skip numbering means, skipping of some numbers and these numbers may be made use to represent the events forgotten. We can skip off numbers like 5, 10, 15 etc. or 10, 20 and 30 or 2, 12, 22 etc.

Another way of numbering the network is to start with 10 and the second event is 20 and so on. This is a better way of numbering the events. Let now see how to write network and find the project completion time by solving some typical problems.

Example 12.1.

A project consists of 9 activities and the three time estimates are given below. Find the project completion time (TE).

1. Write the network for the given project and find the project completion time?
Activities

<i>Activities</i>		<i>Days</i>		
<i>I</i>	<i>j</i>	T_0	T_L	T_P
10	20	5	12	17
10	30	8	10	13
10	40	9	11	12
20	30	5	8	9
20	50	9	11	13
40	60	14	18	22
30	70	21	25	30
60	70	8	13	17
60	80	14	17	21
70	80	6	9	12

Solution

In PERT network, it is easy to write network diagram, because the successor and predecessor event relationships can easily be identified. While calculating the project completion time, we have to calculate t_e *i.e.* expected completion time for each activity from the given three-time estimates. In case we calculate project completion time by using t_0 or t_l or t_p separately, we will have three completion times. Hence it is advisable to calculate t_e expected completion time for each activity and then the project completion time. Now let us work out expected project completion time.

Predecessor Event event	Successor	Time in days			$T_E =$ $(t_o + 4t_L + t_P)/6$	Range $t_P - t_o$	S.D. (\square) $(t_P - t_o)/6$	Variance \square_2
		5	12	17				
10	20	5	12	17	9.66 (10)	12	2	4
10	30	8	10	13	10.17 (10)	5	0.83	0.69
10	40	9	11	12	10.83 (11)	3	0.5	0.25
20	30	5	8	9	7.67 (8)	4	0.66	0.44
20	50	9	11	13	11.00 (11)	4	0.66	0.44
40	60	14	18	22	18.00 (18)	8	1.33	1.78
30	70	21	25	30	25.18 (25)	9	1.5	2.25
60	70	8	13	17	12.83 (13)	9	1.5	2.25
50	80	14	17	21	17.17 (17)	7	1.16	1.36
70	80	6	9	12	9.00 (9)	6	1.0	1.0

For the purpose of convenience the t_E got by calculation may be rounded off to nearest whole number (the same should be clearly mentioned in the table). The round off time is shown in brackets. In this book, in the problems, the decimal, will be rounded off to nearest whole number. To write the network program, start from the beginning *i.e.* we have 10 – 20, 10 – 30 and 10 – 40. Therefore from the node 10, three arrows emerge. They are 10 – 20, 10 – 30 and 10 – 40. Next from the node 20, two arrows emerge and they are 20 – 30 and 20 – 50. Likewise the network is constructed. The following convention is used in writing network in this book.

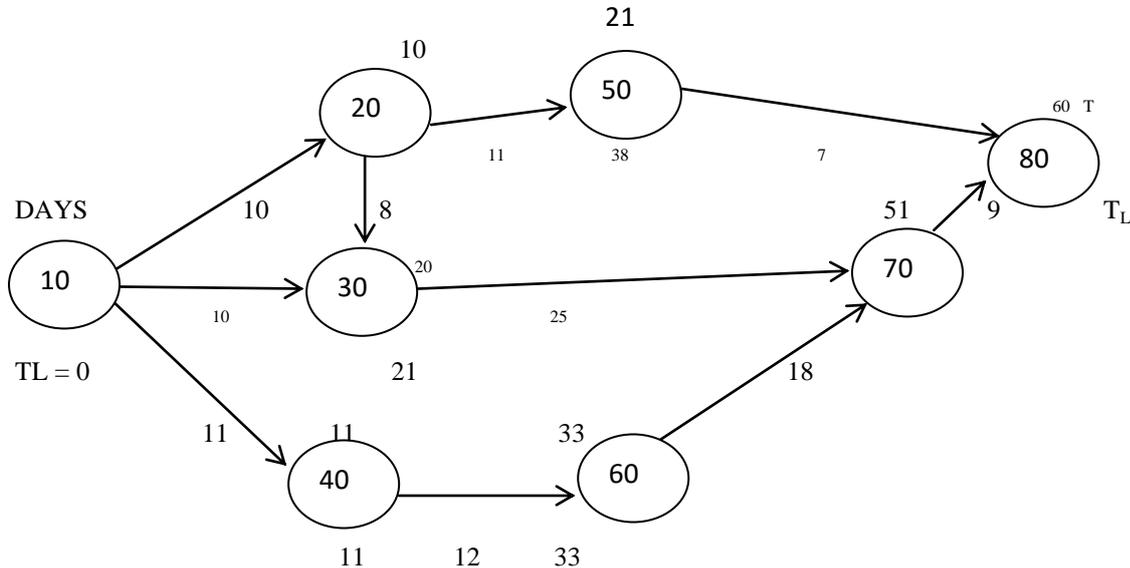


Fig: 12.12. Network for Problem

Let us start the event 10 at 0th time *i.e.* expected time $T_E = 0$. Here T_E represents the occurrence time of the event, whereas t_E is the duration taken by the activities. T_E belongs to event, and t_E belongs to activity.

$$T_E^{10} = 0$$

$$T_E^{20} = T_E^{10} + t_E^{10-20} = 0 + 10 = 10 \text{ days}$$

$$T_E^{30} = T_E^{10} + t_E^{10-30} = 0 + 10 = 10 \text{ days}$$

$$T_E^{30} = T_E^{20} + t_E^{20-30} = 10 + 8 = 18 \text{ days}$$

The event 30 will occur only after completion of activities 20–30 and 10–30. There are two routes to event 30. In the **forward pass** *i.e.* when we start calculation from 1st event and proceed through last event, we have to work out the times for all routes and select the **highest one** and the **reverse** is the case of the **backward pass** *i.e.* we start from the last event and work back to the first event to find out the occurrence time.

$$T_E^{40} = T_E^{10} + t_E^{10-40} = 0 + 11 = 11 \text{ days}$$

$$T_E^{50} = T_E^{20} + t_E^{20-50} = 10 + 11 = 21 \text{ days}$$

$$T_E^{60} = T_E^{40} + t_E^{40-60} = 11 + 18 = 29 \text{ days}$$

$$T_E^{70} = T_E^{30} + t_E^{30-70} = 18 + 25 = 43 \text{ days}$$

$$T_E^{70} = T_E^{60} + t_E^{60-70} = 29 + 13 = 42 \text{ days}$$

$$T_E^{80} = T_E^{70} + t_E^{70-80} = 43 + 9 = 52 \text{ days}$$

$$T_E^{80} = T_E^{50} + t_E^{50-80} = 21 + 17 = 38 \text{ days}$$

$T_E^{80} = 52$ days. Hence the project completion time is 52 days. The path that gives us 52 days is known as **Critical path**. Hence 10–20–30–70–80 is the critical path. Critical path is represented by a hatched line (). All other parts *i.e.* 10–40–60–70–80, 10–20–50–80 and 10–30–70–80 are known as **non-critical paths**. All activities on critical path are **critical activities**.

4.0 CONCLUSION

Project management is the application of skills and knowledge and the use of tools and techniques applied to activities in a project to complete the project as defined in the scope. Project management is not only the use of a scheduling tool such as Microsoft Project and Scheduler Plus. Project management overlaps with general management knowledge and practice, as well as with the project's application areas, knowledge, and practice. Project managers focus on integrating all the pieces required for project completion. General managers or operational managers tend to focus on a particular discipline or functional area.

Programme Evaluation and Review Technique (PERT) and Critical Path Method (CPM) are two techniques that are widely used in planning and scheduling the large projects. PERT is event oriented and CPM is activity oriented. PERT activities are probabilistic in nature in the sense that the time required to complete the PERT activity cannot be specified correctly. Because of uncertainties in carrying out the activity, the time cannot be specified correctly

5.0 SUMMARY

This unit treats the concept of project management. We defined Project management as the application of skills and knowledge and the use of tools and techniques applied to activities in a project to complete the project as defined in the scope. Project Management is a formal discipline with international standards and guidelines developed by the Project Management Institute (PMI). Project Management processes

define, organise and complete the work defined for the project. There are five project management process areas that apply to most projects. They are: Initiating Processes, Planning Processes, Executing Processes, Controlling Processes, and Closing Processes. Programme Evaluation and Review Technique (PERT) and Critical Path Method (CPM) are two techniques that are widely used in planning and scheduling the large projects. A project is a combination of various activities. The basic steps for writing a network are: Listing out all the activities involved in a project, once the activities are listed, they are arranged in sequential manner and in logical order, after arranging the activities in a logical sequence, their time is estimated and written against each activity, in a situation where some of the activities do not have any logical relationship can start those activities simultaneously, add activities to the network, and when two activities start at the same event and end at the same event, they should be shown by means of a dummy activity. The academic differences between PERT network and CPM network include the fact that PERT is event oriented and CPM is activity oriented, and that PERT activities are probabilistic in nature.

6.0 TUTOR MARKED ASSIGNMENT

1. Define project management.
2. Discuss the interrelationship between project management and other disciplines.
3. Identify and explain the five project management process areas that apply to most projects.
4. Identify and discuss two techniques that are widely used in planning and scheduling the large projects.
5. Differentiate between PERT and CPM.

7.0 REFERENCES

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UNIT 5 REPLACEMENT MODEL

- 1.0 Introduction
- 2.0 Objection
- 3.0 Main Content
 - 3.1 Definition of Replacement Model
 - 3.2 Equipment Maintenance/ Replacement/ Reengineering
 - 3.3 Conventional Replacement Problem
 - 3.4 Types of Failures
 - 3.5 Replacement of items with Gradual Deterioration
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor Marked Assignment
- 7.0 References

1.0 INTRODUCTION

If any equipment or machine is used for a long period of time, due to wear and tear, the item tends to worsen. A remedial action to bring the item or equipment to the original level is desired. Then the need for replacement becomes necessary. This need may be caused by a loss of efficiency in a situation leading to economic decline. By efflux of time the parts of an item are being worn out and the cost of maintenance and operation is bound to increase year after year. The resale value of the item goes on diminishing with the passage of time. The depreciation of the original equipment is a factor, which is responsible not to favour replacement because the capital is being spread over a long time leading to a lower average cost. Thus there exists an economic trade-off between increasing and decreasing cost functions. We strike a balance between the two opposing costs with the aim of obtaining a minimum cost. The problem of replacement is to determine the appropriate time at which a remedial action should be taken which minimizes some measure of effectiveness. Another factor namely technical and / or economic obsolescence may force us for replacement.

2.0 OBJECTIVES

At the this study unit, you should be able to

- 1 Define Replacement Model
- 2 Explain the Equipment Maintenance/ Replacement/ Reengineering
- 3 Identify the types of failures

3.0 MAIN CONTENT

3.1 DEFINITION OF REPLACEMENT MODEL

The Replacement Theory in Operations Research is used in the decision making process of replacing a used equipment with a substitute; mostly a new equipment of better usage. The replacement might be necessary due to the deteriorating property or failure or breakdown of particular equipment

In fact, in any system the efficacy (efficiency) of an item deteriorates with time. In such cases, either the old item should be replaced by a new item, or some kind of

restorative action (maintenance) is necessary to restore the efficiency of the whole system.

The cost of maintenance depends upon a number of factors, and a stage comes at which the maintenance cost is so large that it is more profitable to replace the old item. Thus, there is a need to formulate the most effective replacement policy.

Replacement models are concerned with the problem of replacement of machines, individuals, capital assets, etc. due to their deteriorating efficiency, failure, or breakdown. It is evident that the study of replacement is a field of application rather than a method of analysis. Actually, it is concerned with methods of comparing alternative replacement policies.

3.2 EQUIPMENT MAINTENANCE/ REPLACEMENT/ REENGINEERING

To decide the effective mode of maintenance it is essential to carry out reliability analysis of critical parts of the equipment in all modern automated and semi-automated plants. These critical parts may be individual pieces of equipment or a combination of parts that from systems.

Before considering the purchase of any capital equipment, the evaluation of its reliability is essential, which directly depends upon the probability of failures. It is desirable to obtain a reliability index (numerical value) for each machine which is based on such factors as visual inspection tests and measurements, age, environment duty cycle of the equipment. These numbers, so calculated, represent the reliability of particular equipment. It is also possible to combine these indices and express an aggregate reliability index number for the complete system.

From the evaluation of the above index numbers, schedules can be set for equipment maintenance. Wherever needed, the maintenance efforts can be expanded. From the reliability reports it is possible to determine the actions that are required to maintain the operational availability at the desired level. Cost estimates for such maintenance for much maintenance functions can also be prepared based on the reliability information.

Similarly, the decision to replace existing equipment will require the consideration of the following questions, economic factors and reliability index numbers calculated for the existing equipment.

- i. Will the maintenance cost come down with the replacement of the old equipment?
- ii. Will the cost per unit of production/service come down due to automated test features of the new equipment?
- iii. Is the existing equipment not sufficient to meet the future production/service targets?
- iv. Will the new equipment be environment friendly and provide better safety to operators?
- v. Is there any possibility of adding additional accessories to existing equipment in order to make it more versatile for future use, or is the rebuilding of existing equipment possible through minor modifications?

Optimal replacement policy of the equipment can be determined if reliable estimates of revenue (return from equipment), up keep (maintenance cost) cost and replacement costs are available. The equipment in use in industries can be mainly divided into (1) equipment with diminishing efficiency and (2) equipment with constant efficiency. The first category deteriorates with time resulting in increase in operating cost

including maintenance cost, and second category operates at constant efficiency for a certain time period and then deteriorates suddenly.

Several models have been developed using repair vs. time and cost, in order to solve the replacement problem of equipment with diminishing efficiency. Replacement is considered to be the regeneration point of whole life where the operating cost function initially starts. In practice such methods really work well and the life of the equipment/system is enhanced.

On the other hand the concept of reengineering in lieu of replacement is one viable model as the operating cost increases with time. This model maximizes the gain between the operating costs before and after the overhauls. Reengineering can be perceived as the adjustment, alteration, or partial replacement of a process or product in order to make it to meet a new need. Successful implementation of reengineering will improve the equipment or process performance and this reduces the maintenance and operating costs.

3.3 CONVENTIONAL REPLACEMENT PROBLEM

The replacement problems are concerned with the issue that arises when the performance of an item decreases, failure or breakdown occurs. The decrease in performance or breakdown may be gradual or sometimes sudden. The need for replacement of items is felt when,

- i. The existing item or system has become inefficient or require more maintenance.
- ii. The existing equipment has failed due to accident or otherwise and does not work at all.
- iii. The existing equipment is expected to fail shortly.
- iv. The existing equipment has become obsolete due to the availability of equipment with latest technology and better design.

The solution to replacement problem is nothing but arriving at the best policy that determines the time at which the replacement is most economical instead of continuing at an increased maintenance cost. The Main objective of replacement policy is to direct the organization in many situations so that it can take right decision. For Example, few situations are:

- i. Waiting for complete failure of item or to replace earlier at the expense of higher cost of the item.
- ii. Whether to replace the underperforming equipment with the similar kind of item or by different kind (latest model) of item.

The problem of replacement occurs in the case of both men and machines. Using probability it is possible to estimate the chance of death (failure) at various ages.

3.4 TYPES OF FAILURES

As the term 'failure' encompasses wider concept, failures can be discussed under the following two categories.

Gradual Failure: In this, the failure mechanism is progressive. As the age of an item increases, its performance deteriorates. This results in:

- Increased operating cost
 - Decreased productivity of the item
 - Decrease in resale value of item
- (Ex: Mechanical items like pistons, bearing rings, tyres, etc.,)

Sudden Failure: This type of failure can be observed in the items that do not deteriorate gradually with age but which fail suddenly after some period of service. The time period between installation and failure will not be constant for any particular equipment. However the failure pattern will follow certain frequency distribution that may be progressive, retrogressive or random in nature.

Progressive failure: It is said to be progressive failure, when probability of failure increases with the age of an item. Ex: light bulbs, tyres etc.

Retrogressive failure: Certain items will have more probability of failure in the initial years of their life and with the increase in the life of an item the chances of failure become less. That is, the ability of the item to survive in the initial years of life increases its expected life. Aircraft engines exemplify industrial equipments with this type of distribution of life span.

Random failure: It is said to be random failure, when constant probability of failure is associated with equipment that fails because random causes such as physical shocks that are independent of age. In the case of random failure, virtually all items fail before aging has any effect. For example, vacuum tubes, items made of glass or mirror, fruits, vegetables etc may fail independent of their age.

The replacement situations generally are divided into the following four types:

- i. Replacement of capital equipment whose performance decreases with time, e.g., machine tools, vehicles in a transport organization, airplanes, etc.
- ii. Group replacement items that fail completely, e.g., electrical bulbs, etc.
- iii. Problem of mortality and staffing.
- iv. Miscellaneous problems.

3.5 REPLACEMENT OF ITEMS WITH GRADUAL DETERIORATION

As mentioned earlier the equipments, machineries and vehicles undergo wear and tear with the passage of time. The cost of operation and the maintenance are bound to increase year by year. A stage may be reached that the maintenance cost amounts prohibitively large that it is better and economical to replace the equipment with a new one. We also take into account the salvage value of the items in assessing the appropriate or opportune time to replace the item. We assume that the details regarding the costs of operation, maintenance and the salvage value of the item are already known. The problem can be analysed first without change in the value of the money and later with the value included.

If the interest rate for the money is zero the comparison can be made on an average cost basis. The total cost of the capital in owning the item and operating is accumulated for n years and this total is divided by n .

Since we have discrete values for the costs for various years, an analysis is done using the tabular method, which is simple one to use discontinuous data. There are also the classical optimization techniques using finite difference methods for discrete parameters and using the differential calculus for continuous data.

Now we take an example in which an automobile fleet owner has the following direct operation cost (Petrol and oil) and increased maintenance cost (repairs, replacement of parts etc). The initial cost of the vehicle is #70,000. The operation cost, the maintenance cost and the resale price are all given in table 1 for five years.

Table 1

Year of Service	Annual Operating Cost (#)	Annual Maintenance Cost (#)	Resale Value (#)
1	10000	6000	40000
2	15000	8000	20000
3	20000	12000	15000
4	26000	16000	10000
5	32000	20000	10000

Table 2

1	2	3	4	5	6	7	8
At the end of the yr (n)	Annual Operating Cost (#)	Annual Maintenance Cost (#)	Total Running Cost (#) (2+3)	Cumulative Running Cost (#)	Capital Cost (#)	Total Average Cost (#) (5+6)	Annual Cost (#) (7/n)
1	10	6	16	16	30	46	46.00
2	15	8	23	39	50	89	44.50
3	20	12	32	71	55	126	42.00
4	26	16	42	113	60	173	43.52
5	32	20	52	165	60	225	45.00

Table 2 gives the details of the analysis to find the appropriate time to replace the vehicle. The cumulative running cost and capital (Value - Resale value) required for various years are tabulated and the average annual cost is calculated. The corresponding year at which this average annual cost is minimum is chosen to be the opportune time of replacement.

It is evident from the last column of table 2 that the average annual cost is least at the end of three years. (equal to 42,000). Hence this is the best time to purchase a new vehicle.

Example: A mill owner finds from his past records the costs of running a machine whose purchase price is #6000 are as given below.

Table 3

Year	1	2	3	4	5	6	7
Running Cost (#)	1000	1200	1400	1800	2300	2800	3400
Resale Value (#)	3000	1500	750	375	200	200	200

Determine at what age is a replacement due?

Solution: We prepare the following table 3 to find the solution.

1	2	3	4	5
At the end of year n	Cummulative Running Cost (#)	Capital Cost (#)	Total Cost (#) (2+3)	Average Annual Cost (#)
1	1000	3000	4700	4000
2	2200	4500	6700	3350
3	3600	5250	8850	2950
4	5400	5625	11025	2756
5	7700	5800	13500	2700
6	10500	5800	16300	2717
7	13900	5800	19700	2814

From the table 3 above we conclude that the machine should be replaced at the end of the fifth year, indicated by the least average annual cost (#2700) in the last column.

Example

The mill owner in the previous problem has now three machines, two of which are two years old and the third one year old. He is considering a new type of machine with 50% more capacity than one of the old ones at a unit price of #8000. He estimates the running costs and resale price for the new machine will be as follows;

Table 4

Year	1	2	3	4	5	6	7
Running Cost (#)	1200	1500	1800	2400	3100	4000	5000
Resale Price (#)	4000	2000	1000	500	300	300	300

Assuming that the loss of flexibility due to fewer machines is of no importance, and that he will continue to have sufficient work for three of the old machines, what should his policy be?

Solution: As in the previous problem we prepare a table 4 to find the average annual cost of the new type of machine

At the end of year n	Cummulative Running Cost (#)	Capital Cost (#)	Total Cost (#) (2+3)	Average Annual Cost (#)
1	1200	4000	5200	5200
2	2700	6000	8700	4350
3	4500	7000	11500	3833
4	6900	7500	14400	3600
5	10000	7700	17700	3540
6	14000	7700	21700	3617
7	19000	7700	26700	3814

From the above table 4 we observe that the average annual cost is least at the end of five years and it would be #3540 per machine. But the new machine can handle 50% more capacity than the old one. So in terms of the old, the new machine's annual cost is only # $(3540) (2/3) = #2360$. This amount is less than the average annual cost for the old machine, which is #2700. If we replace the old machine with the new one, it is enough to have two new machines in place of with the new one; it is enough to have two new machines in place of three old machines. On comparing the cost of 2 new machines (# 7080) with that for 3 old machines (#8100), it is clear that the policy should be that the old machines have to be replaced with the new one. Still we have to decide about the time when to purchase the new machines.

The new machines will be purchased when the cost for the next year of running the three old machines exceeds the average annual cost for two new types of machines. Examining the table 3 pertaining to the previous problem, we find, the total yearly cost of one small machine from the column 4. The successive difference will give the cost of running a machine for a particular year. For example, the total cost for 1 year is #4000. The total cost for 2 years is #6700. The difference of #2700 will be accounted as the cost of running a small machine during the second year. Similarly we have #2150, #2175, #2475 and #2800 as the cost of running the old machine in the third, fourth, fifth and sixth year respectively.

Now, with this information we calculate the total costs next year for the two smaller machines, which are two years old (entering the third year of service) and one smaller machine aged one year (and hence entering second year of service), which will be $2 \times 2150 + 2700 = #7000$

This is less than the average annual cost of two new machines, which is #7080. So the policy is not to replace right now. If we wait for the subsequent years, the total cost of running the old machines will be #6500, #7125 and #8025 etc., for years 2, 3 and 4 etc. This indicates that the cost of running the old machine exceeds the average annual cost (#7000) of the two new machines after 2 years from now. Hence the best time to purchase the new type machine will be after 2 years from now.

4.0 CONCLUSION

We cannot ignore the contribution of machines and machine based engineering in global developing world as well as developing country like Nigeria.

Therefore, it is impossible to avoid the importance of machine and its components. The concepts of machine /machinery /components have been fully supported by reliability of the system. Here reliability refers the probability of the system or component which can be worked under given environment and specified time limit without any failure.

5.0 SUMMARY

The possibilities viz. re-engineering the equipment, replacement of the equipment etc. to ensure the equipment delivers its normal performance, are discussed.

Also this unit discusses two categories of replacement techniques for determining the best replacement strategies for the items that deteriorate with time and those do not

deteriorate but fail suddenly. These models are discussed with respect to the parameters like maintenance cost, time and value of money.

6.0 TUTOR MARKED ASSIGNMENT

- Discuss types of failures you in replacement model
- What are the conventional replacement model

7.0 REFERENCES

Eiselt, H.A., & Sandblom, C.L. (2012). Operations Research: A Model Based Approach, 2nd ed., New York: Springer Heidelberg

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MODULE 3: PROJECT INCOME AND EVALUATION

Unit 1: Projected Income Statement

Unit 2: Projected Cash Flow Statements

Unit 3: Projected Balance Sheets

Unit 4: Project Evaluation Criteria

Unit 5: Introduction to Economic Analyses

UNIT 1: PROJECTED INCOME STATEMENT

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1.0 Introduction

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3.0 Main Content

 3.1 Projected Income State

 3.2 The Structure in the Projected Income Statement

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Readings

1.0 INTRODUCTION

The key basis for financial planning and project evaluation is financial information. The financial information is required to record, compare and evaluate a firm's earning power and ability. In an already existing project, the financial information is already provided since it is a historical data. The income statement or the profit and loss account is a summary of revenues, expenses and net profit of an enterprise for a period of time. This serves as a measure of the firm's profitability over the period. For an on-going project or firm, when prepared, the income statement becomes a historical statement. The projected income statement is a forecast of the revenues, expenses and the net profit of an enterprise or project.

2.0 OBJECTIVES

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

- Explain the meaning of projected income statement

- Discuss its application in project evaluation
- Prepare a projected income statement.

3.0 MAIN CONTENT

3.1 The Projected Income Statement

The projected income statement is usually needed by a variety of people. Some of the users of the projected income statement might have direct interest in the firm while others have indirect interest. The owners or sponsors of a project have a direct interest in the projected income statement. It is so because they are entrusting their investment to the firm. They wish to know before hand what the revenues, expenses and net profit of the firm will be, and most importantly, their own expected dividends.

Another important group that is expected to have a direct interest in the projected income statement of a project is the management. Usually when a project is conceived and a project plan is written, the plan will contain the projected income statement as conceived by the project sponsors or consultants. Usually, the projected income statement is handed down to the project managers as a guide.

Also financial institutions are interested in a projected income statement.

Practically, when any firm approaches a financial institution for financial assistance, the firm is expected to prepare a business plan or a project feasibility study which contains, amongst other things, the projected income statement. Financial institutions need to study the projected income statement to evaluate the revenues, expenses and profitability of the investment project. When they do this, they will also test the cash flows of the project to see whether the proposed project can repay any loan granted together with the interest.

Other people that might be interested in the projected income statement are potential investors. Potential investors need to examine the projected income statement to decide whether or not they will invest in a firm.

3.2 The Structure of the Projected Income Statement

We have just explained what the projected income statement is. It is a statement that shows projected revenues, projected expenses, and of course, net profit of a proposed investment, an expansion project or an existing project.

In the standard practice, there is an acceptable arrangement that should group like items together and this leads to building a projected income statement that is broken into revenues, expenses and the net profit.

• Revenues

Ordinarily, revenues are the value of output of goods or services that an enterprise supplies to its customers. Revenues, therefore, arise when a firm produces or manufactures goods which it sells to third parties for a fee. Secondly, revenues can arise when a firm is engaged in the buying and selling of goods. It purchases goods which it later resells at a profit or a loss as the case may be. Thirdly, revenues can also arise through provision of services by a firm. A hospital may specialize in surgery and provide surgical services to its customers for whom it collects relevant payments, which when added up, make up the revenues.

Finally, a firm can earn revenue by loaning its economic resources. For example, a bank lends money to customers and earns interest income.

The interest earned is revenue. In projecting for revenues in a project situation, care must be taken so that proper estimates or forecasts are made. And this is made qualitative judgment plus quantitative judgment on the part of the project evaluator. For example, if the project is a manufacturing facility that will produce goods for the market, the best option is to start with the known market price of the good to be produced. For example, if the good in question is the type of bread that sells for N100 a loaf, then the project evaluator or initiator has to start from the known price of a loaf of bread and that is N100 a loaf. If the number of loaves of bread to be produced per annum amount to 1,000,000 then the projected revenue of the project is N100,000,000. Likewise, if a firm is engaged in the provision of services, the revenues likely to be earned can be easily estimated. If for example a hospital is projecting revenues, it has to first estimate the likely number of patients that will use its facility and also the average fee it charges a patient. The number of patients multiplied by the average fee per patient will give us the projected revenue of the health facility.

The projection for revenues can cover various periods. In most organisations, revenue projections for project evaluation purposes stretch over a period of three years. Some

banks ask for five year revenue forecasts. In the revenue projections care must be taken so as not to overstate the revenues or understate them.

• **Expenses**

The cost of earning revenue is known as the expense. Expenses are different from costs. Cost is the outlay incurred to acquire some asset.

For example, when a car is purchased by a company for its business, the sum used to purchase the vehicle is the cost of the vehicle. If the vehicle uses fuel for the firm’s operations, that constitutes an expense. In projecting the expenses of a firm’s investment, a lot of factors are usually taken into consideration.

Firstly, we have to get proper estimates of the current cost profile of the various items. For example, when projecting gas and oil expenses of a project, the proper starting point is to collect data on the current prices of gas and oil.

Revenue Projections

From the proposed production plan, the following is the revenue profile for the project in year one (year 2007).

Table 30: Revenue Projection for a Vegetable Oil Refining Plant

Table 30: Revenue Projection for a Vegetable Oil Refining Plan

Projected Year One Revenues

Product	Quantity Sold (Tons)	Price Per Ton N	Total Revenue N
Refined Vegetable Oil	12,498	145,000	1,812,210,000
Palm Kernel Cake (PKC)	18,418	5000	92,090,000
Palm Kernel Sludge (PKS)	1,315	4000	5,260,000
Fatty acid	657.84	100,000	65,784,000
Total			1975,344,000

Consumption of Utilities and Chemicals per Ton of Bleached and Refined Vegetable Oil

Steam at 50 psig = 70kg

Barometric water = 6 m3

Clean water in circulation = 7 m³

Fuel oil = 4 kg

Bleaching earth = 15 kg

Citric acid = 200 gms

Phosphoric acid (for dosing) = 300 gm

Vegetable Oil Packaging Expenses

The refined vegetable oil will be sold in two ways:

1. Direct to vegetable oil distributors who will purchase the vegetable oil in tanker loads. In this case, the vegetable Oil tankers will come and load vegetable oil at the factory.
2. The refined vegetable oil will be filled into plastic jerry cans of 9 litres and 18 litres capacity and also sold to the market. The purpose of this is to ensure that the brand of vegetable oil will be in affordable units and prices to the market.

Table 31: Projected Manufacturing Account for a Vegetable Oil**Table 31: Projected Manufacturing Account for a Vegetable Oil Refining Plant****Projected Manufacturing Account for Year Ending 31st December**

	2007	2008
Opening raw materials	10,000,000	15,000,000
Raw materials purchased	1,544,257,610	1,544,257,610
	1,554,257,610	1,559,257,610
Raw materials at close	15,000,000	9,000,000
Raw materials consumed	1,539,257,610	1,550,257,610
Add Factory Overheads		
Diesel, oil and lubricant	5,254,959	5,517,707
Factory uniform	110,000	-
Electricity and light	3,721,819	3,907,910
Plant/Machinery repairs	3,002,287	3,152,401
Laboratory consumables	438,820	500,000
Laboratory equipment repair	50,000	80,000
Generator Repairs and maintenance	8,46,556	888,883
Weighbridge fare	290,122	300,000
Salaries and wages	5,793,840	6,083,532
Welding gas	218,499	240,000
Cleaning and sanitation	87,595	90,000
Depreciation	17,248,071	17,248,071
Total factory overheads	37,062,568	38,008,504
Cost of manufactured goods	1,576,320,178	1,588,266,114

Table 32: Projected Expenses for a Vegetable Oil Refining Plant**Projected: Selling and Distribution Expenses**

	2007	2008
Selling and Distribution Expenses		
Advertising	5,000,000	5,000,000
Car and bus running expenses	1,782,230	1,871,341
Transports and travelling	2,185,317	2,185,317
Loading and off loading	586,050	586,050
Gifts, entertainment, donations	293,306	293,306
Public relations	418,813	400,000
Total	10,265,716	10,336,014

Administrative Expenses		
Printing and stationery	310,324	325,840
Truck repairs & maintenance	585,862	615,155
Telephone, courier & postages	900,000	900,000
Consultancy fee	120,000	130,000
Security expenses	102,072	107,175
Medical expenses	1,038,632	1,090,563
Audit fee	120,000	120,000
Building maintenance	389,942	409,439
Directors remuneration	7,200,000	7,200,000
Interest and bank charges	16,000,000	12,000,000
Insurance premium	350,000	350,000
Salaries & wages (office)	3,257,100	3,419,955
Depreciation provisions	1,889,544	1,889,544
Total	32,263,476	28,557,671

Table 33: Projected Trading, Profit and Loss Account for a Vegetable Oil Refining Plant

Projected Trading, Profit and Loss Account for the Year Ending 31st December

	2007	2008
Sales	1,975,344,000	1,975,344,000
Opening Stock	30,000,000	40,000,000
+ Cost of Manufactured goods	1,576,320,178	1,588,266,114
Less Stock at Close	40,000,000	50,000,000
=Cost of Sales	1,566,320,178	1,578,266,114
Gross Profit	409,023,822	397,077,886
Deduct		
Selling and distribution expenses	10,265,716	10,336,014
Administrative expenses	32,263,476	28,557,671
Total expenses	42,529,192	38,893,685
Profit before tax	366,494,630	358,184,201
Tax provision	117,278,281	114,618,944
Profit after tax	249,216,3349	243,565,257

SELF ASSESSMENT EXERCISE

List and explain four expense items that can be found in a projected income statement.

4.0 CONCLUSION

We have discussed the projected income statement. We discussed the structure of the projected income statement, revenues, expenses and net profit concepts. Finally we used as an example to demonstrate a projected income statement.

5.0 SUMMARY

We have treated the projected income statement in this unit. The projected income statement is one of the most important items in project evaluation from the project sponsor's position or from the bank or analyst's position.

6.0 TUTOR-MARKED ASSIGNMENT

Discuss the likely users of a projected income statement.

7.0 REFERENCES/FURTHER READINGS

Leon Ikpe (1999). Project Analysis and Evaluation. Lagos: Impressed Publishers.

UNIT 2: PROJECTED CASH FLOW STATEMENTS

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Content

3.1 Projected Cash Flow Statements – Meaning and uses

3.2 The Structure of the Projected Cash Flow Statement

3.2.1 Cash Inflows

3.2.2 Cash Outflows

3.3 Sensitivity Analysis

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Readings

1.0 INTRODUCTION

In Unit 1 we discussed the projected income statement. There we discussed the concept of revenues and expenses and also net profit. We also discussed the fact that the projected income statement is used by a variety of users like the project initiators, bankers and financial analysts. In this unit, we shall discuss the projected cash flow statements.

2.0 OBJECTIVES

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

- Explain what a projected cash flow statement is
- Explain how it can be prepared
- Explain the usefulness.

3.0 MAIN CONTENT

3.1 Projected Cash Flow Statement – Meaning and Uses

It is important to understand and analyse the projected cash flows of the firm. We shall begin our discussion by defining a cash flow statement. A cash flow statement is

a statement that shows the actual receipt of cash (inflows) and the disbursement of cash (out flows) of a firm or project. Having said that, we can now go ahead to define a projected cash flow statement.

A projected cash flow statement is a statement which shows the forecasts of actual receipts of cash (inflows) and the disbursement of cash (outflows) of a firm or project. There are many users of information contained in projected cash flow statements. The first user of the projected cash flow statement is the project sponsor or initiator.

The project sponsor or initiator is interested in knowing well in advance the future cash flows of the firm. This is important because the future financing needs of the firm have to be known well in advance. The project initiator needs to distinguish between credit sales and cash sales.

If the project initiator does not distinguish between credit sales and cash sales, then his/her project may suffer cash flow problems. The initiator may not be able to estimate the amount of cash needs of the project as well as timing of the cash needs.

Similarly, providers of finance especially the lending banks are usually very interested in the projected cash flow statement. They need to determine the firm's ability to service debt. The debt in question may be existing debts or future debts. Ability to service debts is a function of future cash flows.

Projected cash flow statements assist us to evaluate a firm's future performance and of course financial condition that enables the project evaluator answer the following questions.

- What is the nature of the firm's projected cash flow statement?
- Will the projected cash flow be able to service the project's debts (loan, overdraft + interest)?
- When will the project need financing and to what extent?
- How should the loan or overdraft or finance be structured?
- How stable are the cash flows?

3.2 The Structure of the Projected Cash Flow Statement

The basic format of the projected cash flow statement is displayed in Table 33 is a projected cash flow statement of a company. But it covers a period of only 3 months. You can project a cash flow as long as you require but the basic principles should be

followed. If you examine Table 33 properly, you will realise that the projected cash flow statement is divided into two main sections, namely:

1. The cash inflows
2. The cash outflows (outgoings)

We will now go ahead to break down the projected cash flow statement.

Table 34: A Three Month Projected Flow Statement Niger Limited Cash Inflows January

Table 34: A Three Month Projected Flow Statement Niger Limited

Cash Inflows	January	February	March
Capital introduced	10,000,000	-	-
Loan introduced	20,000,000	-	-
Cash sales	40,000,000	50,000,000	60,000,000
Total Cash Inflows	70,000,000	50,000,000	60,000,000
Cash Outflows			
Raw material	30,000,000	30,000,000	35,000,000
Salary and wages	2,000,000	2,200,000	2,500,000
Office admin expenses	500,000	550,000	600,000
Electricity and gas expenses	500,000	550,000	600,000
Loan repayment	2,000,000	2,000,000	2,000,000
Interest charges	400,000	400,000	400,000
Selling expenses	1,000,000	1,200,000	1,300,000
Total Cash Outflows	36,400,000	36,900,000	42,400,000
Cash Surplus/(Deficit)	33,600,000	13,100,000	17,600,000
Opening Cash Balance	-	33,600,000	46,700,000
Closing Cash Balance	33,600,000	46,700,000	64,300,000

3.2.1 Cash Inflows

We have seen that a projected cash flow statement is broken down into the inflows and the outflows (outgoings). Let us now proceed to examine some of the key items

contained in the projected cash flow statement. The items will vary from capital to loan introduced and also cash sales. We shall treat them individually.

- Capital Introduced

Every firm or project should have a capital. At the time a project conceived or is being expanded, the owners of the firm usually bring in what is known as capital.

In a limited liability company, the share holders usually contribute the capital of the firm. In cash flow construction, capital is usually entered as an inflow. The reason is clear. When you introduce capital, you bring in cash.

- Loan

Another item appearing in a projected cash flow statement is loan. In some cases, a project is funded through loan from banks.

The loan will usually have the following features:

1. The loan amount will be specific
2. The loan has an interest rate attached to it.
3. The loan will be repaid in agreed installments.

- Cash Sales

The sales figure is the most important in a projected cash flow statement. Projections for sales pose one of the most difficult challenges in cash flow projections. We must quickly distinguish between total sales, credit sales and cash sales. Total sales are the total value of goods or service sold to third parties. Credit sales refer to sales for which payment is not made immediately. The figure for credit sales is usually transferred to the debtors list. Cash sales are the difference between total sales revenue and credit sales.

As far as we are concerned, the cash sale is the most important component of sales and it is the one that appears in the projected cash flow statement. Credit sales are only reflected in the cash flow when they are converted to cash. For example, if in January 2007, a company sells four cars at a credit of N10,000,000. In the cash flow for January 2007, there will be no entry for cash sales. But if in February 2007, the company receives a cash payment of N5,000,000, then that figure will appear in the inflows column for February 2007.

The basic rule is that only actual cash received is usually entered in the inflow column. In actual practice, projecting for cash sales will involve exhaustive consideration of the following:

- General economic outlook in the country
- The industry outlook. What is the demand situation like? What is the supply situation?
- What is the structure of competition and how fierce is it?
- What will be the effect of competition on prices in the firm's area of operation?

3.2.2 Cash Outflows

Cash outflows or outgoings will include all expenses that use cash. They will include items like:

- Raw material expenses
- Salary and wages
- Stationery
- Loan repayment
- Interest charges
- Selling expenses
- Office admin expenses
- Oil and gas expenses
- Taxation
- Rates and permits

3.3 Sensitivity Analysis

Usually, when constructing a projected cash flow statement, the first set of projections is what we call normal estimates of cash flows. Normal estimates of cash flows especially cash revenues are based on all things being equal; but all things cannot be equal. A lot of things may happen.

In a market, supply can come from unexpected source and cause prices to fall. Prices of raw materials may rise suddenly and all these tend to reduce our earlier revenue projections and jack up expenses.

Sensitivity analysis provides the tool for subjecting a project's cash flows to adverse market situations. Sensitivity analysis seeks to adjust revenues for risk and also costs. In conducting sensitivity analysis, we say that we are adjusting a project's cash flows for risk. If we conduct sensitivity analysis on a cash flow, we may do that by making one, two or three of the following assumptions:

- Due to intense competition the project will not be able to make the earlier normal sales volume. Cash revenues will drop.
- Due to excess supply, prices in the market will fall, that will reduce cash revenues.
- The prices of raw materials and other items will rise. A close examination will reveal that the impact of any of the above will have the effect of reducing the cash revenues of a project.

We now state that if a normal projected cash flow statement is reconstructed to accommodate the fact that the market could be worse, we say that the reconstructed cash flow is now called a risk "adjusted cash flow statement." The risk-adjusted cash flow is a pessimistic cash flow and should be admired by analysts.

Table 34 is a risk-adjusted income statement reconstructed from Table 33. The critical assumption is that Table 34 assumes that only 75% of cash sales of Niger limited will be realised.

Sensitivity analysis is a tool for subjecting cash flows to risk analysis. The key objective of the sensitivity analysis is to forecast a worst-case scenario for a project.

Other ways of conducting a sensitivity analysis is to assume that expenses attached to a project will increase.

Table 35: A Three Month Risk-Adjusted Projected Cash Flow Statement Niger Limited

Table 35: A Three Month Risk-Adjusted Projected Cash Flow Statement Niger Limited

Cash inflows	January	February	March
Capital introduced	10,000,000	-	-
Loan introduced	20,000,000	-	-
Cash sales	30,000,000	37,500,000	45,000,000
Total Cash Inflows	60,000,000	37,500,000	45,000,000
Cash Outflows			
Raw material	30,000,000	30,000,000	35,000,000
Salary and wages	2,000,000	2,200,000	2,500,000
Office admin expenses	500,000	550,000	600,000
Electricity and gas expenses	500,000	550,000	600,000
Loan repayment	2,000,000	2,000,000	2,000,000
Interest charges	400,000	400,000	400,000
Selling expenses	1,000,000	1,200,000	1,300,000
Total Cash Outflows	36,400,000	36,900,000	42,400,000
Cash Surplus/(Deficit)	23,600,000	600,000	2,600,000
Opening Cash Balance	-	23,600,000	24,200,000
Closing Cash Balance	23,600,000	24,200,000	26,800,000

4.0 CONCLUSION

We have discussed projected cash flow statements. We discussed the nature of cash flow statements and their users. We also examined the structure of cash flow statements. We used an example to show what a projected cash flow statement looks like. We also constructed a risk adjusted cash flow statement.

5.0 SUMMARY

In this unit we treated projected cash flow statements which we said constitutes a very vital document used in the evaluation of projects. The cash flow gives us a picture of cash inflows and outflows together with timing.

6.0 TUTOR-MARKED ASSIGNMENT

Why do you think that banks are interested in projected cash flow statement of projects?

7.0 REFERENCES/FURTHER READINGS

Leon Ikpe (1999). Project Analysis and Evaluation. Lagos: Impressed Publishers.

UNIT 3: THE PROJECTED BALANCE SHEET

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Content

3.1 Meaning of a Balance Sheet

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1.0 INTRODUCTION

In Unit 2, we discussed the projected cash flow statement. There, we discussed inflows and outflows (outgoings) of a firm or project. We also discussed the structure of the projected cash flow statement and went a step further to provide an example of a projected cash flow statement. In this unit, we shall discuss the projected balance sheet.

2.0 OBJECTIVES

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

- Explain the meaning of a projected balance sheet
- Explain the preparation of the projected balance sheet
- Prepare a projected balance sheet.

3.0 MAIN CONTENT

3.1 Meaning of a Balance Sheet

Before we delve into the projected balance sheet proper, it is very important for us to first understand what a balance sheet is. The balance sheet or the statement of

financial position is one of the most important financial statements. It shows the financial condition or better still, the statement of affairs of a firm or business. We will therefore, define a projected balance sheet as a forecast of a future balance sheet as at a future date.

3.2 Components of the Balance Sheet

The balance sheet has two main sides namely:

- Assets
- Liabilities

3.2.1 Assets

When we are talking of assets generally, we are talking about the valuable possessions owned by the firm, valued in monetary terms. They will include land and buildings, stock of goods, raw materials, cash, vehicles and other valuables.

But generally we can classify assets under the following headings:

- Current assets
- Investments
- Fixed assets

Lets us now discuss each of them:

Current Assets

The current assets of a firm or business are those assets which are held in the form of cash or expected to be converted into cash in a period or within the accounting period of the firm. In actual practice, the accounting period is usually of one-year duration.

The current assets of the firm will include the following:

- Cash
- Book debts (debtors).
- Prepaid expenses
- Marketable securities.
- Stock

Let us start with cash which is one of the most liquid current assets. Cash will mean cash on hand or cash in the bank.

Another current asset which is important is book debts (debtors). Book debts are sometimes called account receivables. These are amounts due from debtors to whom

goods have been sold or service rendered. Some of the book debts may be realised by the firm. If they are not realized they turn into what is called bad debts and may be written off later.

Prepaid expenses are also current assets. They are expenses of future periods that are paid in advance. An example of prepaid expenses is rent which may be payable in advance by a firm. For example in January 2007, a firm may pay rent for its office for January 2007 to December, 2007. If in April, 2007, the financial year of the firm ends, it will regard the portion of rent paid from May 2007 to December, 2007 as a prepaid expense which invariably is a current asset.

Stock (inventory) is another current asset and includes raw material, work in process and finished goods. The raw materials and work in process are required for maintenance of the production function of the firm.

Finished goods usually will be already packed and kept ready for purchase by customers of the business. Marketable securities are the firm's short term investment in shares, bonds and other securities. The securities are usually marketable and can be converted into cash in a very short time.

Investments

Investments represent the firm's investments in shares, debentures and bonds of either firms or the government. By their nature, the investments are long term. It is important to note that the investments yield income to the firm.

Fixed Assets

Fixed assets are long-term assets held for periods longer than one year. They are usually held for use in the firm's business. Fixed assets include land, buildings, machinery and equipment, vehicles, etc.

We have briefly seen what the assets are. We shall now move over and discuss liabilities.

3.2.2 Liabilities

When we talk of liabilities, we mean the debts that are payable by the firm or business to creditors. They may represent various obligations due to various third parties arising from various business transactions.

Examples of liabilities include creditors, accounts payable, taxes payable, bonds, debentures, etc. But generally, liabilities are divided into two broad groups namely:

- Current liabilities and
- Long-term liabilities

We shall discuss each of the groups

Current Liabilities

Current Liabilities are those debts that are payable in a short period usually within a year. One of the major current liabilities is the bank overdraft. Most banks grant their customers overdraft which are repayable within a period of one year. The other type of current liability includes provisions for taxes and dividends. These are liabilities that will mature within one year.

Another type of liability is expenses payable. The firm may expenses to public power supply organisation or have rents to be paid.

Long Term Liabilities

Long-term liabilities are the obligations which are payable in a period of time greater than a year. One of the long term liabilities of a firm is term loan. The firm may borrow money from a bank that will be repayable over a period preceding one year. Such a borrowing or loan is regarded as long-term liability. Also, when a firm needs to raise a large sum of money, it debentures. A debenture is an obligation on the part of a firm to pay interest and principal under the terms of the debenture.

However one of the most stable types of long term liability is owners' equity. Owner's equity represents the owners' interest in the firm. In practical terms, the total assets of a firm less the liabilities realized on the interest. The owners interest in the firm consist of

- Paid up share capital and
- Retained earnings (undistributed profits).

SELF ASSESSMENT EXERCISE

Discuss the components of a balance sheet.

3.3 Construction of the Projected Balance Sheet

In the earlier sections of this unit, we have discussed the balance sheet generally. That was from a historical perspective. We shall now discuss the construction of a projected balance sheet.

The following steps are recommended:

- Start from the determination of sales revenue.
- Compute cost of goods sold (COGS)
- Compute admin expenses, general and selling expenses.
- Bring forward sundry income and expenses and generate the projected income statement.
- Determine taxation, dividends and retained earnings.
- Project for assets.
- Project for liabilities.

Table 36: A Projected Balance Sheet

Projected Balance Sheet (N)

As at	Year 1
Assets Employed	
Fixed assets	66,629,024
Preliminary expenses	33,140
Total	66,662,164
Current Assets	
Stock-in-trade	12,000,000
Raw materials	12,000,000
Debtors and prepayment	1,000,000
Cash and bank balance	2,623,497
Total Current Assets	27,623,497
Current Liabilities	
Creditors and accruals	2,000,000
Tax provisions	10,247,185
Total current liabilities	12,247,185
NET CURRENT ASSETS	15,376,312
Total Assets	82,038,476

Record leases if any and project for the future amortisations.	
Bring forward other sundry liabilities,	
Estimate taxation based on the projected income statement and forecast the future trend.	
From the net profit estimate amount going to dividends and retained earnings.	
Record retained earnings. Record paid up capital. Fine tune grey areas.	
Total the liabilities to agree with total assets.	

4.0 CONCLUSION

We have discussed the projected balance sheet. We first discussed assets generally and then went ahead to discuss liabilities. We discussed the construction of the projected balance sheet and provided a checklist for the projection for both assets and liabilities.

5.0 SUMMARY

We have treated the projected balance sheet. The projected balance sheet as we discussed is a forecast of a future balance sheet as at a future date. It will show what the assets will be and also what the liabilities will be. It is a very important document in project evaluation.

6.0 TUTOR-MARKED ASSIGNMENT

1. Who do you think are the users of the information in a projected balance sheet?
2. Why do they need the information contained in it?

7.0 REFERENCES/FURTHER READINGS

Leon Ikpe (1999). Project Analysis and Evaluation. Lagos: Impressed Publishers.

UNIT 4: PROJECT EVALUATION CRITERIA

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Content

3.1 Traditional Criteria of Project Evaluation

3.2 The Discounted Cash Flow (DCF) Method

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Readings

1.0 INTRODUCTION

Let us recall that the focus of this course is project evaluation. From unit 1, we discussed the project cycle. From there we moved on to discuss factors affecting location of projects. We also discussed capacity and production planning, demand analysis, supply analysis, project cost analysis, projected income statements, cash flows and the balance sheet.

All these have set the stage for us to tie the discussions. We now want to discuss a very crucial aspect of this course, which is the project evaluation criterion. Project evaluation criteria seek to present the methods to be adopted to measure the value of an investment project. The evaluation enables us to choose between two or more projects once the values are known. Any project evaluation criterion to be adopted should possess the following characteristics:

- It should provide a means to distinguish between acceptable and unacceptable projects.
- It should also be able to rank projects in order of their desirability.
- It should be a criterion that is applicable to any conceivable project.
- It should recognise that bigger cash flows are preferable to smaller ones.
- It should recognise that early cash flows or benefits are preferable to later cash flows or benefits.

Although there are a lot of project evaluation criteria in the literature, we shall discuss the most widely accepted criteria which are the traditional criteria and the discounted cash flow (DCF) criteria

2.0 OBJECTIVES

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

- Discuss project evaluation criteria
- Distinguish between the traditional criteria and the discounted cash flow relative to project evaluation.

3.0 MAIN CONTENT

3.1 Traditional Criteria of Project Evaluation

In the traditional criteria, we shall discuss two methods, namely: the payback period and the accounting rate of return method.

The Payback Period

The payback period is one of the most popular methods of project evaluation. The payback period is defined as the number of years required to recover the original cash outlay invested in a project. If the project yields constant annual cash inflows, the payback period can be computed by dividing cash outlay by the annual cash inflow. So we say thus:

Payback period = $\frac{\text{Cash outlay (investment)}}{\text{Annual Cash inflow}}$

Example

A project requires a cash outlay of N200,000 and yields an annual cash inflow of N50,000 for a period of 10 years; calculate the payback period.

The payback period is $\frac{N200,000}{N50,000} = 4 \text{ years.}$

$$\frac{\text{-----}}{N50,000}$$

However, it is to be noted that in the case of unequal cash inflows, the payback period can be computed by adding up the cash inflows until the total is equal to the initial cash outlay. The payback period is greatly admired by project evaluators because it is very simple to understand. Another good virtue of the payback period is that it costs less than most of the other sophisticated methods.

However, despite its simplicity, the payback period may not be a desirable investment criterion. In the first place, it fails to recognise the cash flows that come in after the payback period. Again it fails to consider the pattern of cash inflows and that early cash inflows rather than later cash inflows.

Despite its weakness, the payback period is very popular analogy. It tries to emphasize early recovery of an investment. This means that it gives an insight into the cash inflows of the project.

The Accounting Rate of Return (ARR) Method

The accounting rate of return (ARR) is a method that uses accounting information to measure the profitability of an investment. The accounting rate of return (ARR) is computed by dividing average income after taxes by the average investment.

$$\text{ARR} = \frac{\text{Average Income}}{\text{Average Investment}}$$

Example

A project costs N100,000 and has a scrap value of N40,000. The stream of income before depreciation and taxes are N40,000, N50,000 and N60,000 for the first three years. The tax rate is 50% and depreciation is on straight line basis.

Calculate the accounting rate of return for the project.

Solution

	Year 1	Year 2	Year 3
	N	N	N
Earnings before depreciation and taxes	40,000	50,000	60,000
Depreciation	20,000	20,000	20,000
Net earnings before taxes	20,000	30,000	40,000
Taxes at 50%	10,000	15,000	20,000
Net earnings after taxes	10,000	15,000	20,000

Book value of investment

Beginning	100,000	80,000	60,000
Ending	80,000	60,000	40,000
Average	90,000	70,000	50,000

$$\text{Average earnings} = \frac{10,000+15,000+20,000}{3}$$

$$= 15000$$

$$\text{Average investment} = \frac{90,000 + 70,000 + 50,000}{3}$$

$$= 70000$$

$$\begin{aligned} \text{Accounting rate of return} &= \frac{15000}{70000} \\ &= 21.42\% \end{aligned}$$

As an accept or reject criterion, the ARR method will accept all those projects whose ARR is greater than the minimum rate established by management. If the ARR is lower than the minimum rate established by management, then the project should be rejected. The ARR method is very simple to understand and use. It can also be easily calculated using accounting information.

However, the ARR suffers from three main weaknesses. First it uses accounting profits not cash flows in appraising projects. Secondly ARR ignores the time value of money. The profits occurring in different periods are valued equally.

Thirdly, it does not allow the fact that profit can be reinvested to earn more profits.

3.2 Discounted Cash Flow (DCF) Methods

We have discussed two of the traditional methods used in the evaluation of projects. One is the payback period while the other is the accounting rate of return (ARR). Although two of them are simple to use and understand, they are not theoretically sound. Both of them fail to consider the timing of cash flows. Both fail to consider the time value of money.

Because of these limitations, we shall consider two superior investment criteria which fully recognise the timing of cash flows.

The two methods are the net present value (NPV) method and the internal rate of return (IRR) method. These two methods are referred to as discounted cash flow (DCF) methods or the time-adjusted methods.

The Net Present Value (NPV) Method

This method correctly recognises the fact that cash flows arising different time periods differ in value and are comparable only when their equivalent- present values are found out.

The following steps are followed when computing the net present value (NPV).

1. A discount rate is selected to discount the cash flows. The correct discount rate should be the firm's cost of capital which is the minimum rate of return expected by the investors to be earned by the firm.
2. The present value of cash inflows and outflows are computed using cost of capital as the discounting rate.
3. The net present value (NPV) is the present value of cash inflows less present value of cash outflows.

The acceptance rule using the NPV method is to accept a project if the NPV is positive, and to reject it if the NPV is negative.

If NPV is greater than zero, then the value of the firm is expected to increase. It is also important for us to understand the interpretation of NPV. The net present value may be interpreted to mean the immediate increase in the wealth of a firm if the investment proposal is accepted. It is equal to an unrealized capital gain. The net present value can also be interpreted to represent the amount the firm could raise at a required rate of return in addition to the initial cash outlay to distribute immediately to its shareholders and by the end of the project life to have paid off all the capital raised plus interest on it.

Example

Calculate the net present value of a project which cost N500,000. But generates cash inflows of N150,000, N300,000 and N400,000 over a three year period. The required rate of return is 10%.

Solution

Year	Cash inflows	Discount factor at 10%	Present Value of Cash Inflows
	N		N
1	150,000	.909	136,350
2	300,000	.826	247,800
3	400,000	.751	300,400
Total			684,550
Less investment outlay			500,000
Net present value			184,550

In terms of merit, the NPV method is very significant since it recognizes the time value of money. It also is consistent with the objective of maximizing the wealth of shareholders. However, the NPV suffers from the following limitations.

Firstly, it is fairly difficult to use.

Secondly, in computing the NPV, it is assumed that the discount rate which usually is a firm's cost of capital is known. But as we know, the cost of capital is a fairly difficult concept to measure in real life.

Thirdly, NPV may not yield a consistent answer when the projects being compared involve different amounts of investment.

The Internal Rate of Return (IRR) Method

The internal rate of return (IRR) can be defined as that rate which equates the present value of cash inflows with the present value of cash outflows of an investment. Put in another way, the internal rate of return is the rate at which the NPV of an investment is zero. It is called the internal rate because it depends solely on the outlay and the resulting cash inflows of the project and not any rate determined outside the investment.

Let C = Cash outlays of an investment

A1 = Cash inflows received in (I+R). year I discounted at the cost of capital R.

A2 = cash inflows received in year 2 (I+R)² discounted at the cost of Capital R.

A3 = cash inflows received in year 3(I+R)³ discounted at the cost of Capital R.

Write the basic equation

$$C = \frac{A_1}{(1+R)} + \frac{A_2}{(1+R)^2} + \frac{A_3}{(1+R)^3}$$

$$0 = C - \frac{A_1}{(1+R)} + \frac{A_2}{(1+R)^2} + \frac{A_3}{(1+R)^3}$$

The value of R in the equation at which total cash outlays equal total cash inflows is called the internal rate of return (IRR). Usually the value of R can be found out by trial and error. Generally, if the calculated present value of the expected cash inflows is lower than the present value of cash outflows, a lower rate should be tried. On the other hand, if the calculated present value of the expected cash inflows is higher than the present value of cash outflows, a higher rate should be tried.

Example

A barbers' shop costs N32,400 to establish and is expected to generate cash inflows of N16,000, N14,000 and N12,000 over its life of three years. Calculate the internal rate of return.

Solution

Let us start by trying 16%

Year	Cash Inflow	Discount Factor at 16%	Present Value
	N		N
1	16,000	.862	13,792
2	14,000	.743	10,402
3	12,000	.641	7,692

The net present value is –N514 at 16% discount factor. Let us try a lower rate like 14%

Year	Cash Inflow	Discount Factor at 14%	Present Value
	N		N
1	16,000	.877	14,032
2	14,000	.769	10,766
3	12,000	.675	8,100

You will observe from the above calculations that when we tried 16% discount rate, the NPV was negative at –N514, when we tried 14% discount rate, the NPV became

positive at N498. Therefore, the internal rate of return we are looking for lies between 14% and 16%.

The basic accept-or-reject rule, using the IRR method, is to accept the project if its internal rate of return is higher than the firm's required rate of return. However, the project should be rejected if its internal rate of return is lower than the firm's cost of capital. It is important that we understand the interpretation of the internal rate of return (IRR).

The internal rate of return (IRR) represents the highest rate of interest a firm would be ready to pay on funds borrowed to finance the project without being financially worse-off, by repaying the loan principal plus accrued interest out of the cash inflows generated by the project.

We should also see the internal rate of return method as a very sound method. As we said, it is a discounted cash flow method and also it considers the time value of money. It is also compatible with the firm's desire to maximise the owners' wealth. However the IRR method is fairly difficult to understand and it involves complex computations.

SELF ASSESSMENT EXERCISE

Distinguish between the traditional project evaluation methods and the discounted cash. Show criteria.

4.0 CONCLUSION

We have discussed project evaluation criteria which we said constitute a very crucial topic in this course. We discussed traditional criteria of project evaluation. Here we mentioned the payback period and the accounting rate of return (ARR). We also discussed discounted cash inflow criteria. Here we mentioned the net present value (NPV) method and the Internal Rate of Return (IRR).

5.0 SUMMARY

Project evaluation criteria provide us with the tools with which we can choose from various investment proposals using acceptable techniques. The evaluation criteria guide the project initiator and assist him/her to choose among alternative projects. Also banks use project evaluation criteria to decide whether or not to lend money for a project.

6.0 TUTOR-MARKED ASSIGNMENT

Why are the discounted cash flow (DCF) techniques better and more acceptable than the traditional methods of project evaluation?

7.0 REFERENCES/FURTHER READINGS

Leon Ikpe (1999). Project Analysis and Evaluation. Lagos: Impressed Publishers.

UNIT 5: INTRODUCTION TO ECONOMIC ANALYSIS

CONTENTS

1.0 Introduction

2.0 Objectives

3.0 Main Content

3.1 Financial Analysis and Economic Analysis- A Comparison

3.2 The Nature of Economic Analysis

3.3 Adjustments to Financial Analysis

3.4 Linkage Effects of a Project

4.0 Conclusion

5.0 Summary

6.0 Tutor-Marked Assignment

7.0 References/Further Readings

1.0 INTRODUCTION

Generally, in a project analysis situation, most analyses focus on the cash inflows and outflows of a project. Critical expenses and incomes are usually compared to determine whether a project should be undertaken or not. But expenses and revenues in most financial analyses are mainly the consideration of a private investor.

The implication of financial analysis is that it provides a micro view of a project and concentrates attention on things like accounting profits.

Economic analysis on the other hand considers projects from a macro point of view.

The type of questions asked in an economic analysis are:

1. Will the project under consideration lead to the general well being of the community, the state and the nation?
2. Will the project generate employment at various levels in the macro environment?
3. Will the project lead to economic growth?
4. What are the linkages that the project has, i.e., forward or backward linkages?
5. Will the project generate more technical knowledge?

The questions that we have asked are not exhaustive but only go to demonstrate the type of questions that economic analyses seek to answer.

2.0 OBJECTIVES

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

- Explain the meaning of an economic analysis
- Distinguish between an economic analysis and a financial analysis.

3.0 MAIN CONTENT

3.1 Financial Analysis and Economic Analysis – a Comparison

In general theory, a financial analysis tries to solve resource allocation problems. It tries to use information from projects to determine whether projects should come on stream or not. Economic analysis also tries to solve resource allocation problems in an economy. In economic theory, resources are very scarce and it is part of any good analysis to allocate resources between competing projects. For example, resource allocation problems can arise if a community is trying to decide whether to build a school or a hospital with limited scarce resources.

Financial analysis equally tries to allocate resources but from a micro view point. So, both financial and economic analyses solve resource allocation problems.

Financial analysis tries to concern itself with issues of both benefits and costs arising from a project. In the financial analysis, the concern of the analysis is to evaluate the stream of costs attached to a project and deduct same from the stream of benefits.

If the stream of benefits is greater than the stream of costs, then project in question has a positive value and should be accepted, all things being equal. However, if the stream of costs is greater than the stream of benefits, then the project in question has a negative value and should not be accepted, all things being equal.

Economic analysis also concerns itself with costs and benefits arising from a project.

If the stream of benefits is greater than the stream of costs, then the project in question has a positive value and should be accepted.

However, if the stream of costs is greater than the stream of benefits, then the project in question has a negative value and should not be accepted, all things being equal. So we could say that financial analysis and economic analysis both concern themselves with costs and benefits arising from a project. In the end, they provide answers to the

question of whether a project should be acceptable or not. In evaluating projects, both use discounting and compounding techniques to arrive at their answers.

However, there exist conceptual differences between financial analysis and economic analysis. While financial analysis has a primary objective of establishing the viability and acceptability of a project from a financial view point, paying no attention to society, economic analysis has the objective of establishing the fact that a project is acceptable or not to the society as a whole. So while financial analysis has a micro objective, economic analysis has a macro objective.

Finally, in reaching a decision as to whether or not to accept a project, financial analysis and economic analysis both try to establish a relationship between costs and benefits.

For example in financial analysis, costs and benefits arising from a project are usually defined in monetary variables such as profits. But economic analysis goes really beyond the vague definitions of profit. In Economic analysis, costs are defined in terms of opportunity costs or foregone costs to the society as a whole.

SELF ASSESSMENT EXERCISE 1

Compare and contrast financial analysis and economic analysis.

3.2 The Nature of Economic Analysis

In economic analysis, the costs and benefits attached to a project are usually compared before a decision can be reached on whether or not to accept a project.

In the literature, there exist three discounted measures of project worth which we will now discuss:

The Net Present Worth

The net present worth is the difference between the present worth of benefits and the present worth of costs. We can write thus:

$$\text{Net Present Worth} = \boxed{\text{Present Worth of benefits}} - \boxed{\text{Present Worth of costs}}$$

Generally, according to the net present worth theory, a project is acceptable if the net present worth is positive. If the net present worth is negative, the project will be rejected.

Benefit-Cost Ratio

If you divide the present worth of benefits of a project by the present worth of its costs, then you have what is known as the benefit-cost ratio. We can write thus:

Benefit-Cost ratio = Present worth of benefits

$$\frac{\text{-----}}{\text{Present worth of costs}}$$

Generally, a project is acceptable if the benefit-cost ratio is greater than 1 (one).

If the benefit-cost ratio is exactly 1 (one), that project is a break even project.

The Internal Rate of Return (IRR)

The internal rate of return is a discount rate where the present worth of benefits is equal to the present worth of costs.

Under the internal rate of return evaluation method, a project will be acceptable if its internal rate of return is higher than the firm's required rate of return.

The starting point of economic analysis is the financial analysis of a project which should be properly concluded before embarking on an economic analysis. Some adjustments will be made to the calculations to arrive at economic data.

First, it may be necessary to include or exclude some costs and benefits which may have been included or excluded from the financial analysis.

Secondly, some project inputs and outputs may have to be revalued if their shadow prices differ significantly from their market prices.

SELF ASSESSMENT EXERCISE 2

Discuss the nature of economic analysis with emphasis on the methods of evaluating the worth of a project.

3.3 Adjustments to Financial Analyses

We have stated that the starting point of an economic analysis is a financial analysis, so if we have financial data on financial analysis, we need to make some adjustments to the financial analysis to arrive at economic analysis data. We shall now consider some of the adjustments:

Transfer Payments

Transfer payments represent transfer of resources from one section of society to another. They do not make any claim on the country's resources and as such, their impact should be clearly distinguished and analyzed in the economic analysis.

One of the first transfer payments we shall consider is interest. Interest is a reward for capital. For example, if a project is funded through a bank loan, the interest component is included in the profit and loss statement.

The interest charges in the profit and loss statement represent transfer payments from a project to the provider of funds. What the project lost (interest) has become a gain to the provider of funds.

In effect, both figures are equal and cancel out without any net increase to society of funds. Therefore in economic analysis, interest charges are excluded since they only represent transfer payments.

The second transfer payment we shall consider is tax. When a project is profitable it is expected to pay taxes to the government at the ruling rate. In computing the profit of a project taxes are deducted to arrive at net profit. Taxes therefore appear as outgoing cash flows. Taxes represent transfer payments from a project to government.

In the economic analysis of a project, taxes are excluded because from the point of view of the society, they are only a transfer of resources from one section of the economy to another.

The third transfer payment is subsidies. In a traditional private sectors setting, it would be unheard of to talk of subsidies. But in economic analysis, subsidies appear as important data. Most public sector projects enjoy government subsidies to enable the poor gain access to certain services which ordinarily they cannot afford without government assistance. Subsidies represent opportunity costs to a nation as a whole.

Therefore in estimating the true cost of a project in an economic analysis, subsidies should be included.

3.4 Linkage Effects of a Project

Consider a simple case where a university is newly located in an environment. Many investments will begin to spring up. New housing developments will begin to spring up; canteens will begin to spring up; hair dressing salons, etc. will begin to spring up

to cater for the needs of the new university community. Such constitute the linkage effects of a project.

Generally, there are two types of linkage effects which we shall briefly discuss:

Forward Linkage Effects

Forward linkage is the stimulus given to industries that use the products of a project. A case in point is a flour manufacturing project. Flour has so many uses. If a flour mill is located in an environment, it will lead to the establishment of such projects as bakeries which will use the flour.

Backward Linkage Effects

Backward linkage demonstrates the stimulus to industries that supply the inputs to a project. For example, the establishment of a flour mill in an environment will lead to demand for wheat which is a major input for flour mill. The flour mill will lead to investment in wheat cultivation.

Also, the establishment of a car assembly plant will lead to the establishment of tyre manufacturing plants that need to supply tyres to the car assembly plant.

Example of an Economic Analysis

In the year 2006, the World Bank was considering the desirability or otherwise of assisting Nigeria set up an ethanol plant covering thousands of hectares in the Niger Delta area.

Under the scheme, young farmers will be allocated hectares of land for subsidized cassava cultivation. Such inputs like fertilizers will be heavily subsidized while technical advice will be provided by the World Bank/ Nigerian agricultural experts.

4.0 CONCLUSION

In this unit, we discussed the nature of economic analysis and compared it with the financial analysis of a project. We discussed net present benefit cost ratio and the internal rate of return (IRR).

5.0 SUMMARY

Introduction to economic analysis has provided us with the tools to conduct economic analyses, with financial analyses as a starting point.

Financial analysis is the private sector's view of a project without considering a project's impact on the society. Economic analysis is a macro view of a project, taking into consideration the project's impact on society.

6.0 TUTOR-MARKED ASSIGNMENT

What do you see as the basic differences between the financial analysis of a project and the economic analysis of a project?

7.0 REFERENCES/FURTHER READINGS

Leon Ikpe (1999). Project Analysis and Evaluation. Lagos: Impressed Publishers.

