PROJECT ENGINEERING

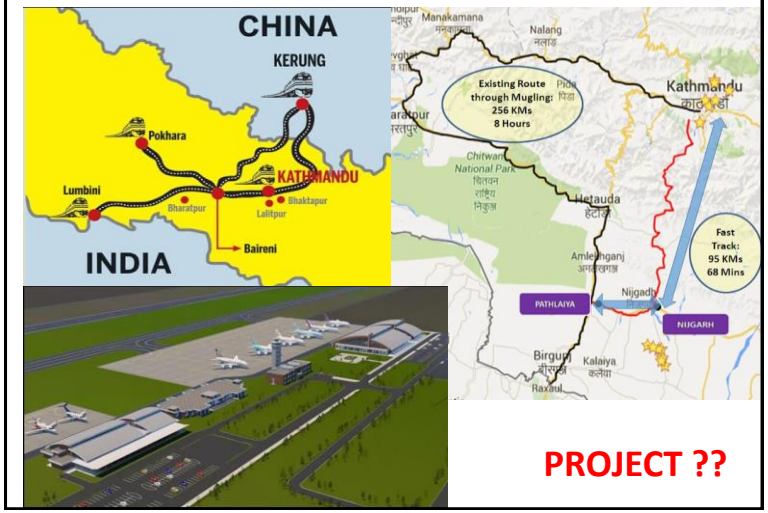
Chapter 1 - Introduction to Project and Project Management

-Er. Sandip Duwadi
Asst. Professor
Pashchimanchal Campus

Chapter 1 - Introduction to Project and Project Management

Contents:

1.1 Definition of Project, its characteristics, and example of project.
1.2 Classification of Project
1.3 Project Objective and Goal
1.4 Project life Cycle Phases
1.5 Project Environment
1.6 Introduction to Project Management



PROJECT ??

PROJECT

- Water Supply Project
- Measuring height of Everest Project
- Bridge Construction Project
- Hydropower Project
- Higher Education Project
- Telecommunication Project
- Environment Protection Project
- Human Right and Civil Liberties Project
- Running a campaign for political office
- Research and Development Project
- Writing a thesis, book

PROJECT

- A project is a series of unique tasks that need to be completed to reach a specific outcome.
- A project can also be defined as a set of inputs and outputs required to achieve a particular goal.
- According to the Project Management Institute (PMI), the term Project refers to " to any temporary endeavor with a definite beginning and end".

Project

- A project is a combination of human and non human resources pooled together in a temporary organization in order to meet the target.
- A project involves a single definable purpose, end item or result usually specified in terms of cost, time schedule and performance requirements.
- It is a process of working together to achieve a goal during the process project pass through several distinct phases called project life cycle.

Project …

- Project is one shot , time limited , goal directed, major undertaking requiring the commitment of varied skills and resources.
- For a **project to be successful** it should be technically feasible, economically viable, politically stable and socially acceptable.
- Every project has two phases

  1. Planning : It involves definition of tasks or activities to be performed to achieve specific objectives.

  2. Implementation: The implementation of the project convert the given input or resources into out put or result.

Characteristics of Project

- ✓ **Specific Goals and Objective:** Project are meant to fulfill certain objectives and goal of a program or plan.
- ✓ **A time frame for completion:** A project is not a continuous process. It must have start and completion date.
- ✓ **Temporary Organization and team:** Project being of temporary existence with certain start and finish date, the organization and team who are responsible for the completion of a project is also of temporary nature.
  - The team composition will also be different at different stages of a project and after completion of project the team has to disperse if there is no similar type of project.

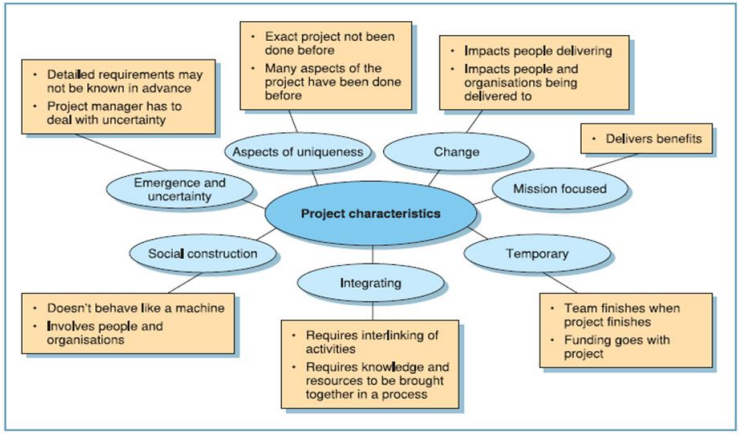
Characteristics of Project

- ✓ **Rapid Expenditure:** Project come up in the form of investment for better return. Hence the level of expenditure is very high compared to the plan or program of permanent nature.
- ✓ **Demanding Time Scale:** The objectives and goals are to be fulfilled by the project can be better materialized if the project is ready in all respect for operation, within certain date fixed at the very initial stage of a project. Hence the duration of the project is fixed and the job to be completed within that time frame which need a very tight schedule

Characteristics of Project

- ✓ An involvement of several people and numerous collaborating organizations- suppliers, designers, contractors, experts of different discipline etc.
- ✓ A limited set of resources (5 Ms' Material, money, manpower, machine, minutes)
- ✓ Uncertainty and financial risks
- ✓ No benefit to the client until project is in operation
- ✓ Sequencing of activities and phases.
- ✓ High level of subcontracting
- ✓ **Uniqueness:** No two projects are similar in all aspects.

Characteristics of Project



Classification of Project

According to FUNDING

1. Private sector project:

- These project are the basis of private investment.
- The private sector bodies are responsible for the development and sponsor of the project.
- Example : Pokhara Trade Mall, Ncell, Midtown etc.

2. Government Sector Project:

- These project are the basis of government development plans.
- Government is the major sponsor of the project.
- Example: Road and Bridge project, hospitals etc.

Classification of Project

According to FUNDING

3) Grant project:

- These are those projects where the investment in project is not repaid by the governments to the donor agencies.

4) Loan Project:

- These are those project where the investment of the project is repaid by the government to the donor agencies.
- Example: Pokhara International Airport

Classification of Project

According to the Foreign Aided Project:

1. **Joint Venture Project:**

- This project is funded through collaboration of foreign and local investors. They involve transferring of capital, technology, management. They are based on the ownership sharing. Example: Everest bank, Maruti- Suzuki etc.

2. Bilateral Project:

- This project is funded from the financial resources of a friendly donor, country, generally through grants under an agreement. Example JICA,KOIKA etc.

3. Multilateral Project:

- This project is funded from the financial resources of multilateral donors such as World Bank and Asian development bank. They are generally funded through loans.

Classification of Project

According to Technique:

1. **Labor intensive project:**

- This Project is labor based. Human labor extensively used for implementation of the project.

2. Capital Intensive project:

- This project is technology based. Technology represented by machinery , automation and computerization is used to implement the project.

What are their Advantages and Disadvantages ?

Classification of Project

According to Orientation :

1.Product oriented

- The focus is on the technical content of the project. Examples- Building, Roads, Bridge etc.

2.Process Oriented

- No consideration is given to technical context. Examples- Person ,Focused Training, repir of cement Plant etc.

Classification of Project

According to Scale and Size :

1. Mega

- It is a big size complex project for 5 to 10 years involving huge investment and high technology. Upper Karnali hydropower project is the major example of mega project of Nepal

2. Major

- It is smaller in size than mega project. Middle Marshyandi hydropower is the example of major project in Nepal.

Classification of Project

According to Scale and Size :

3. Medium

- It is small in size than major project. Eg. Khimti/ Bhotekoshi/ Jhimruk hydropower project

4. Small

- It is the smallest project of short duration. Manang Hydropower is an example.

5. Micro

- It is the smaller and are of very short duration.

Classification of Project

According to Time Frame and Speed.

1. Normal

- Normal time is allowed for project implementation.

2. Crash

- Saving in time is achieved by spending extra money and resources. Overlapping of the project phases is encouraged.

Classification of Project

According to function:

1. Disaster Prevention projects
2. Development Projects
3. Service sector project
4. Environment friendly projects etc.

Classification of Project

According to Nature of Project.

- Simple
- Complex
- Innovative
- Emergency.

National Pride Projects

National Pride Projects

- Pashupati Area Development Project
- Lumbini Area Development Project
- Mid-Hills Pushpalal Highway
- East-West Railway
- Terai Hulaki Marg
- North-South Koshi Corridor
- North-South Kaligandaki Corridor
- North-South Karnali Corridor
- Kathmandu-Terai Expressway
- Melamchi Drinking Water Project
- President Chure-Terai Madhesh Conservation Area Program

Project Objective and goals

- A project has clearly defined objective. The project objective is defined in order to.
  - Make sure that we have indentified the right target.
  - Create team commitment and involve all interested parties in achieving the successful project outcome.
- The objectives and goals of the project should be; **SMART**

Project Objective and goals

Project Objective and goals

SMART

Specific

- The project objectives must be specific.
- Setting out specific objectives require careful planning and input from the project team members involved and if necessary the external consultants and experts.
- The objective should explain what we really want to do.
- For eg. Setting out objectives as “construction of road “ is not specific as it does not tell us about when, where, and which road will be constructed and who is going to construct it.

Project Objective and goals

SMART

Measurable:

- The project objectives should be measurable in terms of its benefit and achievements. If the goals is not measurable it is not possible to know whether a team is making progress towards successful completion or not.
- Measuring progress is supposed to help a team stay on track and reach its target. Indicator should be quantifiable.
- A measurable goal will usually answer the question such as:
  How much? How many? How will I know when it is accomplished?
- Eg. This year the company will increase the monthly product by 20% from 1500 to 1800 pieces. We will be definitely be able to measure these goals within our targeted time frame.

Project Objective and goals

SMART

Achievable:

- A goal is said to be achievable when its accomplishment is within reach. The goals for the project need to be attainable. The goals should be something that you have skills and abilities to achieve it.
- The goals are neither out of reach nor below the standard performance since these are considered meaningless.
- Eg.” I want to be a civil engineer within two year” This is not achievable goal as it takes 4 years to complete the engineering.

Project Objective and goals

SMART

Realistic

- A realistic goal is one that is within a practical range of achievement. The goal should be meeting by using available resource, effort and finance. The goal which is not realistic is meaningless.
- Eg. Increase of sales by 20% in 20 weeks . This is a realistic goal but increase 20% sales within a week may not be realistic objective.

Project Objective and goals

SMART

Time bound

- Goals must have specific timeframes. We must have a deadline by which the goal is accomplished. Setting a deadline reinforces the seriousness of the goal in our mind. It motivates to take action.
- When we don't set a time line, there is no internal pressure to accomplish the goal.
- A time bound goal is intended to establish a sense of urgency.
- Eg. Labour training program commence on 29 may 2016 and last for next two weeks.

Project Objective and goals

Project Life Cycle and Phases

- Project depending upon the nature, size and type undergoes through the different well defined phases right from inception to successful completion.
- The following important five phases contribute to develop a project from the idea to reality.

❖Initiation Phase

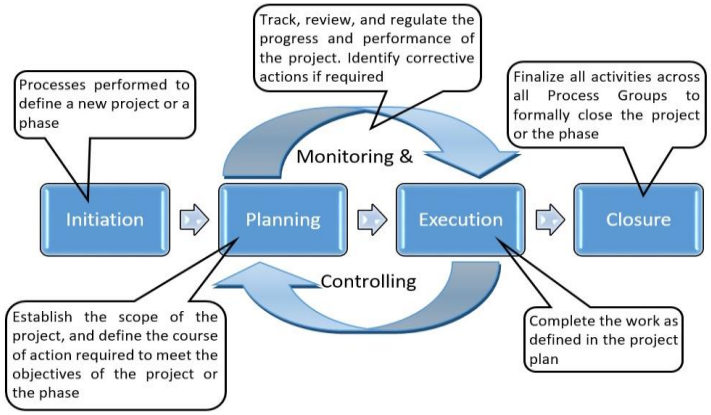
❖Planning Phase

❖Engineering and Design Phase

❖Implantation Phase

❖Termination Phase

Project Life Cycle and Phases



Initiation Phase

This phase includes

- **Conceptual Study:** The projects are born with creative ideas. It includes primary evaluation of ideas, such as project identification, project formulation.
- **Feasibility study:** the objective of the feasibility study is to have more detailed information about the location, nature, dimensions, raw material needed, equipments, cost benefit analysis, and the detail about the users who will be benefitted by the project.

Initiation Phase

- **Market Study:** It includes the study of the marketing prospects and demand of the product considering potential size and composition of the market and present and projected demand of the product / services.

- After completion of Initiation phase **a go/ no go decision is made.**

Planning Phase

- This phase include
- **Work Breakdown Structure:** the project is broken down in to small elements so that all the activities to be performed in the project are included.
- **Cost and Schedule planning:** After breaking down of the project, the time and cost of each activity is determined and overall time and cost of the project is determined.
- **Contract terms and condition:** the contract terms in which the project activities are to accomplish is determined in this phase. The contract may be lump-sum, fixed price, unit rate etc.
- At the end of this phase time and cost estimate of the project is made and major contracts are let.

Engineering and Design

- This phase includes

1. Preliminary Engineering and Design

- It stresses architectural concepts, evaluation of technological process alternatives, size and capacity decisions and comparative economic studies.
- In designing dam, hydropower, irrigation channel preliminary engineering requires the analysis of hydrological analysis, geological condition etc.

Engineering and Design

2. Detail Engineering Design

- It involves the successively breaking down, analyzing and designing the structure and its elements.
- This detail phase include architects, interior designers, landscapes architects and several engineering disciplines including chemical, civil, electrical etc.

Implementation Phase

This phase includes

- Application of paper work physically in the real field.
- Manufacturing, installation of machines and testing and civil works.
- Controlling is performed to check project performance at any point of time during implementation.
- The facility is substantially completed at this phase.

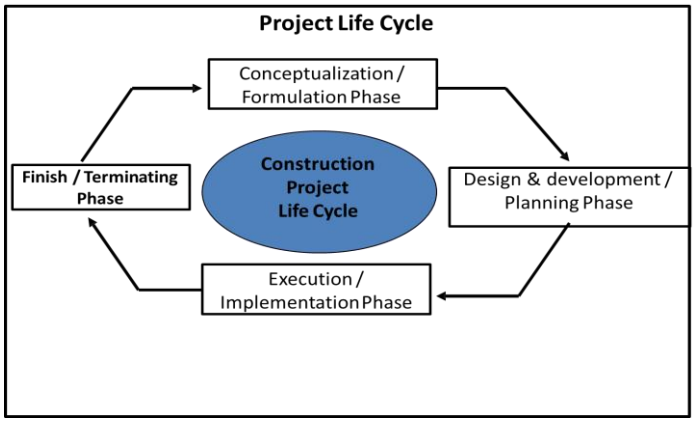
Termination Phase

- This phase is the end of the project is brought to its completion.
- In this phase final testing and maintenance of the project is done and handed over to the customer and resources are released to other project.
- The basic tasks in this phase are evaluation and hand over the project to the beneficiaries.

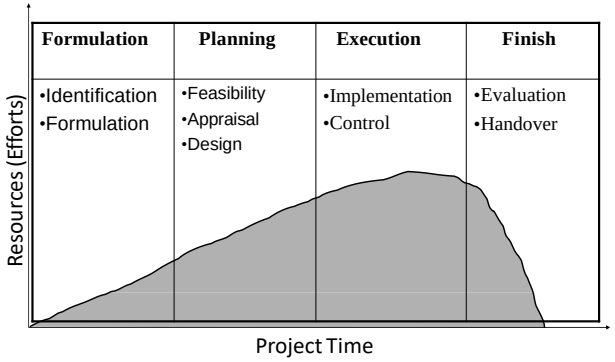
Project life cycles

- Project life cycles in terms of resources / risk and time
- Cost and staffing levels are low at the start, higher towards the end, drop rapidly as project draws to a conclusion.
- The probability of successfully completing the project is the lowest and hence risk and uncertainties are higher at the start. The probability of successful completion gets progressively higher as the project continues.

Project life cycle Phases

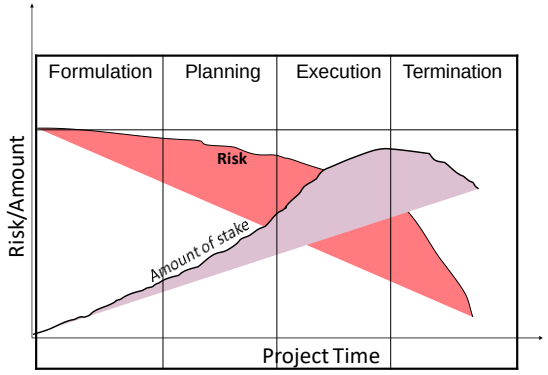


Project life cycle with resources

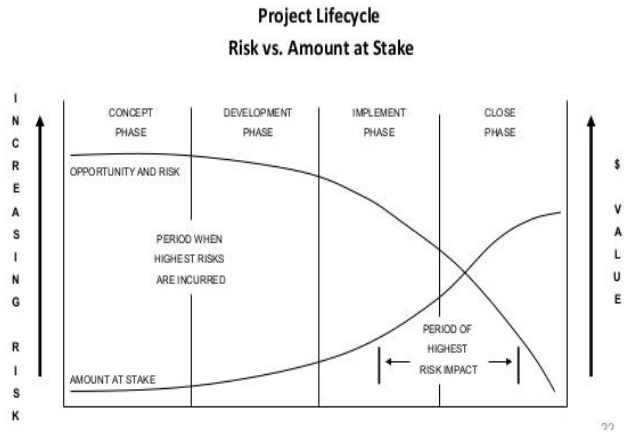


Resources = Cost and Staffing

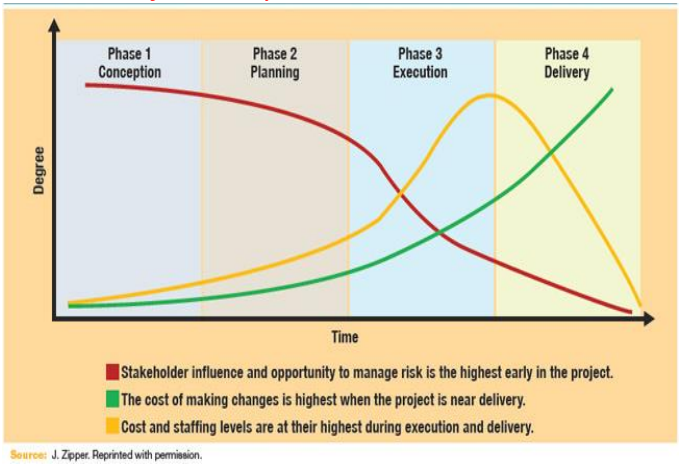
Project life cycle and Risk



Project life cycle and Risk



Project life cycle with resources and risk



Project Environment TIE

- It is the collection of element which affects the project performance.
- The project environment is dynamic and has high probability to change during the projects life cycle.
- The changes in the project environment should be identified, analysed and understand as they occur during the course of the project.
- The project environment can be classified as
  1. External Environment
  2. Internal Environment
  3. Task Environment

External Environment

- The external environment of a project comprises of all entities that exist outside its boundary but have a significance influence on its growth and survival.
- A project has little or no control on this environment but needs to constantly monitor and adopt to these external changes as proactive and reactive response lead to significant different outcome.
- The factors that affect the project environment are

1. Political factor
2. Legal factor
3. Economic factor
4. Social factor
5. Technological factor

SLEPT

External Environment

Political factor:

- It takes country's political situation. It also takes the global political conditions effect on the country and business. When conducting this steps ask question like "what kind of government leadership is impacting decision of firm or project?"
- Some political factors that affect the project external environment are:

➢ Government policies
➢ Taxes and laws
➢ Stability of government
➢ Entry mode regulation

Legal Factor

- Legislative changes take place from time to time. Many of these changes affect the project environment. Some legal factors are:

➢ Employment regulations
➢ Product regulations
➢ Health and safety regulations
➢ Laws and court decisions.

Economic factor

- It involve all the determinants of the economy and its state. These are factors that can conclude the direction in which right economy move.
- The factor affecting the project external environment are:
  1. Inflation rate
  2. Interest rate
  3. Credit accessibility
  4. Unemployment rates
  5. Monetary or fiscal policies
  6. Foreign exchange rates

Social factors

- Every society has distinctive mindsets. These attitudes have an impact on the project. The social factor might ultimately affect the sales of products and services.
- Some social factors are:
  - The cultural implications
  - The social lifestyle
  - Domestic structures
  - The gender and connected demographics
  - Education levels
  - Distribution of wealth

CORS

Technological factors

- The technology is advancing continuously. The advancement greatly influences the project. Technology alters time to time. That is why project needs to stay update with the changes. The project can use these factors for their benefits.
  1. New Discoveries
  2. Rate of technological obsolescence
  3. Rate of technological advances
  4. Innovative technological platforms

Internal Environment

- The study of the internal environment focuses on the project objectives, constraints, and resources that directly influences the project.

1. Objectives

- The project objective describes the projects' outcome.
- It directly influences the project as any changes in objective may change the end result

2. Constraints

- A project operates within the constraints of time, cost and quality performance

CCCCGFS

3. Structure

- A project should have particular structure.
- A group of different people having the different knowledge and skills working together to meet the objectives form a project structure.

4. Resources

- Project requires different types of human and non human resources.
- Any effect in the resources affects the project directly

Task Environment

- The project environment which affects its ability to reach goals. Any business or consumer with direct involvement with the project may be a part of task environment.

It includes:

- **Client:** It is a person or organization which invests in the project and takes benefit from it. The project must satisfy the need of client.
- **Contractor:** Contractor implements the project in field. Contractor tries to maximize the profit and influence the project.

- **Consultants:** As they are involved in design and other activities, they directly influence the project.
- **Suppliers:** Equipments , materials, labours are supplied by the supplier. They effect the efficiency, quality and schedule of the project through delivery timing.
- **Government:** Government policies, facilities etc. affect the project environment
- **Finances:** They provide fund to the project.
- **Competitors:** They compete for the project which affect the projects product and services.

Project Management

- Management is Getting things done by others
- Money makes things possible, people make things happen
- Management is a science - Use of systematic approach or objective study of the problems are to be taken
- Management is an art – man management.

Project Management

- Project management is the **planning, organizing , directing and monitoring of all aspects of a project and the motivation** of all involved to achieve project objectives safely and within defined time, cost and performance.
- Elements to be taken in to consideration in managing the project.

1. People : the project team, boss, and sub ordinates others
2. Resources : 5 M that is what required to accomplish the construction
3. Methods: the method of statement and procedures for doing things.
4. Goal and objectives: for what , resources and the people are directed towards.

Project management vs General Management.

General Management	Project Management
Responsible for managing the status quo	Responsible for overseeing change
Authority defined by management structure	Lines of authority 'fuzzy'
Consistent set of tasks	Responsible for cross-functional activities
Works in 'permanent' organizational structures	Operates within structures which exist for the life of the project
Tasks described as maintenance	Predominantly concerned with innovation
Main task is optimization	Main task is the resolution of conflict
Success determined by achievement of interim targets	Success determined by achievement of stated end-goals
Limited set of variables	Contain intrinsic uncertainties

Assignment – 1(i)

Make a complete note on your note copy itself (with proper figures, charts , tables where ever possible) on following topics :

- Definition of Project, its characteristics, and example of project.
- Classification of Project
- Project Objective and Goal
- Project life Cycle Phases
- Project Environment
- Introduction to Project Management