CHALIMBANA UNIVERSITY

BACHELOR OF EDUCATION LEADERSHIP AND MANAGEMENT

ELM 3282 : PROJECT MANAGEMENT AND ENTREPRENEURSHIP

FIRST EDITION 2016

CHAU 2016

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UNIT 1 : INTRODUCTION TO PROJECT MANAGEMENT

1.1 LEARNING OBJECTIVES

By the end of this unit you should be able to :

- Define the terms 'project' and 'project management.'
- State the key attributes of a project and identify the triple constraint of a project.
- Mention project management knowledge areas, and identify project success factors and the role of a project manager.
- Identify project stakeholders.
- Discuss project phases and project life cycle.

1.2 WHAT IS A PROJECT?

A project is a temporary endeavor undertaken to create a unique product, service, or result. A project ends when its objectives have been reached or the project has been terminated.

Projects can be large or small and involve one person or thousands of people. They can be done in one day or take years to complete.

1.3 PROJECT ATTRIBUTES

a) A project has a **unique purpose**. Every project should have a well-defined objective.

b) A project is **temporary**. A project has a definite beginning and a definite end.

c) A project is developed using **progressive elaboration**. Projects are often defined broadly when they begin, and as time passes, the specific details of the project becomes clearer. A project team should develop initial plans and then update them with more detail based on new information. Therefore, projects should be developed in increments.

d) A project requires **resources**, often from **various areas**. Resources include people, money or other assets. Many projects cross departmental or other boundaries to achieve their unique purpose. People from different departments may be required to work together to achieve the project goal. Sometimes outside consultants may be hired to provide input. Suppliers from outside the company may be required as well.

e) A project should have **a primary customer or sponsor.** Someone must take the primary role of sponsorship. The project sponsor usually provides the direction and funding for the project. This may be a senior manager in-charge of the main parts of the organization affected by the project.

f) A project involves uncertainty. Because every project is unique, it is sometimes difficult to define its objectives clearly, estimate how long it will take to complete, or determine how much it will cost. External factors also cause uncertainty, such as a supplier going out of business or a project team member needing unplanned time off. This uncertainty is one of the main reasons project management is so challenging. An effective project manager is crucial to project's success.

1.4 THE TRIPLE CONSTRAINT

Every project is constrained in different ways by the following things:

a) **Scope.** What work will be done as part of the project? What unique product, service, or result does the customer or sponsor expect from the project. How will the scope be verified?

b) **Time .** How long should it take to complete the project? What is the project's schedule? How will the team track actual schedule performance? Who can approve change to the schedule?

c) **Cost.** What should it cost to complete the project? What is the project budget? How will the cost be tracked? Who can authorize changes to the budget?

Managing the triple constraint involves making tradeoffs between scope, time and cost goals. Alternatively, you might have to reduce the scope of the project to meet time and cost goals. Or you must decide which aspect of the triple constraint is most important. If time is the most important, you must often change the initial scope and/ or cost goals to meet the schedule. If scope goals are the most important, you may need to adjust time and or cost goals.

Although the triple constraint describes how the basic elements of scope, time, and cost interrelate, other elements can also play significant roles. Quality is often a key factor in projects, as is customer or sponsor satisfaction.

A project should be able to meet scope, time, cost, and quality goals if it is to satisfy the sponsor. This calls for good project management.

1.5 WHAT IS PROJECT MANAGEMENT?

Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements.

Project managers must strive to meet specific scope, time, cost, and quality goals of projects. They must as well facilitate the entire process to meet the needs and expectations of the people involved in or affected by the project activities.

1.6 PROJECT MANAGEMENT KNOWLEDGE AREAS

Project management knowledge areas describe the key competencies that project managers must develop. They are altogether nine (9). They are divided into four core knowledge areas and four facilitating knowledge areas, and one project integration management areas.

i) **CORE KNOWLEDGE AREAS**

There are knowledge areas because they lead to specific project objectives. Brief descriptions of the four core knowledge areas as follows:

a) **Project Scope Management**
Involves defining and managing all the work required to complete the project successfully.

b) **Project Time Management**
Includes estimating how long it will take to complete the work, developing an acceptable project schedule, and ensuring timely completion of the project.

c) **Project Cost Management**
Consists of preparing and managing the budget for the project.

d) **Project Quality Management**
Ensure that the project will satisfy the stated or implied needs for which it was undertaken.

ii) **FACILITATING KNOWLEDGE AREAS**

These are so called because they are the process through which the project objectives are achieved. The following is the brief description of each of the facilitating knowledge area.

a) **Project Human Resource Management**
Is concerned with making effective use of the people involved with the project.

b) **Project Communications Management**
Involves generating, collecting, disseminating, and storing project information.

c) **Project Risk Management**
Includes identifying, analyzing and responding to risks related to the project.

d) **Project Procurement Management**
Involves acquiring or procuring goods and services for a project from outside the performing organization.

iii) **PROJECT INTEGRATION MANAGEMENT**

Project Integration Management is the ninth knowledge area. It is an overarching function that affects and is affected by all of the other knowledge areas. Project managers must have knowledge and skills in all nine of these areas.

1.7 PROJECT SUCCESS

How do you define project success or failure of a project? Using an example of a project to construct 500 houses within 12 months for K25, 000, 000. The success of that project can be defined as follows:

a) The project must meet **scope, time** and **cost** goals. If the 500 houses were constructed and met the other scope requirements, the work was completed in 12 months or less and the cost was K25, 000, 000 or less, you could consider it as a successful project based on this criterion.

b) The project must satisfy the **customer/sponsor**. Even if the project met the initial scope, time and cost goals, the users of the houses (the main customers or sponsors in this example) might not be satisfied. If the users or customers are not happy with important aspects of the project, it would be deemed a failure. However, if the users or customers are very satisfied with the project it would be deemed a successful project regardless of whether it took a long time to accomplish or it spent more money than estimated.

c) The results of the project must meet its **objectives**. If its goals or objectives are met, then it would be deemed a success.

1.7.1 WHAT HELPS PROJECTS SUCCEED?

The following things will help a project to succeed:

- Executive support.
- Clear objectives.
- Proper planning.
- Formal methodology.
- Competent staff.
- Small milestones.
- User involvement
- Minimized scope.
- Firm basic requirements.
- Reliable estimates.
- Ownership

1.7.2 THE IMPORTANCE OF TOP MANAGEMENT COMMITMENT

It will enable a project to have adequate resources if they have top management support. This is so because top managers will ensure that resources are made available for the project.

Top management commitment will also help project managers get the cooperation from people in other departments and sections of the organization.

Top managers can also mentor and coach project managers on leadership issues.

1.8 THE ROLE OF A PROJECT MANAGER

The following are the roles of a project manager:

- Define the scope of the project.
- Identify stakeholders, and decision makers.
- Estimate time required.
- Develop initial project management flowchart.
- Develop detailed task list (Work Breakdown Structures)
- Identify required resources and budget.
- Evaluate project requirements.
- Prepare contingency plan.
- Identify interdependencies.
- Identify and track critical milestones.
- Participate in project phase review.
- Secure needed resources.
- Manage the change control process.
- Report project status.
- Identify and evaluate risk

1.9 PROJECT STAKEHOLDERS

Stakeholders are the people involved or affected by project activities. They include the project sponsor, project team, support staff, customers, users, suppliers, and even opponents of the project. These stakeholders often have very different needs and expectations. For example, building a new house is a well-known example of a project. There are several stakeholders involved in a home construction project.

a) The project sponsor would be the potential homeowners. They would be the people paying for the house and would therefore expect the contractor to provide accurate estimates of the costs involved in building the house.

b) The project manager in this example would be the general contractor responsible for building the house. He or she needs to work with all the project stakeholders to meet their needs and expectations.

c) The project team for building the house would include several construction workers, electricians, carpenters, and so on. These stakeholder need to know exactly what work they must do and when they need to do it.

d) Support staff might include the buyers' employers, the general constructor's administrative assistant, and other people who support other stakeholders.

e) Suppliers of various materials such as wood, windows, flooring materials, appliances, and so on.

f) There may be or may not be opponents of the project. For example a neighbor might oppose the project because the workers are making so much noise that she cannot concentrate on her work at home.

For the project to be successful, a project manager should develop good relationship with project stakeholders to understand and meet their needs.

Stakeholders are divided into internal and external stakeholders.

Internal project stakeholders generally include top management, project sponsor, project team, support staff, internal customers for the project, functional managers, project managers, etc.

External project stakeholders include the project's customers, competitors, suppliers, government officials, concerned citizens and other external groups potentially involved in or affected by the project.

Since the purpose of project management is to meet the project requirements and satisfy stakeholders, it is important that project managers should identify, understand, and manage relationships with all project stakeholders.

Technical and analytical skills are not enough to guarantee success in project management. To be more effective a project manager should identify and address the needs of different stakeholders and understand how his project relates to the entire organization.

1.10 PROJECT PHASES AND THE PROJECT LIFE CYCLE

A project can be divided into several phases. A project life cycle is a collection of project phases. In general a project life cycle defines what work will be performed in each phase, what deliverables will be produced and when, who is involved in each phase and how management will control and approve work produced in each phase.

A deliverable is a product, or service, such as a technical report, a training session, a piece of hardware, etc., produced or provided as part of a project.

There are four phases of a project. A project should successfully complete each phase before moving to the next.

The first two phases focuses on planning and are often referred to as **project feasibility.** The last two phases focuses on delivering the actual work and are referred to as **project acquisition.**

The following are the four project phases:

- **Phase 1 : The Concept Phase**
  In this phase of a project, managers usually briefly describe the project. They develop a very high level or summary plan for the project, which describes the need for the project and basic underlying concepts.

  A preliminary or rough cost estimate is developed in the first phase, and an overview of the work involved is created.

  A Work Breakdown Structure (WBS) outlines project work by decomposing the work activities into different levels of tasks. WBS is a deliverable oriented document that defines the total scope of the project.

- **Phase 2 : The Development Phase**
  After the concept phase is completed, the next project phase is the development phase. In this phase the project team creates more detailed project management plans, a more accurate cost estimate and a more thorough Work Breakdown Structure (WBS).

  A project idea must pass the concept phase before evolving into the development phase.

- **Phase 3 : The Implementation Phase**
  In this phase, the project team creates a definitive or very accurate cost estimate, delivers the required work, and provides performance reports to stakeholders.

- **Phase 4 : The Closeout Phase**
  The last phase of a project life cycle is the close out. In this phase, all of the work is completed, and there should be some sort of customer acceptance of the entire project. The project team should document its experiences on the project in a **lessons learned report.**

It is however important to state that not every project follow all these phases. Some have fewer phases while others follow multiple phases.

Whatever the case, a project should have phases that connect the beginning and the end of the project, so that people can measure progress towards achieving project goals during each phase.

A management review should occur after every phase to evaluate progress, potential, success, and continued compatibility with organizational goals. Reviews are very important for keeping projects on track and determining if they should be continued, redirected or terminated.

UNIT 2 : PROJECT PLANNING

Given in the table below is a summary of the steps in project planning. Each of the steps are then discussed in detail in the subsequent pages that follow

2.1 LEARNING OBJECTIVES

By the end of this unit you should be able to :

- List down the steps involved in project planning.
- Conduct a simple project planning exercise.

TABLE 2.1 AN OUTLINE OF PROJECT PLANNING ACTIVITIES

Steps:	Activities within project planning
0	Select program
1.	Identify project scope and objectives a. Identify objective and measures of effectiveness in meeting them b. Establish a project authority c. Identify stakeholders d. Modify objective in the light of stakeholders analysis e. Establish methods of communication with all parties
2.	Identify project infrastructure a. Establish relationships between project and strategic planning b. Identify installation standards and procedures c. Identify project team organization
3.	Analyze project characteristics a. Distinguish the project as either objective or product driven b. Analyze other project characteristics c. Identify high-level project risks d. Take into account user requirements concerning implementation e. Select general life-cycle approach f. Review overall resource estimates
4.	Identify project products and activities a. Identify and describe project products (including quality criteria) b. Document generic product flows c. Recognize product instances d. Produce ideal activities network e. Modify ideal to take into account need for stages and checkpoints
5.	Estimate effort for each activity a. Carry out bottom-up estimates b. Revise plan to create controllable activities
6.	Identify activity risks a. Identify and quantify activity-based risks b. Plan risks reduction and contingency measures where appropriate c. Adjust plans and estimate to take account of risks
7.	Allocate resources a. Identify and allocate resources b. Revise plans and estimate to take account of resources constraints
8.	Review/publicize plan a. Review quality aspects of projects plans

b. Document plans and obtains agreements

9. Execute plan/lower levels of planning

1. This may require the reiteration of the planning process at a lower level

STEP 0: SELECT A PROJECT

This is called step zero because in a way it is outside the main project planning process. Proposed projects do not appear out of thin air. Instead, some process must decide to initiate this project rather than some other. While a feasibility study must suggest the project is worthwhile, it would still need to be established that it should have priority over other projects found to be worthwhile. This evaluation of the merits of projects could be part of strategic planning.

STEP 1: IDENTIFY PROJECT SCOPE AND OBJECTIVES

The activities in this step ensure that all the parties to the project agree on the objectives and are committed to the success of the project. A danger to be avoided is overlooking people who are affected by the project.

- **Identify objectives and practical measures of the effectiveness in meeting those objectives**
  Come up with objectives for a project and ways of measuring the success in achieving those objectives. In doing so there is need for agreed objectives. Ensure that these are objectives that the parties to the project are agreeable to.

- **Establish a project authority**
  Single overall project authority needs to be established so that there is unity of purpose among all those concerned

- **Stakeholder analysis-identify all stakeholders in the project and their interest**
  Essentially all the parties who have an interest in the project need to be identified.

- **Modify objectives in the light of stakeholders analysis**
  In order to gain the full cooperation of all concerned, it might be necessary to modify the project objectives. This could mean adding new features to the project which give a benefit to some stakeholders as a means of assuring their commitment to the project. This is potentially dangerous as the project size may be increased and the original objectives obscured. Because of these dangers, it is suggested that this process be done consciously and in a controlled manner.

- **Establish methods of communication with your parties.**
  This should be fairly straightforward. The project leader would also need to find a contact point with other parties.

STEP 2 : IDENTIFY PROJECT INFRASTRUCTURE

- Projects are rarely carried out in a vacuum. There is usually some kind of existing infrastructure into which the project must fit. Where project managers are new to the organization, they must find out the precise nature of this infrastructure.

- **Identify relationship between the project and strategic planning**
  As well as identifying projects to be carried out, an organization needs to give priorities to the projects to be carried out. It also needs to establish the framework within which the proposed new systems are to fit. For instance in a software project, both the Hardware and Software standards, for example are needed so that various systems can communicate with each other. These strategic decisions must be documented in a strategic business plan or in an Information Technology plan that is developed from the business plan.

- **Identify installation standards and procedures**
  Any organization that develops a product through a project should define their development procedures. As a minimum, the normal stages in the life cycle to be carried out should be documented along with the products created at each stage.

  Change control and configuration management standards should be in place to insure that changes to requirements are implemented in safe and orderly way.

  The procedural standards may lay down the quality checks that need to be done at each point of the project life cycle or these may be documented in a separate *quality standards and procedures* manual.

  The organization as part of its monetary and control policy may have a *measurement program* in place which dictates that certain statistics have to be collected at various stages of a project.

  Finally, the project manager should be aware of any project planning and control standards. These will relate to how the program is controlled: for example the way that the hours spent by team members on individual tasks are recorded on timesheets.

- **Identify project team organization**
  Project leaders, especially in the case of large projects, might have some control over the way that their project team is to be organized. Often, though, the organizational structure will be dictated to them. For example, a high level managerial decision might have been taken that developers and business analysts will be in different groups.

  If the project leader does have some control over the project team organization then this would be best considered at a later stage (see step 7 allocate recourse).

STEP 3 : <u>ANALYZE PROJECT CHARACTERISTICS</u>

The general purpose of this part of planning operation is to ensure that the appropriate methods are used for the project.

- **Distinguish the project as either objective or project driven**
  As development of a project advances it turns to become more product driven, although the underlying objectives always remain and must be respected.

- **Analyze other project characteristics (including quality based ones)**
  What exactly should be developed? Will the project be safety critical, where human life could be threatened by a malfunction?

- **Identify high level project risks**
  Considerations must be given to the risks that threaten the successful outcome of the project. Generally speaking, most risks can be attributed to be the operational or development environment, the technical nature of the project or the type of the project being created.

- **Take into account user requirement concerning implementation**
  The clients may have their own procedural requirements. For example, an organization might mandate the use of a particular development method.

- **Select development methodology and like-cycle approach**
  The development methodology and project life cycle to be used for the project will be influenced by the issues raised above. The term 'methodology' is simply, the group of methods to be used in a project. For a project planner, some research into the methods typically used in the problem domain is worthwhile. For example, sometimes, as part of a project, a questionnaire survey has to be conducted. Do this at the planning stage.

- **Review overall resource estimates**
  Once the major risks have been identified and the broad project approach has been decided upon, this would be a good point at which to re-estimate the effort and other resources required to implement the project. Where enough information is available a function point-based estimate might be appropriate.

STEP 4 : <u>IDENTIFY PROJECT PRODUCTS AND ACTIVITIES</u>

Identify and Describe Project Products (deliverables).

In general there can be no project product that do not have activities that create them. Wherever possible, we ought to also ensure the reserve: That there are no activities that do not produce a tangible product. Identifying all the things the project is to create helps us to ensure that all the actives we need to carry out are accounted for.

Some of these products will be handed over to the clients at the end of the project-these are deliverables. Other products might not be in the final configuration, but are needed as intermediate products used in the process of creating deliverables.

These products will include a large number of technical products, including training materials and operating instructions, but also products to do with the management and the quality of the product. Planning documents would, for example, be management products.

The products will form a hierarchy. The main product will have sets of components products which in turn may have sub-component products and so on. These relationships can be documented in a Product Breakdown Structure (PBS).

Some products are created from scratch, e.g. new software components. A product could quiet easily be a document, like a software design document. It might be a modified version of something that already exist, such as an amended piece of code. Product could even be a person, such as a trend user, a product of the process of training. Always remember that a product is result of any activity. A common error is to identify as products things that are really activities such as training design and testing. Specifying documentation as a product should also be avoided-by itself this term is just too vague.

This part of the planning process draws heavily on the standard laid down in PRINCE TWO. These specify products are the bottom of the PBS should be documented by product descriptions which mean:

- The name/identity of the product;
- The purpose of the product;
- The derivation of the product (that is, the other product from which it is derived)
- The composition of the product;
- The form of the product;
- The relevant standards;
- The quality criteria that should apply to it.

Document generic products flows: Some products will need one or more other products to exist first before they can be created. For example, a program design must be created before the program can be written and the program specification must exist before the design can be commenced. These relationships can be portrayed in a product flow diagram (PFD).

Recognize products instances: Where the same generic PFD fragment relates to more than one instance of a particular type of product, an attempt should be made to identify each of those instances.

Produce ideal activity network: In order to generate one product from another there must be one or more activities which carry out the transformation. By identifying these activities we can create an activity network which shows the tasks that have to be carried out and the order in which they have to be executed.

Modify the ideal to take into account need for stages and checkpoints: The approach to sequencing activities described above encourages the formulation of a plan which will minimize the overall duration or elapsed time, for the project. It assumes that an activity will start as soon as the preceding ones upon which it depends have been completed.

There might, however, be a need to modify this by dividing the project into stages by introducing check point activities. These are activities which draw together the products of preceding activities to check that they are compatible. This could potentially delay work on some elements of the project. There has to be a trade- of between efficiency and quality.

The people to whom the project manager reports could decide to leave the routine monitoring of activities to the project managers. However, there could be some key activities, or milestones, which represent the completion of important stages of the project of which they would want to take particular note. Checkpoint activities are often useful milestones

STEP 5 : ESTIMATE EFFORT FOR EACH ACTIVITY

- **Carryout bottom-up estimates:** some top-down estimates of effort, cost and duration will already have been done (See step 3)

  At this point, estimates of the staff efforts required, the probable elapsed time and the none - staff resources need for each activity will need to be produced. The method of arriving at each of these estimates will vary depending on the type of activity.

  The difference between **elapsed time** and **effort** should be noted. **Effort** is the amount of work that needs to be done. If a task requires three members of staff to work for two full days each, the effort expended is **six** days.

  Elapsed time is the time between the start and end of a task. In our example above, if the three members of staff start and finish at the same time then the elapsed for the activity would be two days.

  The individual activity estimates of effort should be summed to get an overall bottom-up estimate which can reconciled with the previous top-down estimate.

  The activities on the activity network can be annotated with the elapsed times so that the overall durations of the project can be calculated.

- **Revise plan to create controllable activities:** the estimates for individual activities could reveal that some are going to take quite a long time. Long activities make a project difficult to control. If an activity involving system testing is to take 12 weeks, it would be difficulty after 6 weeks to judge accurately whether 50% of the work is completed. It would be better to break this down into a series of smaller sub-tasks.

  There might be a number of activities that are important, but individually take up very little time. For a training course, there might be a need to book rooms and equipment, notify those attending, register students on the training system, order refreshments, copy training materials and so on. In a situation like this it would be easier to bundle or blend the activities into one general activity 'make training course arrangements' which could be supplemented with a check list.

  In general, try to make activities about the length of reporting period used for monitoring and controlling the project. If you have a progress meeting every two weeks, then it would be convenient to have activities of 2 weeks' duration on average, so that progress meeting would normally be made aware of completed tasks each time they are held

STEP 6 : <u>IDENTIFY ACTIVITIES RISKS</u>

- **Identify and quantify activity based risks**
  Risks inherent in the overall nature of the project have already been considered in step 3 we now want to look at each activity in turn and assess the risk to its successful outcome.

Any plan is always based on certain assumptions. Say the design of a component is planned to take five days. This is based on the assumption that the client's requirement is clear and unambiguous. If it is not then additional effort to clarify the requirement would be needed. The possibility that an assumption upon which a plan is based is incorrect constitutes a risk.

In this example, one way of expressing the uncertainty would be to express the estimate of effort as a range of values.

A project plan will be based on a huge number of assumptions, and so some way of picking out the risks that are most important is needed. The damage that each risk could cause and the likelihood of it occurring have to be gauged. This assessment can draw attention to the most serious risks. The usual effect if a problem materializes is to make the task longer or more costly

- **Plan risk reduction and contingency measures where appropriate**
  It may be possible to avoid or at least reduce some of the identified risks. On the other hand, contingency plans specify action that is to be taken if a risk materializes. For example, a contingency plan could be to use contract staff if a member of the project team is unavailable at a key time because of serious illnesses.

- **Adjust overall plans and estimates to take account of risks**
  We may change our plans, perhaps by adding new activities which reduce risks. For example, in a software project, a new programming language might mean we schedule training courses and time for the programmers to practice their new programming skills on some non-essential work.

STEP 7 : ALLOCATE RESOURCES

- **Identify and allocate resources**
  The type of staff needed for each activity is recorded. The staff available for the project are identified and are provisionally allocated to tasks.

- **Revise plans and estimates to take into account resource constraints**
  Some staff may be needed for more than one task at the same time and, in this case, an order of priority is established. The decisions made here may have an effect on the overall duration of the project when some tasks are delayed while waiting for staff to become free.

STEP 8 : REVIEW AND PUBLICIZE PLAN

- **Review quality aspects of the project plan**
  When controlling any project it is important to carry out quality checks or quality reviews. Each task should have quality criteria. These are quality checks that should be passed before the activity can be signed off as completed. This will help us to be sure that the completed work is really complete in all respects.

- **Document Plans and Obtain Agreement**

It is important that the plans be carefully documented and that all parties to the project understand and agree to the commitments required of them in the plan. Accurate cash flow forecasting is not easy, as it is done in the early stages of the project's life cycle and many items to be estimated might be some years in the future.

STEP 9 : EXECUTE THE PLAN

Once the project is underway, plans will need to be drawn in greater detail for each activity as it becomes due. Detailed planning of the later stages will need to be delayed because more information will be nearer the start of the stage. At this stage the plan should be executed or put into effect.

UNIT 3 : PROJECT EVALUATION

Our main focus in this unit is to look more closely at how the feasibility of an individual project can be evaluated.

Three major factors need to be considered in the evaluation of potential projects. These are, a) technical feasibility, b) the balance of costs and benefits, c) and finally the degree of risk associated with the project.

3.1 LEARNING OBJECTIVES

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

- Identify different methods of project evaluation.
- Write a project charter.

3.2 TECHNICAL ASSESSMENT

Technical assessment of a proposed project consists of evaluating the required functionality against the project. In other words do we have ideal and relevant technical tools and know-how in place to enable us meet project expectation.

One limiting factor may be organizational policy. This is so because Organizational policy is likely to place limitations on the nature of the technical solutions that might be considered by the project.

The constraints will, of course, influence the cost of the solution. This must be taken into account in the cost-benefit analysis.

3.3 COST-BENEFIT ANALYSIS

The most common way of carrying out an economic assessment of a proposed project is by comparing the expected costs of undertaking the project with the benefits of having it in place.

Assessment focuses on whether the estimated income and other benefits exceed the estimated costs. Additionally, it is usually necessary to ask whether the project under consideration is the best of a number of options. There might be more candidate projects than can be undertaken at

any one time and, in any case projects will need to be prioritized so that resources are allocated effectively.

The standard way of evaluating the economic benefits of any project is cost-benefit analysis, comprising of two steps.

- **Identifying and estimating all of the costs and benefits of carrying the project and operating the delivered application.** These include the development costs, the operating costs and the benefits that are expected to accrue from the project.
- **Expressing these costs and benefits in common units.** We need to evaluate the net benefit, that is, the difference between the total benefits and total cost of carrying out the project. To do this we must express each cost and each benefit in some common unit, that is, as money.
- **Most direct costs are relatively easy to identify and quantify in approximate monetary terms.** It is helpful to categorize costs according to where they originate in the life of the project.
- **Development costs** : They include the salaries and other employment costs of the staff involved in developing the project, and all associated costs.
- **Operational costs:** They include the costs of operating the product of the project once it has been put in place.
- **Set up costs:** include the costs of putting the product into place.

Benefits on the other hand are often quite difficult to quantify in monetary terms even once they have been identified. I n cost benefit analysis the focus has to be on the benefits that can be financially valued in some way.

3.4 CASH FLOW FORECASTING

Another important aspect is the forecasting of the cash flows that will take place and their timing. A cash flow forecast will indicate when expenditure and income will take place.
It is important that we know that we can fund the project whether from the organization's own resources or by borrowing from the bank. Thus some forecast is needed of when expenditure such as payment of salaries and bank interest will take place and when any income is to be expected.
Accurate cash flow forecasting is not easy, as it is done in the early stages of the project's life cycle and many items to be estimated might be some years in the future.

3.5 COST BENEFIT EVALUATION TECHNIQUES

In the following section we will take a brief look at some common methods for comparing and evaluating projects on the basis of their cash flow forecasts.

3.5.1 The Main Methods

There are four main techniques that a person can use in project appraisal or evaluation in regard to capital investment in a project.

1) The Payback Method

The payback method is the length of time it takes for an initial investment to be repaid out of the net cash inflows from a project. It is a time that a project will take to pay back the money spent on it. It is based on expected cash flows from the project. For example, Mwiinga Secondary school, wishes to buy a machine for a project. The School Manager has to choose between two machines that costs **K35 000** each. However, their cash flows perform differently over a **four** year period due to different labour, material, and maintenance costs.

To calculate the payback period, simply calculate how long it will take to recover the initial amount of money invested or used in the purchase of the machine. (See table below):

YEAR	CASH FLOW MACHINE 'A'	CASH FLOW MACHINE 'B'
0	K35 000	K35 000
1	K20 000	K10 000
2	**K15 000**	K10 000
3	K10 000	**K15 000**
4	K10 000	K20 000
PAYBACK PERIOD	2YEARS	3 YEARS

When you add the cash flows for each machine, machine 'A' will be able to raise K35 000 in year two, while machine 'B' will raise that money in year three.

Where projects are ranked by the shortest payback period machine A' is selected in preference to machine 'B'.
The disadvantage of the pay back method is that it does not consider the time value of money.

2) The Accounting Rate of Return Method

The accounting rate of return (ARR) method attempts to compare the profit of a project with the capital invested in it. It is usually expressed as a percentage. The formula is as follows:

$$ARR = \frac{\text{Profit}}{\text{Capital Employed}} X\ 100$$

Two important problems arise from this definition. These are as follows:

1. The definition of profit. Normally, the average annual net profit earned by a project would be used. However, accounting profit can be subject to a number of different assumptions and distortions (e.g. depreciation, taxation and inflation), and so it is relatively easy to arrive at different profit levels depending upon the accounting policies

adopted. The most common definition is to take profit before interest and taxation. The profit included in the equation would then be a simple average of the profit that the project earns over its entire life.

2. The definition of capital employed. The capital employed could be either the initial capital employed in the project or the average capital employed over its life.

Thus, depending upon the definition adopted, the ARR may be calculated in one of the two ways, as follows:

1. **Using the original capital employed:**

$$\text{ARR} = \frac{\text{Average annual net profit before interest and taxation}}{\text{Initial capital employed on the project}} \times 100$$

2. **Using the average capital employed**

$$\text{ARR} = \frac{\text{Average annual net profit before interest and taxation}}{\text{Average annual capital employed on the project}} \times 100$$

$$\frac{\text{Initial capital employed} + \text{residue value}}{2}$$

The two methods are illustrated in the Example below:

The accounting rate of return method

Bridge Limited is considering investing in a new project, the details of which are as follows:

Project life		5 years	
		K000	K000
Project cost			50
Estimate net profit:			
Year	1	12	
	2	18	
	3	30	
	4	25	
	5	5	

The estimated residual value of the project at the end of year 5 is K10 000.

Required:

Calculate the accounting rate of return of the proposed new project, using the two methods described above.

The accounting rate of return would be calculated as follows:

1 **Using the average capital employed**

$$Average\ annual\ net\ profit = \frac{12000+18000+30000+25000+5000}{5} = \frac{90000}{5} = K\ 18000$$

$$Average\ deperciation = \frac{50000-10000}{5} = \frac{40000}{5} = K8000$$

$$Average\ annual\ operating\ profit = 18000 - 8000 = K10000$$

$$Average\ investment = \frac{50000+10000}{2} = \frac{60000}{2} = K30000$$

$$Accounting\ rate\ of\ return\ on\ profit = \frac{10000}{30000} x\ 100 = 33.3\%$$

2 Using the initial capital employed

$$\frac{\text{Average annual net profit}}{\text{Cost of the investment}} \times 100$$

Average annual net profit = K18000

$$\text{Therefore accounting of return} = \frac{18000}{50000} \times 100 = \underline{36\%}$$

The Main Advantages of ARR Method

1. It draws attention to the notion of overall profit.

The Main Disadvantages of ARR Method

1. It is not always clear whether the original cost of investment should be used, or whether it is more appropriate to substitute an average for the amount of capital invested in the project.
2. The method gives no guidance on what is an acceptable rate pf return.
3. The method does not take into account the time value of money.

3) The Net Present Value Method

The net present value method

Rage Limited is considering two capital investment projects. The details are outlined as follows:

Project	1	2
Estimated life	3 years	5 years
Commencement date	1.1.01	1.1.01
	K000	K000
Project cost at year 1	100	100

Estimated net cash flows:

Years:		
1	20	10
2	80	40
3	40	40
4		40
5		20
	140	150

The company expects a rate of return of 10% per annum on its capital employed.

Required:

Using the net present value method of project appraisal, assess which project would be more profitable:

Rage Limited

Project 1					Project 2		
year	Net cash flow	Discount factor	Present value		Net cash flow	Discount factor	Present value
(1)	(2)	(3)	(4)		(5)	(6)	(7)
	K(kwacha)	K	K		K	K	K
1	20 000	0.9091	18 182		10 000	0.9091	9091
2	80 000	0.8264	66 112		40 000	0.8264	35056
3	40 000	0.7513	30 052		40 000	0.7513	30052
4					40 000	0.6830	27320
5					20 000	0.6209	12418
Total present value			**114 346**				**111 937**
Less initial cost			**100 000**				**100 000**
Net present value			**14 346**				**11 937**

1. The net cash flows and the discounted factor of 10% (i.e. the rate of return) were given in the question.
2. **The discount factors may be obtained from the discount table (Present Value Table) given at the end of this unit.**
3. Column 4 has been calculated by multiplying column 2 by column 3
4. Column 7 has been calculated by multiplying column 5 by column 6.

Both projects have a positive NPV, but project 1 will probably be chosen in preference to project 2 because it has a higher NPV, even though its total net cash flow of £140 000 is less than the total net cash flow of £150 000 for project 2.

Advantages of Net Present Value (NPV)

1. The use of net cash flows emphasized the importance of liquidity.
2. The time value of money is taken into account.

3. It is easy to compare the NPV of different projects and to reject projects that do not have an acceptable NPV.

Disadvantages of NPV

1. Some difficulties may be incurred in estimating the initial cost of the project and the time periods in which instalments must be paid back (although this is a common problem in capital investment appraisal)
2. It is difficult to estimate accurately the net cash flows for each year of the project's life.
3. It is not easy to select an appropriate rate of interest. The rate of interest is sometimes referred to as cost of capital, i.e. the cost of financing an investment.

NPV is considered to be a highly acceptable method of capital investment appraisal. It takes into account the timing of the net cash flows, the project's profitability, and the return of the original investment.

4. The Internal Rate of Return Method

An alternative method of investment appraisal based on discounted net cash flow is known as the internal rate of return IRR. This method is very similar to the NPV method. However, instead of discounting the expected net cash flows by a predetermined rate of return, the IRR method seeks to answer the following questions:

In the theory, a rate of return that was lower than the entity required rate of return would be rejected. In practice, however, the IRR would only be one factor to be taken into account in deciding whether to go ahead with the project. The method is illustrated in the example given below:

The internal rate of return method

Bruce limited is considering whether to invest K50 000 in a new project. The project's expected net cash flows would be as follows:

Year	K 000
1	7
2	25
3	30
4	5

Required:

Calculate the internal rate of return for the proposed new project.

Calculation of the internal rate of return:

Step 1: select two discount factors

The first step is to select two discount factors, and then calculate the net present value of the project using both factors. The two factors usually have to be chosen quite arbitrarily, but they should preferably cover a narrow range. One of the factors should produce a positive net present value NPV, and the other factor a negative NPV. As far as this question is concerned, a factor of 10% and 15% will be chosen to illustrate the method. In practice, you may have to try various factors before you come across two that are suitable for giving a positive and negative result.

Year	Net cash flow	Discount factors		Present value	
		10%	15%	10%	15%
1	7 000	0.9091	0.8696	6364	6087
2	25 000	0.8264	0.7561	20 660	18 903
3	30 000	0.7513	0.6575	22 539	19 725
4	5000	0.6830	0.5718	3 415	2 859
Total present value				52 978	47 574
Less Initial cost				50 000	50 000
Net present value				2 978	(2 426)

1. Column (2) has been obtained from the question.
2. Column (3) and (4) are based on the arbitrary selection of two interest rates of 10 % and 15% respectively. The discount factor may be found in the table on the appendix page.
3. Column (5) has been calculated by multiplying column (2) by column (3).
4. Column (6) has been calculated by multiplying column (2) by column (4)

The project is expected to cost K50 000. If the company expects a rate of return of 10%, the project will be accepted, because the NPV is positive. However, if the required rate of return is 15% it will not be accepted, because its NPV is negative. The maximum rate of return that ensures that a positive rate of return must, therefore, lie somewhere between 10% and 15%, so the next step is to calculate the rate of return at which the project would just pay for itself.

Step 2: Calculate the specific break-even rate of return

To do this it is necessary to interpolate between the rates used in step 1. This can be done by using the following formula:

$$\text{IRR} = \text{Positive rate} + \left\{ \frac{\text{Positive NPV}}{\text{Positive NPV} + \text{Negative NPV}} \times \text{Range of rates} \right\}$$

Ignore the negative sign and add the positive NPV to the negative NPV.

Thus in our example:

$$\text{IRR} = 10\% + \left\{ \frac{2978}{(2978 + 2426)} \times (15\% - 10) \right\}$$

$$= 10\% + (0.5511 \times 5\%)$$

$$= 10\% + 2.76\%$$

$$= 12.76\%$$

The project will be profitable provided that the company does not require a rate of return in excess of about 13%. Note that the method of calculation used above does not give the precise rate of return (because the formula is only an approximation), but it is adequate enough for decision-making purposes.

The advantages and disadvantages of IRR method may be summarized as follows:

Advantages:

1. Emphasis is placed on liquidity
2. Attention is given to the timing of net cash flows.
3. The method gives clear percentage return on an investment.

Disadvantages

1. It is not easy to understand
2. It is difficult to determine which two suitable rates to adopt.
3. The range between the two rates should be as narrow as possible. You will find that if you use a trial- and-error method, you may have to try many times before you arrive at two suitable rates.
4. The method gives only an approximate rate of return.

NB* (For discount factors, See the present value table at the end of this unit).

3.6 RISK EVALUATION

Every project involves risk of some kind. When assessing and planning a project, we are concerned with the risk that the project might not meet its objectives. In this section our concern is that of taking risk into account when deciding whether to proceed with a proposed project or not.

- **Risk Identification and Ranking :** In any project we should attempt to identify the risks and quantify their potential effects. One common approach to risk analysis is to construct a

project risk matrix utilizing a checklist of possible risks and to classify each risk according to its relative importance and likelihood. Note that the importance and likelihood need to be separately assessed.

Thus once the basic project risk matrix listing has been done, the next one is to assess the importance and likelihood of each identified risk as high (H), medium (M), low (L) or exceedingly unlikely (-).

Thus if we are trying to select a project out of several other projects then we compare all the projects. This will help us to avoid projects that are highly risk.

The project risk matrix may be used as a way of evaluating projects (those with high risks being less favoured. It may also be used as a means of identifying and ranking risks for a specific project.

- **Risk and Net Present Value:** Where a project is relatively risk, it is common practice to use a higher discount rate to calculate net present value. This risk might, for example be an additional 2 percent for a reasonable safe project or 5 percent for a fairly risk one. Projects may be categorized as high, medium or low risk. The premiums, even if arbitrary, provide a consistent method of taking risk into account.

- **Cost-benefit Analysis:** This is another approach to the evaluation of risk. it requires that you consider each possible outcome and estimate the probability of its occurring and the corresponding value of the outcome. Rather than a single cash flow forecast for a project, we will then have a set of cash flow forecasts, each with associated probability of occurring. The value of the project is then obtained by summing the cost or benefit for each possible outcome weighted by its corresponding probability.

  This approach is frequently used in the evaluation of large projects

- **Risk Profile Analysis:** This involves the construction of risk profiles using sensitivity analysis. It require varying each of the parameters that affect the project's cost or benefits to ascertain how sensitive the project's profitability is to each factor.

  We might, for example, vary one of our original estimates by plus or minus 5 percent and recalculate the expected costs and benefits for the project. By repeating each of our estimates in turn we can evaluate the sensitivity of the project to each factor.

  By studying the results of a sensitivity analysis we can identify those factors that are most important to the success of the project. We then need to decide whether we can exercise greater control over them or otherwise mitigate their effects. If neither is the case, then we must live with the risk or abandon the project.

- **Using Decision Trees:** The analysis of a decision tree consists of evaluating the expected benefit of taking each path from a decision point. The expected value of each path is the sum of the value of each possible outcome multiplied by its probability of occurrence. One of the great advantages of using the Decision Trees to model and analyze problems is the ease with which they can be extended.

PROJECT CHARTER

After management has decided on which project to pursue, management needs to create and distribute documentation to authorize project initiation. This documentation is known as the project charter.

A project charter is a document that formerly recognizes the existence of a project and provides direction on the project's objectives and management. It authorizes the project manager to use organizational resources to complete the project.

Other organizations do not use project charter but simply a letter of agreement, while others use a longer document or a formal contract.

Table 1.1: Sample Project Charter

Project Title: Information Technology (IT) Upgrade Project

Project Start Date: March 4, 2008 **Projected Finish Date:** December 4, 2008

Project Manager: Kim Nguyen, 691-2784, *knguyen@course.com*

Project Objectives: Upgrade hardware and software for all employees (approximately 2,000) within nine months based on new corporate standards. See attached sheet describing the new standards. Upgrades may affect servers, as well as associated network hardware and software. Budgeted $1,000,000 for hardware and software costs and $500,000 for labor costs.

Approach:

- Update the information technology inventory database to determine upgrade needs
- Develop detailed cost estimate for project and report to CIO
- Issue a request for quote to obtain hardware and software
- Use internal staff as much as possible for planning, analysis, and installation

ROLES AND RESPONSIBILITIES:

NAME	ROLE	RESPONSIBILITY
Walter Schmidt	CEO	Project sponsor, monitor project
Mike Zwack	CIO	Monitor project, provide staff
Kim Nguyen	Project Manager	Plan and execute project
Jeff Johnson	Director of Information Technology Operations	Mentor Kim
Nancy Reynolds	VP, Human Resources	Provide staff, issue memo to all employees about project
Steve McCann	Director of Purchasing	Assist in purchasing hardware and software

Sign-off: (Signatures of all the above stakeholders)

Walter Schmidt Steve McCann

Mike Zwack Nancy Reynolds

Kim Nguyen Jeff Johnson

Comments: (Handwritten or typed comments from above stakeholders, if applicable)

"This project must be done within ten months at the absolute latest." Mike Zwack, CIO

"We are assuming that adequate staff will be available and committed to supporting this project. Some work must be done after hours to avoid work disruptions, and overtime will be provided." Jeff Johnson and Kim Nguyen, Information Technology department

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A Present Value Table

Year n	Present value of $1
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%	36%	40%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.806	0.781	0.758	0.735	0.714
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.797	0.769	0.756	0.743	0.718	0.694	0.650	0.610	0.574	0.541	0.510
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.712	0.675	0.658	0.641	0.609	0.579	0.524	0.477	0.435	0.398	0.364
4	0.961	0.924	0.889	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.636	0.592	0.572	0.552	0.516	0.482	0.423	0.373	0.329	0.292	0.260
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.567	0.519	0.497	0.476	0.437	0.402	0.341	0.291	0.250	0.215	0.186
6	0.942	0.888	0.838	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.507	0.456	0.432	0.410	0.370	0.335	0.275	0.227	0.189	0.158	0.133
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.452	0.400	0.376	0.354	0.314	0.279	0.222	0.178	0.143	0.116	0.095
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.404	0.351	0.327	0.305	0.266	0.233	0.179	0.139	0.108	0.085	0.068
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.361	0.308	0.284	0.263	0.226	0.194	0.144	0.108	0.082	0.063	0.048
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.322	0.270	0.247	0.227	0.191	0.162	0.116	0.085	0.062	0.046	0.035
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.287	0.237	0.215	0.195	0.162	0.135	0.094	0.066	0.047	0.034	0.025
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.257	0.208	0.187	0.168	0.137	0.112	0.076	0.052	0.036	0.025	0.018
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.229	0.182	0.163	0.145	0.116	0.093	0.061	0.040	0.027	0.018	0.013
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.205	0.160	0.141	0.125	0.099	0.078	0.049	0.032	0.021	0.014	0.009
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.183	0.140	0.123	0.108	0.084	0.065	0.040	0.025	0.016	0.010	0.006
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.163	0.123	0.107	0.093	0.071	0.054	0.032	0.019	0.012	0.007	0.005
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198	0.146	0.108	0.093	0.080	0.060	0.045	0.026	0.015	0.009	0.005	0.003
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.130	0.095	0.081	0.069	0.051	0.038	0.021	0.012	0.007	0.004	0.002
19	0.828	0.686	0.570	0.475	0.396	0.331	0.276	0.232	0.194	0.164	0.116	0.083	0.070	0.060	0.043	0.031	0.017	0.009	0.005	0.003	0.002
20	0.820	0.673	0.554	0.456	0.377	0.319	0.258	0.215	0.178	0.149	0.104	0.073	0.061	0.051	0.037	0.026	0.014	0.007	0.004	0.002	0.001
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092	0.059	0.038	0.030	0.024	0.016	0.010	0.005	0.002	0.001	0.000	0.000

UNIT 4 : PROJECT SCOPE MANAGEMENT

4.1 LEARNING OBJECTIVES

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

- Carry out scope planning.
- Do scope definition.
- Create the work breakdown structure
- State what scope verification is.

4.2 WHAT IS A PROJECT SCOPE MANAGEMENT?

Scope refers to all the work involved in creating the products of the project and the process used to create them. Deliverables describes a product produced as part of a project. Deliverables can be product related such as a piece of hardware or software or process-related such as a planning document or meeting minutes.

Project scope management includes the processes involved in defining and controlling what is or what is not included in a project. There are five main processes involved in project scope management. These are:

- Scope planning
- Scope definition
- Creating the work breakdown structures
- Scope verification
- Scope control

a) SCOPE PLANNING AND THE SCOPE MANAGEMENT

The first step in project scope management is scope planning. The project size, complexity, and importance are the factors that will affect how much effort is spent on scope planning. The main output of scope planning is a project scope management plan.

Scope management plan is a document that includes descriptions of how the project team will prepare the project scope statement, create the work breakdown structures, verify completion of the project deliverables, and control requests for changes to the project scope.

Key inputs of the scope management plan include the Project Charter, preliminary scope statement, and project management plan.

Information from the project charter provides a basis for scope management decisions in the sense that it describes the high-level scope goals for the project, a general approach to accomplishing the project's goals, and the main roles and responsibilities of the key or important project stakeholders.

The charter will therefore, guide the project team in developing the scope management plan

b) SCOPE DEFINITION AND PROJECT SCOPE STATEMENT

The next step in project scope management is to define the work required for the project further. Scope definition is very important to project success because it helps improve the accuracy of time, cost and resource estimates. It defines the baseline for performance measurement and project control, and it aids in communicating clear work responsibilities.

The main tools and techniques used in scope definition include analyzing products, identifying alternative approaches to doing work, understanding and analyzing stakeholder needs, and using expert judgment.

The main output of scope definition is the project scope statement.

The project team develops a preliminary scope statement. This document together with the project charter and approved change requests provide a basis for creating the project scope statement.

A project scope statement should include a description of the project, including its overall objectives and justification, detailed descriptions of all project deliverables and the characteristics and requirements of products and services produced as part of the project.

It is also helpful to document the project boundaries, project acceptance criteria, project constraints and assumptions, project organization, defined risks, schedule milestones, cost estimate, and approval requirements.

c) CREATING THE WORK BREAKDOWN STRUCTURES

The third step in the project scope management is to create a work breakdown structure. A work breakdown structure is a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project.

The work breakdown structure is an important document in the sense that it provides the basis for planning and managing project schedules, costs, resources, and changes.

The project scope statement and the project management plan are the primary input for creating a work breakdown structure.

Work breakdown structure organize and divides the work into logical parts based on how the work will be performed. To create a good work breakdown structure, you must understand both the project and its scope and incorporate the needs and knowledge of stakeholders.

The project manager and the project team must decide how to organize the work.

The work breakdown structures may be organized around project products, project phases, or using project management process groups.

i). APPROACHES TO DEVELOPING WORK BREAKDOWN STRUCTURES

- **Using Guidelines:** If guidelines for developing work breakdown structure exist in your organization, it is very important to follow them. Many organizations provide guidelines as well as examples from the past projects.

- **The analogy approach:** In this approach, you use a similar project's work breakdown structure as a starting point. If another organization did a similar project in the past, then you could ask them to share their work breakdown structure for that project to provide a starting point for you.

- **The top-down approach:** Under this approach, you start with the largest items of the project and break them into their subordinate items. This process involves refining the work into greater levels of detail.

- **Bottom-up approach:** In this approach, team members first identify as many specific tasks related to the project as possible. They then aggregate the specific tasks and organize them into categories and further into summary activities. This method can be an effective way to create work breakdown structure.

d) SCOPE VERIFICATION

In project work, scope is often very unclear from the very start. Project teams must therefore work to develop a process for scope verification.

Many projects suffer from scope creep. Scope creep is the tendency for project scope to keep getting bigger and bigger. It is therefore, very important to verify the project scope throughout the life of a project and develop a process for controlling scope changes.

Scope verification involves formal acceptance of completed project scope by stakeholders. This therefore, means that before stakeholders accept the completed project scope, the project team must develop a clear documentation of the project's products and procedures to evaluate if they were completed correctly and satisfactorily.

To minimize scope changes, it is crucial to do a good job. The main tool for performing scope verification is inspection. The work must be inspected thoroughly.

e) SCOPE CONTROL

Scope control involves controlling changes to the project scope. The goal of scope control is to influence the factors that cause scope changes, assure changes are processed according to procedures developed as part of integrated change control, and manage changes when they occur.

To do a good job of scope control, you first have to do scope definition and verification. You also need to develop a process for soliciting and monitoring changes to project scope. Two important tools for performing scope control include a change control system, and configuration management (identifying and documenting the functional and physical characteristics of the project's products, recording and reporting changes, and auditing the products to verify conformance to requirements).

Other tools include re-planning project scope and performing variance analysis. Variance is the difference between planned and actual performance.

UNIT 5 : PROJECT TIME MANAGEMENT

5.1 LEARNING OBJECTIVES

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

- Explain activity definition and activity sequencing.
- Estimate project resources requirements and project duration.
- Do a schedule development
- Conduct schedule control.

Project time management involves the process required to ensure timely completion of a project. There are six main processes involved in project time management. These are:

- Activity definition.
- Activity sequencing.
- Activity resource estimating.
- Activity duration estimating.
- Schedule development.
- Schedule control.

5.2 ACTIVITY DEFINITION

This involves identifying the specific activities the project team members and stakeholders must perform to produce the project deliverables. An activity or a task is an element of work

normally found on the Work Break Down Structure that has an expected duration, a cost and resource requirements.

The main outputs of this process (activity definition) are an activity list, activity attributes, milestone list, and requested changes.

Project schedule starts from the basic documents that initiate a project. These documents are project charter, the project scope statement, the work breakdown structure and project management plans. With these documents in place, the project manager and his project team begin to develop a detailed list of activities and their attributes, a milestone list and requested changes if possible.

Activities that should be included on a project schedule must be tabulated on an **activity list.** The list should include the activity name, an activity identifier or number, and a brief description of the activity.

The **activity attributes** provide more schedule-related information about each activity such as resource requirements, constraints, assumptions, leads, lags, logical relationships, predecessors, successors, etc. The activity list and activity attributes should be in agreement with the work breakdown structure.

Information is added to activity attributes as it becomes available.

A **milestone** on a project is a significant event that normally has duration. It often takes several activities and a lot of work to complete a milestone.

A mile stone helps in identifying necessary activities. Milestones are also useful tools for setting schedule goals and monitoring progress. For example a milestone on a project might include completion of specific products such as installation of new hardware, or completion of important process related work such as project review meetings, tests and so on. It may also include completion and customer sign-off documents such as design documents and test plans.

Not every deliverable or output created for a project is really a milestone. Milestones instead, are the most important and visible deliverables or outputs.

Activity information is required input to other time management processes.

The goal of activity definition process is to ensure that the project team has complete understanding of all the work they must do as part of the project scope so that they can start scheduling the work.

The work breakdown structure is often dissected further during the activity definition process as the project team further defines the activity required for performing the work.

Activities or tasks are elements of the work performed during the course of a project. They have expected durations, costs, and resource requirements.

The project team should review the activity list and activity attributes with project stakeholders before moving on to the next step in project time management. This will help in resolving misunderstandings and thus call for requested changes.

5.3 ACTIVITY SQUENCING

After defining project activities, the next step in project time management is activity sequencing. Activity sequencing involves identifying and documenting the relationship between project activities.

To determine the relationships between activities one must review the activity list and attributes, project scope statement, milestone list, and approved change requests. One must also evaluate the reasons for dependencies and different types of dependencies.

a) DEPENDENCIES

A dependency or relationship relates to the sequencing of project activities or tasks. For example does a certain activity have to be finished before another one can start? Can a project team do several activities in parallel? Can some activities overlap? Determining these relationships or dependencies between activities has a big significance on developing and managing a project schedule. There are three basic reasons for creating dependencies among project activities. These reasons are :

i). Mandatory Dependencies

These are inherent in the nature of the work being performed on a project. They are also known as hard logic. For example you cannot test the product until after the product is produced or made.

ii). Discretionary Dependencies

These are defined by the project team. For example, a project team might follow good practice and not start a detailed design of a new product until the users are agreeable. Discretional Dependencies are also known as soft logic. They should be used with care as they may limit later scheduling options.

iii) . External Dependencies

This involves relationships between project and non-project activities. For instance, the installation of a new software may depend on delivery of a new hardware from an external supplier. The new hardware may even come late. Late delivery will affect the project schedule.

It is important that the project stakeholders work together to define the activity dependencies that exist on their project.

b) **NETWORK DIAGRAMS**

These are the preferred techniques for showing activity sequencing. A network diagram is a schematic display of the logical relationships among (or sequencing of) project activities.

One may use the Arrow Diagramming Method (ADM) also known as Activity on Arrow (AOA) approach. It is a network diagram technique in which activities are represented by arrows and connected at points called nodes to illustrate the sequence of activities.

A node is simply the starting and the ending point of an activity. The first node signifies the start of a project, and the last node represents the end of a project.

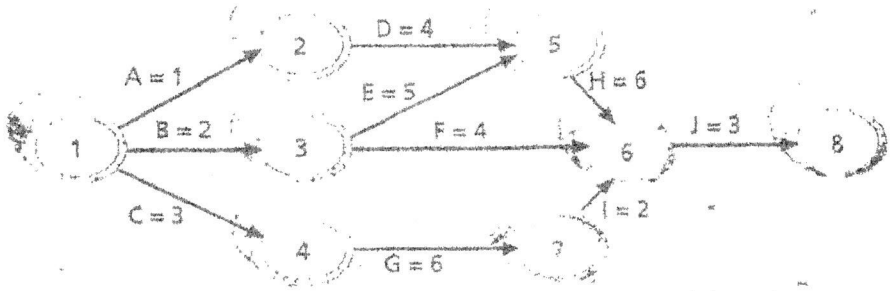
The network diagram represents activities that must be done to complete the project. Every activity on the network diagram must be completed.

Putting every activity on the network is only a matter of preference. Others put only those activities that have dependencies. This because if a project has hundreds of activities, it may be difficult to include everything.

It may be enough to put summary tasks on a network diagram or to breakdown the project into several smaller network diagrams.

On the diagram given below, the letters 'A' through 'J' represent activities with dependencies that are required to complete the project. These activities come from the Work Breakdown Structure (WBS) and activity definition process.

The arrow represents the activity sequencing or relationships between tasks. For example, activity 'A' must be done before activity 'D'. Activity 'D' must be done before activity 'H'.



Note: Assume all durations are in days; A=1 means Activity A has a duration of 1 day.

Figure 1: Activity-on-Arrow (AOA) Network Diagram for Project X

c) **HOW TO DRAW A NETWORK DIAGRAM**

Using the above diagram as an example, the diagram was done using the following basic steps.

Step 1

First all the activities that start at node 1 were identified. Then it was followed by drawing their finish nodes. Thereafter, arrows between node 1 and each of their finish nodes were drawn. Then activity letter or name on the associated arrow was put. A duration estimate was written next to the activity letter or name. For example A-1 means that the duration of activity A is one day. Other standard unit of time may be used, e.g. 1 week, 1 month, 1 year etc. The arrowheads represents the direction of relationships.

Step 2

As you continue drawing, working from left to right look for bursts and merges. Bursts occur when two or more activities follow a single node. A merge occur when two or more nodes precede a single node. For example, node 1 is a burst since it goes into 2, 3, and 4. Node 5 is a merge preceded by node 2 and 3.

Step 3

The drawing of AOA network diagram continued until all activities were included on the diagram.

Step 4

All arrow heads must face towards the right, and no arrow should cross on an AOA network diagram.

d) THE PRECEDENCE DIAGRAMMING METHOD

The other network diagram technique that can be used for activity sequencing is the precedence diagramming method. In this technique, boxes represent activities.

There are four types of dependencies or relationships between activities or tasks. These are as follows:

- **Finish-to-Start**
  This is a relationship where the 'from' activity or predecessor must finish before the 'to' activity or successor can start. For example you cannot provide a user training until after a software or a new system has been installed. (Activity-on-Arrow (AOA) network diagrams use only finish-to-start dependencies).

- **Start-to-Start**
  This is a relationship in which the 'from' activity cannot start until the 'to' activity or successor is started. For example, on several technology projects, a group of activities all start simultaneously.

- **Finish-to-Finish**
  A relationship where the 'from' activity must be finished before the 'to' activity can be finished. One task cannot finish before another finishes. For example quality control efforts cannot finish before production finishes, although the two activities can be performed at the same time.
- **Start-to-Finish**
  This is a relationship where the 'from' activity must start before the 'to' activity can be finished. This type of relationship is rarely used but it is appropriate in some cases, For example, an organization might strive to stock raw materials just in time for the manufacturing process to begin. A delay in the manufacturing process starting should delay completion of stocking the raw materials.

The **precedence Diagramming Method (PDM)** is used more than AOA network diagrams and offers a number of advantages over the AOA technique.

- First most projects use the PDM.
- Secondly, the PDM shows different dependencies among tasks, whereas AOA network diagrams use only finish-to-start dependencies.
- Third, the PDM avoids the need to use dummy activities. Dummy activities have no duration and no resources but are occasionally needed on AOA network diagrams to show logical relationships between activities.

5.4 ACTIVITY RESOURCE ESTIMATING

This involves estimating how many resources (people, equipment, and materials) a project team should use to perform project activities.

You should have a good idea about the quantity and type of resources that will be assigned to each activity. Expert judgment, the availability of alternatives, and estimating data are the tools available that can assist in resource estimating.

The nature of the project and the organization will affect resource estimating.

A project's activity list, activity attributes, project management plan, enterprise environmental factors, organizational process assets (such as policies regarding staffing and outsourcing) and resource availability information are all important inputs to activity resource estimating.

- You should thoroughly brainstorm and evaluate alternatives related to resources. Solicit ideas from different people to help develop alternatives and address resource-related issues early in the project. Update your resource estimates as more detailed information become available.

5.5 ACTIVITY DURATION ESTIMATING

Involves the number of work periods that are needed to complete individual activities. Duration includes the actual amount of time worked on an activity plus elapsed time.

Elapsed time is the extra time for obtaining outside information or other resources. For example, even though it might take one week to do the actual work, the duration estimate might be two weeks, to allow extra time needed to obtain information.

A duration estimate of one day could be based on eight (8) hours of work. Project Team members must document their assumptions when creating duration estimates and update the estimates on the project progress.

The people who will actually do the work, in particular, should have a say in these duration estimates. If scope changes occur on the project, the duration estimate should be updated to reflect those changes. Also review similar projects that were done. Seek the advice of the experts in estimating activity durations.

The inputs for activity estimating are enterprise environmental factors, organizational process assets, the project scope statement, activity list, activity attributes, activity resource requirements, resource calendars, and project management plan.

When making duration estimates you should consider the availability of resources, especially human resource. Do you have well qualified people to do the work?

The outputs of activity duration include updates to the activity attributes, if needed, and duration estimates for each activity.

Duration estimates are often provided as a discrete number, such as four weeks. Or may be provided as a range, such as three to five weeks. Or as a three-point estimate. A three point estimate is an estimate that includes an optimistic, most likely and pessimistic estimates. This would for instance be three weeks for the optimistic, four weeks for the most likely, and five weeks for the pessimistic estimate.

5.6 SCHEDULE DEVELOPMENT

The ultimate goal of schedule development is to create a realistic project schedule that provides a basis for monitoring project progress for the time dimension of the project. Schedule development involves analyzing activity sequences, activity resource estimates, and activity duration estimates to create the project schedule.

Several tools and techniques assist in the schedule development process. These include the following:

- Gantt charts.
- Critical Path Analysis
- Critical Chain Scheduling
- PERT analysis

a) GANTT CHARTS

Gantt charts provide a standards format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format. Gantt Charts are sometimes referred to as Bar charts.

The figure below indicates the format of the Gantt chart. The top line is the calendar time scale in days(1), and the activities (2) are listed on the left hand column. The scheduling of each activity is represented by a horizontal line (3), from the activity's start to finish date. The length of the activity line is therefore, proportional to its estimated duration.

A second line along the planned schedule indicates work done (4). The relative position of the progress line indicates percentage complete and remaining duration, while the relative position between the progress line and Time now (5) indicates actual progress against planned progress. This is a simple Gantt chart.

Gantt charts often do not show dependencies, and this is their major disadvantage.

The activities on a Gantt Chart should always coincide with activities on work breakdown structure, which should coincide with the activity list and milestone list.

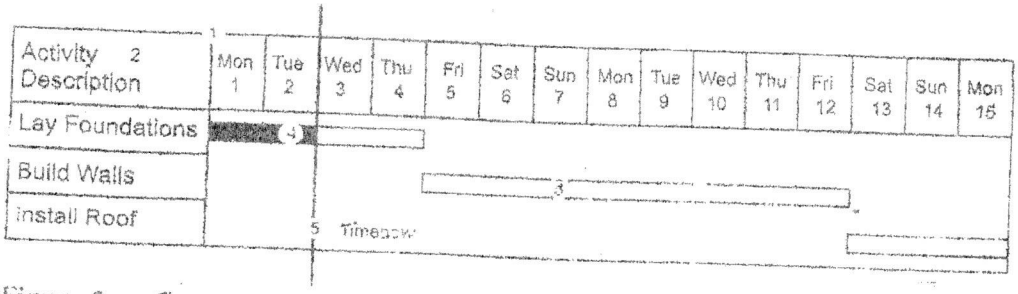


Figure 2. : Gantt Chart

b) CRTICAL PATH ANALYSIS

This is also called critical path method. It is a network diagramming technique used to predict total project duration. It helps in combating project schedule overruns.

A critical path for a project is the series of activities that determine the earliest time by which the project can be completed. It is the longest path through the network diagram and has the least amount of slack or float. Slack or float is the amount of time an activity may be delayed without delaying succeeding activity or the project finish date.

There are normally several tasks done in parallel on projects and most projects have multiple paths through a network diagram. The longest or path containing the critical tasks is what is driving the completion date for the project.

i). Calculating the Critical Path.

To find a critical path for a project, you must first develop a good network diagram, which in turn, requires a good activity list based on the work breakdown structure. Once you create a network diagram, you must also estimate the duration of each activity to determine the critical path.

Calculating the critical path involves adding the durations for all activities on each path through the network diagram. The longest path is the critical path.

You can either use the AOA network diagram or the precedence diagramming method to determine the critical path on projects.

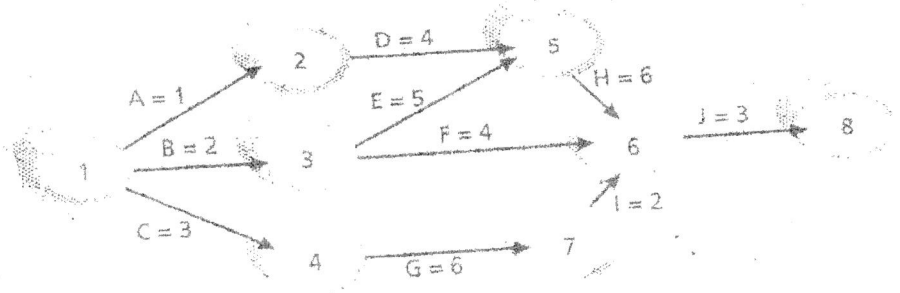
The figure below shows all the paths. They are altogether four for this network diagram. Each path starts at the first node (1) and ends at the last node (8) on the AOA diagram.

The figure also shows the length or total duration of each path through the network diagram. These lengths are computed by adding the durations of each activity on the

path. Since path B-E-H-J at 16 days has the longest duration, it is the critical path for the project.

What does the critical path really mean? The critical path shows the shortest time in which a project can be completed. Even though the critical path is the longest path, it represents the shortest time it takes to complete a project.

If one or more of the activities on the critical path takes longer than planned, the whole project schedule will slip unless the project manager takes corrective action.



Note: Assume all durations are in days.

Path 1:	A-D-H-J	Length = 1+4+6+3 = 14 days
Path 2:	B-E-H-J	Length = 2+5+6+3 = 16 days
Path 3:	B-F-J	Length = 2+4+3 = 9 days
Path 4:	C-G-I-J	Length = 3+6+2+3 = 14 days

Since the critical path is the longest path through the network diagram, Path 2, B-E-H-J, is the critical path for Project X.

Figure 3.4 Determining the Critical Path for Project X

ii). Using Critical Analysis to Shorten a Project Schedule

The sponsor or other stakeholders may ask for the project schedule estimate to be shortened. By knowing the critical path, the project manager and his team can use several duration compression techniques to shorten the project schedule.

One technique is to reduce the duration of activities on the critical path. The project manager can shorten the duration of activities on the critical path by allocating more resources to those activities or by changing their scope. He could for instance ask the organization to provide more people to work on the project in an effort to shorten the completion time. He could also request that the scope of the activities be reduced to complete the project on time.

He could also use project time management techniques such as crashing or fast tracking to shorten the project schedule. Crashing is a technique for making cost and schedule

trade-offs to obtain the greatest amount of schedule compression for the least incremental cost. If a task was estimated to take two weeks. The manager should suggest that workers should double their effort so that they can finish the task in one week instead of two weeks.

This change would not cost the organization more money, and it would shorten the project end date by one week.

If the organization cannot meet this request, the project manager can consider bringing in more workers for one week to help get the task done faster.

By focusing on tasks on the critical path that could be done more quickly for no extra cost or a small cost, the project schedule can be shortened.

The main advantage of crashing is shortening the time it takes to finish a project.

Another technique for shortening project schedule is fast tracking. Fast tracking involves doing activities in parallel that you would normally do in sequence. Thus, instead of probably waiting for one activity to finish before starting another one that is supposed to follow, you instead start even before the first one or other activity is not yet complete.

The advantage of fast tracking is that it can shorten the time it takes to finish the project. The main disadvantage is that starting soon often increases project risk and may result in reworking the project again.

iii). Other Important Points on the Critical Path Method

It is important to note that sometimes there can be two or more longest paths of equal duration. If there is more than one critical path, project managers must keep their eyes on all of them.

It is also important to note that the critical path on a project can change as the project progresses. Thus if the activity on one non-critical path takes longer than those on the critical path to finish due to unforeseen problems, this delay may cause that path to become the longest path. Thus, this change would cause that path to be the new critical path.

c) CRITICAL CHAIN SCHEDULING

Another technique that addresses the challenge of meeting or beating project finish date is an application of the theory of constraints called critical chain scheduling.

The theory of constraints is a management philosophy developed by Eliyahu M. Goldratt. The theory states that any complex system at any point in time often has one aspect or constraint that limits its ability to achieve more of its goal. For a system to attain any significant improvements, that constraint must be identified, and the whole system must be managed with it in mind.

Critical chain scheduling is a method that considers limited resources when creating a project schedule and includes buffers to protect the completion date.

An important concept in critical chain scheduling is the availability of scarce resources. Some projects cannot be done unless a particular resource is available to work on one or several tasks.

Critical chain scheduling acknowledges that you must either delay the affected project tasks until resources are available or you must find alternative resources in order to meet the schedule.

Other important aspects related to critical chain scheduling are multitasking and time buffers.

Multitasking occurs when a resource works on more than one task at a time. People are assigned to multiple tasks within the same project or different tasks on multiple projects.

The disadvantages of multitasking are:

- It can delay task completion
- It involves wasted set up time, which increases total duration.

Therefore, resource should not multitask or multitasking should be minimized. Someone should not be assigned to two tasks simultaneously on the same project when critical chain scheduling is in effect. Likewise, projects should be prioritized so that people working on more than one project at a time know which tasks take priority. Preventing multitasking avoids resource conflicts and wasted set up time caused by shifting between tasks over time.

An essential concept to improving project finish dates with critical chain scheduling is to change the way people make task estimates. Many people add a safety or buffer, which is additional time to complete a task, to an estimate to account for various factors such as the negative effect of multitasking, fear that estimates will be reduced, distractions and interruptions. Critical chain scheduling removes buffers from individual tasks and instead creates a project buffer, which is additional time added before the project's due date.

Critical chain scheduling also protects tasks on critical chain from being delayed by using feeding buffers. These are additional time added before tasks on the critical chain that are preceded by non-critical path tasks.

In conclusion, critical chain scheduling is a powerful tool that involves critical path analysis, resource constraints, and changes in how task estimates are made in terms of buffers.

d) PROGRAM EVALUATION AND REVIEW TECHNICH (PERT)

Another project time management technique is the Program Evaluation and Review Technique (PERT). It is a network analysis used to estimate project duration when there is a high degree of uncertainty about individual activity duration estimates. PERT applies the critical path method to a weighted average duration estimate.

PERT uses three point estimate or probabilistic time estimates or rather duration estimates based on using optimistic, most likely and pessimistic estimates of activity durations instead of one discrete duration estimate.

To use PERT, you calculate the weighted average for the duration estimate of each project activity using the following formula:

$$\text{PERT weighted average} = \frac{optimitic\ time + (4\ x\ most\ likely\ time) + pessimistic\ time}{6}$$

By using the PERT weighted average for each activity duration estimate, the total project duration estimate takes into account the risk or uncertainty in the individual activity estimates.

Suppose a project team uses PERT to determine the duration for the online registration system project. They would have to collect numbers for the optimistic, most likely, and pessimistic duration estimates for each project activity.

Suppose one of the activities was to design an input screen for the system, and it is estimated that it would take two weeks or 10 work days to do this activity. Without using PERT, the duration estimate for that activity would be 10 work days.

However, using PERT, the project team would also need to estimate the pessimistic, and optimistic times for completing this activity.

Suppose an optimistic estimate is that the input screen can be designed in 8 workdays, and a pessimistic time estimate is 24 workdays. Applying PERT formula you get the following

$$\text{PERT weighted average} = \frac{8 + (4 \times 10) + 24}{6} = 12\ work\ days$$

Instead of using the most likely duration estimate of 10 workdays, the project team would use 12 workdays when doing critical path analysis. These additional two days could really help the project team in getting the work completed on time.

The main advantage of PERT is that it attempts to address the risk associated with duration estimates. Since many projects exceed schedule time estimates, PERT may help in developing schedules that are more realistic.

PERT's main disadvantage is that it involves more than the critical path method since it requires several duration estimates.

5.7 SCHEDULE CONTROL

Schedule control involves controlling and managing changes to the project schedule. Schedule control is the final process in project time management. It is an integrated change control process under project integration management. The goal of schedule control is to:

- Know the status of the schedule.
- Influence the factors that cause schedule changes.
- Determine that the schedule has changed.
- Manage changes when they occur.

a) REALITY CHECKS ON SCHEDULING AND THE NEED FOR DISCIPLINE

A project should have realistic schedule goals. Project managers should also use discipline to help meet those goals.

One of the first reality checks a project manager should make is to review the draft schedule usually included in the project charter. The project charter will include the start and end date, the charter also sets some initial schedule expectations for the project.

Next, the project manager and his team should prepare a more detailed schedule and get stakeholders approval. The schedule estimates should be realistic. Managers should arrange for additional resources to be committed to the project.

Another type of reality check comes from progress meetings with stakeholders. The project manager is responsible for keeping the project on track, and the key stakeholders should be informed, often through periodic reviews. To show the progress of the project, to stakeholders, the project managers will illustrate this by using a tracking Gantt Chart showing key deliverables and activities.

Project managers should also verify schedule progress by reviewing the actual work to ensure work is completed as planned or changes are reported as needed. Project managers must be clear and honest in communicating project status.
Project managers must also use discipline to control project schedules. They should insist that important schedule dates be met and that proper planning and analysis be completed upfront. This helps everyone focus on doing what is most important. This discipline results in meeting project schedules.

b) USING TRACKING GANTT CHARTS TO COMPARE PLANNED AND ACTUAL DATES

The tracking Gantt Chart can be used to evaluate progress on a project by showing actual schedule information.

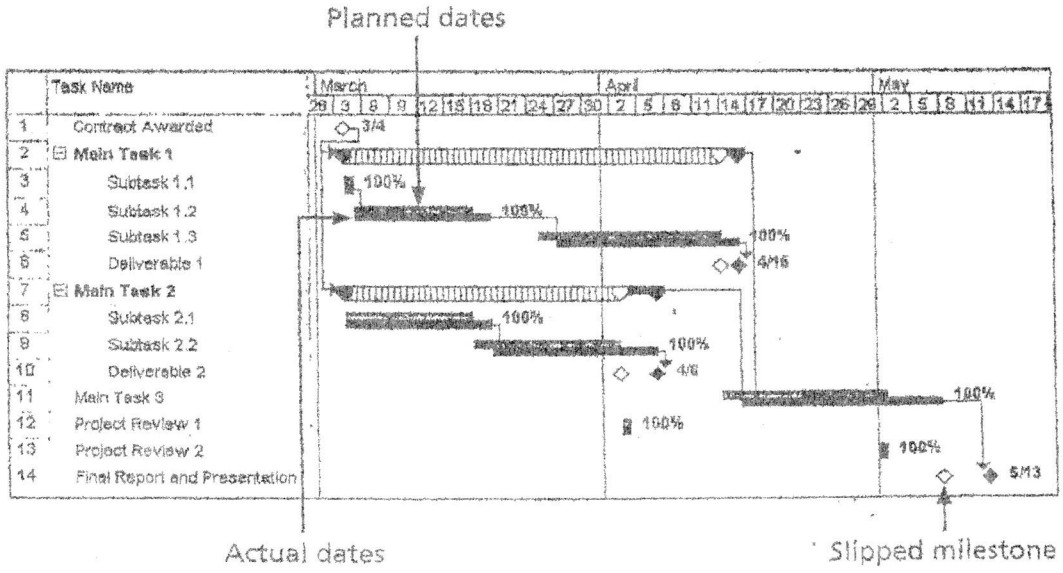


Figure 4.5 Sample Tracking Gantt Chart

A tracking Gantt chart is a Gantt chart that compares planned and actual project schedule information. The planned dates for activities are called baseline dates and the entire planned schedule is called the schedule baseline.

The Tracking Gantt Chart often shows two horizontal bars for tasks. The top horizontal bar represents the planned or baseline duration for each task. The bar below it represents the actual duration. If these two bars are the same length, and start and end on the same dates, then actual schedule was the same as the planned schedule for that task.

If the top horizontal bar is shorter than the bottom one the task took longer than planned. If the top bar is longer than the bottom one, the task took less time than planned. In this example stripped horizontal bar represents the planned duration of summary tasks.

A white diamond on the Tracking Gantt Chart, in this example, represents a slipped milestone. A slipped milestone means the milestone activity was actually completed later than originally planned.

Percentages to the right of the horizontal bars display the percentages of work completed for each task. For example, 100 percent means the task is finished, 50 percent means the task is still in progress and is 50 percent completed.

A Tracking Gantt Chart is based on the percentage of work completed for project tasks or the actual start and finish dates. It allows the project manager to monitor schedule progress on individual tasks and the whole project.

The main advantage of using Gant Charts is that they provide a standard format for displaying planned and actual project schedule information. They are also easy to create and understand.

The main disadvantage of Gantt Charts is that they do not usually show relationships or dependencies between tasks.

UNIT 6 : PROJECT COST MANAGEMENT

3.1 LEARNING OBJECTIVES

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

- ❖ Define a cost.
- ❖ Explain project cost management.

6.2 WHAT IS A COST?

- Something given up in exchange.
- A resource sacrificed or forgone to achieve a specific objective.

Costs are often measured in monetary amounts, such as dollars, pounds, etc., that must be paid to acquire goods and services

6.3 WHAT IS PROJECT COST MANAGEMENT?

Project cost management includes processes required to ensure that a project team completes a project within an approved budget. There are three project cost management processes as indicated below:

- Cost estimating.
- Cost Budgeting.
- Cost control.

a). COST ESTIMATING

This involves developing an approximation or estimate of the costs of the resources needed to complete a project.

- **TYPES OF COST ESTIMATES**

  There are three basic types of cost estimates. These include the following:

  i). A Rough Order of Magnitude (ROM) Estimates

  This type of estimate provides an estimate of what a project will cost. ROM estimates can also be referred to as a ballpark estimate, a guess-time, a swag, or a broad gauge.

This type of estimate is done very early in a project or even before a project is officially started.

Project Managers and top management use this estimate to help make project selection. The accuracy of these estimates is minus fifty per cent (-50%) to 100 per cent. Meaning that they are 50% below estimate or 100% above the ROM estimate

ii). Budgetary Estimate

This is used to allocate money into an organization's budget. Many organizations develop budgets at least two years into the future.

The accuracy of budgetary estimates is minus ten per cent (-10%) to twenty-five per cent (25%). Meaning the actual cost could be 10% less or 25% more than the budgetary estimate.

iii). Definitive Estimate

This provides an accurate estimate of project costs. Definitive estimates are used for making many purchasing decisions for which accurate estimates are required and for estimating final project costs.

Definitive estimates are made one year or less prior to project completion. Its accuracy is minus 5 per cent to 10 per cent, meaning the actual costs could be 5 per cent less or 10 per cent more than the definitive estimate.

Definitive estimate is the most accurate of the three types of estimates.

In addition to creating cost estimates, it is also important to come up with a Cost Management Plan. This is a document that describes how the organization will manage cost variances on the Project. The cost management plan should describe how to respond to proposals (supplier's proposals) that are higher or lower than the estimates. A proposal that is within ten per cent of the estimate is acceptable and only negotiate items that are more than 10 per cent higher or 20 per cent lower than the estimated costs.

Another important consideration in preparing cost estimates is labour costs. This is so because a large percentage of the total project costs are often labour costs. Many organizations estimate the number of people or hours they need by department or skill over the life cycle of a project.

- **COST ESTIMATION TOOLS AND TECHNIQUES**

i) Analogous Estimates

These are also called **Top-down Estimates.** This type of estimate uses the actual cost of a previous similar project as the basis for estimating the cost of the current project.

This technique requires a great deal of expert judgment and is generally less costly than other techniques.

Analogous estimates are most reliable when the previous projects are similar.

ii) Bottom-up Estimates

This type involves estimating individual work items and summing them to get a project total. It is sometimes referred to as **Activity Based Costing.**

The size of the individual work items and the experience of the estimators drive the accuracy of the estimates.

The drawback with the bottom-up estimates is that they are usually time intensive and therefore expensive to develop.

iii) Parametric Modelling

This type of estimate uses project characteristics (parameters) in a mathematical model to estimate project costs. For instance, a parametric model of project that wants to develop an educational computer software may for example provide an estimate of $50 per line of code for a software development based on the programming language that the project is using, the level of expertise of the programmers, the size and complexity of the data involved, and so on.

Parametric models are more reliable when the historical information that was used to create the model is accurate, and the parameters are readily quantifiable.

In practice, using a combination or hybrid approach involving analogous, bottom-up, and or parametric modeling provides the best cost estimates.

b). COST BUDGETING

This involves allocating the overall cost estimate to individual work items to establish a baseline for measuring performance.

For project management, project cost budgeting involves allocating the project cost estimate to individual work items over time. These work items are based on work-breakdown structure for the project.

Cost estimates should also include the amount projected to be paid to suppliers. It should as well include travel, depreciation, rents, leases, project staff's emoluments and other expenses.

The main goal of the cost budgeting process is to provide a coast baseline for measuring project performance and project funding requirements.

A cost-baseline is a time-phased budget that project managers use to measure and monitor cost performance.

c). COST CONTROL

This involves controlling changes to the project budget.

Project cost control includes monitoring cost performance, ensuring that only appropriate project changes are included in a revised cost baseline, and informing project stakeholders of authorized changes to the project that will affect costs.

Several tools and techniques can assist in project cost control:

i). Performance Review Meetings : Performance Review Meetings can be a powerful tool for plateful to control project costs. People often perform better when they know they must report on their progress. The project manager should ensure that performance control meetings are held regularly.

ii). Earned Value Management : This is a project management technique that integrates time, scope, and cost data.
Given a cost performance baseline, project managers and their teams can determine how well the project is meeting scope, time, and cost goals by entering actual information and then comparing it to the baseline. A **baseline** is the **original project plan plus approved changes.**
Actual information includes whether or not a work breakdown structure item was completed or approximately how much of the work was completed, when the work was actually started and ended, and how much it actually cost to do the completed work.

Earned Value Management involves calculating three values for each activity or summary activity from a project's work breakdown structure. The three values are :

- **Planned Value (PV)**
  This is also called the budget. It is that portion of the approved total cost estimate planned to be spent on an activity during a given period. For instance, suppose a project included a summary activity of purchasing and assembling new desks for a school. Suppose, according to the plan, it would take one week and cost a total of

K10000 for the labour hours of assembling the new desks. The planned value for that activity that week is therefore, K10 000.

- **Actual Cost (AC)**
  This is the total direct and indirect costs incurred in accomplishing the work on an activity during a given period. For instance, suppose it took two weeks and it cost K80000 to purchase and assemble the new desks. Assume that K70 000 of these actual costs were incurred during week 1 and K10 000 was incurred during week 2. These amounts are the Actual Cost (AC) for the activity each week.

- **Earned Value (EV)**
  This an estimate of the value of the physical work actually completed. It is based on the original planned costs for the project and the rate at which the team is completing work on the project or activity to date.

  The rate of performance is the ratio of actual work completed to the percentage of work planned.

  For example, suppose the assembling of the school desks was half way completed by the end of week 1. The rate of performance would be 50 percent (50%) because by the end of week 1, the planned schedule reflects that the task should be 100 percent complete and only 50 percent of that work has been completed.

  The earned value estimate after one week is therefore K5 000.

The disadvantage of earned value management is that it is based on estimates. When the estimate is wrong, all the calculations will be incorrect.

UNIT 7 : PROJECT QUALITY MANAGEMENT

7.1 LEARNING OBJECTIVES

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

- Explain quality planning.
- Define quality assurance
- Outline the tools and techniques for quality control.

7.2 WHAT IS QUALITY

Quality is the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs or the degree to which a set of inherent characteristics fulfills requirements.

The purpose of project quality management is to ensure that the project will satisfy the needs for which it was undertaken. Project management involves meeting or exceeding stakeholder needs. Project quality management involves three main processes as outlined below:

- Quality Planning
- Quality Assurance
- Quality Control

7.3 QUALITY PLANNING

This includes identifying which quality standards are relevant to the project and how to satisfy those standards. Incorporating quality standards into project design is a key part of quality planning.

Quality planning involves communicating the correct actions for ensuring quality in a format that is understandable and complete. In quality planning for projects it is important to describe important factors that directly contribute to meeting the customer's requirements. Organizational policies related to quality, the particular project's scope statement and product descriptions, and related standards and regulations are all important inputs to the quality planning process.

Important scope aspects of projects that affect quality are functionality and features, outputs, performance, and reliability and maintainability.

Functionality is the degree to which a product performs its intended function. Features are the product's special characteristics that appeal to users. It is important to clarify what functions and features the product or system must perform and which ones are optional.

Outputs are what the system, machine or any other product produces or generates. It is important to define the outputs.

Performance addresses how well a product or service performs the customer's intended use. It is important that the product or service gives a high quality performance.

Reliability is the ability of a product or service to perform as expected under normal conditions. Maintainability addresses the eases of performing maintenance on a product. A good quality product should be highly reliable and should be maintainable.

Project Managers and their teams need to consider all these project scope issues in determining quality goals for the project. Customers must also communicate their quality expectations to the project team.

7.4 QUALITY ASSURANCE

Quality assurance includes all activities related to satisfying the relevant quality standards for a project. Another goal for quality assurance is continuous quality improvement. Several tools are used in quality assurance. One of these tools is Benchmarking. Benchmarking generates ideas of quality improvements by comparing specific project practices or product characteristics to those of other projects or products within or outside the performing organization. For example if a competitor can finish the work in one week instead of three weeks, that might be a benchmark for which to strive.

The other tool for quality assurance is quality audit. A quality audit is a structured review of specific quality management activities that helps to identify lessons learned that could improve performance on current or future projects. In-house auditors or third parties with expertise in specific areas can perform quality audits.

By definition quality assurance involves periodically evaluating overall performance to ensure that the project will satisfy the relevant quality standards.

The quality assurance process involves taking responsibility for quality throughout the project's life cycle. Top managers must take the lead in emphasizing the roles all employees paly in quality assurance.

7.5 QUALITY CONTROL

Quality Control involves monitoring specific project results to ensure that they comply with the relevant quality standards while identifying ways to improve overall quality. The process is often associated with the technical tools and techniques of quality management.

- **Tools and Techniques for Quality Control**

  There are seven tools, and are known as the **seven basic tools** of quality. These are as outlined below:

  a) The Cause-and-Effect Diagrams

  These diagrams function as tools that helps in ensuring and improving quality by finding the root causes of quality problems. They trace complaints about quality

problems back to the responsible production operations. In other words, they help you find the root cause of a problem.

The cause-and-effect diagrams are also known as the Fishbone or Ishikawa diagrams, named after the creator Kaoru Ishikawa.
The two examples given below illustrates how the cause-and-effect diagrams can be used to uncover the root cause of the problem.

In the first example the problem is that users (pupils) are not able to log into their school computer system. The fishbone diagram lists the main areas that could be the cause of the problem :
1) The system's Hardware, 2) the user's hardware, 3) the software, and 4) training.

In the diagram, two of these areas are described in more detail. These two are the individual user's hardware and training.

The root cause of the problem would have a significant impact on the actions taken to solve the problem.

If users could not get into the system because their computers did not have enough memory, the solution might be to upgrade memory for those computers. If many users could get into the system because of forgetting their passwords, there might be a much quicker, less expensive solution.

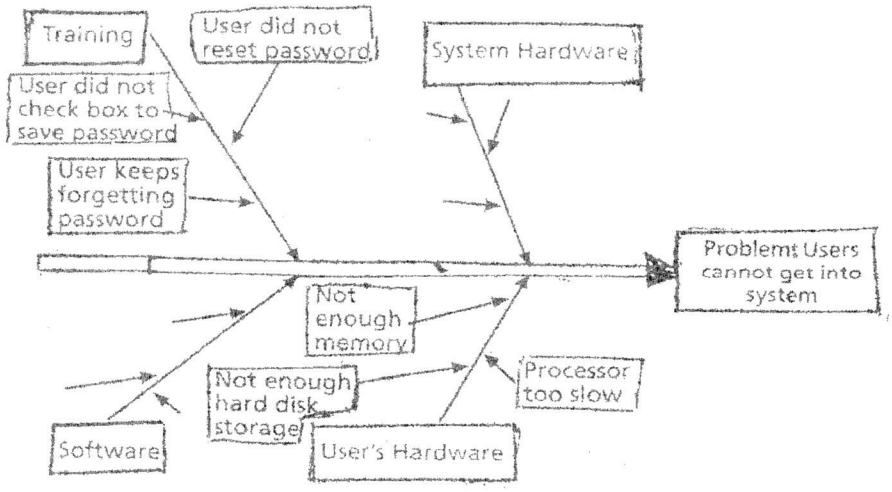


Figure 5: Sample Cause-and-Effect Diagram

Another good example of the use of the fishbone diagram is illustrated by one school where it was widely perceived by teachers that insufficient time was being spent covering the curriculum. To help understand and analyze the problem, a fishbone diagram was developed as shown in the figure below.

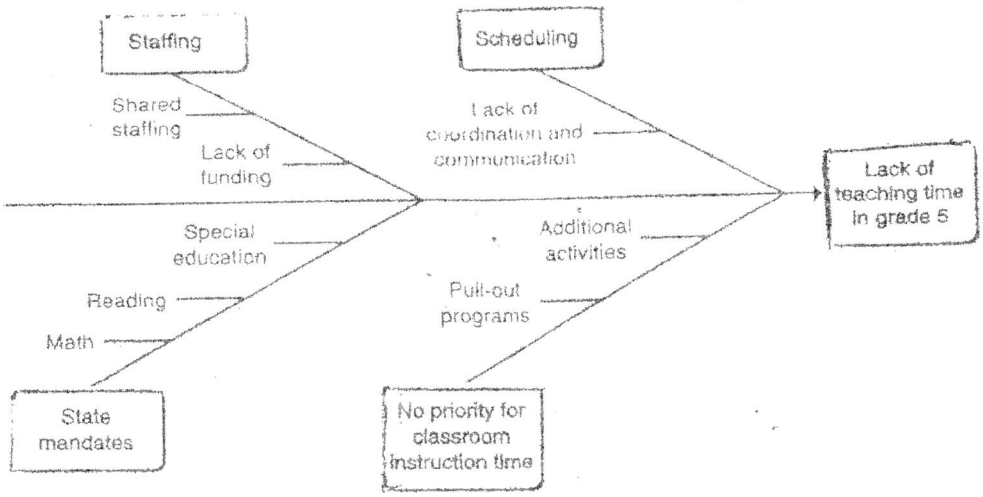


Figure 6: Fishbone diagram to analyze the problem of insufficient time being spent covering the curriculum. *Source:* Adapted from R. Manley and J. Manley, "Sharing the Wealth: TQM Spreads from Business to Education," *Quality Progress* (June 1990), pp. 51–55.

b) Control Charts

This is a graphic display of data that illustrates the results of a process overtime. Control Charts allow you to determine a process is in control or out of control.

By putting control limits on a chart of sample data, the operator can determine if the operation is out of control or in control.

The chart in the example below provides an example of a control chart for a process that manufactures 12 inch rulers. Each point on the chart represents a length measurement for a ruler that comes off the assembly line. The scale on the vertical axis goes from 11.90 to 12.10 inches long or 12 inches plus or minus 0.10 inches. These numbers represent the lower and upper specification limits for the ruler.

The lower and upper control limits on the quality control chart are 11.91 and 12.09 inches long.

Looking for and analyzing patterns in process data is an important part of quality control. Use quality control charts and the seven run rules to look for patterns in data.

The seven run rules states that if seven data points in a row on a quality control chart are all below the mean, above the mean or are all increasing or decreasing, then the process needs to be examined for nonrandom problems.

In our example on the chart data points that violate the seven run rule are starred. These data points, in the ruler manufacturing process, may indicate that the machine that cuts the wood for rulers might need to be adjusted or the blade on the machine may need to be replaced.

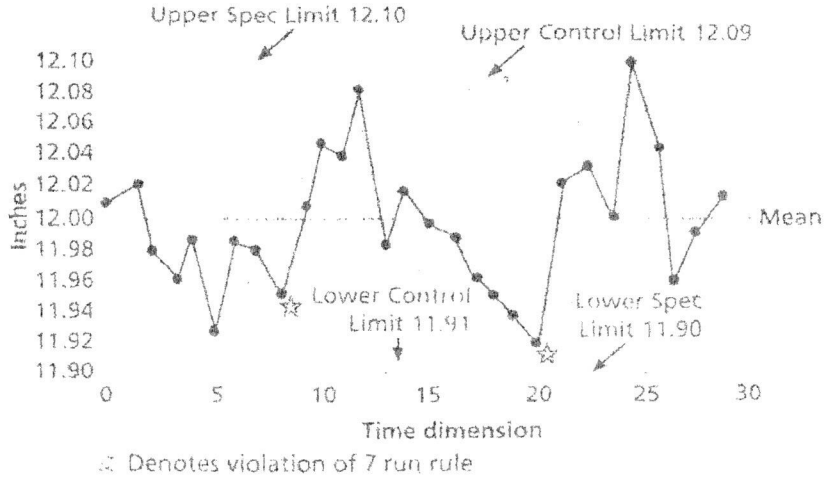
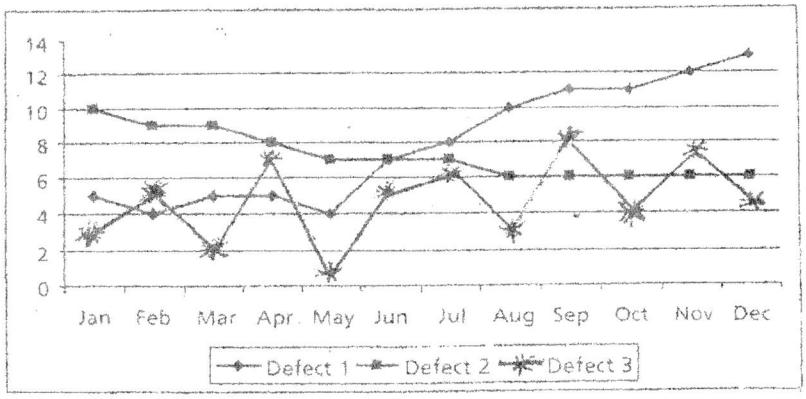


Figure 7.4: Sample Control Chart

c) The Run Chart

This displays the history and pattern of variation of a process over time. It is a time chart that shows data points plotted in the order in which they occur. You can use run charts to perform trend analysis to forecast future outcomes based on historical results. For example, trend analysis can help you analyze how many defects have been identified over time and see if there are trends.

The chart in our example below shows a sample run chart, charting the number of defects each month for three different types of defects. Notice that you can easily see the pattern of defect 1 continuing to increase overtime, defect 2 decreasing the first several months and then holding steady, and defect 3 fluctuating each month.



Sample Run Chart

d) The Scatter Diagram

This helps to show if there is a relationship between two variables. The closer the data points are to a diagonal line, the more close the two variables are related.

In our example below the diagram provides a sample of scatter diagram to compare user satisfaction rating of a computer system to age of respondents to see if there is a relationship.

You might find that younger users are less satisfied with the system, for example, and make decisions based on that finding.

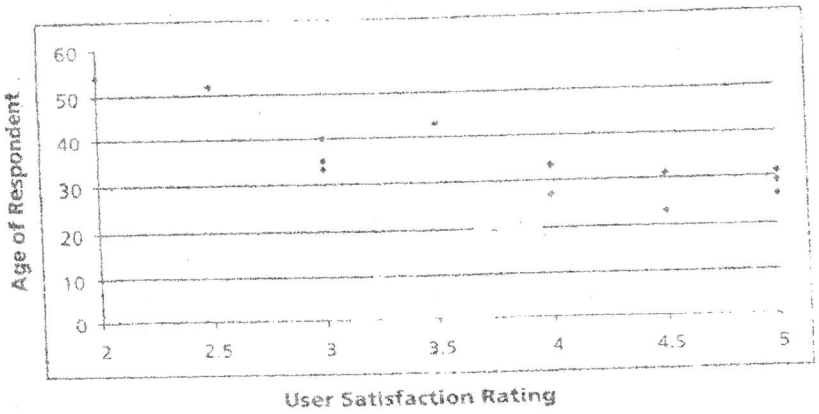


Figure 9: Sample Scatter Diagram

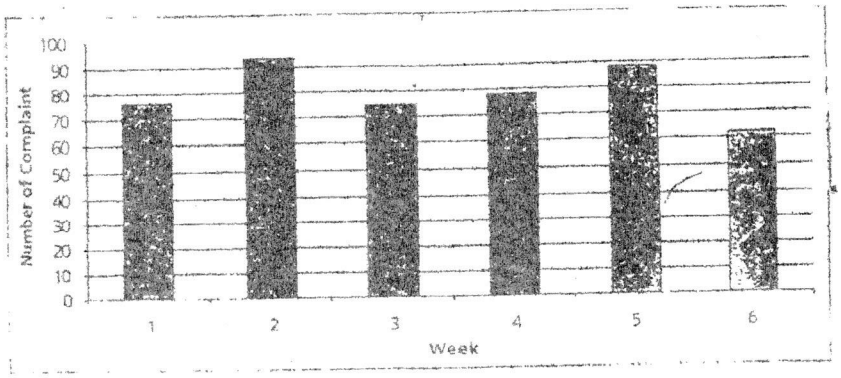
e) The Histogram

This is a bar graph of a distribution of variables. A histogram or bar graph shows the statistical frequency distribution of a variable of interest.

Each bar graph represents an attribute or characteristic of a problem or situation, and the height of the bar represents its frequency.

For example an organization might create a bar graph (histogram) to show how many total complaints they received each week related to its sale and marketing operations.

Given below is an example of a simple histogram. From this chart it can be determined how often some variable is "too low" or "too high" and whether further action is required.



f) Flow Charts

These are graphic displays of logic and flow of processes that help you analyze how a problem occur and how processes can be improved. They show activities, decision points, and the order of how information is processed.

In other words, a flow chart is a process analysis of how a system or a process works. It shows inputs, operations, and outputs. By depicting the process visually, the workers can often spot the source of a problem.

Our example below provides a simple example of a flowchart that shows the process that a project team might use for accepting or rejecting deliverables.

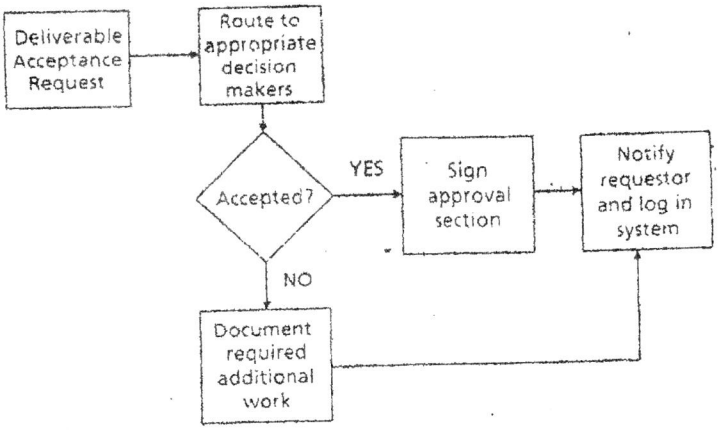


Figure 11: Sample Flowchart

g) Pareto Charts

A Pareto Chart is a chart based on natural tendency for the majority of problems to be due to a minority causes. Typically, 80 percent of the symptoms (problems) are due to 20 percent of the causes. By concentrating on the primary problems, most of the difficulties can be resolved.

In other words, a Pareto chart is a histogram that can help you identify and prioritize problem areas.

The variables described by the histogram are ordered by frequency of occurrence. Pareto Charts help you identify the vital few contributions that account for most quality problems in a system.

A Pareto analysis is sometimes referred to as the 80-20 rule, meaning that 80 percent of the problems are often due to 20 percent of the causes.

For example, suppose there was a detailed history of user complaint about the computer system. The project team create a Pareto Chart based on that data as shown on the Chart given below. From this chart notice that log-in problems are the most frequent user complaint, followed by the system locking up, the system being too slow, the system being hard to use, and reports being inaccurate.

The first complaint accounts for 55 percent of the total complaints. The first and the second have a cumulative percentage of almost 80 percent, meaning these two areas account for 80 percent of the complaints. Therefore, the organization should focus more on resolving the first two problems as they are the major sources of complaints.

complaints, surveys, comments, and market research that represent the views and needs of organization's customers.

ii). Measure

Define measures, then collect, compile, and display data. Measures are defined in terms of defects per opportunity.

iii). Analyze

Scrutinize process details to find improvement opportunities. A project team working on a six sigma is known as a six sigma team. It investigates and verifies data to prove the suspected cause of quality problems and substantiate the problem statement. An important tool in this phase is the Fishbone or Ishikawa diagram.

iv). Improve

Generate solutions and ideas for improving the problem. A final solution is verified with the project sponsor. The six sigma team then develops a plan to pilot test the situation. The six sigma team receives the results of the pilot test to refine the solution, if needed, and then implements the solution where appropriate.

v). Control

Track and verify the stability of the improvements and the predictability of the solution. Control charts are one tool used in the control phase.

UNIT 8 : PROJECT RISK MANAGEMENT

8.1 LERANING OBJECTIVES

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

- Define project risk management.
- Explain project risk management.
- Discuss the framework for dealing with risk.

8.2 WHAT IS PROJECT RISK MANAGEMENT

Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interest of meeting project objectives.

A frequently overlooked aspect of project management is that risk management can often result in significant improvements in the ultimate success of projects.

Risk management can have a positive impact on selecting projects, determining the scope of projects, and developing realistic schedules and cost estimates. It helps

project stakeholders understand the nature of the project, and it also involves team members in defining the strengths and weaknesses of the project.

Risk may be defined as a chance of exposure to the adverse consequences of future events. This definition highlights the negativity often associated with risk and suggests that uncertainty is involved.

In many respects, negative risk management is like a form of insurance. It is an activity undertaken to lessen the impact of potentially adverse events on a project.

However, there are also positive risks, which can result in good things happening on a project. Arising from this understanding, **risk** can therefore be defined as an uncertain event or condition that, if it occurs, has a negative or positive effect on a project's objectives.

A general definition of a **project risk**, therefore, is **an uncertainty that can have a negative or positive effect in meeting project objectives.**

Positive risk management is like investing in opportunities.

It is important to note that risk management is an investment. There are costs associated with it. In any case, the cost for risk management should not exceed the potential benefits of the project.

The investment an organization is willing to make in risk management activities depends on the nature of the project, the experience of the project team, and the constraints imposed on both.

8.3 FRAMEWORK FOR DEALING WITH RISK

Planning for risk includes these steps :

a) **Risk identification.**
b) **Risk assessment.**
c) **Risk planning.**
d) **Risk monitoring.**

a). RISK IDENTIFICATION.

There are several approaches, tools and techniques to risk identification as indicated in our discussion below:

i). Brainstorming : Representatives of the main stakeholders can be brought together to identify particular problems that might occur. It is a technique by which a group attempts to generate ideas or find a solution for a specific problem by amassing ideas spontaneously. This approach can help the group to create a comprehensive list of risks to address. Brainstorming can also be used to identify possible solutions to the problems that emerge.

ii). Delphi Technique : The basic concept of this approach is to derive a consensus among a panel of experts who make prediction about future developments. The Delphi technique uses repeated rounds of questioning and written responses. The responses, together with opinions and justifications would be evaluated by the facilitator who would provide a feedback to each expert. More rounds of questioning and written responses would continue until the group responses converge to a specific solution.

iii). Interviewing : This is a fact finding technique for collecting information in a face-to-face, phone, e-mail, or instant messaging discussion. Interviewing people with similar project experience is an important tool for identifying potential risks.

iv). Checklists : Checklists based on risks that have been encountered in previous projects provide a meaningful template for understanding risks in a current project. Checklists are simply lists of risks that have been found to occur regularly in projects.
Project managers might use the checklist to identify risks to a project.

You can use checklists that have been developed by any of the various groups or individuals that are currently in existence. You can find these on internet.

v). Diagramming Techniques : This includes the cause-and-effect diagrams or fishbone diagrams. The fishbone diagrams will help you to trace problems back to their root cause.

Risk Register

After the risk identification process is over, there will be need to create a risk register. This is a document where project planners will record their findings. It is a tool for documenting potential risk events.

After work starts on the project, more risks will emerge and be added to the register. At a regular interval, the risk register should be reviewed and amended.

Many risks threaten one or two activities, and when the project staff have completed these, the risk can then be closed as no longer relevant. In any case, the probability and impact of a risk are likely to change during the course of the project.

b). RISK ASSESSMENT.

A common problem with risk identification, is that a list of risks is potentially endless. Some way is therefore needed of distinguishing the more damaging and likely risks. This can be done by estimating the risk exposure for each risk using the formula:

Risk exposure = (potential damage) × (probability of occurrence)

Planners and project managers should focus attention on the risks that are more damaging and on those with high frequency of occurrence.

c). RISK PLANNING.

Having identified the major risks, the next task is to decide how to deal with them. The choices discussed will be :

- Risk acceptance
- Risk avoidance
- Risk mitigation
- Risk transfer

i). Risk Acceptance : This is the do-nothing option. You would have decided to ignore some risks. This is so because the damage inflicted by some risks would be less than the costs of action that might reduce the probability of a risk happening.

ii). Risk Avoidance : Some activities may be prone to risk. Therefore, the best thing will be to avoid them altogether. This will help in eliminating the threat as it will have no chance of occurring at all.

iii). Risk Mitigation (risk reduction) : Here we go ahead with the course of action despite the risks, but take precaution that reduce the probability of the risk occurrence. Suggestions of risk mitigation include having competent project personnel, using various analysis and validation techniques, etc.

iv). Risk transfer: This is a strategy which require shifting the consequences of a risk and responsibility for its management to a third party. For example risk transfer is often used in dealing with financial risk. A project team may purchase special insurance for certain aspects of its project.

d) . RISK MONITORING.

Risk monitoring and control involves executing the risk management processes to respond to risk events. Executing risk management processes means ensuring that risk awareness is an ongoing activity performed by the entire project team throughout the entire project.

Project risk does not stop with the initial risk analysis. Previously identified risks may be determined to have a greater probability of occurrence or a higher estimated loss value.

Similarly new risks will be identified as the project progresses. Newly identified risks need to go through the same process as those identified during the initial risk assessment.

A redistribution of resources devoted to risk management may be necessary because of relative changes in risk exposure.

Carrying out individual risk management plans involves monitoring risks based on defined milestones and making decisions regarding risks and their response strategies.

It may be necessary to alter a strategy if it becomes ineffective or eliminate a risk from a list of potential risks when it no longer exists.

UNIT 9 : PROJECT MONITORING AND CONTROL

9.1 LEARNING OBJECTIVES

By the end of this unit you should be able to:

- Explain the steps undertaken in project monitoring and control.
- Conduct simple project monitoring and control.

9.2 INTRODUCTION

Once the project is underway, attention must be focused on ensuring progress. This requires monitoring of what is happening, comparison of actual achievement against the schedule and, where necessary, revision of plans and schedules to bring the project as far as possible back on target. The following are the steps in project monitoring and control.

9.3 CREATING THE FRAME WORK

a) Responsibility

The overall responsibility for ensuring satisfactory progress on a project is often the role of the project steering committee or Project Board. Day-to-day responsibility will rest with the project manager, and in all but the smallest of projects, aspects of this can be delegated to team leaders. In small projects, individual team members usually report directly to the manager. But in most cases, team leaders will collate reports on their section's progress and forward summaries to the project manager. These, in turn will, be incorporated into project level reports for the steering committee, and via them or directly, progress reports for the client.

b) **Assessing Process**
Progress assessment will normally be made on the basis of information collected and collated at regular intervals or when specific events occur. Progress assessment will also at times rely on the judgment of team members who are carrying out the project activity.

c) **Setting Checkpoints**
It is essential to set a series of checkpoints in the initial activity plan. Checkpoints may be, (i) regular (monthly, for example) or (ii) tied to specific events such as the production of a report or other deliverable.

d) **Taking Snapshots**
The frequency with which a manager needs to receive information about progress will depend upon the size and degree of risk of the project or that part of the project under their control. Team leaders, for example, need to assess progress reports daily, whereas project managers may find weekly or monthly reporting appropriate. In general the higher the level, the less frequent and less detailed reporting needs to be. Equally it is also acceptable to formally collect data at the end of each week.

9.4 COLLECTING THE DATA

a) **Partial completion Reporting**
Use weekly time-sheets to break jobs down to activity level. Weekly time-sheets are valuable sources of information about resources used. They are often used to provide information about what has been achieved. They are also be used to obtain required information about work done in addition to time spent. This report form should also capture information about the slippage of completion dates as well as estimates of completeness.

b) **Risk reporting**
One popular way of overcoming the objections to partial completion is to avoid asking for estimated completion dates, but ask instead for the team members' estimates of the likelihood of meeting the planned target date.

Take note only of the risk of non-achievement. This is so because this exercise is not an attempt to estimate work done or to quantify expected delays.

Any critical activity that would be classified as being at risk will require further consideration and often leads to a revision of project schedule. Non critical activities are likely to be considered as a problem if they are classified as being at risk.

The project manager can use these as basis for evaluating the overall status of the project.

9.5 VISUALIZING PROGRESS

a) **The Gantt Chart**

One of the simplest technique for tracking progress is the Gantt Chart. This is essentially an activity bar chart indicating schedule activity dates and durations. Reported progress is normally recorded on the chart by shading activity bars. The Gantt Chart will indicate whether the project on schedule, ahead of schedule or behind schedule.

There are other techniques available for organizations to use. Some of these are the Slip Chart, the Ball Chart, the Timeline, etc. But in this module, our focus is limited only to the Gantt Chart.

9.6 COST MONITORING

Expenditure monitoring is an important component of project control. A project might be on time but only because more money has been spent on activities than originally budgeted. A cumulative expenditure chart or cost chart can help in comparing actual and planned expenditure.

9.7 EARNED VALUE ANALYSIS

Earned value analysis is based on assigning a value to each task or work package as identified in the Work Breakdown Structure (WBS) based on the original expenditure forecasts. The assigned value is the original budgeted cost for the item and is known as planned value (PV) or budgeted cost of work schedule (BCWS). The total value credited to a project at any point is known as the earned value (EV) or budgeted cost of work performed (BCWP) and this can be represented as a value or a percentage of the PV.

Common methods in a project are :

- **The 0/100 technique:** when the task is assigned a value of zero until such a time when it is completed when it is given a value of 100 percent of the budgeted value.

- **The 50/50 technique:** where a task is given a value of 50 percent of its value as soon as it is started and then given a value of 100 percent once it is complete.
- **The milestone technique:** where a task is given a value based on the achievement of milestones that have been assigned values as part of the original budget plan.

a) **The Baseline Budget**

The first stage in setting up an earned value analysis is to create the baseline budget. The baseline budget is based on the project plan and shows the forecast growth in earned value through time.

b) **Monitoring Earned Value**

Having created the baseline budget, the next task is to monitor the earned value as the project progresses. This is done this by monitoring the completion of tasks (or activity starts and milestone achievements).

c) **Schedule Variance**

This is measured in cost terms as EV-PV (Earned Value-Planned Value) and indicates the degree to which the value of completed work differs from that planned. A negative SV (Schedule Value) means the project is behind schedule.

d) **Cost Variance**

This is calculated as EV-AC (Actual Cost) and indicates the difference between the budgeted cost and the actual cost of completed work. It is also an indicator of the accuracy of the original cost estimates. A negative CV (Cost Variance) means the project is over cost.

e) **Performance Ratios**

Two ratios are commonly used. These are the cost performance index (CPI) and the schedule performance index. They can be thought of as value for money index. A value greater than one indicates that work is being completed better than planned, whereas a value less than one means that work is costing more than and or proceeding slowly than planned. Cost Performance index is calculated as CPI = EV ÷AC . Schedule Performance index on the other hand is calculated as SPI = EV÷PV .

9.8 PRIORITIZING MONITORING

In this section we list the priorities we might apply in deciding levels of monitoring.

- **Critical Path Activities:** Any delay in an activity on the critical path will cause a delay in the completion date for the project. Critical Path Activities are likely to have a very high priority for close monitoring.

- **Activities with no free float:** A delay in any activity with no free float will delay at least some subsequent activities even though, if the delay is less than the total float, it might not delay the project completion date.

- **High Risk Activities:** A set of high risk activities should have been identified as part of the initial risk profiling exercise. If we are using the PERT three-estimate approach we will designate as high risk those activities that have a high estimated duration variance. These activities will be given close attention because they are most likely to overrun or overspend.

- **Activities using critical resources:** Activities can be critical because they are very expensive. Staff or other resources might be available only for a limited period, especially if they are controlled outside the project team. In any event, an activity that demands a critical resource require a high level of monitoring.

9.9 GETTING THE PROJECT BACK TO TARGET

Almost any project will, at one time or another, be subject to delays and unexpected events. The project manager must attempt to mitigate the effects of the problem. Outlined below are some of the ways of how to get the project back to its target.

a) **Shorten the Critical Path**
   - The project manager must consider allocating more resources to the critical path.
   - Staff might be asked to work overtime.
   - Staff to be told to work harder.
   - Embark on fact finding by conducting some interviews.

   The aim is to try and shorten the critical path.

b) **Reconsider the precedence requirements**
   If attempting to shorten the critical path proves insufficient, the next step is to consider the constraints by which some activities have to be deferred pending completion of others. The original project network would most probably have been drawn up assuming ideal conditions and normal working practices.

   It might be that, to avoid the project delivering late, it is now worth questioning whether as yet un-started activities really do have to await the completion of others. It is still within acceptable limits if the project manager could identify some of the activities that can be started at the same time with others instead of waiting for others to finish first. Once identified, they can as well be started.

9.10 CHANGE CONTROL

Control of changes and documentation ought to be the responsibility of someone who may variously be named the Configuration Librarian, the Configuration Manager or Project librarian.

a) **Configuration Librarian's Role**

Among the duties of this person would be:

- The identification of all items that are subject to change control.
- The establishment and maintenance of a central repository of the master copies of all project documentation.
- The setting up and running of a formal set of procedures to deal with changes.
- The maintenance of records of who has access to library items and the status of each library item.

b) **Changes in Scope of a System**

One common occurrence in projects is for the size of the project to gradually increase. One cause of this is changes to requirements that are requested by the users. The scope of a project needs to be carefully monitored and controlled. One way is to re-estimate the size or function points at key milestones.

UNIT 10 : MANAGING CONTRACTS

Project contracting means employing an outsider to carry out the project work rather than doing it yourself.

10.1 LEARNING OBJECTIVES

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

- List down the stapes in project acquisition and supply
- State the types of contracts.
- Identify the stages in contract placement.
- Explain the terms of a contract

10.2 APPROACH TO THE ACQUISITION AND SUPPLY OF PROJECT PRODUCTS BY CONTRACT

The acquisition process is the set of procedures that a customer who wish to acquire a project product through a contract should follow. The following are the procedures:

Steps By the Acquirer

a) **Initiation**

The initiation activity starts with the acquirer describing the need which they wish to satisfy. The requirements which the product should meet in order to fulfil the need should be defined by the acquirer organization. Often external expert could be employed for this purpose, but the responsibility for the accuracy of these requirements would remain with the acquirer.

The acquirer is now in a position to prepare the acquisition plan, detailing steps needed to take to acquire the product. The precise scope of the work to be undertaken externally needs to be decided. Other issues to be decided are those that relate to potential risks and criteria for final product acceptance, including methods by which compliance with requirements is to be evaluated.

b) **Request for Proposal**
The groundwork has now been laid for the production of the request for proposal document. This should include the following sections:
   -. Product requirements
   -. Scope statement
   -. Instructions for bidders
   -. Control of subcontracts
   -. Technical constraints

c) **Contract Preparation and update**
Before you can have a contract, you must have a supplier with whom to have the contract. With this in mind, the criteria for selecting the supplier and the method of judging the degree of compliance by potential suppliers with the criteria have to be set down. Based on these, the preferred supplier is now selected. The form of contract between the supplier and the acquirer can now be negotiated and agreed. This may involve some agreed adjustments to the process.

d) **Monitor Supplier**
This will be done by using joint reviews, audit, verification and validation.

e) **Accept Completed Contract**
When the supplier finally delivers the product, the acquirer will conduct acceptance tests and if the specified acceptance criteria are satisfied, the completed product can be signed off as completed.

THE SUPPLY PROCESS (Steps by the Supplier)
This documents the activities that a supplier would need to undertake in response to the request of the acquirer. The following are the steps:

a) **Initiation**
The process is started when a potential supplier receives a request for a proposal from an acquirer and the supplier decides to bid for the work.

b) **Preparation of a Response**

The supplier, after consulting people with various types of expert knowledge, now prepares a response. This should include any proposals about how tailor it for the project in view.

c) **Contract**

If all goes well, the supplier's proposal makes the right impression and leads to acceptance by the acquirer. The details of the contract are then negotiated and signed.

d) **Planning**

The supplier can now draw up a detailed plan of how the work is to be done. The starting point for this will be the requirements as laid down in the request for proposal (REFP). You would expect this to include the life cycle approach to be applied by the supplier as this will to some extent dictate the points at which consultation between supplier and acquirer is to take place during the development process.

e) **Execution and Control**

The plan can now be executed. During the execution process, the supplier is expected to monitor and control progress and product quality, and to have a mechanism for identifying and recording the problems that occur and to have the mechanism for their analysis and resolution. The supplier will be responsible for passing on the requirements that accurately reflect those of the acquirer to any subcontractors and for ensuring the compliance of the subcontractors with those requirements. The supplier also needs to cooperate fully with any independent verification and validation processes that were laid down in the contract.

f) **Review and Evaluation**

The provisions here are mainly to ensure that the supplier allows the acquirer access to the information needed to review the progress of the project, although the precise extent to which the acquirer has a reviewing role and access to supplier documentation is to be specified in the contract.

g) **Delivery and Completion**

Acquisition may be given in any management plans to the way in which this is to be done and to how any required post-delivery support is to be provided.

10.3 TYPES OF CONTRACT

a) **Fixed Price Contracts**

In this situation, a price is fixed when the contract is signed. The customer knows that, if there are no changes in the contract terms, this is the price they will have to pay on the completion of the work. In order for this to be effective, the customer's requirements have to be known and fixed at the outset. This is so because once the development is underway, the customer organization will not

normally be able to change their requirements without negotiating the price of the contract.

b) **Time and Material Contracts**
With this type of contract, the customer is charged at a fixed rate per unit of effort, for example per staff-hour. At the start of the project the supplier may provide an estimate of the overall cost based on their current understanding of the customer's requirements. Because the supplier has decided to do things in this way, this approach does not normally find favour with customers.

c) **Fixed Price per Unit Delivered Contracts**
In this approach, the size of the project to be delivered is calculated or estimated at the outset of the project. A price per unit of the product is also quoted. The final price is then the unit price multiplied by the number of units.

d) **Open Tendering**
In this case, any supplier can bid to supply the goods and services. Furthermore, all bids that are compliant with the original conditions laid down in the invitation to tender must be considered and evaluated in the same way. With a major project with many bids, this evaluation process can be time consuming and expensive. Usually rules about how tendering processes should be carried out are laid down.

e) **Restricted Tendering Process**
In this case there are bids only from suppliers who have been invited by the customer. The customer may at any time reduce the number of suppliers being considered. This is usually the best approach to adopt.

f) **Negotiated Procedure**
In a situation where a project has been successfully done and implemented by an outsider, but the customer realizes that they would like to have some extensions to the project or to its product. As the original supplier has staff who have complete familiarity with the existing finished product of the project, it may be inconvenient to approach other potential suppliers via a full tendering process. In this case, an approach to a single supplier may be justified. All that you need is to negotiate with the same supplier to undertake the work. It is important to note that approaching a single supplier could open the customer up to charges of favouritism and should only be done where there is a clear justification.

10.4 STAGES IN CONTRACT PLACEMENT

a) **Requirement Analysis**

Before potential suppliers can be approached, you need to have a clear set of requirements. You may bring in an external consultant to draw up a requirements document. The customer will have to look at the resulting requirements document to ensure that it accurately reflects their needs. The requirements define carefully the functions that need to be carried out by the finished product of the project. The requirements should also state any standards with which there should be compliance and any operational and quality requirements. In general, the requirements document should state needs as accurately as possible.

The requirements document might typically have sections with the following headings :

- -. Introduction
- -. The customer's future strategies or plans.
- -. Project's finished product requirements
  - i). Mandatory
  - ii). Desirable
- -. Deadline
- -. Additional information required from potential suppliers.

b) **Evaluation Plan**

Having drawn up the list of requirements, we now need to draw up a plan of how the proposals which are submitted are to be evaluated. First we have to identify ways of checking that all the mandatory requirements have been met. The next consideration is how the desirable requirements can be evaluated. One way is to assess the supplier organization and its products. The value of the quality product can sometimes be assessed by its cost. The higher the cost the more likely the higher the value.

c) **Invitation to Tender**

Having produced the requirements and the evaluation plan, it is now possible to issue invitation to tender prospective suppliers. Essentially, this will be the requirement document with a supporting letter which will have additional information about how responses to the invitation are logged. A deadline will be specified and it is hoped that by then a number of proposals with price quotations will have been received.

In law, for a contract to exist, there must be an offer on one side which must be accepted by the other side. The invitation to tender is not an offer itself but an invitation for prospective suppliers to make an offer.

d) **Evaluation of Proposals**

This needs to be done in a methodical and planned manner. The proposal documents provided by the suppliers can be scrutinized to see if they contain features satisfying all the original requirements. Clarifications might be sought over certain points. Any factual statements made by a supplier imply a legal commitment on their part if they influence the customer to offer contract to that supplier. It is therefore, important to get a written, agreed, record of these clarifications.

The process of evaluation may include:

- Scrutiny of the proposal documents
- Interviewing supplier's representatives
- Demonstration.
- Site visits
- Practical tests.

Eventually a decision is made to award the contract to one of the suppliers.

10.5 TYPICAL TERMS OF A CONTRACT

a) **Definitions**

The terminology used in the contract document may need to be defined. For example, who is meant by the words "client and supplier."

b) **Form of Agreement**

For example is it a contract of sale, a lease, or license?

c) **Goods and Services to be Supplied**

Goods should include the actual list of items to be delivered. Services on the other hand may include such things as, training, documentation, installation, maintenance agreements, insurance arrangements, etc.

d) **Ownership of the Product**

Who will own the product? Will it be the customer or the supplier? Who is going to have exclusive rights over the finished product of the project?. This question needs to be answered clearly.

e) **Environment**

Confirm the kind of work environment required for the project. Will it require electricity, water, free air circulation, open environment or inside closed doors. All these and many more would need to be confirmed.

f) **Customer Commitments**
The customer will have to participate even if the work is carried out by external contractors. The customer may have to provide accommodation for the suppliers and perhaps other facilities such as telephone lines.

g) **Acceptance Procedures**
Good practice would be to accept a delivered product only after it has undergone user acceptance tests. This part of the contract would specify such details as the time the customer will have to conduct the tests, deliverables upon which the acceptance tests depend and the procedure for signing off testing as completed.

h) **Standards**
This covers the standards with which the goods and services should comply. For instance, the customer could require the supplier to conform to international or any other acceptable standard.

i) **Project and Quality Management**
The arrangements for the management of the project must be agreed. Among these would be frequency and nature of progress meetings and the progress information to be supplied to the customer. The contract could require that appropriate quality standards are followed. The customer should have access to quality documentation generated by the supplier, so that the customer can ensure that there is adherence to standards.

j) **Time Table**
This provides a schedule of when the key parts of the project should be completed. The time table will commit both the supplier and the customer.

k) **Price and Payment Method**
Agree on the price and payment method. As the supplier would want to be paid in time, he should also remember to balance this with the customer's requirement to ensure that goods and services are satisfactory before parting with their money.

l) Miscellaneous Legal Requirements

10.6 CONTRACT MANAGEMENT

We now need to consider communications between the supplier and customer while the contract work is being carried out. It would probably suit all concerned if the contractor is left to get on with the work undisturbed. However at certain decision points, the customer might wish to examine work already done and make decisions about the future direction of the project. The project could require representatives of the supplier and customer to interact at many points in the development cycle.

This interaction, or other external factors, could lead to changes being needed which effectively vary the terms of the contract and so a carefully change control procedure is needed.

When a contract is being negotiated, certain key points may be identified where customer approval is needed before the project can proceed.

For each decision point, the deliverables to be presented by the suppliers, the decisions to be made by the customers by the customer and their outputs all need to be defined.

Where work is contracted out, there will be concern about the quality of that work. Other agents independent of both the supplier and the customer, who will carry out the verification, valuation, and quality assurance can be brought in. Also, there should be room for joint reviews of project processes and products to be agreed when the contract is negotiated.

Major changes to requirements may emerge. These could vary the terms of the contract. Oral evidence is not normally allowed. Instead all agreed changes need to be documented so that they become part of a written contract.

It could happen that the supplier does not meet one or more of their legal obligations. In such a case the customer should protect their legal rights by officially notifying the supplier that the failure has been recognized.

10.7 ACCEPTANCE

When the work is has been completed, the customer needs to take action to carry out acceptance testing. The contract may put a time limit on how long acceptance testing can take, so the customer must be organized to carry out this testing before the time limit for requesting corrections expires.

Part or all of the payment to the supplier should depend on this acceptance testing. Sometimes part of the final payment will only be paid if the levels of reliability of the product are as contracted for. There may also be a period of warranty during which the supplier should fix any errors found for no charge.

UNIT11 : INTRODUCTION TO ENTREPRENEUARSHIP:

This unit introduces you to the concept of entrepreneur and entrepreneurship:

11.1 OBJECTIVES

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

1. **Define the terms entrepreneurship, entrepreneur, business and venture.**
2. **Explain the importance of entrepreneurship in an organization.**
3. **Discuss theories of entrepreneurship.**

11.2 DEFINITION

According to Nagarajan (2015), the term entrepreneur is derived from a French verb entreprendre which means 'to undertake'. Entrepreneur is one who undertakes a business venture. What is special about starting a business venture? To know the answer for this, we must define the term' business' and' venture'.

A business can broadly defined as a commercial or an industrial activity that is carried out with an intention to reaping profit. A venture can be defined as an attempt whose results are uncertain.

Thus, an entrepreneur is one who undertakes a business or an industrial activity, which contains inherent risks. Entrepreneurship is that quality of an individual that makes him/her assume risks, organize the required resources and set up a business venture. In the absence of entrepreneurs, the resources in a society will only remain dormant.

The definition of entrepreneurship as given by the entrepreneurship center at Miami University of Ohio is as follows;

> ➢ 'Entrepreneurship is the process of identifying, developing, and bringing a vision to life. The vision may be an innovative idea, an opportunity, or simply a better way to do something. The end result of this process is the creation of a new venture, formed under the conditions of risk and considerable uncertainty.'

Entrepreneurship is important for production. This recognized by Alfred Marshall as early as in 1890. In his famous book 'Principles of Economics' he explain that there are four aspects of production; **land, labour, capital** and **organization.**

Organization is the coordinating factor which brings the other factors together. Marshall believes that entrepreneurship is the driving element behind organization. According to Marshall, entrepreneurs create new commodities or improve the plan of producing an old commodity 'creatively organizing' the required resources. Marshall believed that in order to creatively

organize the resources, entrepreneurs must have a through understanding of their respective industries and an overall knowledge of the way the economy operates and that they must be natural leaders.

A quality that Marshall finds essential for entrepreneurs is the ability to foresee the changes that may take place in supply and demand and the willingness to act on such risky forecasts in the absence of complete information.

What Marshall visualized in respect of entrepreneur and entrepreneurship remain valid even today: however, in the course of time, many experts and economists have added their views to this subject. Some of the definitions given by experts are as follows:

The term entrepreneur may be properly applied to those who incubate new ideas, start enterprises based on those ideas and provide added value to the society based on their independent initiative (David Holt).

An entrepreneur is an innovator playing the role of a dynamic business adding material growth to economic development. (Joseph Schumper).

An entrepreneur is a change agent (Frank Young).

An entrepreneur is one who always search for change, responds to it and exploits it as an opportunity (Peter F. Ducker)

An entrepreneur is the person who will establish a successful new business venture: besides, he must also be a visionary leader- a person who has great dreams.(Robert D. His rich).

The difference between mangers and entrepreneurs

Entrepreneurs are different from managers and entrepreneurship is different from management. A manager takes the given resources, viz, men, material, money, machines etc,. and organizes them so as to achieve the best possible business results. As against a manger, an entrepreneur looks for exploiting new opportunities for profitable economic transactions. Thus, entrepreneurs act as change agents in an economy.

Activity:

1. Discuss in groups of five at least five differences between a manager and an entrepreneur.
2. Entrepreneurship is essential for production. (Discuss in your groups to support this assertion).
3. Are your members of staff in your school entrepreneurs? If so explain why.

What are the qualities of entrepreneurial?

Entrepreneurial requires certain special qualities. Therefore all successful entrepreneurs are found to possess some or all the following qualities. It is possession of these qualities that distinguish entrepreneurs from average people.

The following are some of the qualities possessed by entrepreneurs:

- posses the inquiring mind with a thirst to search for opportunities.
- Have foresight to assess the market trends.
- Show extreme alertness to grab any unexploited opportunities.
- Have an enthusiastic vision and driving force to set up enterprises. They take the initial responsibility to cause their vision to become a success.
- Take prudent, calculated risks. They asses costs, market/customer needs and persuade others to join and help them in their ventures.
- Exhibit determination and grit to pursue relentlessly till they reach their goals
- Usually are positive thinkers and decision makers.
- Never feel complacent and always look for better ways of doing things.
- Have high level of self-confidence and have a positive attitude- they find opportunities even amidst situations of chaos, confusion and hopelessness.
- Have strong desire to earn money and to create wealth.
- Apart from earning money, they derive satisfaction from achievement. It is this quality that drives them continuously in search of excellence in everything they do.
- Entrepreneurs are not averse to take risk. They bold enough to take calculated risk in promoting their business venture.
- They posses single-minded devoted to achieve their vision and not cowed down by discouragements/negative criticisms from others.
- They are hard -working and put forth their heart and soul in their work.
- They are energetic; they maintain good physical and mental health and passion to achieve.
- They have strong desire to innovate new products, new processes and new ideas
- They finally exhibit high level of creativity.

ACTIVITY:

1. Discuss some of the qualities of entrepreneurs and which of them are vital in the running of your school as an organization.

11.3 THEORIES OF ENTREPRENEURSHIP

A). The theory of Risk- Bearing;

In his first part of his book 'Essay on the Nature of Commerce in General' Richard Cantillon made the distinction between entrepreneurs and workers and their divergent functions in a market economy. It was Richard Cantillon who first used the term entrepreneur in his book. Other classical economics used words like adventurer, undertaker and projector were used to refer to entrepreneurs.

Richard Cantillon viewed entrepreneurs as risk-bearing agents of production. According to him an entrepreneur is one who buys factors of production at certain prices, produces a product by combining the factors of production and putting forth his efforts sells the product at an uncertain price. He quotes the example of a farmer who takes lands on lease from the landlords, produces agricultural produce in the land and sells the produce at prices that are uncertain. It may be noted that while the lease rent payable by the farmer to that landlord, the price of the agricultural inputs required to be purchased by the farmer and the wages payable by the farmer to the workers on the field are known. Thus the receipts that the farmer may get are uncertain and not exactly known to the farmer while the payments that he will have to make are certain.

In spite of the returns being uncertain, the farmer bears the risk and parts with his capital in his agricultural venture. Apart from capital, he also puts forth his untiring effort. The farmer does all these in anticipation of a return that is uncertain. This can be possible only if the farmer is prepared to bear the risk associated with his venture. If he is risk averse, he will not opt for such a venture where the returns are unknown and uncertain.

Conclusion:

Cantillon concludes that readiness to bear risk is the critical factor that is required of a person, for him to be considered as an entrepreneur. An entrepreneur bears the risk associated with an enterprise as he foresees business opportunities that he believes could offer him yields commensurate with the level of risk attached to the investment.

B). The Theory of Uncertainty

Frank Hyneman, considers that the main function of an entrepreneur is to act in anticipation of future events and that future events are surrounded with uncertainty. He also recognizes that an entrepreneur profit because he undertakes risks in promoting entrepreneurial ventures. He classifies risk associated with entrepreneurial ventures into two types, viz, **insurable risks** and **non-insurable risk.** He urges that those risks that can be insured against cannot produce profit for an entrepreneur because the entrepreneur can always guard against such risks by insuring such risks with an insurer.

However, the entrepreneur has to necessarily bear the burden of non-insurable risks. The profit that an entrepreneur earns from his venture is the reward for his bearing the non- insurable risk. Fire accident, theft etc., are some of the insurable risks. The entrepreneur is not going to be affected very much by these risks as he can insure against such risks.

There are certain risks that are not insurable. For example, changes in demand for product, changes in fashion and taste of consumers, entry of competitors, changes in the political conditions, and depletion of raw material that are naturally available, unpredicted and unprecedented actions that are taken by the government etc are some of the factors that may affect the performance of an industry very much. These risks are non – insurable in nature. This is because their occurrence cannot be predicted and their effects on the financial performance

of a venture cannot be quantified accurately. There will be no institution ready to insure such kinds of risks. These risks are called 'Business risks'. Though economist and business experts can claim to have the knowledge and expertise to predict the business trends, there prevails a lot of uncertainty in this area since there are many unknown factors acting behind the performance of any economy. He calls the non-insurable risks as 'uncertainty'. Thus according to Hyneman knight bearing uncertainty is the essential ingredient of an entrepreneur and it is this quality that is essential for production. Therefore, knight considers this quality as a factor of production.

Conclusion:

According to knight, entrepreneurs are under compulsion to guess at their expected total receipts out of sale of their products. However, this is a difficult job in view of the uncertainties involved. This is more so in view of the non-insurable nature of the uncertainties. Knight visualized that whenever uncertainties yield higher total receipts than forecasted total receipts, entrepreneurs earn their profit.

Thus, Knight introduced an element of luck in the profits earned by entrepreneurs. Such entrepreneurs who get lucky will try to reproduce their success; in their attempt, they may at times fail when luck eventually takes a reverse turn. Knight concluded that economic change is a result of the constant interplay between new entrepreneurial action, which is the result of new entrepreneurs trying to earn profit by taking a chance and attempting to earn extra income over and above the forecasted income and existing businesses hedging against uncertainty by improving their internal organization.

C). The Theory of Coordination, Organization and Supervision

J.B Say described an entrepreneur as one who possessed certain arts and skills of creating new economic enterprises and a person who had exceptional insight into society's needs and was able to fulfill them.

Say , thus combined the 'economic risk taker' of Richard Cantillion and industrial manager Adam Smith into the character of entrepreneur. J.B.Say makes a distinction between the capitalist and the entrepreneurs. He considers the capitalist as the financier and the entrepreneur as an organizer. The capitalist gets his income out of interest that he earns from the money lent to entrepreneur. As the interest payable on the borrowings by the entrepreneurs is not connected with the business prospects of the entrepreneurs, irrespective of the success/failure of the entrepreneurs' ventures, the capitalist gets his return. Thus, the business risk is borne only by the entrepreneur.

According to J.B.Say, an entrepreneur is one who coordinates and organizes and oversees the activities of the enterprise to produce goods and services required for the satisfaction of human want. Thus, the entrepreneur acts as a change agent. **He is the agent who unites all means of production and produces a product.** The entrepreneur combines the land owned by one person, the capital offered by another person and the labour of yet another person. By coordinating these

three factors, he produces a product/ service that satisfies human want. The entrepreneur sells the product in the market and realizes the sale proceeds. Out of the sale proceeds, he pays rent on the land, pays interest on the capital to the capitalist who offered capital, wages to those who offered their labour and retains the balance as his profit. Thus, J.B.Say makes a clear distinction between a capitalist and the entrepreneur.

Conclusion:

According to J.B.Say, the capitalist plays the role of a financier while the entrepreneur plays the role of a coordinator, organizer and supervisor. Though entrepreneurial success is sought after by the individual entrepreneurs, J.B. Say visualized that entrepreneurial success is very much essential for the welfare of the society as a whole. While J.B.Say distinguished entrepreneur from capitalist, he, however, did not spell out the motive force that induces the entrepreneur to take up the role of coordinating, organizing and supervising.

D). Schumpeter's Theory of innovation

According to Schumpeter, entrepreneur is an innovator. According to him an entrepreneur is an innovator and develops untried technology. He considers entrepreneur as one who acts as a catalyst by his innovative ideas and actions and introduces dynamism in the economy, they by interrupting and altering the stagnant circular flow of the economy and bringing about development. He expresses that an economy, which is devoid of innovative entrepreneur, will be dormant. Such an economy will follow a circular flow of conversion of resources into products/ services that lack variety, creativity and innovative features and the economy will remain stationary. Schumpeter describes what innovative entrepreneurs do as **'the entrepreneurial function."** The purpose of the entrepreneurial function is to disturb the stationary state of the economy, to create change and thrive in conditions of uncertainty, to seek new profit opportunities and to try to establish monopoly position in the market. The concept of Schumpeter's analysis was a perfectly competitive market in which, given consumer tastes and technologies, there existed a state of perfect equilibrium. Schumpeter visualized the entrepreneur as one who upsets this state of equilibrium by introducing new, innovative product/services, new methods of production, new way of marketing or a new way of organizing.

In his book "**can capitalism survive?**", Schumpeter defines the function of an entrepreneur as under,' the essence of entrepreneurship lies in perception and exploitation of new opportunities in the realm of business..... it always has to do with bringing about a different use of national resources in that they are withdrawn from their traditional use and subjected to new combinations.....the function of entrepreneurs is to reform or revolutionize the pattern of production by exploring an invention, or more generally, an untried technological possibility for producing a new commodity, or producing an old in a new way, opening a new source of supply of materials or a new outlet for products by organizing a new industry.....'

According to Schumpeter, innovation can take the following form:

- Introduction of a new product.
- Adding new quality features to existing products.
- Introduction of a new, improved technology for the production of an existing product.
- Identifying and opening of a new market into which a particular product has not entered so far.
- Discovery of new source of supply of raw material.
- Carrying out a new form of organisation

Summary:

Going by the types of innovations enumerated by Schumpeter, a person who sets up an enterprise for producing a product that already exists in the market, makes use of the existing technology and caters to the existing market is kept outside the definition of entrepreneur. Schumpeter argues that inventions and discoveries by themselves have little economic effect. He also makes a distinction between an inventor and an innovator. While the inventor finds out new materials, new products, new methods and techniques of production etc., the innovators makes use of such inventions and discoveries to produce and offer new products/ services to the economy. Schumpeter calls the innovator as the entrepreneur.

Activity

1. According the theory of Schumpeter discuss why a Head teacher is said to be an entrepreneur.
2. Compare and contrast the theory of risk bearing with that of uncertainty and do the two apply in your management of your institution.
3. Discuss why you think the J.B.Say's theory of entrepreneurship is important to you as the manager of an institution?

E). Peer Drucker's Theory of Opportunity.

According to Peter Drucker , entrepreneurs always search for change, respond to the change and exploit it as an opportunity. Entrepreneurs shift resources from areas of low productivity and yield to areas of higher productivity and yield. Innovation is the specific instrument of entrepreneurship. Innovation need not necessarily be an innovation of technology. According to Drucker, whatever that changes the wealth producing potential of already existing resources constitutes innovation. Entrepreneurship calls for the practice of systematic innovation. Systematic innovation consists in the purposeful and organized search for changes and in the systematic analysis of the opportunities such changes might offer for economic or social innovations.

According to Drucker, entrepreneurship is behavior rather than a personality trait. The behavior can be cultivated by a systematic process of innovation. Innovation creates a resource. For a person, there is no such thing as 'resource' until the person finds a use for something in nature

and thus endows it with economic value. In other words, an entrepreneur spots an opportunity which others do not. Drucker spells out seven areas for innovative opportunity. They are under:

1.The unexpected success, the unexpected failure and unexpected event:

Drucker advocates looking for areas of unexpected success for possible opportunities that it may offer. He finds that the reason for management to ignore unexpected success is that all of us tend to believe that anything that has lasted a fair amount of time must be 'normal' and go on 'forever'; we consider such 'normal' issues as laws of nature and that they can't be contradicted; contradicting such beliefs is generally considered abnormal and unsounded by us. Hence, the majority of people fail to perceive the unexpected success. An entrepreneur is one who will find fortunes through exploiting the opportunity of 'unexpected successes.

Unlike success, failure always gets noticed. But failures are not seen as symptoms of opportunity. People, in general, fail to see the opportunities that lie behind any failure. Many failures are nothing but mistakes committed and will throw open a vast opportunity for succeeding again. An entrepreneur is one who is shrewd enough to spot the opportunities that are hidden behind failures.

1. The incongruity between reality and the assumption about reality:

Whenever the people in an industry misconceive reality, they make erroneous assumptions and their assumptions will be misdirected. They will put forth their efforts on areas where opportunities do not exist. The incongruity between reality and assumptions about it can occur in any area of business/ industry. Drucker advocates that correct perception of reality will throw light on the opportunities lost due to faulty assumptions. And perceiving the reality correctly does not require 'heroic' innovations: all that is required is a focused, unbiased attention to reality with a genuine interest to perceive things correctly, keeping in mind that an incorrect perception will lead top erroneous results.

2. Innovation based on process need

Innovation based on process need perfects a process that already exists, replaces a link that is weak and redesigns an existing old process. An entrepreneur spots the opportunity that exists in this area that will open up new business prospects.

3. Changes in industry structure or market structure that catches everyone unaware:

A change in the industry in industry structure and market structure may offer huge opportunities. Unless one is keen to observe and react to such changes, one will loose to capitalize on the opportunities.

4. Demographics

Demographics defined as changes in population, its size, age structure, composition, employment, educational status, income level etc., these factors have the most predictable consequences. Successful exploitation of demographic changes will offer lot opportunities.

5. Changes in perception, mood and meaning:

Perceptional phenomenon is a fact. Often it can not be quantified; but it very much exists. When a change in perception takes place, the facts do not change. But, their meanings change. Perception based innovation offers opportunities that can be tapped. But, since perceptions of consumers keep changing, one has to be 'first' in exploiting the perception based innovation opportunities. An entrepreneur has the ingenuity to spot the perception based innovation opportunities first.

6. New knowledge , both scientific and non-scientific:

Knowledge based innovation is the 'super-star' of entrepreneurship. But, it has the longest lead time of all innovations. There is a long time span between the emergence of a new knowledge and its becoming applicable to technology. And then, there is another long period before the technology turns into products, processes or services in the market place. Knowledge based innovation pays rich dividends, but requires careful analysis of all connected factors before spotting the opportunity; else, it may turn out to be a premature attempt and lead to failure.

Entrepreneurial Mobility

From time immemorial, people have moved from one part of the country to another part and also from one country to another due to various reasons. Their movement was caused by social, economic, political and cultural factors.

Movement of entrepreneurs from one geographical location to another, due to whatever reason, is referred to as their locational mobility.

Similarly, movement of entrepreneurs from one occupation to another is referred to as their occupational mobility. Here, by movement, we mean shifting or changing of occupations.

In general, people prefer to remain settled in one particular environment that is conducive to their life style. They opt to avoid movement as long as they are comfortable with their present set up. When their comfort is disturbed, due to economic, political, social or cultural factors, they choose to become mobile. This has been so for a long time in the history of mankind.

As distinguished from common people, the locational mobility of entrepreneurs affects the economic prospects of the places from where they have moved and strengthens the economic prospects of the places to where they have moved. Similarly, occupational mobility of entrepreneurs also has a bearing on the growth/ decline of the different sectors of occupations.

Activity

1. What does the term entrepreneurial mobility mean?
2. Are your members of staff in your institution affected by the aspect of mobility and if so what could be the causes of mobility?

UNIT 12 : BASIC PRINCIPLES OF ENTREPRENEURSHIP

12.1 LEARNING OBJECTIVES

By the end of this unit you should be able to :

1. Recognize and conduct a simple business opportunity screening.
2. Design a business plan.
3. Identify sources of finance for small and young enterprises.

12.2 RECOGNIZING BUSINESS OPPORTUNITIES

How To Recognize And Screen Business Opportunities

Alongside the definition given in unit 1, entrepreneurship may be viewed as a way of thinking, reasoning and acting that is opportunity obsessed, holistic in approach and leadership balanced.

The entrepreneurial process begins with an idea. Finding a good idea is the first step in the task of converting an entrepreneur's creativity into an opportunity.

Since ideas are building tools, one cannot build a successful business without them. In this regard, experience is essential in looking at new ideas. Experienced entrepreneurs exhibit an ability to quickly recognize a good new idea and an opportunity.

At the heart of the entrepreneurship process is the opportunity. Thus, the entrepreneurial process is opportunity driven. The following are the most important characteristics of good opportunities:

a) **Market** - Market demand is the key ingredient to measuring an opportunity. Higher potential businesses can identify a suitable market for a product or service that meets an important customer need and provides high value added benefits to customers. Customers are reachable and receptive to the product or service.
b) **Market structure** - A fragmented, imperfect market or emerging industry often contains vacuums that creates unfulfilled market niches. The more imperfect the market, the greater the opportunity.

In addition, those markets where information or knowledge gaps exists and where competition is not strong, as to be overwhelming, are attractive. Thus, the greater the vacuums and gaps in information and knowledge, the greater the opportunities.

c) **Market Size** - An attractive new venture sells to a market that is large and growing. One where capturing a small market share can represent significant and increasing sales volume.

d) **Growth Rate** - An attractive market is large and growing. An annual growth rate of 30 percent to 50 percent is very good for new entrants.

e) **Market capacity** – another signal of the existence of an opportunity is a market at full capacity in a growth situation. This is where the demand cannot be met by the existing suppliers. Thus, the demand far exceeds the capacity of the suppliers.

f) **Market Share Attainable** - The potential to be a leader in the market and capture at least 20 percent share of the market is important. This can create a very high value for a company.

g) **Cost Structure** – A firm that can become the low cost provider is attractive. Where costs per unit are high, a firm that has low costs can face attractive market opportunities.

h) **Profits after tax** – Attractive opportunities have potential for durable profits of at least 10 to 15 percent, and often 15 to 20 percent or more.

i) **Time to breakeven** – New businesses that can quickly achieve a positive cash flow and breakeven are highly desirable. Breakeven and positive cash flow for attractive enterprises are possible within two years. Once the breakeven and positive cash flow is greater than three years, the attractiveness of the opportunity diminishes accordingly.

j) **Return on Investment (ROI) Potential** – Very attractive opportunities have the potential to yield a return on investment of 25 percent or more per year.

k) **Capital requirements** – Enterprises that can be funded and have capital requirements that are low to moderate are attractive.

l) **Gross margins**- The potential for high and durable gross margins (i.e. the unit selling price less all direct and variable costs) is important. High Gross margins exceeding 40 to 50 percent can mean that a business venture can reach breakeven earlier.

m) **Value added potential** - New enterprises that are based on strategic value in industry, such as valuable technology are attractive, while those with low or non-strategic value are less attractive.

n) **Competitive advantage issues (Variable and fixed costs)** – An attractive opportunity has the potential for being the lowest cost producer and for having the lowest costs of marketing and distribution.

o) **Degree of control** – Attractive opportunities have potential for moderate-to-strong degree of control over prices, costs, and channels of distribution.

In short, the greater the growth, size, durability, and robustness of the gross and net margins and free cash flow, the greater the opportunity. The greater the rate of change, the discontinuities, and chaos, the greater are the opportunities. The greater, the inconsistencies in existing service and quality, in lead times and lag times, the greater the opportunities.

12.3 THE BUSINESS PLAN

A business plan is for the owners of the enterprise. Thus, the owner may needs to develop a business plan because it will help him or her to think carefully about what the business is going to do, and what resources will be needed. This will help him calculate how much start-up capital is needed. It is important that the entrepreneur has a clear idea of what the business is going to do.

A business plan is also meant for the financial backers. It is meant to help the owner source for funds. Financial backers will need to be convinced that the new business is a sound investment. Given below is an outline of a business plan:

1. EXECUTIVE SUMMARY
   - Description of the business concept and the business.
   - The opportunity and strategy.
   - The target market and projections.
   - The competitive advantages.
   - The economics, profitability, and harvest potential.
   - The team(summarize the relevant knowledge, experience, and skills of your team members).
   - The offering (how much of the enterprise are you prepared to offer to equity and debt financing).

2. THE INDUSTRY AND THE ORGANIZATION AND ITS PRODUCTS OR SERVICES
   - The industry
   - The organization (company) and the concept.
   - The products or services.
   - Entry and growth strategy.

3. MARKET RESEARCH ANALYSIS
   - Customers.
   - Market size and trends.
   - Competition and competitive edges.
   - Estimated market share and sales.
   - Ongoing market evaluation

4. THE ECONOMICS OF THE BUSINESS
   - Gross and operating margins (selling price less variable costs).
   - Profit potential and durability.
   - Fixed, variable, and semi-variable costs.
   - Months to breakeven.
   - Months to reach positive cash flow.

5. MARKETING PLAN
   - Overall marketing strategy.
   - Pricing.
   - Sales tactics.
   - Service and warranty policies.
   - Advertising and promotion.

6. DESIGN AND DEVELOPMENT PLANS
   - Developing status and tasks.
   - Difficulties and risks.
   - Product improvement and new products.
   - Costs.
   - Proprietary issues

7. MANUFACTURING AND OPERATIONS PLAN
   - Operating cycle (how will seasonal production loads be handled?)
   - Geographical location.
   - Facilities and improvement.
   - Strategy and plans.
   - Regulatory and legal issues.

8. MANAGEMENT TEAM
   - Organization.
   - Key management personnel.
   - Management compensation and ownership.
   - Other investors.
   - Employment and other agreements and stock option and bonus plans.
   - Board of Directors.
   - Other shareholders, rights, and restrictions.
   - Supporting professional advisors and services.

9. OVERALL SCHEDULE

- A schedule that shows the timing and interrelationship of the major events necessary to launch your business and realize its objectives is an essential part of a business plan. You may include the following:

    a) Lay out (use a bar chart) the cash conversion cycle in the business to capture for each product or service expected the lead and elapsed times from an order to the purchase of raw materials or inventory to transportation and collection.

    b) Prepare a monthly schedule that shows the timing of such activities as product development, market planning, sales programs, production, and operations, and that show the timing of the primary tasks required to accomplish an activity.

    c) Show on the schedule the deadlines or mile stones critical to the business's success, such as : completion of design and development, obtaining of sales representatives, starting of production or operations, delivery of first sales, etc.

10. CRITICAL RISKS, PROBLEMS, AND ASSUMPTIONS
    - Description of the risks and the consequences of adverse outcomes relating to your industry, your organization and its personnel, your product's market appeal, and the timing and financing of your startup business. Be sure to include assumptions concerning sales projections, customer orders, and so forth.

11. THE FINANCIAL PLAN
    - Actual income statements and balance sheets.
    - Pro forma income statements (the plan for profit).
    - Pro Forma balance sheets.
    - Pro forma cash flow analysis (cash flow projection).
    - Breakeven chart and calculation.
    - Cost control.
    - Highlights (highlight important conclusions).

12. PROPOSED ORGANIZATIONAL OFFERING
    - Desired financing (how much money is required to carry out your business).
    - Offering (stock, securities to be sold).
    - Capitalization (number of outstanding shares after offerings).
    - Use of funds.
    - Investor's return.

13. APPENDIX

- Include pertinent information here that is too extensive for the body of the business plan but which is necessary e.g. reports, list of suppliers, special location factors, facilities, technical analysis, copies of regulatory approval etc.

12.4 FINANCING NEW AND YOUNG BUSINESS ENTERPRISES.

A new and young business enterprise may be financed through any of the following methods:

a) **Venture Capital**

The word venture suggests that this type of capital involves risk. Specifically the venture capital industry supplies capital and other resources to entrepreneurs in business with high growth potential in hope of achieving a high rate of return on invested funds. Venture capital corporations or partners have an established capital base and professional management. Capital for these investments can be provided by wealthy families, financial institutions such as insurance companies and or pension funds. Most are organized as limited partnerships.

b) **Debt Capital**

The principal sources of borrowed capital for new and young businesses are trade credit, commercial banks, finance companies, and leasing companies.

Trade credit may take some of the following forms:

- Extended credit terms.
- An enterprise purchases goods and services from a supplier and agrees to pay for them later. The supplier then sends the goods in advance to the purchaser and accepts payment 90 to 120 days later.

Leasing is a form of renting. Leasing companies will give an enterprise a variety of equipment on lease. Generally, industrial equipment leases have a term of three to five years.

c) **Owner's Capital**

Owner's capital is one of the most important sources of finance for any business enterprise. It is usually the first source of capital available to start a new business. It serves as the basis from which other (mostly outside) capital can be attracted. Without own capital invested in the enterprise, it is very unlikely that other potential suppliers of capital will be interested in putting money in your business.

REFERENCES

Atrill, Peter and McLaney Eddie, (2008), **Accounting and Finance for Non-Specialists,** Harlow: Prentice Hall.

Coradie, W. M. and Fourie, C.M.W (2014), **Basic Financial Management**, Claremont : JUTA.

Dyson. J. R. (2001), **Accounting for Non-Accounting Students**, London : Prentice Hall.

Hughes, Bob, and Cotterell, Mike, (2006), **Software Project Management**, New Delhi : Tata McGraw-Hill.

Nagarajan, (2015), Project Management, New Delhi

Schwalbe, Kathy, (2007), **Information Technology Project Management**, Boston : Course Technology CENGAGE Learning

Timmons A. Jeffry, (1999), New Venture Creation: Entrepreneurship for the 21st Century, Boston: Irwin McGraw-Hill.