Engineering Professional Practices

Chapter 1

Chapter 1: History of engineering practices

1.1 Man & Society

The term **society** is derived from the Latin word "socius" which means companion, associate, comrade or business partner. It indicates that man lives in company of other people. Man is a social animal. It is difficult to live without society. No infant could reach maturity without the care of other people. According to **MacIver**, family was the first form of the society. Society means collection of individuals united by certain relations or modes of behavior which make them off from others who do not enter into these relations.

Aristotle said "Man is a social animal". Man needs society for his living, working and enjoying life. Society refers to the group of people, but to the complex pattern of the norms of interaction that arise among them. For the health of society it is essential that there must be a like-minded and unlike minded people. Likeness brings recognition whereas unlike mindness helps in generating new ideas. Invisible likeness and active cooperation is the backbone of society. Man forms the society and develops standard and norms.

The world system is a network of many nations and societies. A society is an organization of people who share a common territory, govern themselves, and cooperate to secure the survival of the group. Not all societies are nations; there may be several societies within a single nation. Nepal and India share the society of Hindus. Iraq and Iran share the society of Kurds. The presence of many societies within a single nation can become a source of serious conflicts and sometimes war.

Although nations may contain several societies, not all these societies are necessarily equal in power or benefit equally from social, political, and economic arrangements. For example, The Kurds in Iraq were oppressed by a more powerful prevailing society under late Suddam Hussein. And although blacks in South Africa are now in political majority, for many years they were exploited and oppressed economically, socially, and politically by the dominant white society in that country.

Definition of society

Society has been defined differently by different scholars.

According to **Giddings** – "Society is the union itself, the sum of formal relations which associating individuals are bound together"

J.F.Cuber has defined society, as a group of individuals who have lived together long enough to become organized and consider themselves distinct from others.

Most appropriate definition of the term society given by **MacIver** is that "The society is the system of usages and procedures, of authority and mutual aid, of many groupings and divisions of controls of human behaviors and liberties. It is the web of social relationship".

Society gives content, direction, and meaning to our lives, and we in turn, in countless ways, reshape the society that we live to the next generation. Sociology is the scientific, or academic, study of society and human behavior.

Society (definition summary):

- ***Group*** of People(collection of individuals)
- Sharing ***common territory***/boundary of a country
- Sharing ***common rules/regulation*** (government)
- Sharing ***common culture/belief/value***
- Considered as a stable institution
- A formal association of people with similar interests
- The state of being with someone

Elements of Society:

- Plurality (male/female/young/old)
- Differences (opinion/gender/interest)
- Dynamic(changeability/inherit quality)
- Interdependence (Like mother & baby)
- Cooperation(like in family,friendship)
- Likeness(Blood/nationality)
- Mutual understanding/interaction,/awareness
- Social control/Stability
- Culture(traditions, activities, values)

Social structure/Social needs

To survive, every society must successfully address the same fundamental social needs. **Talcott Parsons** identified six basic fundamental social needs as follows:

1. All societies must organize the activities of the members to obtain the basic goods and services necessary for survival (such as food, clothing, shelter, fuel, potable water).
2. Societies must protect their members from both external and internal threats. External threats includes invasion by other societies and destructive natural disasters like hurricanes, tornadoes and earthquakes. Internal threats include crime like robbery, murder, rape and health epidemics like AIDS, measles, polio, and the flu.
3. All societies must replace members lost by death or emigration.
4. Whenever societies gain new members, they must transmit knowledge of the rights, obligations, responsibilities, and expectations of appropriate behavior to the new members. New members must also be taught the skills they will need to participate as productive member of the society.
5. All society must motivate both new and continuing members to fulfill their responsibilities and conform to expected behaviors.
6. Finally, societies must develop mechanisms for solving conflicts.

Social Structure / Social needs : Summary

For the survival, every society must address some fundamental needs. On this regard Talcott Parsons (American sociologist) identified six basic fundamental social needs.

- ***Organizing*** the activities (to obtain basic goods & services –food/clothing/shelter/fuel/water)
- ***Protection*** (of members from external & internal threats)
- ***Replacement***(of members lost by death or immigration)
- ***Transmission*** (of knowledge to the new members- regarding :rights/obligation/responsibilities/expectation)
- ***Motivation*** (to both new & continuing members to fulfill their responsibility & confirm to expected behavior)
- ***Development*** (of mechanism for solving conflicts)

Social Institutions

Five basic institutions can be found in all known societies. They are: the family, religion, economy, education, and the state. Each institution is intended to address one or more of the basic needs determining society's survival.

Institutions may even provoke or exacerbate systemic inequalities between groups within society. For example, when the U.S. went to war against Iraq in early 1991, the state was fulfilling its function of protecting U.S. society from external threats. Indeed, President Bush argued that it was necessary to go to war "to protect our way of life", because Iraq's invasion of Kuwait threatened U.S. access to Mideast oil.

1. **The Family:** The family is the institution whose manifest function is to contribute new members to society. Family also teaches the new members what is expected of them, and they try to motivate

members to fulfill those expectations. Families may reinforce race, gender, and class inequalities in the way they transmit expectations regarding appropriate behaviors and goals.

2. **The Religion:** Religion manifestly motivates members to comply with their responsibilities and obligations by assigning meaning and purpose to such activities. Religion attempts to reinforce the family's transmission of appropriate behaviors and goals to new members of society, and it parallels the family's role as a mechanism of conflict resolution.
3. **The Economy:** In U.S. the institutions of the economy includes corporations, organized markets, the banking community, international trade associations, labor unions, and consumer organizations. The purpose of economic institutions is primarily to produce and distribute goods and services throughout society. They also discipline and motivate members of society to perform their role in the production, distribution, and consumption of goods and services.
4. **Education:** The manifest function of education is to transmit the skills that all young members of society need to become productive members of the economy as adults. Educational institutions can also be powerful mechanisms for social change. When skills taught by school include independent, critical, and creative thinking, they produce the potential for challenges to society to alter inequalities and discrimination.
5. **The State:** State protects society's members from both external and internal threats. The state also establishes penal and codes to formally define standards of acceptable and unacceptable behaviors, responsibilities and obligations, and it specifies sanctions for violations of these standards. Finally, the state aid the economy by developing social welfare programs that distribute goods and services to individuals the economy can not support. By enhancing the ability of the poor to consume goods and services, state directly support the private producers and the economy. The state may reinforce other inequalities as well.

Social Institutions summary: Five Basic Institutions can be found in all known societies, which are enumerated below.

- ***Family***
- ***Religion***
- ***Economy***
- ***Education***
- ***State – Politics, Warfare, Art & Leisure***

Types of societies

Thousands of societies have existed on this planet since time immemorial. But these societies have been classified into a limited member of basic types depending on the technologies they adopted exploit the natural environment. The existence of present day societies has a trend of socio-cultural evolution. Different societies have used different subsistence strategies while exploiting the food resources. Types of societies are as follows:

1. Tribal societies
2. Pastoral societies
3 Horticultural societies
4. Agricultural societies
5. Industrial societies

Tribal societies

A few thousand years ago, human being relied on hunting and gathering for their survival. This was the subsistence strategy of these societies. Even today one can find this handful of isolated people living in the Australian deserts and in the deep interiors of India. Their needs are simple and easily satisfied spending less time working for their food than the average inhabitants of any other type of society. The family is the only defined institution in these societies.

Tribal societies have common territory, a sense of unity, common language, blood relationship, endogamous (customs permitting a man to marry within the tribe), worship common god. A tribal is a primitive society which existed in the early period of human history. Each tribe knows the norms and standards of behavior and is watched that younger learn the proper way of behaving.

Pastoral societies

Some ten to twelve thousands years ago a few hunting and gathering tribal started domestication of herds of animals. This strategy of subsistence (existence) gave birth to pastoral societies. They usually believe in a god or gods who take an active interest in human affairs and look after the people who worship them. A few religions such as Judaism (the religion of the Jewish people), Christianity and Islam originated among pastoral people.

Horticultural societies

These societies specialize in the domestication of plants which they cultivate manually with hoes. Horticulture became necessarily alternative to pastoral people. Horticulture provided an assured supply of food and surplus that enabled some individuals wealthy and more powerful than others. Many horticultural societies are still in existence in Africa, Asia, South America and Australia.

Agricultural societies

The agricultural wealth of the society was unevenly distributed with a small majority of people enjoying the surplus produce by the working society. Political institutions were more elaborated. Power was concentrated in the hands of a single individual and heredity monarchy prevailed. The religions of agricultural societies often include a belief in a 'family' of gods. One of these is a high god regarded as more powerful god than other god. Trade is more elaborated in agricultural society. Money is used as medium of exchange. Agricultural societies tend to be at war constantly. These conditions create the need of military set up. The need for efficient communication and transportation was developed in these large societies.

Industrial societies

Application of scientific knowledge to the technology of production is the basis of industrial society. Industrial revolution gave birth to industrial societies. New technologies – such as steam engine, electrical power tend to bring about social change. This society produced bulk quantity to feed the majority. This society was found practicing a new system of production and distribution. Division of labor in factories and in management predominates in industrial society. Growth and development of trade unions is also an important characteristic of industrial society.

Types of societies - summary:

- ***Tribal Societies*** (From 2 million to Thousands years before) – lived as Hunters & gatherers / no permanent settlement /needed several hundred square miles of territory/ constantly on the move for new food supply/ used to take food directly from environment rather than maintaining gardens, fields or domesticated animals / family is the only defined institution
- ***Pastoral societies*** (Ten to Twelve thousands years before) -categorized by domestication of herds of animals/ typically found in mountainous region and in areas with insufficient rainfall to support horticultural & agricultural societies/ family & religion are major two institution which was appeared in this society/Slavery is more common in this society
- ***Horticultural societies***(developed between 13000 to 7000 B.C.) – produce food by gardening (domestication of plants)/ cultivate manually/ this society was occurred due to large declination of animals/ the gardens were usually made by clearing(slash and burn) a forested area and planting the crops/ the people in this society used to move on to make new gardens as the forest reclaimed the

garden and the soil lost nutrients (no plow system)/ family,economy religion are the major social institutions exists in this society/ slavery is fairly common

- ***Agricultural (Agrarian) societies***(6000 years ago) – plow was invented/ maintained the fertility of the soil by turning top soil using plow/ first society to develop city/ permanent settlements /Trade elaborated/money used as medium of exchange/ all the social institutions (family, religion, economy, politics, education, art & leisure ,warfare) was developed more elaborately & move towards complexity
- ***Industrial societies***(280 year before)– characterized by use of machine rather than animals including human / planet's first industrial society was England / majority of people live in urban areas rather than rural settings / all the social institutions (family, religion, economy, politics, science, education, art & leisure ,warfare) was developed more elaborately & move towards complexity / Industrial revolution gave birth of industrial societies/ production & distribution, establishment of trade unions

Social Change:

- Change in the society due to alteration in patterns of culture, social structure and social behavior over time
- Dynamic and ongoing process
- Progressive transformation of society
- Subject to constant change
- MacIver: Change in the human relationshipM.P. Jenson: Modification in ways of doing and thinking of people

Factors causing social change:

- ***Cultural innovation*** – innovation, discovery and diffusion/pattern of culture, social structure, social behaviour
- ***Technology*** – Use of computer, mobiles/ kitchen gadgets to automobiles
- ***Geography*** – Oceans/deserts/mountain ranges/jungles
- ***Environment*** – Hurricanes/Landslides/Fires/ Earthquake/Greenhouse effect
- ***Population***- Significant decrease or decrease in population size or growth rates may disrupt social life
- ***Human actions*** - Ideas/opinion/social conflicts/social movements/invasion

1.2 Technology& Society

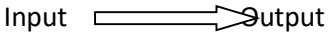
The term **technology** refers to how input is transferred to output. Technology is a systematic knowledge which facilitates in the use of machines and tools. One of the most distinctive of all human characteristics is that men are tool-using animals. People have used increasingly sophisticated techniques to act on the social and the natural world for thousands of years and they have done so in many ways that have transformed, and continue to transform, the very conditions of life on this planet.

Over the generations, simple tools and machines made by human beings such as the knife, the wheel, the plough, the compass, the clocks, the printing press, the steam engines, the nuclear reactors, the computer, the mobile phones, etc have dramatically influenced our social and natural surroundings. These all are the examples of technologies, the practical application of scientific or other knowledge.

Technology and social change are intimately connected, particularly in the modern world, where rapid technological and social change tends to go hand in hand. Many people in modern societies seem to implicitly assume that technological development and human progress is much the same thing.

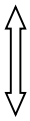
Technology - summary:

- Part of ***knowledge*** that deals with the ***creation*** and ***use*** of ***technical means*** and their interrelation with life, society, and the environment, drawing upon such subjects as industrial arts, engineering, applied science, and pure science.
- Practical ***application*** of systematic ***knowledge***using ***machine and tools***resulting high productivity and higher efficiency for the satisfaction of requirements such as utility, usability & safety



Technical change:

- Modification
- Alteration
- Innovation



Achieved from Information, Technique &Tools

Technology and social change are intimately connected, particularly in the modern world, where rapid technological and social change tends to go hand in hand. Many people in modern societies seem to implicitly assume that technological development and human progress is much the same thing

Impact & consequences of technology on society:

Technological development(Media Player/Mobile)

- *Economics & Technological development* (earlier – occasional & spontaneous exchange of goods & services)
- *Values* (Change in expectation & realities/ Mechanistic world view, Efficiency, Social progress)
- *Ethics- According to Winston* , four major ethical implications of technological development are
  (a)Challenges traditional ethical norms (b)Creates an aggregation of effects (c) Changes the distribution of justice (d)Provides great power
- *Lifestyle* – a) simplifications of life : rise of leisure class/ quick responses to events & trends /global networking/cheaper prices/specialization in jobs
  b) complications of life :Pollution /Congestion /New forms of danger /New forms of entertainment/increased probability of some diseases & disorders/social separation of singular human interaction
- *Institutions and groups*: (Rise of very large organizations e.g. government, the military other welfare institutions)
- *International*: Enables wider knowledge of international issues, values and cultures due to mass transportation & mass media/ World seems to be much smaller place due to globalization of ideas, embeddedness of value, population growth & control & others among other reasons)
- *Environment* : Obvious (depletion of nonrenewable natural resources such as petroleum, coal, ores) & Subtle (global warming, deforestation, natural habitat destruction, loss of coastal wetland)/technological waste – no such mechanism exists for the removal

Influence of technical change on society:

- Mass production of goods through machines
- Mass communication
- Faster means of transportation
- Faster pace of life
- Automation
- Availability of labour saving devices
- Commercialized recreation
- Emphasis on high degree of specialization

Technological change & family system:

- Emergence of nuclear family
- Women's involvement in male dominated area
- Change in standard of living
- New way of socialization of children
- Change in orthodox values
- Mechanical life style
- Formal type of relationships
- Change in existing social customs

- Less family ties between family members

Technological change & Religion:

- Analysis of religious doctrines & traditions
- Rigidity in caste system has been relaxed
- Men are free from religious ritual
- Religion has become secondary thing not a primary one

Technological change &rural life:

- Migration towards urban areas
- Increase in consciousness of rural people
- Life become comfortable than before
- Change in life pattern

Technological change & Urban Life:

- Shortage of land and houses
- Increase in slums
- Problem of transportation
- Increase in crimes
- Expensive life
- Money has become the most important thing
- Lack of security

Theories of social change:

1) ***Socio-cultural evolution theory:***

Evolutionary process implies that societies would necessarily reach new and higher level of civilization. Socio-cultural evolution theory is based on the assumption that societies gradually develop from simple beginnings into ever more complex forms. This assumption rests on both anthropological and historical evidence. Evolution theory assumes that social change occurs for betterment. Many simple societies like tribal, pastoral, horticultural, and agricultural societies have grown steadily larger, and some of them have been transformed into the industrial and postindustrial societies of the modern world.

Summary

- Developed from simple beginning into ever more complex forms (horticulturist /hunters)
- Assumption based on anthropological/historical evidence
- Influence of Charles Darwin's organic evolution
- Evolutionary process implies that societies would necessarily reach new & high level of civilization

2) ***Functionalist theory:***

Talcott Parsons argued that a society consists of interdependent parts each of which helps to maintain the stability of the entire social system which has a tendency to seek equilibrium and balance. Parsons viewed that social change occurs when internal or external strains such as unemployment or war through the system out of balance. This imbalance provokes adjustments that help bring the system back into equilibrium once more built the new equilibrium establishing different social arrangements and cultural components than the previous one.

Imbalances means system has to adjust to new equilibrium. In short, social change is simply a means of getting from one form of social stability to another. Movement of traditional societies from traditional to industrialization is an example of social change. Emile Durkheim laid the basis for functionalism. This theory has emphasized social order rather than social change.

Summary

- Developed from simple beginning into ever more complex forms (horticulturist /hunters)
- Assumes that society consist of interdependent parts, each of which helps to maintain the stability of the entire social system
- Social change occurs when internal or external strain such as unemployment or war throws the system out of balance

3) **Conflict theory**:

Conflict theory was developed by Karl Marx and has been modified and developed by later sociologists. Conflict theory of social change holds that many changes are caused by tensions between competing interests in the society. Conflict theorists regard conflict as inevitable and normal process. This theory assumes that the existing social conditions always contain the seeds of new social change. Based on the condition of economic production, the form of society is defined as: primitive socialist, slave, feudal, capitalist, socialist and finally communist society.

Summary

- Developed by Karl Marx &later developed by sociologist
- Social change is the result of the conflicts between classes existing in the society
- Different classes of different interest
- Classes are fundamentally on the economy based
- Based on the condition of economic production
- The form of society can be defined as socialist/slave/feudal/capitalist/communist

4) Cyclical theory:

This theory assumes that each civilization is like a biological organism and has a similar life-cycle: birth, maturity, old age and death. Each society faces challenges at first from environment, internal enemies, external enemies etc. The nature of response determines the fate of society. The achievements of the civilization consist of its successful responses to challenges, if it cannot mount an effective response it dies.

Summary

- Focus on the rise & fall of civilization attempting to discover & account for these pattern of growth & decay
- Assumes that each civilization is like a biological organism & has a similar life cycle/birth/maturity/old age & death
- Each society faces challenges at first from environment/internal enemies/external enemies

Community

When the members of a group live together and share no particular interest but the basic condition of common life. Man cannot live in isolation. Man is linked in many ways to his fellows in many ways who form a group. By living together for years in a definite part of territory, a sort of relation with people or social likeness is established. This fact of social living, likeness among these in specific area gives birth to community. Community is a cluster of people living with a narrow territorial radius, who share a common way of life.

According to Bogardus, community is “a social group with some degree of feeling and living in a given area”. Blaire and Meeca said, “A human community is a functionally related aggregate of people who live in a particular geographic locality at a particular time, share a common culture, are arranged in a social structure, and exhibit an awareness of their uniqueness and separate identity as a group”. According to Ginsberg, “Community is a group of social being living a common life including all the infinite variety and complexity of relations which result from that common life or constitute it”.

Elements of community

Followings are the elements of community:

1. A community is essentially the group of people sharing the common feeling and basic conditions of a common life.
2. Group of people residing in a definite locality form a community. It occupies a territorial area.
3. Feeling of community sentiments is another important characteristic of a community. It means a feeling of belonging together. In cities and towns feeling of sentiments lacks drastically. In village one can still find feeling of community sentiments.
4. Unlike crowd, community is of permanent nature.
5. Community is not created and made by an act of will but its emergence is quite natural.
6. Likeness in language and customs is significant elements of community.
7. Ends and objectives of community are wider and natural not artificial.
8. A community has no legal status. It can neither sue nor to be sued.
9. Every community has some specific and particular name.

Comparison betweencommunity and society

1.	Population is very essential for the formation of a community.	Population is essential but more important is that the members should have feeling of oneness as well.
2.	For community, some locality or area is essential.	Society needs no area and the people living in far off areas can form a society.
3.	Its scope is narrow and localized. It is homogenous group.	It has wide scope and is thus of more heterogeneous character.
4.	Community came after society and in a community there cannot be many communities.	Society came prior to community and its scope is wide, as it embraces many communities.
5.	Common objectives are loosely coordinated.	Common objectives are closely coordinated.
6.	Members are supposed to obey the commands and thus they have less chances of personal development.	Chances of personal development are much more as compared with the community.

Impacts of computer on society:

- Social Applications: Solve human/social problem such as
- Medical Diagnosis
- Computer assisted instruction
- Government program planning
- Environmental quality control
- Law enforcement
- Employment and productivity
- Increase in employment & productivity
- Reduction in specific type of job
- Competition
- Allows large organization to become more efficient or gain strategic competitive advantage
- Small firms are driven
- Individuality
- Reduce human relationship

- Inflexible
- Quality of life
- Production of better quality of goods/services at low costs/effort/time
- Increase in leisure time
- Eliminated monotonous tasks
- Privacy
- Collect, store, integrate, interchange and retrieve - easy
- Lost privacy
- Computer crime
- Unauthorized use, access, modification and destruction of hardware /software /data
- Unauthorized release of information, copying of software
- Denying an end user access to his or her own hardware, software or data resources
- Using or conspiring to use computer resource to commit felony (major crime)
- Illegally obtain information or tangible property
- Establish control for the purpose of unauthorized experimentation with computer resources
- Computer viruses: It is a computer program that is potentially dangerous. They are not biological in nature but behave in similar manner. They are not created or spontaneously generated but are designed for a specific malignant purpose.

  Examples of computer crime:
- Money Theft: Bank fraud
- Computer viruses
- Service Theft
- Program and Data Theft
- Program Copying
- Data Alteration
- Program Damage
- Data Destruction
- Malicious Access
- Violation of Privacy
- Violations of Antitrust or International Law

Development and underdevelopment

- One of the most significant of all social changes is the transition from pre-industrial to an industrial type of society. Based on the socioeconomic development of the society, the societies of the world have been grouped into three categories as first world, second world, and the third world.
- **First world:** Countries such as North America, Western Europe, Australia, Japan, Singapore etc. are grouped as first world. These countries are industrialized, stable and developed.
- **Second world:** Countries such as Eastern Europe, Malasia etc. are grouped as second world. They are less industrialized and developed.
- **Third world:** Countries like Nepal, Bangaladesh etc. are grouped as third world. They are less industrialized and underdeveloped.

Characteristic of developing countries:

- Poverty/ unemployment/ under employment
- Limited access to education and healthcare

- Poor level of nutrition & health
- Immature and unbalanced economy
- Unstable political climate
- Belief in culture
- Lack of scientific /technological infrastructures
- Less respect for time/ corruption

Characteristic of developing countries (Western):

- Achievement & success
- Activity & work
- Moral orientation
- Efficiency & practicability
- Progress
- Material comfort
- Equality
- Freedom
- Use of technology
- Individualistic
- High concern over time

Technological achievement of 20th century:

- High performance material
- Nuclear Tech
- Laser & optical fiber
- Petrol & Gas Tech
- Health technology
- Household appliances
- Imaging technology
- Internet
- Space exploration
- Interstate highway
- A/c Refrigeration
- Telephone
- Computer
- Agriculture mechanization
- Radio television
- Electronic appliances
- Safe & abundant water
- Aero plane
- Automobile
- Electrification

1.3 History of Engineering Practice in Eastern Society - summary

- Civilization Developed (During 5000 BC.) near Yanshao
- Chinese communities planned cities according to grid pattern with right angled intersecting streets(4000BC)
- In Sumer(Southern Mesopotamia/Modern Iraq) , the appearance of towns and cities (3500 – 3000BC)

- Chinese philosopher Chang Heng invented a Seismoscope (132 AD)
- Sassaid kings built a palace at Ctesiphon, capital of Tigris (400 AD)
- Persian building method with stone instead of wood was introduced in India (515 BC)

1.4 History of Engineering Practice in Western Society - summary

- American scientist Benjamin Franklin theorized that lightning is a form of electricity(1747 – 1752 AD)
- Simon Stevin discovered the triangle of forces in Netherland, which helped to calculate the actual load on the members of cranes, trusses and other structures (1548-1620)
- Engineering school appeared in France (1800 AD)
- The first research institute was founded in 1560 AD

Chapter 2: Profession &Ethics

2.1 Profession definition

- Systematic knowledge and skill acquired through specialized training or education
- Synonym to job or occupation
- Helps to provide specialized type of service for the needy person, organization, community

2.2 Charateristics/Features of Profession

- **Systematic knowledge and skill**
  A profession is based on the systematic knowledge and study. Based on such a acquired knowledge and skill a professional delivers the services to the needy people and society. A four years of comprehensive study and practical works requires to become an engineer.
- **Authenticity & honor**
  The professional possess special knowledge and skill. So, they are provided special rights and honor to carry out their professional work to the society. An engineer certifies the safety design of required components for the people. Professional provides specialized types of service to the people that they do not understand and hence the people offer honor to them
- **Public property & Public evaluation**
  Professionals are honored in the society and are also a subject of public evaluation. People are always watching each and every professional's behavior and practice. Hence, a professional's activity usually becomes a matter of public evaluation. People always discuss about the practicing doctors or engineers and their behavioral approach on the society.
- **Bound by code of ethics**
  Professionals are regulated by professional bodies through licensing, code of ethics and disciplinary procedures. Professionals are required to maintain high morale and high standard of behavior. They are not free to act as what they desire.
- **Professional culture**
  With reference to the different socialization process (consider during the study period),the nature of the profession itself and the code of ethics developed by the concerned professional society do have their own professional culture. Every professional do have some set of behavior that are similar to the other person of the same profession.

Factors affecting morale of professionals:

In societies, some of the professionals are found losing their professionalism due to following reasons.

- **Inadequate Salary:** If the salary and fee provided to a professional is far low to meet their reasonable requirement, they may have difficulty in maintaining professional service to public so that s/he may try other way.
- **Defective social norms/values** – labor honorin the society the dignity of labour is equivalent to nil : money has got a high value irrespective of the source, professionals are not able to show high moral standard
- **Low morale of the self**
- **Non implementation of the rules and regulation**
- **Lack of political commitment**

Professional Engineering

- Act of designing, composing, evaluating, advising, reporting, supervising
- Safeguarding of life, health, property, public welfare
- Application of engineering principles but not practicing as a natural scientist

- Engineering council act 2055 defines the engineering profession as the occupation which is done by the engineers

The engineer according to council defined as a person having graduate degree in engineering from the institute recognized by the council

2.3 Professional Institutions

Professional Engineering Body:

- It is an independent body that regulates the practice of professional engineering
- It governs its members in accordance with the statute of the body and rules, regulation and bylaws of the country in order to serve and protect the public interest
- NEA, SONA, SCAEFetc are few examples of professional body.

Principal Objective of Professional Body/Associations:

In general the purpose of the professional association should be to regulate the practice of professional engineering and to govern its member, holders of certificate of authorization, holders of temporary licenses and holders of limited licenses in accordance with the act of the country or provinces in order that the public interest can be served and protected.

- Center of learning (library, professional network, universities, school zones)
- Professional membership (providing professional status)
- Voice of profession (consultation with government, media interaction)
- Facilitator of best practice (providing training and recruitment)

Additional Objectives of professional body/Associations:

- To establish, maintain and develop standards of knowledge and skill among its member
- To establish, maintain and develop standards of qualification and standard of practice for the practice of professional engineering
- To establish, maintain and develop standards of professional ethics among its member
- To promote public awareness of the role of association
- To perform other duties and exercise for other powers as are imposed or conferred on the association by or under any act.

Role of professional body/Associations:

- Regulation of the practice of the profession
- Licensing
- Guidance for training new entrants into the profession
    - Set Norms and standards
    - To grant permission / approval
    - monitoring
- Advice, assistance and monitoring to engineering colleges
- To Upgrading and monitoring the professional and technical competence of member
- Providing technical expertise as requested for the guidance and assistance of legislators
- Seeing to the matter of safety and general welfare of the public in engineering works

General Requirements for Membership:

- Citizenship (nationality)
- Academic Qualifications
- Experience
- Character Certificate
- Knowledge of law & ethics

- Language & Competence

Nepal Engineering Council

- Nepal engineering council is an autonomous body formed under government act (NEC act 2054. It regulates engineering profession effectively and scientifically. It also undertakes licensing of engineering accordance with their qualification.

Background

- It can be said that Nepal entered a modern phase in engineering after the political change in the sixties. Engineering activities began to contribute to the development of the country and the engineering profession started to gain respect in the society. The engineering community began to grow in number and was involved in all spheres of national development and engineers were allowed to compete in administrative service also for the post of secretary. Furthermore, the introduction of democracy in 1990 encouraged the growth of engineering colleges in Nepal abd the enrolment of students into these engineering colleges was rising very fast. Hence it was expected that nearly 3000 engineers would be graduating from local engineering colleges every year with nearly an equal amount graduating from colleges abroad. So, a need was felt for an organization to manage the engineering profession. Therefore, to make the engineering profession more effective, Nepal Engineering Council was formed under the Nepal Engineering Council Act, 2055 promulgated by Nepal Government on B.S. 2055/11/27 (11th March, 1999 A.D.). As per the Act, NEC has been vested with the statutory authority for the planning, coordinated development and monitoring of engineering profession and education in the country. NEC Act 2055 gives an outline on the formation of the Council, its tenure and the roles and responsibilities of the Chairman, Vice Chairman and the Registrar.
- Nepal Engineering Council Rules, 2057 has also been prepared and approved by Nepal Government as per the provision of Clause 37 of the Act. It defines the registration of engineers into three categories as well as the formats for application:

a) General Registered Engineer
b) Professional Engineer
c) non - Nepali Registered Engineer

- NEC Rules 2057 also lays down the professional code of conduct for engineers registered with the Council. The first Executive Council was formed on Magh 2056 under the chairmanship of Er**. Ram Babu Sharma** and completed its tenure on Magh 2060.
- The objective of Nepal Engineering Council is to make the engineering profession effective by mobilizing it in a more systematic and scientific and also to register the engineers as per their qualifications

Nepal Engineering Council (NEC)- Summary:

- Autonomous body formed under NEC act 2055 (2055/11/27, March 11, 1999)
- To regulate engineering profession effectively & scientifically
- Undertakes registration of engineers in accordance to their academic qualification
- The first Executive Council was formed on Magh 2056 under the chairmanship of Er**. Ram Babu Sharma** and completed its tenure on Magh 2060.

Duties & responsibilities of NEC:

The objective of Nepal Engineering Council is to make the engineering profession effective by mobilizing it in a more systematic and scientific and also to register the engineers as per their qualifications.

- To prepare policies, plans and programs for the smooth functioning of the engineering profession and to execute them
- To set norms and standards for engineering education in Nepal
- To grant permission and approval to carry out engineering education to those engineering colleges and institutions that meet the required norms and standards and to honour their degrees and certificates

- To monitor and inspect the quality of engineering education provided by the engineering colleges and institutions
- To fix the qualification necessary in order to practice engineering profession and to register their name in the Council
- To remove their name from the registration of the engineering council if found to violate the code of ethics

Jurisdiction of Nepal Engineering Council:

- Registration of engineers
- Accreditation of certificates of academic qualifications
- Recognition of academic institutions
- Professional code of conduct

Registration category:

- General Engineer (category – A)
- Professional engineer (category – B)
- Non- Nepali (Foreigner) registered engineer (category – C)

Registration requirements of Nepal engineering council according to NEC act 2055:

1. Application in an approved form
2. Copies of the certificates of academic qualifications
3. Registration fee
4. Other relevant document

Nepal Engineering Council - Professional Code of Conduct

The professional code of conduct to be followed by the registered engineers of the council, subject to the provision of Nepal Engineering Council Act, 2055 (1998) and Nepal Engineering Council Regulation, 2057 (2000), has been published as the following:

1. **Discipline and honesty**: Engineering service/profession shall have to be conducted in disciplined manner with honesty, subject not to contrary to the professional dignity and well being
2. **Politeness and secrecy: I**n connection with the profession, polite dealing shall be made with the customers concerned with the engineering services, and professional information relating to the customers shall not be given to others except with the consent of customers, provided however, that it shall not be deemed to have been restricted to submit such information to the concerned authority as per the existing law.
3. **Non-discrimination:** No discrimination shall be made among customers on the grounds of religions, race, sex, caste or any other things in the course of applying professional knowledge and skills.
4. **Shall have to do only the concerned professional work:** Shall have to do professional works or submit recommendation or suggestions only within the area of subject of study or obtained knowledge or skills. With regard to the works not falling within the subject of one's profession, recommendation of the works shall be made to an expert of the of the subject matter.
5. **Not to do such works, which may cause harm to engineering profession:** Except the salary, allowance, and facilities to be received for the services provided one shall not obtain improper financial benefit of any kind of conduct improper activities of any kind, which would cause harm to engineering profession.
6. **Personal responsibility:** One shall be personally responsible for all works performed by him in connection with the engineering profession.
7. **State name, designation, registration no:** While doing signature on the documents or description like design, map, specification, and estimate, etc, relating to engineering profession to be done, the name , designation, and registration no. should be stated clearly in understandable manner.

8. **No publicity or advertisement shall be made which cause unnecessary effect:** In connection with the professional activities to be done, no publicity or advertisement shall be made so as to cause unnecessary effect upon the customers.

Contact address:

Nepal Engineering Council
Bhagabatimarga, 742/41, Naxal, Kathmandu- 1
Post Box No . 2049, Phone No (977- 01 – 4420656)
Fax no 977-01-4422099
Website: www.nec.gov.np/necgov@ntc.net.np]

Oath

I …… having been registered with the Nepal Engineering Council agree to be governed by the memorandum, rules regulations and byelaws of the council, as they now stand or as they may hereafter be altered or added to according to law and I undertake to observe the ethics of the profession and to promote objects and interest of the council in so far as it lies in power.

Professional codes of conduct(for engineers) in accordance with NEC act 2055 & NEC regulation 2057- summary:

- Act of discipline & honesty
- Act of politeness & confidentiality (generosity and secrecy)
- Non discrimination
- Professional work (Working only in related engineering profession)
- Deeds which may cause harm to the engineering profession (Act should not offence engineering profession)
- Personal responsibility (Individual accountability)
- State name, designation and registration no.
- No publicity or advertisement must be made which may cause unnecessary effect (Should not misinform client from undue advertisement and communication)

Features (Quality)of Engineers:

- Knowledge of Technology
- Social understanding
- Economic realities
- Legal awareness
- Environment skills
- Management
- Leadership and innovation

Nepal Engineers' Association

It is an independent non-profit organization of Nepalese engineers. It was established in 1968.Today, it represents more than 7500 engineers. Nepal Engineers Association office is located at Pulchowk behind UNDP building. NEA is governed by an executive body of 15 members elected by members of the association. As the democratically elected representative body of the profession, the Executive Council, supported by its various 17 committees decides major policy issues and NEA's overall direction. Members are encouraged to participate in the affairs of the association. The noble aim of developing engineering professionals to promote the development process by application of engineering sciences and technologies and at the same time increasing the interaction, goodwill and cooperation among engineers in Nepal and protect their professional rights.

NEA was successful in expansion of in-country NEA centers, conversion of existing ones to Regional Centers as well as establishment of an international wing, NEA-Bangkok Center during the last decade. During the

past decade, NEA broadened its activities by expanding its relation with international Engineering societies. NEA became member of World Federation of Engineering Organizations (WFEO) and was successful to establish Federation of Engineering Institute of South and Central Asia (FEISCA). During the past decade, NEA has been successful in construction of its own building at Pulchowk . The finished two floors have been rented out to Nepal Telecommunications Corporation.
The NEA office at Jamal has been shifted to ground floor of NEA building at Pulchowk following demolition of the historic building housing NEA building during December 2001. The engineering community and well-wishers donated funds to complete the ground floor and basement of the existing NEA building. The basement has been hired out to Nepal Telecom. The ground floor is fully used by NEA. Rent revenue thus generated now goes directly in paying construction loans. The Jamal office has also been rented out. In the recent past, NEA has successfully promoted the enactment of Nepal Engineering Council Act. Today NEA has prepared a draft five-year strategy plan, which aims at upgrading current membership to internationally recognized standards. In this connection, a study on strengthening NEA is currently underway with support of Institution of Civil Engineers, UK and DFID.

The Nepal engineer's Association Preamble:

Where, it is expedient to make timely amendments to the Statute prepared in the year 2024 B.S. (1967) under which the Nepal Engineers Association, established in the year 2025 B.S. (1968) with the objects to establish an Association to make the role of the engineer community of the professional interest and progress of the Community, has carried out its business, this third amendment having been adopted by the Extra-ordinary. General Assembly held on 051/01/31 (14 May 1994) is brought into force since 051/03/20 (4 July 1994).

Nepal Engineers' Association (NEA)- Summary:

- General national body of Nepalese engineers of various disciplines established on 2024 B.S. (1968 A.D)
- An independent and non-profit organization of Nepalese engineers
- It regulates the practice of professional engineering in the national development
- It governs its member in accordance with the statute of the association and related law of the country in order to serve and protect the public interest.
- It safeguards the rights and strengthens the professional capacity of engineer.
- NEA is the member of World Federation of Engineering Organizations (WFEO)
- It was successful to establish Federation of Engineering Institute of South and Central Asia (FEISCA)

Objectives of Nepal Engineer's Association:

- To facilitate the proper development and mobilization of engineering science and technology in Nepal
- To promote mutual cooperation, interaction, and goodwill among Nepalese engineers and safeguards their interest and rights
- To ensure maximum participation of Nepalese engineers in the national development activities with and effort to stop the foreign dependency
- To enhance the highest professional ideas continuously among its member
- To establish linkages, cooperation and goodwill with international engineering institutions.

Major Activities of Association:

- Status and recognition
- Network and professional contact
- Motivation for membership
- Publications and advertisement (via print & electronic media/internet/website)
- Programs for continuing professional development

- Workshop, seminars and conferences
- Policy intervention in engineering issues
- Participation
- Mutual recognition agreements with the engineering bodies overseas
- Disciplinary procedures to ensure members uphold ethical standard
- An effective and united voice for the welfare of engineering community

Benefits of association membership:

Professional

- Provide a focus for the profession maintaining professional standards and complying with international rules of professional conduct
- Offers worldwide recognized qualifications , support and advice required to achieve them
- Allocates fund for local activities
- Provide training facilities, training advises and training courses
- Provides & publishes wide range of engineering information, journals, newsletters, proceedings etc.
- Offers national program of conference, seminars, workshops, trainings, lectures.
- Offers arbitration and conciliation services

Personal

- Participation/Technical visits/Have your views in major responses to draft policy
- Access to the international recognition, status and networking opportunities
- Chances to give views on professional issues to the politician, government, civil society
- Regular update with the occurrence happenings in the profession
- Maintain good contact with media an promote wider image with the public
- Benefit from excellent award/utilizing services and facilities of association
- Get benefits from the discount & other services from different sectors in the society
- Wider range of link, opens a new horizon for career advice & employment opportunities
- Initiate technical papers or articles about projects you are involved with

Disciplinary action:

- To maintain high professional standards and deal with situations, in which the public's safety/welfare may be endangered, a disciplinary actions process formed by association
- This process is not an alternative to the civil court. It deals solely with professional and ethical practice
- Anyone with concern about the conduct of member of the association is encouraged to contact the association
- Complaints are required to provide evidence and written summary of the allegations.

Steps of action:

- First step – Gathering evidence of the complaint
- Second Step – Investigation of the complaint
- Third Step – Disciplinary hearing

If a professional is found not doing wrong in his/her practice, the complaint is dismissed and no further action is taken. But, if proved professional's misconduct or misbehavior, then he/she has to undergo following actions:

- Further clarification
- Suspended for specific period
- Cancelled completely
- Subject to fine
- Have to appear professional standards examination/obtain experience in particular field

Code of ethics for engineer adopted by NEA

NEA Adopted code of ethics for its fellow since 2025. According to NEA, fundamental principle of professional engineering ethics is:

- Upholding and advancing engineering profession
- Keeping high standard of ethical conduct

Qualities of engineers to adhere with above principles are:

- Will be honest and fair and serve employer, clients and public
- Will dedicated to the advancement of competence of engineering profession and to disseminate engineering knowledge
- Will use his knowledge and skill in the service of humanity

The code of ethics also directs the relationship of Nepalese engineer with public, employers & clients and fellow engineers.

2.4 Relation with public: Engineer

- Will have proper regard for the health, safety and welfare of public in performing his professional duties
- Will endeavor to extend public knowledge and appreciation of engineering and its achievements and oppose any untrue, unsupported or exaggerated statements regarding engineering
- Will be dignified and modest in explaining his work and merit and refrain from misrepresentative or self-laudatory advertisement
- Will express an opinion on an engineering subject

2.4 Relation with employers and clients: Engineer

- Will act faithful agent or trustees for employer or clients
- Will not accept compensation or remuneration from more than one party for same service or service pertaining same work without consent of all interested parties
- Will inform his employer or client of his financial interest in any vendor or contractor and this should not affect to his services
- Will indicate employer the adverse consequences if his judgement is overruled
- Will undertake only those engineering assignments for which he is qualified
- Will not disclose information concerning business affairs or technical processes
- Will not divulge(reveal) any confidential findings of studies or action of any commission or board in which he is member
- Will not exert undue influence or offer solicit or accept compensation for the purpose of affecting negotiations for an engineering engagement

2.4 Relation with Engineers: Engineer

- Will take care that credit for engineering works is given to those directly responsible for
- Will provide complete information on working conditions and status of employment
- Will uphold the principle of appropriate and adequate compensation for those engaged in engg. Works
- Will endeavor opportunity for professional development and advancement of fellow engineer under his supervision
- Will not attempt to injure falsely or maliciously professional reputation, prospects or practice of other engineer
- However, he has proof that engineer has been unethical, illegal or unfair in his practice, he should be advised to practice proper authority
- Will not use the advantage of salaried position to compete unfair with other engineer
- Should give due regards to all professional aspects of the engagement

- Will not attempt to supplant (replace) other engineer in a particular engagement
- Will not review the work of other engineer for the same client except with the knowledge of such engineer
- Will cooperate in advancing the engineering profession by interchanging information and experience with other engineers by contributing to public communication

Relationship of engineering profession to basic science and technology; relationship to other professions

Engineering: Application of knowledge and skills acquired through a specialized training, education and experiences and practicing the same as an occupation in the areas of public safety, health and property protection. In short it is a systematic application of knowledge and skill.

The basic science: Study of law of nature, properties of matters and sources of power that are available around us.

Technology: Best application of those laws of nature and utilization of the properties of matters and sources of power by which, engineer can make new facilities and create new services.

Basically the basic science and technology used in an integrated form as a separate profession for the welfare of people is engineering. So we concluded engineering knowledge is not possible without basic science and technology.

Basic science and technology includes physics, chemistry, mathematics and technology includes those in which the process or method of applying those describes how to become or how to make. Combining both of these subjects forms engineering subjects.

Engineering works involve large funds for creating facilities and services for the people. As the project involves budget and the people the engineer in charge and staff need to have good procedure of keeping record and rapport with stakeholders. Therefore engineering profession involves mainly the following profession, accountant, lawyers, medicals and managers. Accountants keep records of expenditures, lawyers help in executing works within legal sphere, medical person helps in keeping people of engineering safe and healthy and managers help in sorting and executing works as per state rules and regulation and maintaining good relationship with other stakeholders without creating conflicts.

Therefore, engineering profession has a deep relation with law, account, medicine, and management profession. Auditing, budgeting, managing conflicts and maintaining harmonies in work sphere are some of the professions with whom engineering profession has deep relationships.

2.5 Ethics, code of ethics & engineering ethics

Moral :

- Concerned with goodness and badness of human character
- Measures the standard of good behavior by which people are judged
- Standards of behavior accepted by the culture and religion of the society
- Basic human marker of right conduct or behavior ; Free from action of nature and animal
- Delve into right or wrong at much deeper level, which is both personal & spiritual
- Made of sterner (severe/harsh/firm/strict) stuff & usually do not change
- Morals are of a subliminal (hidden / unconscious/Unintentional) nature & defines personal character

Ethics :

Abstract: Set of guidelines that defined accepted practice & behavior for group of people/society.
It can be changed according to the nation/society/peer group/religion/profession.
It is not doing just the right things; also it is making tough decision about ambiguous things.
Things that are legal may not be considered ethical.

- Science of human character as expressed in right or wrong conduct for purposeful action: Science of morality
- Science of ideal (truth, beauty, good) involved in human life;

- system of belief that supports the view of morality
- seeks to teach us how we can pass correct moral judgment upon human conduct and consider it as right or wrong with reference to supreme ideal of human life
- Activity of understanding moral values, resolving moral issues, and justifying moral judgment
- The particular set of belief, attitudes, and habits that a person or groups displays concerning morality
- Define the code, that a society / group of people adhere
- Ethics that a person adheres too are impacted upon by external factors like nation /society/ religion/ profession & could change with change in any of those influencing factors
- It is set of guidelines that define accepted practices & behavior for a certain group of people
- It relates to society & more in a professional life
- It stress a social system in which those morals are applied
- Ethics point to standards or codes of behavior expected by the group to which the individual belongs
- Ethics he or she practices can be other dependent

Ethics and morals both relate to "right" and "Wrong" conduct. However, **ethics** refer to the series of rules provided to an individual by an external source e.g. their profession. On the other hand, morals refer to an individual's own principles regarding right and wrong.

Difference between Ethics and Morals

Subject Matter	Ethics	Moral
1. What is it?	The rules of conduct recognized in respect to a particular class of human actions or particular group, culture etc. It defines how thing are according to the rules	Principles or habits with respect to right or wrong conduct. It defines how things should work according to individuals' ideals and principles
2. What is the Source ?	Social System/External	Individual/Internal
3. Why we do it ?	Because society says it is the right things to do it	Because we believe in something being right or wrong
4. What if we don't do it ?	We will face peer/societal disapproval or even fired from our job	Doing something against one's morals and principles can have different effects on different people., they may feel uncomfortable, remorse (regret), depressed etc.
5. Flexibility	Ethics are dependent on others for definition. They tend to be consistent within a certain context but can vary between contexts.	Usually consistent, although can change if an individual's change

Actions neither moral nor immoral

- Calamities
- Animal actions
- Children action/mad action/idiot action/drunkard action
- Action under compulsion

Code of ethics:

Concept: It expresses the rights, duties and obligation of its member.
Code of ethics provides framework for ethical judgment for a professional

Limitations: It is not a recipe for ethical behavior
It is not a legal code
It only deals with choices
One may not be arrested if he/she disobeys code of ethics
Code provides little space for an employer where he/she could fight against the employer's request to behave unethically

Engineering Code of ethics : The study of moral values, issues and decision involved in engineering practice

Why : How technical works impact on society ?

Should study ethics because they need to get sensitized to ethical issues before they are confronted with professional problem. Past experience may help us to increase our sensitivity to ethical problem which show us to find sound solutions

Objective

The ethics as normative science of any professional conduct needs codes of ethics and guidelines to maintain high level of standard of good behaviour or conduct in the public. Engineers create facilities and services by any or all of the acts and do so by applying engineering principles and the experiences gained.

Summary of engineering code of ethics

- Code provides a positive stimulus/motivation for ethical conduct and a set of guidelines with fundamental canon/norms
- Code gives a positive support to those seeking to act ethically and in taking stands on moral issues when a professional in under pressure to act unethically
- Code serves as legal support for professional
- Codes also serve the formal basis for investigating unethical conduct
- The current codes are by no means perfect, but they are steps in the right direction
- A code of ethics governs the conduct of all practitioners
- It endures that engineers practice within their realm of expertise, they do so in a fair and ethical manner and they place the good of society above their personal gain
- Means by which engineers govern themselves
- It is privilege earned over the years through knowledge, experience and trust

Core ethical values of engineering code :

- Honesty
- Integrity
- Fidelity
- Charity
- Responsibility
- Self-Discipline

The core concept to be found among the various engineering code, in order of significance are

1. The public interest
2. Quality of truth, honesty, and fairness
3. Professional performance

Limitation of engineering code

1. Codes are not straight forwardly applicable to all situation. More problems can arise in a complex profession like engineering.
2. It is easy for different entries in codes to come in to conflict with each other that may create moral dilemmas.
3. A code cannot serve as the final moral authority for professional conduct.

Fundamental canons of ethics issued by NSPE

The national society of professional Engineers NSPE US approved by the board of directors on 5th Oct 1977 has set the following *fundamental principles9canons) for engineers* to support and advance the integrity, honor and dignity of engineering profession by

1. Using their knowledge and skill for the advancement of human welfare
2. Being honest and impartial and serving with loyalty the public, their employers and clients.
3. Striving to increase the competencies and prestige of engineering profession
4. Supporting the professional and technical societies of their disciplines.

Professional ethics concerns the moral issues that arise because of the specialist knowledge that professionals attain, and how the use of this knowledge should be governed when providing a service to the public.

Professional ethics concerns the moral issues that arise because of the specialist knowledge that professionals attain, and how the use of this knowledge should be governed when providing a service to the public.

Fundamental canons for code of ethics issued by NSPE – Summary

Engineers must perform under standard of professional behavior that requires adherence to the highest principle of ethical conduct. Engineers in the fulfillment of their professional duties, shall

- Hold paramount the safety, health, and welfare of the public
- Perform services only in areas of their competence
- Issue public statements only in a objective and truthful manner
- Act for each employer or client as faithful agents or trustees
- Avoid deceptive (illusory/misleading) acts
- Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession

Fundamental ethical values for codes (general)

- Protection of life and safeguarding people
- Sustainable management and care for the environment
- Community well being
- Professionalism, integrity and competence
- Sustaining engineering knowledge

Rules of code of ethics (code of conduct/ rules of practice) /Fundamental norms for professional engineers

- Public safety and welfare
- Competence and knowledge
- Issue public statement in an objective and truthful manner
- Sealing and signing
- Faithful agent and trustee
- Should build their reputation, unfairness to others
- Enhance honor, integrity and dignity of the profession
- Conflict of interest / Do not engage in conflicting Services
- Overruled by judgment
- Professional career development
- Professional advertisement on factual representation
- Do not offer or accept the hidden payment
- Securing assignment/ Sign those documents which are prepared under your own direct involvement
- Conduct through client
- Confidentiality of information/ Do not disclose confidential matter (information)

- Reporting on professional practice/Report if any unethical matter etc.

2.6 Moral dilemma & ethical decision making

Dilemma: A situation necessitating a choice between two equally unpleasant/ undesirable alternatives. A problem that seems incapable of solution.

Moral Dilemma: A painful decision, where every solution involves some kind of loss is a moral dilemma. It is even worse, because whichever option you chose, someone or something will suffer. Decision has to be made on the morally correct course of action, not just the one you would prefer.

The engineers / professionals need to overcome the moral dilemma considering following law of ethics:

5. Eternal – based on nature and the scriptures, common sets of moral standards are set
6. Utilitarianism – greatest amount of benefit for the largest no. of people
7. Universalism - everyone faced with same set of circumstances
8. Distributive justice – a belief in the primary of justice
9. Personal liberty – value of liberty, primacy of single value

Discussion on moral (ethical) dilemma on decision making taking reference of laws of ethics

In every pace of life, ethical dilemma happens on decision making process. Ethical dilemma happens on decision making process happens due to economic and social reasons for an institution and want or desire and duties for an individual.

Disposal of industrial waste to the river basin may fulfill industries desire or wants due to economic reasons but it harm the environment and society.

An individual do something to fulfill his wants or desire what he is not supposed to do.Asphalt lay during rainy seasons and day after broken out almost. Software model using crack version and cannot run properly.

On the basis of moral value, society can distinguish the good and bad things. The aim of manager need to create an ethically healthy climate for his or her employees, where they can do their work productively and confront a minimal degree or ambiguity regarding what constitutes right wrong behaviour.

The aim of ethics is to define the nature of the highest good of a man as a member of society. Problems faced by a manager was examined in great detail to consider in detail the actual nature of the ethical dilemma in management and from that examination five conclusions were drawn concerning the complexity of managerial ethics. Ethical problems in management are complex and ethical decisions have:

1. Extended consequence
2. Multiple alternative
3. Mixed outcomes
4. Uncertain consequences
5. Personal implications

1. Extended consequence: most ethical decision have extended consequences. The decisions of manager have an impact upon others; both within the organisaion and within society; that is beyond their control and therefore should be considered when the decisions are made. For example bribe (backhander) change governmental process, pollution affects environmental health, unsafe products destroy individual lives.
2. Multiple alternatives: Most ethical decision decisions have multiple alternatives. Should a manager pay a bribe or not? Should a factory pollute the air or not? Should a company manufacture unsafe product or not? As has been seen in the simple illustration of bribery payments for import clearances. Multiple alternatives have to be considered in making ethical choices.
3. Mixed outcomes: most ethical decisions have mixed outcomes. Ethical issues in management are considered antithetical (negating). Pay an indirect bribe, but maintain the sales volume of imported goods through prompt delivery. Cause some air or water pollution, but avoid the cost of installing and

operating pollution control equipment. Design a slightly unsafe product, but reduce the material and labour costs of manufacture. Social benefits and costs as well as financial revenues and expenses are associated with almost all of the alternatives in ethical choices.

4. Uncertain consequences: Most ethical decisions have uncertain consequences. It is commonly thought that ethical issues in management are free of risk or doubt, with a known outcome for an alternative. Pay the bribe, and receive the imported goods promptly. Investment in pollution control equipment, and the emission will be reduced X% at Y costs of operation. Produce an absolutely safe product at an additional costs Z dollars per unit. It is not all clear what consequence will follow from most ethical choices.
5. Personal implications: Most ethical decisions have personal implication. It is commonly thought that ethical issues in management are largely impersonal. Many people believe that prima facie ethical decision in a given operation may reduce the profits of the company but not the executive's salaries or their opportunities for promotion. Maintain the sales of imported goods at expected levels, and despite slightly increased expenses for bribes, the quarterly review will be pleasant. Delay installation of pollution control equipment, and the rate of return will be close to the planed percentage. Redesign the product to reduce the material and labour cost, profit margin and chances of promotion will increase. Individual benefits and costs as well as financial social benefits and costs associated with most of the alternatives in ethical decisions.

2.7 Detailed duties and liabilities of engineers/architects

- Fitness for purpose
- Negligent misstatement
- Statutes, bylaws and building regulations
- Examination of site above and below the ground
- Public and private rights
- Plans, drawings and specifications
- Materials
- Novel, risky design and employers interference in design
- Revision of design during

2.8 Liability, Negligence and Tort

Negligence:

The law expects certain standard of behavior from the citizen it governs. When a person fails to meet these standards by acting in a way the law considers unreasonable that person may be guilty of negligence. Negligence is the lack of proper care or intention.

Elements of Negligence:

In order to plaintiff to win damages, the attorney must establish in the following three elements.

- The defendant had a legal obligation to behave in a certain way "duty of care"
- The defendant failed to fulfill this obligation by acting inappropriately " Breach of that expectation"
- The plaintiff's injury (loss/damage) was caused because of defendants legal breach of conduct "Resulting damage"

Once these three critical statements are determined to be the case the court may offer compensation to the injured victim of negligence.

Tort: It is an action or inaction of one or more individuals, which leads to loss or damage of another. The court seeks compensate to those who suffers as a result. This is independent of any contract that might exist. It is any private or civil wrong (other than breach of contract) for which damage may be claimed.

Objective of Tort law:

- Compensation to victim
- Transferring the cost of injury from victim to the person responsible for that

- Prevention of repetition of harmful action
- Defending the law and rights of victim

Grounds to bring tort cases in the court:

- Negligence
- Intentional wrong
- Strict liability

Liability:
- It is the obligation to pay penalty for fulfilling or not fulfilling predefined duties.
- It is the consequences of negligence
- Professionals can be liable for incorrect advice, design or reports

Vicarious Liability:A person who commits tort is liable for the damage that he caused. Another person may also be liable in respect of the same tort even though he did not commit it. This can arise when an employee commits a tort in the course of his employment: his employer is also liable for his employee, which is known as vicarious.

Liability of Partners in Tort:All the forms of partners are liable for a tort committed by a partner who committed tort. In the ordinary course of the firms business or with the expressed or implified authority of his copartners, such liability arises on the basis of vicarious liability because each partner is the agent of his co partners. Hence lawyers sue everybody they can find. If one of the parties is unable to pay the share the other parties will be expected to cover the short fall.

Types of liability:

- Liability under contract: e.g. works not meeting specification
- Liability in tort: For causing injury to others through negligence and reckless action
- Liability under statute: In accordance with the laws and statute

Engineering Professional Practice- **Public Sectors in Nepal**

- Public sectors (organization that are run with the budget sanctioned by government).
- Government organization (ministries) Department, Regional , district office,Board, project
- Constitutional body
    - commission, parliament, court, CIAA, Office of attorney general, Centre for national vigilance,
- Provincenal organizations/local level government /Corporation ,Municipalities, DDC, VDC
- Universities, institute etc

Engineering Professional Practice- **Private Sectors in Nepal**

- Construction company, Consultancy, Private hydropower company
- Resource and management firms
- Banks and financial institutions, trading houses
- UN country offices, International donor agencies
- Private engineering colleges

General Job description of engineers

1. An engineer has following responsibilities
    a. Vision
    b. Mission
    c. Program
    d. Implement
    e. Supervision
    f. Monitoring
    g. Training
    h. Enhance profession
2. An engineer involve one of
    a. Private sector
    b. Public sector
    c. Free consultant
3. An engineer assign one of
    a. Consultant
    b. Contractors
4. An engineer serve as
    a. Designer
    b. Programmer
    c. execution
    d. Surveyor
    e. Supervisor/ monitoring
    f. Administrative
    g. Researcher/ analyser
    h. Academician (teacher/professor/trainer)
    i. Preliminary survey, prefeasibility, feasibility, detail design , estimate
5. Public Service commission provide job description of engineer
    a. 3rd Class
        i. Preliminary survey, prefeasibility, feasibility, detail design , estimate
        ii. Execution of project works
        iii. Reporting
            1. Pre activities
            2. Interim progress
            3. Monitoring
            4. Evaluation
            5. Post implementation report
        iv. Job assigned by immediate boss (superiors)
        v. To facilitate donor agency vi) Job specific for engineer
    b. 2nd class
        i. Planning, programming, and execution of works
        ii. Research on technology, cases, various skill upgrade
        iii. Monitoring and evaluation
        iv. Supervision of project
        v. Administrative works
        vi. Financial planning a and administration

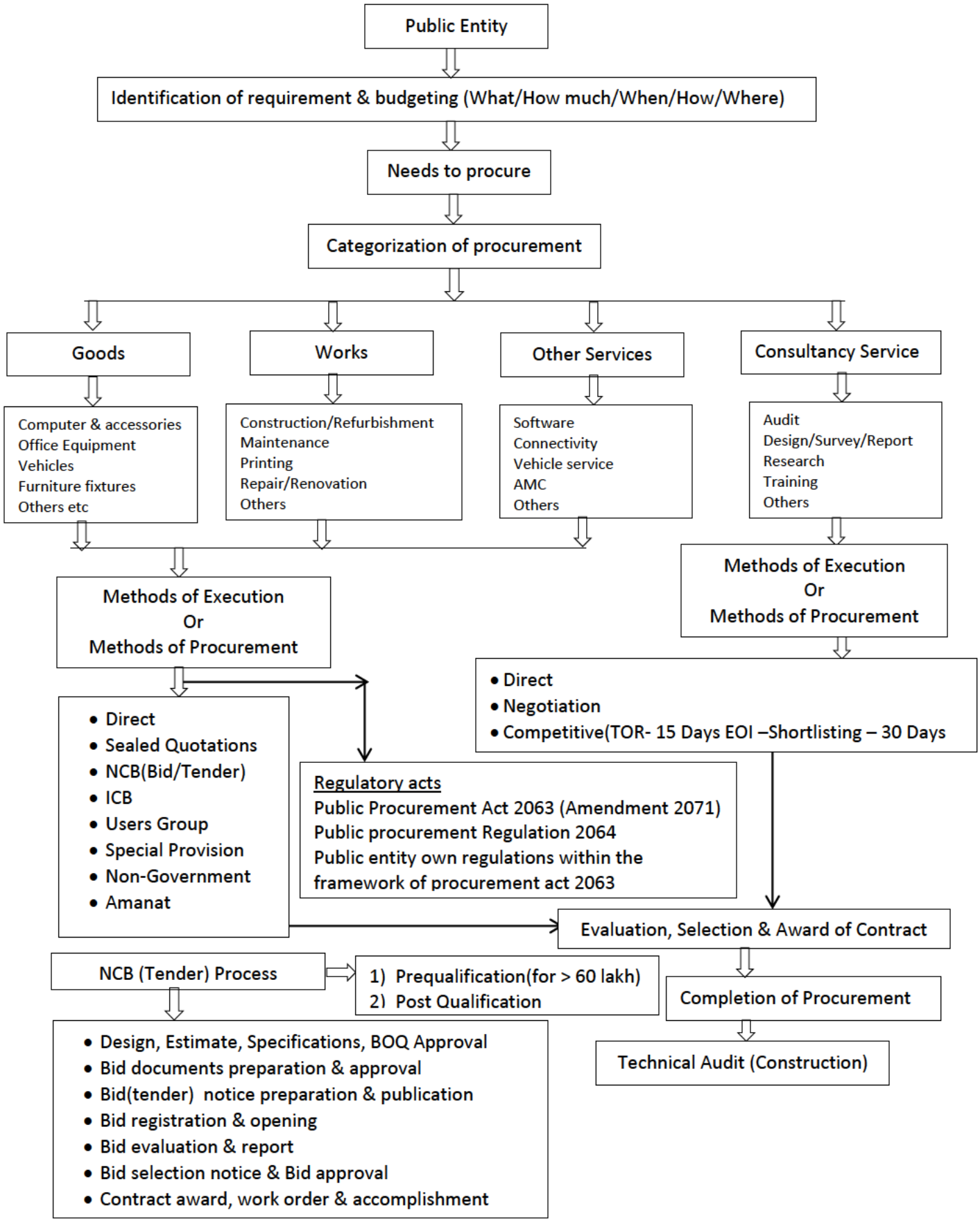
General job description of fresh graduates

- Perform preliminary & detailed survey, design estimation
- Execution of project works

- Report writing (Progress, feasibility, final, monitoring & evaluation)
- Monitor and evaluate ongoing projects
- Facilitate donor agencies involved
- Execute & perform works and job assigned by immediate superiors
- Execute others engineering job planned

Chapter 4 Contract Management

Flow Diagram of Procurement Process



Methods of execution references for- Works/Goods

1) Direct purchase

- Minimum three quotation from standing list is required if purchase is above 25000
- Estimate up to 500000 for construction work (revised)/Estimate up to 300000 for goods
- Estimate up to 1500000 for domestic products for one time in FY

2) Sealed Quotations

- Estimate upto 2 million for construction work (revised)/Estimate up to 1 million for goods
- 15 days notice in national or local newspaper
- 3 minimum three quotations are required
- 45 days bid validity and 75 days bid security validity
- 7 days notice for agreement /No withdraw and no modifications
- Contract only within or below the estimate amount

3) NCB (Bid/Tender)

- 30days notice in national newspaper/website
- minimum one responsive bid
- 90(upto 10 crore)/120(10 crore above) days bid validity and 120/150 days bid security validity
- 15days notice for agreement
- Onetime withdraw or modifications
- Single of joint venture(maxm three and not less than 25% share)
- Selection notice for 7 days
- Contract can award if bid amount is not substantially higher than the approved estimate

4) ICB (Bid/Tender)

- 45days notice in national English newspaper of international journal/website
- minimum one responsive bid/Single or joint ventures

5) User's committee / beneficiary committee

- Including all cost /Up to 6 million /Up to one third of estimate – mobilization

Comparison between Sealed Quotation and National Competitive Bidding - NCB (Tender/Bid)

S.N	Subject matters	Sealed Quotation	NCB (Tender/Bid)
1	Estimate Range	≤20,00,000.00 for goods & works	>20,00,000.00 for goods & works
2	Public Bid Notice Duration	15 Days	30 Days
3	Bid Validity period	45 Days	**90** Days for ≤ 100,000,000.00 **120** Days for > 100,000,000.00
4	Bid Security (2 to 3% of estimate amount) period	75 Days	**120** Days for ≤ 10,000,000.00 **150** Days for > 10,000,000.00
5	Minimum no. of bids	Three	One responsive is enough
6	Opportunity of withdrawal or Modification	Not allowed	One time one action only either withdrawal or modification
7	Mode of approval of bid	Bid amount must be < estimate amount	Substantially not > estimate amount
8	Notice of Intention to approve	Optional (not compulsory)	Must publish – 7 days duration
9	Duration for contract signing	7 days	15 days
10	Bid to be approved within	15 days (from last date of submission)	30 days (from last date of submission)
11	Calling of pre bid meeting	No provision	If so, 15 days before bid submission date
12	Re notice	7 Days if 3 bids are not submitted	No provision (Amend- 15 /7days notice)
13	Provision of extension of bid validity	No provision	Can be requested to contractor/supplier for extension bid validity period
14	Qualification criteria	Can be set (Optional)	Must be set
15	Bid document cost	NRs. 500 or lesser	NRs. 1000 or more
16	Provision of Joint venture(JV)	No provision	Can be (Maxm 3 & 1 must have 25% share)

4.1 **Methods of work execution**

Procurement of works -ICB/NCB/Sealed Quotations/Direct/Users group/Special/Non-government/Amanat

Procurement of goods - ICB/NCB/Sealed Quotations/Direct/Users group/Special/Non-government/Amanat

Procurement of consultancy services - Competitive(15 days' notice of EOI &30 days' notice of presenting Proposals) /direct

4.3 tendering procedures

Tender:- Definition

- It is an offer in writing by the tenderer/owner (the person/firm who offers the tender) to execute some specified work or to supply some specified goods at certain rate/amount within stipulated time under certain conditions of agreement.
- This is the initial process/step in formulation of contract.

Purpose for tendering/bidding:

- Use of fund for intended purpose (project implementation)
- For the observation of economic and efficient project (best value for money)
- To give an equal opportunity to compete for eligible bidders
- To encourage for the development of domestic contracting & manufacturing industries
- For the transparency in all stage of procurement process

Tender notice:

- It is the information inviting bids from competent and capable contractors /firms /service providers and forms a part of contract document
- It should be widely published in important newspapers or acclaimed national daily newspaper eg. Gorkhapatra/ Kantipur/ Nagarik etc.

Preparation before inviting Tender notice publication:

- Project preparation
- Estimation of quantities
- Cost estimation(abstract of cost)
- Approval of cost estimate from concerned authorities
- Resource planning
- Tender/bid document preparation& approval
- Tender invitation

Information to be furnished inTender notice:

- Name of authority publishing the notice
- First date of publication
- Brief description of the job
- Duration of the project to be completed
- Date time and place-where and when the bid documents is available and to be submitted
- Cost of tender/bid document
- Cost estimate (optional)
- Date, time and place of opening the tender/bid
- Earnest money(bid security) and Security deposit amount(performance security)
- Expected date of acceptance of successful bids etc.

Earnest money (bid security):

- It is the amount of money deposited while bidding a tender as a guarantee of the party's willingness of carrying out the work awarded to him/them
- Its amount generally ranges from 1% to 3% . In Nepal 2 to3 % of the estimate amount is demanded as earnest money and for foreign party, the amount is considered to be 5%
- This money(fund) is refunded to unsuccessful bidder
- If a successful bidder fails to carry the work, this amount will be forfeited

Security Deposit (Performance security):

- It is the amount of money which is deposited by a successful bidder as a security for the satisfactory performance (quality of work)
- In Nepal, security deposit is equal to 5% of the contract amount whereas 10% of the bid amount will be taken as security amount for foreigner
- It includes the earnest money deposited
- This is refunded after the completion of defect liability period (maintenance period)
- This fund can be forfeited if contractor fails to perform his duty

National competitive bidding(NCB):

- Local competitive bidding
- All the eligible bidders are invited to participate in bidding
- Tender notice to be published in national daily newspaper for two consecutive days
- Also tender shall be published in the concerned office

International competitive bidding(ICB):

- If the amount of work is big and national/domestic contractor cannot perform the job, eligible bidders are invited from all over the world
- In this process tender notice is provided to diplomatic missions working in the country

Information to be furnished in the bid by foreign bidder:

- Whether the bidder is having a local agent or not
- Name and address of the agent if any
- Types of the service being provided by the agent
- Currency and procedure of payment to the agent
- Other agreement with the agent if any

Qualification Procedure for tendering

Two forms of qualification – prequalification and post-qualification – are used to ensure that bidders have adequate capability and resources to perform the particular contract satisfactorily, taking into account their

(1) Experience record on works of a similar nature and complexity,
2) Financial capability,
(3) Personnel capability,
(4) Equipment capability and
(5) Litigation(Legal Actions) history.
(6) Other relevant information of certification(ISO certificate),particular job experience, methodology etc

Prequalification is carried out in advance of bidding to establish a list of capable firms to be invited to tender while ensuring that a proper level of competition is safeguarded. Post qualification is used where no prequalification has been carried out and bids are invited at large from one or more classes of contractor, and is carried out after bids are received as part of the bid evaluation process. Post-qualification has the advantage of reducing the total procurement time by cutting out the prequalification steps. Under FAR Rule 65 amended in October 2001 bidders shall be prequalified for undertaking all G/N-funded works costing more than NRs 10 million (currently this FAR rule again amended in .2003 sep).

However, project managers should be aware that, in many donor-assisted projects, post qualification is often applied in NCB/LCB contracts. For example, the SBD Procurement of Works for Medium Contracts contained in PWD Part III is designed for either prequalification or post-qualification Under FAR Rule 66(12) the implementing agency may relax the requirement that contractors are registered under the Contractors Rules, 2056 for contractors in a remote area and for foreign contractors. The Secretary shall approve the qualification criteria.

Why Prequalification?

The successful execution of contracts for large buildings, civil engineering, supply and installation, turnkey, and design and build projects requires that contracts are awarded, only to firms, or combinations of firms, that are suitably experienced in the type of work and construction technology involved, that are financially and managerially sound, and that can provide all the equipment required in a timely manner. The assessment by an implementing agency of the suitability of firms to carry out a particular contract prior to being invited to submit a bid is a process called prequalification.

The Requirement for Prequalification of bidders

GN and most multilateral Donor Agencies require the prequalification of firms for the construction of large or complex Works contracts, followed by a closed competitive bidding procedure in which only those firms meeting specified prequalification criteria are invited to submit a bid. All applicants meeting the specified criteria should be allowed to bid. Therefore, prequalification should not be used for limiting competition to a predetermined number of potential bidders.

The decision whether to carry out prequalification is a matter of professional judgment based upon a number of considerations about the contract itself, and about the actual process of prequalification. Contract considerations include size, complexity, limitations on completion time, the critical nature of the works, environmental impact, associated risks, etc. Considerations regarding the process of prequalification should weigh the potential benefits against the potential disadvantages.

Pre-Qualification (PQ):

It is a process of short listing of eligible bidder and to avoid crowd of bidder. It also ensures that the invitation to the bid is extended only to those perspective bidders who have adequate capability and resources to perform the work/contract satisfactorily taking into accounts their:

- Experience & past performance on similar work/contract
- Capabilities with respect to personnel , equipment and construction & manufacturing facilities
- Financial status
- Litigation history

Benefits of Pre-Qualification:

- Reduces the amount of work and time involved in evaluating bids from unqualified contractors
- Encourages local firms to form joint ventures with other local or international firms, thereby benefiting from their resources and experience
- Reduces significantly, if not eliminate, problems associated with low prices submitted by bidders of doubtful capability
- Enables contractors, who may be insufficiently qualified on their own, to avoid the expense of bidding or to form a joint venture, which may give a better chance of success
- The well qualified firms may also price their bids more competitively with the knowledge that they will only be competing with other qualified bidders meeting realistic minimum competence criteria
- The assurance that competitors which lack the necessary qualifications will be excluded from bidding thus encourages leading contractors or suppliers to bid

Post Qualification:

All eligible bidders can participate in the bidding. No pre-qualification process is adopted. This process may include single envelope system(financial proposal only) or double envelope system (financial as well as technical proposal). In double envelop system successful bidders are selected by adopting one of the following three methods:

- Short list from technical proposal and select the lowest bidder to award the contract
- Select the lowest bidder first and check the technical proposal. If technical proposal is ok select the firm. If technical proposal is not satisfactory, select second lowest bidder and check the technical proposal
- Give weightage to both technical proposal as well as financial proposal. Select the bidder getting highest point.

Contract:

- An agreement between two or more competent parties in which an offer is made and accepted, and each party benefits.
- Agreement concluded between two or more parties for performing /not performing any work
- If any person or firm advances any proposal to any other person or firm and latter gives his/their consent, they shall be deemed to have a contract
- It is done to seek a legal action/remedies any parties breached the agreement
- In extensive sense, it includes every description of agreement, or obligation, whereby one party becomes bound to another to pay a sum of money or to do or to omit to do a certain act
- It is an act which contains a perfect obligation

Agreement:

- It is the acceptance to the offer(proposal) with or without any conditions
- It does not have any legal obligations

Essential elements of contract

1. **Offer and acceptance:**
   In simple expressions, offer is a promise made by one party (or a person) to another party (or a person). The party who made promise is called “offeror” and the party whom to whom a promise has been made is called “offeree” As per contract act 2056, the offer made by a person to another person with the intention of getting approval to do or not to do any business. Similarly, acceptance has been in the Act as the consent given by the offeree to the matters in the offer in the same spirit of the offeror.
2. **Competent parties:** parties or person who make contract must be competent according to law
3. **Mutual intent to enter into contract:**
   Both parties in a contact shall have intentions to establish a legal relationship. Therefore, agreements made without the intentions of establishing legal relationship cannot be considered as contract. A social, family and even commercial agreement that has no intention of establishing legal relationships can be taken as example.
4. **Consideration:**
   Consideration can be described as something of value that is exchanged by contracting parties (D.L Martson , Law for professional engineer, 1996). As per contract act 2056, consideration means the promise of doing or not doing any thing because of doing or not doing the work stated in the offer. In general, the court does not see for the adequacy of the consideration.

5. **Capacity to contract:**

The parties need to have capacity to contract. As per contract Act 2056 except the following person, all others persons are capable to contract.

a. Person below 16 yearsb.Person not in own control (mad senseless)

6. **Lawful purpose:**
   Contract must have lawful purpose otherwise; law cannot enforce it. As per contract act 2056, contract becomes void if there is an an illegal objective or consideration in the contract.
   a. Lawful consideration b. Law full object
7. **Free consent:**
   The parties in a contract should have given free consent that is without any correction, undue influence, fraud, misrepresentation etc. In such cases the party suffering damage may make the contract void.
8. **Possibility of performance:**
   Any contract should be within possibility of performance. The law does not consider legal of the contract work is not within possibility of performance.
9. **Certainty:**
   Contractual conditions must not be unclear and unlimited. Both parties under the contract must have understood the term and conditions

Elements of Contract - Summary:

- Two or more competent parties
- Offer & acceptance
- Intention of creating legal relation by both parties
- Considerations
- Capacity to contract/competence to contract
- Free consent
- Lawful purpose
- Possibility of performance
- Verbal or written and registration

Importance of contract: (Make/Record/Specify-6/Identify/Set/define-2)

10. To make an agreement legally enforceable
11. To record the terms of agreement
12. To specify what the contractor/supplier/service provider must do & what the owner must pay
13. To specify the quantity & quality of work to be done
14. To specify the time frame within which the work is to be completed and payment to be made
15. To specify the means, methods/mode, terms and time of payment
16. To identify the parties to the agreement
17. To identify the official agent or representatives of parties to the agreement and define their authority and responsibility
18. To set out in advance the courses of action that will be taken in different possible situations
19. To define words and establish common meanings
20. To define what is and what is not included in contract
21. To specify how the contract will be terminated
22. To specify the responsibilities of the parties not just to each other but to third parties such as government, community in which work is to be done, workers, sub-contractors, material suppliers, unions, etc.

4.2 Types of contract (Classification of contract) :

(I)With respect to mode of creation

1) **Indirect contract**:

Notwithstanding anything contained elsewhere in thisact, a contract shall be deemed to have been concluded as follows in the following circumstances:

(a) In case a person who is incompetent to conclude a contract under this Act or other prevailing Nepal law, or any other person who is to be maintained by him/her is provided with any material, commodity or service which material commodity service paid from the property of such he/sheneeds and that is consistent with his social status, to have the cost of suchperson to the person so meeting his/her need.

(b) In case any person, who is concerned with the payment or nonpaymentof any amount to be paid by another person under the prevailingNepal law makes such payment him/herself, to have that payment repaid tohim/her from the property of the person who is actually under obligation tomake the payment.

(c) In case any person gives anything to another person, or employshim/her in any work, to pay the appropriate cost or remuneration.

(d) In case any person keeps under his/her personal possession anyproperty belonging to another person that may be kept as such under thelaw, to keep that property as a bailment property.

(e) In case any person pays any amount (to any person) by mistake, to refund the same.

2) **Contingent contracts**:

(a) In case a contract has been concluded toperforming or not to perform any work if any event happens in the future,the contract shall not create any liability until such event happens.

(b) In case a contract has been concluded subject to the conditionthat it shall be deemed to have been concluded in case person performs anyspecified work in the future, no liability shall be deemed to have emergedfrom that contract if such person does anything in such a manner as not toperform that work or acts in such a manner that the work cannot beperformed.

(c) In case a contract has been concluded to perform or not toperform any work if any uncertain event does not happen in the future,liability under that contract shall emerge only after the happening of thatevent becomes impossible.

(d) In case a contract has been concluded with a provision toperform or not to perform any work if any event happens within a specifiedperiod in the future, the contract shall be deemed to have become invalidafter the happening of that event becomes impossible within the specifiedperiod or after the expiring of that period.

(e) In case a contract has been concluded with a provision toperform or not to perform any work if any event does not happen within aspecified period in the future, liability under such contract shall emerge ifthat event does not happen within that period or if it becomes certain thatthe event will not happen within that period.

(II) With respect to legal relationship[Valid/Void/Voidable]

1) **Valid Contracts**:

A contractthat complies with all the essentials of a contract and is binding and enforceable on all parties.

2)Void Contracts:

The following contracts shall be void:

(a) A Contract preventing anyone from engaging him/herself in any occupation, profession or trade which is not prohibited by prevailing law. Provided that a contract shall not be deemed to have been concluded in preventing profession or trade in the following circumstances:

(I) A contract preventing the seller from engaging him/herself in a profession or trade at the time and place as mentioned in the contract concluded between the buyer and the seller on selling and buying of the goodwill of any trade;

(II) A contract concluded among partners in preventing their engagement in any trade or business, other than those of the partnership firm, similar to those of the partnership firm or any other trade or business together with other competitors belonging to the same kind of trade or business as long as the partnership continues.

(III) A contract concluded among the partners in preventing them from engaging in a trade or business under the partnership firm for the specified time or place after being separated from the partnership;

(IV) A contract preventing any individual from receiving the service of any such agency, company, firm, individual or competitor of such agency, company, firm, or individual for the specified period of time after the retirement from service or during the service of such agency, company, firm or individual pursuant to contract concluded by any individual with any agency, company, firm or individual.

(b) A contract restraining marriages other than those prohibited by the prevailing law.

(c) A contract preventing any one from enjoying the facilities already being enjoyed by the general public.

(d) A contract seeking to prevent the legal rights of any person from being enforced by any government office or court.

(e) A contract concluded in matters, contrary to or prohibited by the prevailing law.

(f) A contract concluded for immoral purpose or against Public morality or public interest.

(g) A contract which cannot be performed because the parties there to do not exactly know about the matter in relation to which it has been concluded.

(h) A contract which is considered impossible to fulfill even at the time is concluded.

(i) A contract which is vague as it does not provide reasonable meaning thereof.

(j) A contract concluded by an incompetent person to conclude such contract.

(k) A contract concluded with an unlawful consideration or objective.

3)Voidable Contracts: **(Coercion/Undue influence/Fraud/Deceit)**

(1) The following contracts may be made void by the aggrieved party:

*(a) A contract concluded through **coercion**:*

Explanation

A person shall be deemed to have indulged in coercion if he/she, with the objective of compelling any person, to accept any contract against his/her will, withholds or threatens to withhold property belonging to him/her, or threatens to defame him/her, or takes or threatens to take any other action in contravention of prevailing law.

*(b) A contract concluded through of **undue influence**:*

Explanation

(I) Undue influence means influence exercised by a person upon another person who is under his/her influence and is amenable to his/her personal benefit or interest.

(II)Without prejudice to the generality of Clause (1), the following persons shall be deemed to be under the influence of any person and amenable to his/her wishes:

(1) A person living under his/her guardianship, protection or custody.

(2) a persons who cannot take care of their interest temporarily or permanently by reason of old age, sickness or physical or mental weakness.

(3) A person who can be subjected to under one's economic or ranking influences.

*(c) A contract concluded through **fraud:***

Explanation

A party to the contract or his/her agent shall be deemed to have committed fraud if he/she, leads the other party or his/her agent to believe or takes any action to believe the particular matter is true, although he/she knows that it is false, or suppresses any information in his/her possession, or indulges in any other fraudulent act punishable under prevailing law, with the intention of deceiving the opposite party or his/her agent.

(d) A contract concluded through deceit:

Explanation

(1) Any of the following act shall be taken as deceit:

(i) Submission of false particulars on any matter without reasonable basis for doing so;

(ii) Misleading any party so as to aggrieve him/her;

(iii) Causing any wrong deliberately on the matter of contract;

(2) In a case of a voidable contract under this section, the following matters shall be dealt with as prescribed below:

(i) The party caused to enter into a contract may, instead of making the contract void, demand his/her position to be remained the same, as it was prior to conclusion of the contract.

(ii) Burden of proof of innocence of undue influence shall be rest in the party who claims that such contract is not concluded under an undue influence in case a contract is concluded with

Difference between Void and Voidable

When dealing with contracts, the terms void and voidable are widely used. A void contract is considered to be a legal contract that is invalid, even from the start of signing the contract.

On the other hand, a voidable contract is also a legal contract which is declared invalid by one of the two parties, for certain legal reasons.

While a void contract becomes invalid at the time of its creation, a voidable contract only becomes invalid if it is cancelled by one of the two parties who are engaged in the contract.

In the case of a void contract, no performance is possible, whereas it is possible in a voidable contract. While a void contract is not valid at face value, a voidable contract is valid, but can be declared invalid at any time.

A contract can become void if it involves any illegal activity, if the contract is made in such a way that it cannot be executed, or if the contract is not properly structured. An example of a void contract is a contract between a drug dealer and a buyer. This type of contract is void because it involves an illegal activity.

There are many reasons attributed to a voidable contract. It is a situation where one party of the contract may repudiate it. A contract involving minors is an example of voidable contract. Although minors can enter into contracts, these agreements cannot be enforced, as minors are at liberty to change their stand. While a void contract is nonexistent and cannot be upheld by any law, a voidable contract is an existing contract, and is binding to at least one party involved in the contract.

Summary:

1. While a void contract becomes invalid at the time of its creation, a voidable contract only becomes invalid if it is cancelled by one of the two parties who are engaged in the contract.
2. A contract can become void if the contract involves any illegal activity, if the contract is made in such a way that it cannot be executed, or if the contract is not properly structured.
3. A voidable contract is where one party in the contract may repudiate it.
4. A void contract is nonexistent and cannot be upheld by any law. On the other hand, voidable contracts are existing contracts, and are bound to at least one party involved in the contract.

Comparison between Void & voidable contract

S.N.	Subject matters	Void contract	Voidable contract

1	Starting of invalidation	At the time of creation	As one party declared invalid
2	Existence	Non existence	Bind to at least one party
3	Reason for invalidation	Contract involve illegal act	If one party repudiate contract
4	Performance of contract	Not possible	Possible
5	Time of invalidity	At face value	At any time

(III) Types of contract with respect to procurement method

A) For goods or other services – (SSC/URC/MYC/DSEC/TKC)

Goods or other services may be procured by entering into any one contract out of the following contracts:

(a) Contract for supply of specific goods or other services:

A contract for the supply of specific goods or other services may be used for the procurement of raw materials, equipment required for any specific purpose, pharmaceuticals, drugs, tools or similar other goods of specific nature.

(b) Framework or unit rate contract:

A framework or unit rate contract may be used for obtaining the goods or other services set forth in the procurement contract from one or more than one supplier at the prices and terms specified in the procurement contract as and when a demand is placed by the public entity. This contract shall specify the minimum and maximum quantity of goods or other services to be procured by the public entity. The term of this contract shall normally not exceed one year.

(c) Multi-year contract:

A multi-year contract can be entered into in the following circumstances:

(a) If procurement under a multi-year contract would result insubstantial savings to the public entity as compared to procurement under an annual contract,

(b) If the quantity of procurement remains substantially unchanged during the period of procurement contract,

(c) If the design of goods to be procured remains unchanged during the period of procurement contract, and

(d) If the technical risks associated with the supplies of goods are not excessive.

(d) Design, supply and erection contract:

A design, supply and erection contract may be used for designing of goods involving state-of-art or complex technology such as big power plants or pumping stations, delivering such goods at the construction sites, assembling thereof, testing and commissioning the same and providing training, as required, to the employees of the concerned public entity for handling such goods. Such contract may also be entered into for any two works out of design, supply and erection.

(e) Turn-key contract:

A turn-key contract may be entered into for designing, supplying, building and erecting an industrial plant involving state of art technology such as fertilizer plant and milk processing plant in accordance with the procurement contract, specifying the performance capacity of such plant, and then transferring the plant to the public entity.

Note: The contracts referred to in Clauses (a), (b), (d) and (e) may also be multi-year contracts.

B) For Construction work (URC/LSC/CRC/TMRC/DBC/MC/PBMC/PWC)

(a) Unit price contract:

An unit price contract may be entered into where the quantity of a construction work is difficult to be ascertained or where a construction work is to be procured on the basis of unit price set forth in the bill of quantity. The bidder has to include in such unit price the materials, labor and other matters required to complete the proposed construction work. In making payment for work done under this

contract, the public entity shall make such payment on the basis of the unit of work actually done and measured in the field.

(b) Lump sum contract:

A lump sum contract may be entered into for procuring a construction work such as ground water pipeline installation, the quantities of which are difficult to measure or a construction work such as superstructure of bridge, the quantities of which can be measured. Such contract shall specify that the construction entrepreneur shall be responsible for all types of risks and liabilities associated with the construction work. Provided that if the financial liabilities of the construction entrepreneur increases as a consequence of an order issued by the public entity that involves any type of change in the construction work after the commencement of work upon making the contract, the public entity shall bear such liabilities.

(c) Cost reimbursement contract:

A cost reimbursement contract may be entered into for procuring a construction work involving high risks and unpredictable conditions, when it is likely that a construction entrepreneur would refuse to, or be unable to, perform the work under a unit price contract. While making payment to the construction entrepreneur for the construction work procured under this contract, such payment may include the costs actually incurred by that entrepreneur, overheads of that work plus profits set forth in the approved cost estimate. In procuring a construction work under this contract, the chief of public entity shall establish the ceiling of maximum amount of cost reimbursement; and approval of the departmental head shall be required to make reimbursement of cost in excess of that ceiling.

(d) Time and materials rate contract:

Where the labor and materials required for the repair and maintenance of any construction work cannot be predicted at the time of entering into a procurement contract, a time and materials rate contract can be entered into for procuring work by calculating labor on the basis of time and materials on the basis of unit price. This contract shall clearly provide for payment as follows to the construction entrepreneur:

(i) Amount to be set by adding overheads and profits set for thin the approved cost estimate to the amount set by dividing the construction entrepreneur's labor on the basis of per hour or per day or per month, and

(ii) Amount paid for the materials used in the repair and maintenance subject to the ceiling set forth in the procurement contract.

(e) Design and build contract:

A design and build contract may be entered for procuring the design and build of any construction work from the same construction entrepreneur. The work set forth in this contract shall commence only after the public entity has through its technician or a group of technicians examined and approved the design of construction work. The technician or group of technician who so examines the design shall, in examining and accepting such design, drawing and cost estimate, examine and accept in accordance with the procedures to be adopted for making examination and acceptance.

(f) Management contract:

Under a management contract, the construction entrepreneur entering into procurement contract with a public entity, while undertaking full legal and contractual liabilities for time and quality of a construction work, shall execute the work through a number of sub-contractors managed and supervised by that entrepreneur. Payments for work set forth in this contract shall be made only to the construction entrepreneur entering into contract with the public entity.

(g) Performance based maintenance or management contract:

A performance based maintenance or management contract may be entered into for the procurement of any construction work by specifying only the final performance without specifying the equipment and various item-wise works required for the maintenance or management of such work.

(h) Piece work contract:

A piece work contract, which establishes a list of prices of construction work, may be entered into for procuring commonly occurring minor items of construction work to be used as and when the need arises. The validity period of this contract shall not normally exceed one year.

C) For consultancy services (LSC/TBC/PBRC/PC/IDC)

(a) Lump sum contract:

A lump sum contract may be entered into for procuring consultancy service for a clearly defined assignment, the quality of which can be readily assessed, with minimum risks to the consultant, such as feasibility studies, project design and preparation of tender documents. This contract shall provide that the consultant is to submit a report to the public entity upon performing the assignment of specified technical characteristics set forth in the terms of reference within the specified period and the entity is to pay remuneration to the consultant for the same.

(b) Time based contract:

Where it is difficult to estimate the period of consultancy service such as supervision of construction works, management of complex business institutions or design of complex structures such as dams and tunnels, a time based contract may be entered into for such service. This contract shall provide that the consultant's remuneration shall be based on:

(a) Amount to be set upon multiplying the rate of remuneration set forth in the contract by the actual time spent by the consultant in executing the assignment,

(b) Reimbursable expenses using actual expenses supported by bills, receipts.

(c) Performance based remuneration contract:

If it is required to procure consultancy service on conditions that the consultant shall be called as and when required to perform the assignment set forth in the procurement contract or remuneration is to be paid based on the assignment executed by the consultant, a performance based remuneration contract may be entered into. The remuneration of the consultant shall be as set forth in such contract.

(d) Percentage contract:

A percentage contract may be entered into for procuring goods inspection service, architect service, supervision or monitoring service or similar other service. This contract shall provide that consultant's remuneration is to be paid on the basis of the percentage of the estimated or actual cost of the concerned construction work or project or the cost of goods procured or inspected.

(e) Indefinite delivery contract:

An indefinite delivery contract may be entered into for the procurement of a consultancy service as and when required on a particular activity such as adviser required from time to time for the implementation of a construction work, adjudicator or arbitrator for the settlement of any dispute relating to the procurement contract, adviser on institutional reforms or procurement and technical problem shooter. This contract shall provide for the following matters:

(a) The contractor shall perform the assignment set forth in the contract at the rates stipulated in the procurement contract as and when the public entity so requires,

(b) Remuneration shall be paid on the basis of the time actually used by the consultant in the performance of assignment.

Types of contract : Summary

1. Mode of creation of contract

b. Expressed and implied contract

c. Direct and indirect contract
d. Formal and simple contract

2. *Performance of contract*
    a. Executed and executory contract
3. *Origin of the liability of the parties*
    a. General, quasi and contingent contract
4. *Nature of contractual liability*
    a. Unilateral and bilateral
5. *Nature of offer*
    a. Contract in particular and general
6. *Enforceability of contract*
    a. Void agreement
    b. Void contract
    c. Voidable contract
    d. Unenforceable contract
    e. Illegal contract and
    f. Lawful or valid contract

Factors to be considered in preparing contract:

1) *The contract must be fair*

Since it is usually the owner who prepares the contract, there is tendency for a contract to be biased in the owner's favor. We must be careful about this. It is important to honestly look at the motives that both parties have for entering into contract.

The owner wants to have his project constructed. &the contractor wants a profit.

Both of these are legitimate motives, and the contract drawn up between the two parties must protect both interests, the owner who takes advantage of the contractor by writing an unfair contract will pay for this advantage. He pays in several ways.

The first way will be through high tender prices. Since the contractor feels that the contract terms make it difficult or risky for him to earn a profit, he will naturally charge more money to cover his risks and difficulty.

If there is a lot of competition for a contract, so that the contractor can't submit a high bid in order to cover his increased difficulty and risks, prudent contractors will refrain from tendering at all. This leaves the ownerwith tenders from imprudent contractors these contractors will have to bid low, and resort to other methods to make their profit margin. They might resort to making excessive claims for extra payment, reducing services to the owner, or cheating.

One of the worst consequences of an unfair contract is that the contractor won't take it seriously. From the very beginning of the project, he will have no intention of working according to the contract. This kind of situation sets the scene for two possible working relationships between the contractor and the construction manager.

One in which the owner must fight with the contractor at every stage of contract in order to prevent bad practices (which often leads to default and/or litigation).

One in which the contractor tries to gain the favor of the manager so that the manager will overlook the contractor's bad practices (which often leads to corruption and bribes).

Quite clearly, neither of these cases serves the interests of the project. Fairness then, is one of the main qualities that a manageable contract must have.

2) *The contract must be clear*

The intention of the contract is to communicate precise information to people who must act on it. Construction errors are costly and difficult to correct. There is no need to use confusing legalistic

language in a contract. Contract language must be clear and precise. It does not have to impress anyone with the use of "therefore", "whereas", "herein after", or any other terms that don't serve the interests of clarity.

3) *Contract language must be consistent*
   We often see contracts that use five or more words to refer to the same thing or person. This can be quite confusing. There is no need to use: the owner, the project, the party of the first part and the client, when all of these mean the same thing. In literature, variety is important. In writing contracts the need for clarity comes first.Similarly, we must take care not to call two different things by the same name. Drawings, contracts drawing, approved drawings, plans, shop drawings, working drawings, detail drawings, design drawings etc. must be defined and used in restricted way.
4) *Do not repeat (No repetition)*
   Unless there is some special reason for doing so, there is no need to put the same requirement or term in three different places in the same contract. This can lead to difficulty later on if you need to change the term. The working rule is:SAY IT ONCE - SAY IT IN THE PROPER PLACE - LET IT BE.
5) *Use each part of the contract for its proper purpose*
   Don't put technical specification in the General Conditions. Don't put commercial terms in the Technical Specifications. This makes it difficult to find specific information when it is needed.One common error is worth special mention. Don't make notes on a drawing when the same purpose could be served by writing a requirement into the Technical Specifications. If a change has to be made in the future, it is much easier to make a change in the Technical Specifications that it is to revise every set of drawings that had been issued.
6) *Contract information must be retrievable*
   Remember that the contract is going to be used to guide and manage the construction process. It is not enough to put the right information into the contract; users have to be able to find it when they need it and they have to be able to find it quickly. Number each article, each section, each clause, each page. Provide a clear index.
7) *Use foresight:* Try to foresee any possible area of confusion and clear them up in advance.
8) *If you want it, get it in the contract(Get it what you want)*
   The contractor cannot read your mind. If the contract does not clearly state that something is to be done, do not expect the contractor guess that you want it done. The contractor is not giving things away. He is in business to make a profit. When he submits a tender, he is bidding on the work specified in the contract. It does not matter whether you think. It is obvious that a BASE COURSE must be provided, if it is not specified in the contract, it is not part of the contract. If it is not part of the contract it is not included in the contract price. If it is not included in the contract price it is an extra cost item.

Factors to be considered in preparing contract(Summary):

(Fair/Clear/Consistent/Unrpeat/Purposefuul/Retrievable/Foresight/Get it)

- The contract must be fair(Owner wants his work done in lesser amount and contractor wants profit)
- The contract must be clear(Intention of contract is to communicate precise information to people who must act on it)
- The Contract language must be consistent
- No repetition(Say it once , say it in proper place)
- Use each part of the contract for its proper purpose
- Contract information must be retrievable
- Use foresight (try to foresee any possible area of confusion and clear them up in advance)
- If you want it get it in the contract

Conditions of contract:

Whatever agreement is reached between different parties, it is followed by certain terms and references (conditions) that bind all the parties reaching the agreement. This helps for the ease and smooth functioning of work and minimizes disputes. These terms and references (conditions) are called the conditions of contract.

These maybe of two parts i) General conditions of contract and ii) Special conditions of contract.

Elements of General conditions of contract (GCC):

- Definition & interpretation
- Security deposits
- Time for completion and delays
- Mode of payment
- Alterations, additions, variations and omissions
- Execution of work and measurement of completed wok
- Defects and maintenance of defects
- Subletting
- Breach of contract
- Arbitration- settlement of disputes
- Suspension of works
- General obligations of contract
- Labor and labor welfare
- Changes in cost and legislation
- Materials and workmanship etc.

Contract documents:

- The document that describes in detail the scope of the agreement and responsibilities of the parties to it is called contract document.
- The documents that lead towards a contract are referred to as contract document.

Priority of contract documents:

- The Contract agreement
- The letter of acceptance
- The tender/bid
- Conditions of contract – General/Special
- The detail specifications
- The detailed drawing
- Priced bill of quantities(BOQ)
- Addenda (list of things) to clarify, corrects and provide additional information

Roles of contract documents:

- Define duties and responsibilities of the parties involved in the contract
- Defines payment procedures such as lump sum /unit price/cost plus etc.
- Deals with variation/changes in the work during implementation
- Guides for the procedure, pricing and payment of the altered, added & omitted work
- Value and duration of the contractual work
- Contract termination process
- Assigns risks(soil condition/weather condition/delays/changes/performance etc

Rules of contract interpretation:

- Self-explanatory
- Court interprets in case of ambiguity

- Contra proferentem- rule of contractual interpretation which provides that an ambiguous term will be construed against the party that imposed its inclusion in the contract or more accurately, against (the interest of) the party who imposed it. The interpretation will therefore favor the party that did not insist on its inclusion. The rule applies only if, and to the extent that clause was included at the unilateral insistence of one party without having been subject to negotiation by the counter-party. Additionally, the rule applies only if a court determines the term to be ambiguous, which often forms the substance of contractual dispute.It translates from the Latin literally to mean against(contra) the one bringing forth(the proferens).
- Contractual exclusion clauses

Specification

Exact statement of the particular needs to be satisfied, or essential characteristics that a customer requires (in a good, material, method, process, service, system, or work) and which a vendor must deliver.

Specifications are written usually in a manner that enables both parties (and/or an independent certifier) to measure the degree of conformance. They are, however, not the same as control limits (which allow fluctuations within a range), and conformance to them does not necessarily mean quality (which is a predictable degree of dependability and uniformity).

Specifications are divided generally into two main categories:

(1) Performance specifications: conform to known customer requirements such as keeping a room's temperature within a specified range.

(2) Technical specifications: express the level of performance of the individual units, and are subdivided into (a) individual unit specifications which state boundaries (parameters) of the unit's performance consisting of a nominal (desired or mandated) value and tolerance (allowable departure from the nominal value,

(b) acceptable quality level which states limits that are to be satisfied by most of the units, but a certain percentage of the units is allowed to exceed those limits, and

(c) distribution specifications which define an acceptable statistical distribution (in terms of mean deviation and standard Deviation) for each unit, and are used by a producer to monitor its production processes.

Chapter 5. Regulatory Environment in Nepal

Nepal Engineering Council (NEC) Act
Labour Law (Labour Act 2048)
Intellectual Property Right (Copyright Act 2022-2059/ Design Patent & Trade mark act 2052)
Building Codes & Bylaws
Company Regulation (Company Act 2055/ Private Firm Registration act 2022)
Public Procurement Act 2063 &Public Procurement Rules 2064
Arbitration act 2055 (1999)

Engineer Licensing Process (According to NEC act):

Registration of engineers is done into one of the three categories:
1. General Engineers - Category A : (Requires Bachelors Degree in Engineering)
2. Professional Engineers - Category B : (Requires Master Degree in approved Engineering field)
3. Foreign Engineers - Category C : (Non-Nepali engineers willing to work in Nepal, Bachelors Degree in Engineering and minimum 10 years of experience in engineering field.)

- An application should be submitted to Nepal Engineering Council with applicable fees along with the following documents:
1. Attested copies of Academic Certificates
2. SLC mark sheet
3. Character certificate of SLC
4. Intermediate level or 10+2 Transcript
5. Character certificate of Intermediate level or 10 +2
6. B.E. Provisional Certificate
7. B.E. Transcript
8. Character certificate of B.E.
9. Attested copy of Citizenship

Labour Law (labour Act 2074):

Labour law is concerned over the rights, interests, facilities and safety of workers and employees working in the enterprises of various sectors.

Labour- meaning & importance:

- It is the aggregate of all human physical and mental effort used in the creation of goods and services
- It is a productive activity
- Anything that shapes its form from abstract to concrete
- It acts as a means of changing external nature
- It is a fundamental element that brought out human from animal world
- Without labour, nothing is possible-no machine function, no rupees work
- Significant role played by labor can easily be seen everywhere in construction work/factories
- Engineer should be able to work with workers(labor)
- Engineer should be able to inspire workers and should get maximum output
- Engineer should understand the welfare activities that influence the efficiency of the workers

Labour Act 2074 (Obsolete 2048):

Labour act 2074 has some special provisions related with construction industry. Before this, there was no special law regarding labour in the construction industry. There was a trace of interpretation regarding workers in factory and factory workers act 2019.

Labour Act 2074 – Definition of terminology used:

- *Productive process* : It means by the following process

- The process of using the goods with the purpose of manufacturing of goods, alterations, repair and maintenance, fabrication, packaging, oiling, washing, cleaning, dismantling, breaking into pieces or use of goods, sales and distribution, transportation or disposal.
- Pumping of oil, water or sewerage
- Generating, transforming or transmitting energy
- Printing press, lithography, photography, book binding or similar other works

- *Enterprises* :
  It is defined as any factory, organization, institutions, firm or a group established under prevailing laws for the purpose of operation of industry, business or services and having minimum of 10 or more staff or workers. This also covers:
  - Tea state established for commercial purpose
  - Enterprises operating within the industrial estate established by government and have less than 10 staff or workers
- *Seasonal Enterprises* :
  The enterprises that cannot be operated or which is not feasible to operate all the season, except in a specific season. It also covers the seasonal enterprises that cannot be operated more than 180 days in a year. Some of the sugar factories are examples of seasonal enterprises.
- *Employee and workers* :
  Employees are the persons engaged in administrative functions of the enterprises.
  Workers are the persons employed on the basis of salary or wages to work in any building, premises, machinery or any part of production process or providing service or any act relating to such works. This also includes the workers working at piece rate, contract or agreement.
- *Minor, Adult* :
  - Minor is the person having age between 16and 18 years
  - Major is the person having the age of 18 years and above.
- *Proprietor* :
  Proprietor is the person having final authority on the activities of the enterprise. This also includes any person appointed as the chief of any part or unit of enterprises with power to exercise final responsibility or authority in respect thereof.
- *Remuneration* :
  Means the salary or wage to be received in cash or kind from the enterprise by the worker or employee for the works performed in the enterprise and this waord shall also include any amount to be received in cash or kind for the works done under piece rate or contract.

<u>Labour Act 2074 – Some important provisions:</u>

- ***Employment***
- *Types of employment*
- ***Regular Employment,***
- ***Work Based Employment****: for completion of certain work or rendering certain service,*
- ***Time Bound Employment****: employment for certain time period determined,*
- ***Casual Employment****: employment for seven or less days in a month,*
- ***Part time Employment****: employment for 35 or less hours in a week.*
- *Prohibition on employment without employment contract*
- *Formation of employment relationship*
- ***Probation period***
- ***Trainee & Apprentices***
- *Trainees may be hired*

- *Applicability of labour provision*
- *May be employed as apprentices*
- ***Part time Workers***
- ***Work Permits***
- *Restriction on employment of foreign nationals*
- *Requirement of work permits for foreign nationals to work in Nepal*
- *Works permit may be issued*
- *Language of the agreement*
- *Repatriation of remuneration in convertible foreign currency*
- *Remuneration, employment conditions and benefits and other provisions for foreign workers*
- *Working Hours*
    - Working hours
        - Maximum 8 hours a day or 48 hours a week has been fixed as working hour. Workers are to be provided one-day leave in a week.
    - Computation of beginning of working hour
        - The time for starting work shall be as prescribed by the proprietor
    - Interval for refreshment and rest
        - No workers shall be kept working continuously for more than 5 hours. Workers shall be provided with 30 minutes break (interval) for tiffin and rest. This break is also counted in regular working hour. In any enterprise, where works have to be carried out continuously without interruption, such breaks shall be provided on rotation basis
    - Extra wage for overtime works
        - Workers or employee (staff) shall be provided extra remuneration for the overtime work working more than 8 hours a day or 48 hours a week
        - Workers shall be paid one and half of the ordinary wage for the overtime work. However, no workers or staff shall be forced to work overtime.
        - In general, no workers or staff shall be allowed to work overtime for more than 4 hours a day or 24 hours in a week
    - Attendance register to be kept
        - Each enterprise shall keep attendance register of its workers and employees.
- *Remuneration*
    - Minimum remuneration fixing committee
    - Payment of remuneration
    - Period of remuneration
    - Prohibition on deduction of salary
    - Petition against undue deduction or delay in payment
    - Provision of appeal
- **Leave**
- Weekly holiday
- Public holiday
- Substitute leave
- Home leave
- Sick leave
- Maternity leave/mourn leave/accumulative leave

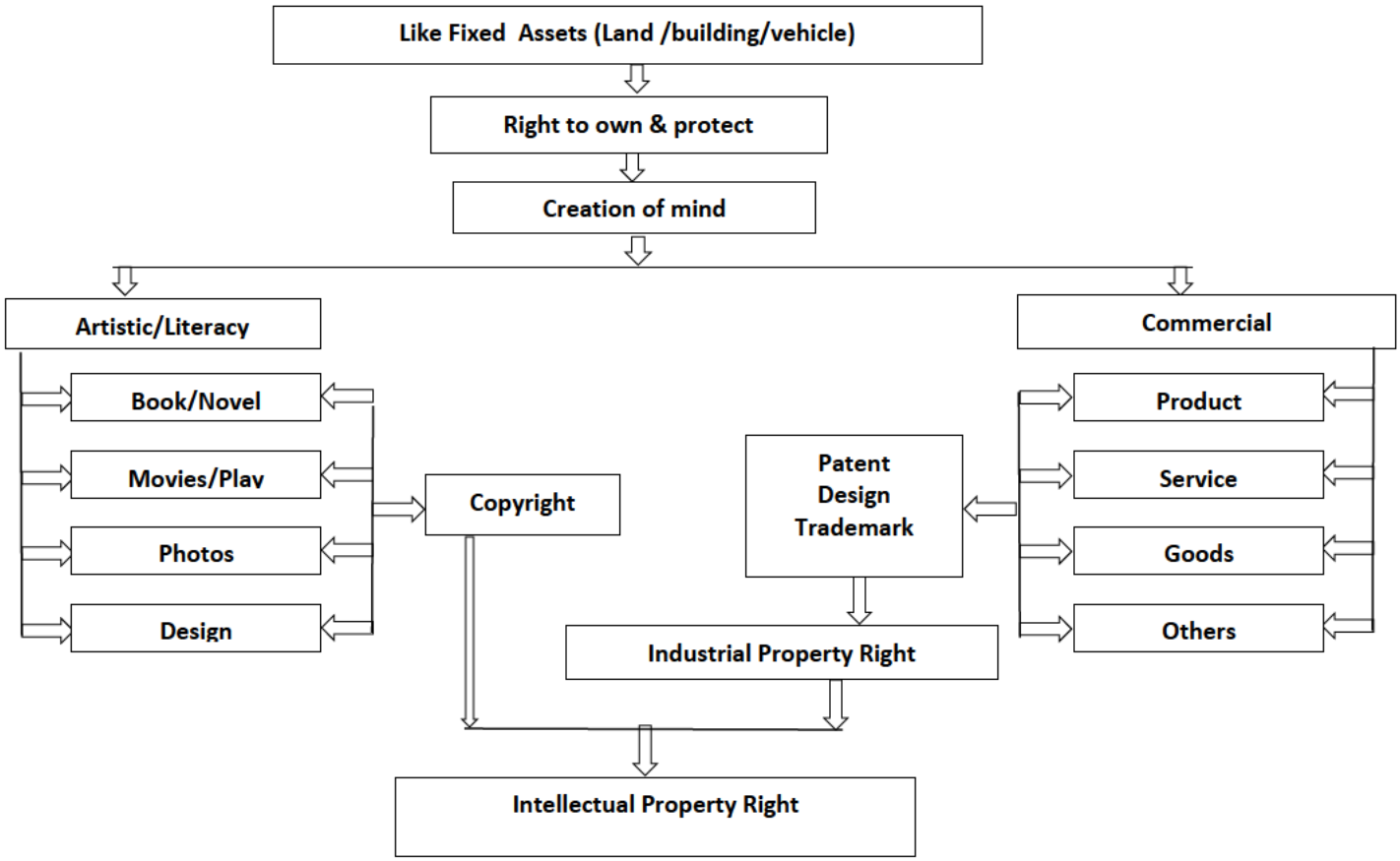
Provident fund, gratuity and Insurance

- Contribution for provident fund
- Right to receive gratuity
- Provision of medical insurance
- Provision of accidental insurance

- *Health and safety*
  - Provisions relating to health and safety: Manager of an enterprise is responsible
    - In keeping clean the working place
    - In managing sufficient air. Light and temperature
    - In managing waste disposal
    - For cleaning all the foul dust, air, vapour any other foul substances that may cause hazard to health
    - For making necessary arrangement to prevent loud noise from any source
    - A worker shall be provided 15cu.m. space. In calculating this volume, only 4m height measured from floor level is considered
    - For arranging potable water
    - For arranging toilets separate for ladies and gents
    - Considering the nature of the work, the working area shall be made non-smoking area
    - Arranging for medical checkup for staffs and workers at least once in a year in the enterprises having probability of health hazards
  - Protection of eyes
  - Protection from chemicals
  - Provision for safety against fire
  - Hazardous machines to be fenced
  - In relation to lifting of heavy weight
  - Pressure plants orders to provide for safety
  - Provision of notice
  - Authority to determine the standards
- *Provision of welfare*
  - Welfare fund
  - Compensation
  - Gratuity, provident fund and medical service
  - Leave
  - Provision of quarters
  - Provision of children
  - Rest (relaxing) room
  - Canteen/Cafeteria
- *Special provisions to be applicable to special type of enterprise*
  - Tea state
  - Construction business
    - Provision for construction tools
    - Special arrangement at temporary construction sites
    - Accident insurance
    - Safety arrangements
  - Transportation business
  - Tourism related business

- *Conduct and punishment*
- *Committee, officers and other provisions*
- *Settlement of labour disputes*
- *Miscellaneous*

Intellectual Property Rights



Intellectual property is a right you have on your creations, like a film, a musical composition, an invention, a brand name, etc. Like any other real property, you have the right to own and protect the creations of your mind. Such a right is called intellectual property. If you have an intellectual property (IP) over any of your work or ideas, others need to take your permission before using it. Otherwise you can initiate legal action against such persons.

Intellectual property refers to the right over the intellectual work and not the work itself. The work can be either artistic or commercial. The artistic works come under the category of copyright laws, while the commercial ones, also known as industrial properties, are ruled by patents, trademarks and industrial design rights. Copyright laws deal with the intellectual property of creative works like books, music, software, painting, etc. Industrial properties cover those created and used for industrial or commercial purposes. As stated earlier, intellectual property is categorized into various types as per the nature of work. The most common types of intellectual property are copyrights,trademarks,patentsandindustrialdesignrights.

Copyrights

A copyright is a right conferred on the owner of a literary or artistic work. It is an exclusive right to control the publication, distribution and adaptation of creative works. The right lies with the owner-cum-copyright holder for a certain period of time. As time lapses, the work can be republished or reproduced by others. Usually, the timespan of a copyright extends through the entire life of the owner and lasts up to a period

of about 50 to100 years after death. In case of anonymous works, the right lasts for 95 years after publication or 120 years after the creation.

Trademarks

A trademark is a symbol, which is generally used to identify a particular product, which indicates its source. A trademark can be a combination of words, phrases, symbols, logos, designs, images or devices, used by an individual, legal entity or business organization to distinguish their products from that of others. For example, you can identify the products of Nike Inc., through their logo, which is embossed on their products. Once registered, trademarks are protected legally and the owners can sue persons who use their trademarks.

Patents

Patents are rights related to new inventions. This right is conferred on persons who invent any new machine, process, article of manufacture or composition of matter, biological discoveries, etc. In order to grant a patent, the invention should fit into the following criteria, which may differ from country to country. In general, the invention must be new, inventive and should be useful or can be applied in industries. The person who receives a patent for his invention has an exclusive right to control others from making, using, selling, or distributing the patented invention without permission. Generally, the time limit of a patent is 20 years from the date of filing the application (for the patent)

Industrial Design

These rights also come under intellectual property and protect the visual design of objects that are not purely utilitarian, but have an aesthetic or ornamental value. It can refer to the creation of a shape, color, pattern or a combination of all these things. It can be an industrial commodity or a handicraft. The design can be either two-dimensional (based on pattern, colors and lines) or three-dimensional (as per shape and surface). An industrial design right is conferred after considering factors like, novelty, originality and visual appeal. The person who has an industrial design right has the exclusive right to make or sell any objects in which the design is applicable. The right is conferred for a period of 10 to 25 years.

Copyright: (Copy right act 2022 has been repealed and Copyright act 2059 prevail)

Copyright generally means the sole right to produce or reproduce the work or any substantial part thereof in any material form whatever. Subject to provision of copyright act, copyright exist in every original literary, dramatic, musical and artistic work.

The basic principle of copyright is that a person or a group of people has the sole right of physical and intellectual ownership to any work that is in it a “unique work of art” created by the person or a group of people.

The concept of copyright can be broken down into three basic areas.

- *Attribution (Credited) and integrity (Unchanged)*: The author of the work has the right to have his name attributed to the work when it is published, quoted or otherwise displayed. The integrity of the work shall be maintained unchanged unless the author gives explicit permission.
- *Ownership, reproduction and distribution*: For technical and economic reasons it has been customary for authors to share the rights of commercial exploitation or their work with publishers either by employment or contract.
- *Display and performance*: Rights associated with unique creativity in performance interpretation and display.

Having created a unique work, two elementary aspects of responsibility follow specially in situations where conflicting claims need to be resolved.

- *Income and compensation*: There are numerous examples of vast sums being awarded in compensation for lost income because a work has been illegally copied and distributed.

- *Legal liability*: Claims for offensive creation such as defamation of character, personal injury, lost income and infringement of copyright etc. It is quite normal for many professions such as law, medicine, engineering and the journalistic media to retain insurance policies in case of claims against professional negligence.

Ownership of copyright and his rights :

- *Acquisition of ownership of copyright*: Any person registering any of his work shall have the copyright in accordance with the provision of copyright act. The right to have the copyright of any work registered shall vest only in the author of the work except few conditions.
- *Transfer of copyright*: The person having the right to register the copyright may transfer with or without any conditions, his right, wholly or partially, to another person.
- *Notice to be given of the transfer of copyright*

Registration of copyright and his rights :

Any person who desires to register any work shall apply to the office of the registrar giving such particulars as have been prescribed together with evidence of his ownership in such copyright; such application shall accompany the prescribed registration fee.

Term of copyright

The copyright in any work subsists during the lifetime of the author and shall continue for fifty years after his death.

Provision regarding license of copyright:

- *Grant of license of copyright holder*: Incase any owner of the copyright grants license to publish whole or part of such work, the licensee shall be entitled to publish suck work in accordance with the conditions of the license only.
- *Grant of license by registrar*: Incase any work, which has once been published for the public, is required in the interest of public to be published again, and the owner of the copyright fails to publish and also refuse to grant permission to any other person for such publication, the registrar may grant license to any other person.
- *License for translation*: Publication of translation of work rendered into Nepali may grant such license provided that such license shall not be deemed to bestow sole ownership on the translator.
- *License of public exhibition*: Registrar may grant general or special license for public exhibition after specifying the necessary conditions.
- *License of public library*: Registrar may, for the purpose of keeping such copy in the library, grant license for the reproduction of whole or any specified portion of the work.

Unauthorized publication and punishment:

- Any publication which has been made without the license of the owner or without license from the registrar, for monetary gain shall be deemed to be an authorized publication.
  Provided that any publication made in the following circumstances shall not be deemed to be an unauthorized publication.
- Fair and necessary publication of any work in connection with private study, research, criticism, review and any act in connection with news and magazines, radio diffusion and court proceedings; or
- Any publication of an expert from an unpublished work made with bona fide intention of using it for an academic institutions and which clearly indicates in its title the purpose of using it for an academic institutions and the description of author
- No person shall sell or distribute or give on hire or arrange any show or keep it in possession for any other similar purpose or publicize or broadcast it in any manner knowing fully well or having sufficient reason to believe that any publication is unauthorized publication.

Any importation of a single copy made for personal use shall not be deemed to be contravention of this section.

Punishment :

In cases where any person infringes protected right, such person shall be punished with a fine of a sum from ten thousand to one hundred thousand rupees or imprisonment for a term not exceeding six months or both and with a fine of a sum from twenty thousand to two hundred thousand rupees or imprisonment for a term not exceeding one year or with both for each instance from the second time.

Compensation for the loss caused to the copyright owner by the infringer of the protected right shall also be realized and provided to the copyright owner.

Industrial property right (Patent, Trademark, Design)

Rights that relate generally to patents, trademarks, copyrights and industrial design are sometimes called industrial property rights. The Patent, Design and Trademark Act 2022 govern these rights.

Patent:

- It is an important invention of any theory, principle or formula
- An invention regarding to technology or process on the structure of matter or group of matters
- An invention of new way of operation and dissemination.

Right over the Patent (Acquisition of patent right):

- Any person, willing to have rights on any patent, has to register such patent under the Patent, Design and Trademark Act .
- Any patent registered in the name of any person shall not be copied, used or utilized without the patentee's written consent.
- Ownership of a patent can be transferred in any way to any person as movable property
- If anybody does or attempt to do so or encourage to do any work against these rights of patentee may be punished with a fine by the order of concerned department and all the materials related with such offence shall be confiscated.

Application for acquiring patent right:

Person willing to acquire patent right in his own name shall have to apply to the concerned department with following information including all other evidence.

- Name, address and profession of inventor
- In the case of invention not invented by the applicant himself, the conditions acquiring such right from inventor by the applicant.
- Method of operation or utilization of such invention
- Principle or formula, if such patent is based on any principle or formula
- Drawings and sketch o invention (if necessary)
- Prescribed application fee as mentioned in schedule.

Un-patentable invention:

- If it has already been registered in the name of other
- If the patent asked to be registered is not invented by the applicant himself and he has not acquired the right from the inventor
- If the patent asked to be registered is found to cause adverse effect in health, conduct or morale or people in general or in the national interest
- If it violates any prevailing laws of Nepal

Examination of patent application:

- Concerned department upon submission of an patent application examine the invention whether it is new or not, it is useful to the people in general or not

- If it deems necessary, concerned authority takes the advice of experts of related field
- Basically concerned department will follow the principle of novelty, industrial applicability and inventive step to examine

Certificates of registration:

- If concerned authority found the patent application is patentable after examination, provides certificate to the applicant
- Applicant shall pay a registration fee as prescribed in price schedule

Publication of registered patent:

- Concerned authority shall publish all patents, except those to be kept secret o national interest in journal (media)
- Anybody willing to see or take a copy of the statement, drawing or sketch of a patent published in journal may see or take a copy of such patent document on payment of a fee as prescribed in schedule

Opposition:

- If anybody has any complain upon any patent, he may lodge such complains to the concerned department within thirty-five days from the date on which the patent is seen or a copy of such patent document is taken
- Upon receipt of the complain, concerned authority take necessary action through an investigation

Term and renewal:

- Patentee shall have his right on the patent for a period of seven years from the date of registration
- The patentee shall renew the patent within the 35 days from date of expiry having paid the fee mentioned in schedule
- Renewal of patent may be made for two times of seven years

Design:Any design, form or shape of materials made through the preparation by any method

Right on Design (Acquisition of design right):

- Anybody may have a right on design of any goods under the act, which is made or caused to be made by him, and has been registered in concerned authority
- Ownership of a design can be transferred
- Nobody shall make any goods by using other's design or in a way to manipulate the people in general and copying such design without written consent of the person in whose name, design is registered.

Application for acquiring design right:

- Person willing to get registered a design of any goods made or caused to be made by him shall apply to the concerned department along with description, drawings and sketch of design and four copies of its model
- Applicant shall submit prescribed application fee

Un-registrable design:

- If it is deemed to make adverse affect in the dignity of any individual or institution or
- If it makes bad affect in the well being and morale of the people in general or in the national interest or
- If such design has already been registered to the name of other person
- Concerned authority also looks whether the design to be registered is new and original

Registration of design:

- The concerned department after examination of any application shall register the design in the name of applicant
- The applicant shall pay prescribe registration fee to the concerned department to obtain the certificate of registration

Term and renewal of design:

- The design holder shall have his right on the design for a period of five years from the date of its registration
- The design holder shall renew the registration of the design within 35 days from the date of expiry

Penalty to the violator:

- If anybody violates the rights of registered design holder may be punished with a fine by the order of the concerned department and all the goods related with such offence shall be confiscated

Trademark:

- It is any word, symbol or picture or the combination of the three used for showing difference from goods or service of others to the goods produced by any firm, company or individual or the service provided by it.

Right on trademark(Acquisition of trademark):

- Anybody may have a right on any trademark of his trade or business under the act having it registered in the concerned department
- Nobody shall use or copy any trademark in a way of manipulating the people in general without written consent of person in whose name the trademark is registered
- Ownership of a trademark can be transferred to other with a permission of the department

Application for registration of trademark:

Person willing to get registered any trademark of his trade or business under the act shall apply to the department in a prescribe format along with:

- Copy of registration or license of the business for product or service in which trademark is used or intend to use
- Four copies of model of trademark
- Authorization letter if somebody has been authorized to act on behalf of the owner to register the trademark
- If the applicant is foreigner, certified copy of any foreign registration certificate and address for service In Nepal must be submitted with application
- Receipt of payment of prescribe application fee
- Separate application shall be submitted for the registration of trademarks of different categories goods or services

Condition for refusal to register the trademark:

- If such trademark is deemed to make adverse effect in the dignity of any individual or institution
- If such trademark makes bad affect in the well being and morale of the people in general or in the national interest
- If such trademark effects in the goodwill of trademark of any other person or
- If such trademark has been already been registered in the name of the other person
- The trademark, which is contrary to the principle, norms and international conventions of industrial property

Classification of goods and services:

- Nepal Government, for the purpose of registration of trademark relating to any gods and any types of services may classify such goods and services
- International classification of goods and services for the purpose of the registration of marks (Nice classification) is applied to this effect

Registration of trademark:

- After examination if it is found registrable, the concerned department register the trademark in the name of applicant and issue a certificate
- The applicant shall pay a registration fee of the trademark as prescribed in the schedule

Publication of registered trademark:

- Concerned authority may publish the registered design and trademark and a statement in regard to their renewal and cancellation of registration for the information of the people in general

Opposition and complain:

- Any person if he has any complain on the statement publish by the department concerning the design and trademark may lodge a complaint to the concerned department within thirty-five days of such publication
- Upon receipt of the complain, concerned authority shall take necessary action through an investigation

Term and renewal:

- The registered trademark holder shall have his right on the trademark for a period of seven years from the date of registration
- The registered trademark holder shall renew the trademark within the 35 days from date of expiry

Cancellation of Trademark:

- The concerned authority may cancel the registration of trademark in case of that there is condition of refusal to register
- The authority may cancel the registration of trademark incase if it is not put into use within one year from the date of registration

Penalty and compensation:

- If anybody violates the rights of registered trademark owner and use of the trademark which is cancelled by the concerned department, he may be punished with a fine by the order of the concerned department and all the goods related with such offence shall be confiscated

In relation to the patent, design and trademark registered under the act, the authority may cause to pay a reasonable amount of the loss, incurred through the violation of the act by anybody, to the person who had really been suffered from such loss and whose name the patent, design and trademark was registered, from the person of such violation, as a compensation

Comparison Chart between copyright, patent, design and trademark

S. N.	Particulars	Copyright	Patent	Design	Trademark
1	Subject matter/coverage	Rights relate to work of authorship/literary work /artistic work- music, book,movie/painting/photos	Rights relate to new inventions/theory/principles/process/formula	Rights relate to shape , pattern , color of commodities, product	Rights related to word, symbol, picture, figure or combination of all these to recognize goods .products
2	Terms	a) lifetime+50 years b)50 years from death of last surviving author c) for anonymous or pseudonym work – 50 yrs form first date of publication d)for applied art & photograph- 25 yrs from years form preparation of such work e) 50 yrs for work published after death of author	7 years and two time renewable (21 years)	5 years and two time renewable (15 years)	7 years and indefinite period as long as timely renewed
3	Infringement	Person other than owner comes up with same work there is no infringement	Confers statutory monopoly that prevents anyone other than patent holder from making, using or selling	Confers statutory monopoly that prevents anyone other than patent holder from making, using or selling	Confers statutory monopoly that prevents anyone other than patent holder from making, using or selling

4	Punishment on infringement	a) 10,000 to 100,000 or 6 months imprisonment or both b) 20,000 to 200,000 or one year imprisonment or both	250,000 to 500,000	Not more than 50,000	Not more than 100,000
5	Start of protection	As soon as work created	Until the patent is issued	As soon as design was created and registered	As soon as trademark was created and registered
6	Requirement of protection	Original	Novel/non obvious/useful	New and different	New and different
7	Fee for application, regn & renew	low	2000,10000,(5000,7500)	1000,7000, (1000,2000)	1000,5000
8	Governing act	Copyright act 2059	Patent, design and trademark act 2022	Patent, design and trademark act 2022	Patent, design and trademark act 2022

Building Act, codes and bylaws

Regulating building construction activities was essential for the purpose of keeping building safe from earthquake, fire and other natural calamities. For fulfilling this purpose **Building act 2055(1998)** was promulgated (circulated) and meantime **Building rules 2062(2005)** was also come into operation. With reference to building rules, building are to be constructed following **National Building Code 2060.**Building codes are classified as follows:

List of codes in NBC

Code Number	**Code Title**
NBC 000: 1994	Requirements for State-of-the-Art Design: An Introduction
NBC 101: 1994	Materials Specifications
NBC 102: 1994	Unit Weight of Materials
NBC 103: 1994	Occupancy Load
NBC 104: 1994	Wind Load
NBC 105: 1994	Seismic Design of Buildings in Nepal
NBC 106: 1994	Snow Load
NBC 107: 1994	Provisional Recommendation on Fire Safety
NBC 108: 1994	Site Consideration for Seismic Hazards
NBC 109: 1994	Masonry: Unreinforced
NBC 110: 1994	Plain and Reinforced Concrete
NBC 111: 1994	Steel
NBC 112: 1994	Timber
NBC 113: 1994	Aluminium
NBC 114: 1994	Construction Safety
NBC 201: 1994	Mandatory Rules of Thumb: Reinforced Concrete Buildings WithMasonry Infill
NBC 202: 1994	Mandatory Rules of Thumb: Load Bearing Masonry
NBC 203: 1994	Guidelines for Earthquake Resistant Building Construction: Low StrengthMasonry
NBC 204: 1994	Guidelines for Earthquake Resistant Building Construction: EarthenBuilding (EB)
NBC 205: 1994	Mandatory Rules of Thumb: Reinforced Concrete Buildings WithoutMasonry Infill
NBC 206: 2003	Architectural Design Requirements
NBC 207: 2003	Electrical Design Requirements for (Public Buildings)
NBC 208: 2003	Sanitary and Plumbing Design Requirements

Classification of NBC according to their use

SN	Type of Building Code	Purpose
1	International State-of-Art Applicable codes: NBC 000 international	Applicable to large building structures. The structures must comply with existing state-of-the-art building codes
2	Professionally Engineered Buildings Applicable codes:NBC 101 NBC 107 NBC 113 NBC 102 NBC 108 NBC 114 NBC 103 NBC 109 NBC 206 NBC 104 NBC 110 NBC 207 NBC 105 NBC 111 NBC 208 NBC 106 NBC 112	Building designed and constructed under supervision of engineers, buildings with plinth area more than 1000 sq. ft., buildings having more than 3 stories, buildings with span more than 4.5 m with irregular shapes
3	Mandatory Rules of Thumb Applicable codes: NBC 201, NBC202, NBC 205	Buildings of plinth area less than 1,000 sq.ft, Building having stories less than 3, building having span less than 4.5m and regular shape less and constructed by technicians in the areas where professional engineer's service is not available
4	Guidelines of Remote Rural Buildings (Low Strength Masonry/ Earthen Buildings)	Buildings constructed by local masons in remote areas and not more than 2 stories

NBC 000 categorizes design and construction of buildings into four types according to their level of sophistication. (Classification of building codes)

a) International state of art

The major thrust of the code is aimed at the typical and most common buildings currentlybeing constructed in Nepal. It does not suggest as being practical for everyday considerationthe sophisticated design philosophies and analytical techniques that appear in the buildingcodes of developed countries. Under the first category **International State-of-the-Art**, ifconsultants ensure that their designs meet the corresponding international standard, thedesigns are considered to be in conformity with NBC.

b) Professionally engineered building

It covers all usual structures such as hospitals,meetings halls, factories, warehouses, multi-storey buildings and residential buildings.Building having plinth area more than 1000 S.ft., more than 3 storied and structural span of more than 4.5 m which will be constructed under design and supervision of engineer fall in this category.

c) Buildings of restricted size designed with simpleRules-of-Thumb - Mandatory rules of thumb (MRT)

It refers to Buildings of restricted size designed with simple Rules-of-Thumb, and mostly applies to remote areas where simpler buildings are prominent.The explanatory documents are such that an experienced overseer will be able to understandthem and present sufficient details at the time of permit application to prove to a skilledappraiser at the Local Authority that the requirements have been met.

The requirements are interms of limits on spans and heights, minimum reinforcing and member sizes, positioning ofearthquake-resisting elements and other such rules.

Simple buildings that are constructed, where professional engineers and technicians are not available, under supervision of middle level technicians of which plinth area is less than 1000 Sq. ft. , less than 3 storied and structural span less than 4.5 m fall in this category. NBC 201,202 and 205 are applicable for buildings under this category and the codes deals with Mandatory Rules of thumb (MRT) reinforced concrete building with masonry infill, mandatory rules of thumb load bearing masonry and MRT reinforced concrete building without masonry infill respectively.

d) Guidelines for remote rural building

These guidelines addressabout a dozen typical building styles that have been condensed from an inventory ofapproximately fifty-five building types surveyed in 1993. In the form of diagrams anddescriptions aimed at technical advisors, house owners and lay-men, these guidelinesemphasize those changes that should be made to current practices to improve the seismicresistance of these buildings not subject to modern quantitative analysis and rational designconsideration. These structures are normally of earthen construction (e.g. unburned masonry,mud-mortar, rubble, dry stone, wattle and daub). Whereas these recommendations aredescribed as guidelines, it is intended to be mandatory for such structures built in areascontrolled by a building permit-issuing local authority.

Simple buildings having less than two storied that are constructed in remote rural areas, where control is impractical because of non-availability of regular technical supervision fall under this category and implemented NBC codes are as mentioned below:

NBC 203 : Guidelines for earthquake resistance building construction: Low strength masonry

NBC 204 : Guidelines for earthquake resistance building construction: Earthen building

Building act has directed to comply with the building codes while constructing a building by any persons, institutions or public entities. Similarly, it is also mandatory to have building permission from concerned valley Development Corporation, urban development office, metropolitan or sub metropolitan city, municipal office.

Building bylaws

It is the set of guidelines regarding the design of buildings, orderly and systematic planning of the area and ensure safety standards. These are prepared by concerned town development committees and are followed by the municipalities of the country. Building bylaws are prepared to ensure public health and safety, planned urban development and planned built environment. With rapid growing urbanization and increase in population, it

becomes an important tool & mechanism for the controlling of growth and development of the cities. Building codes & bylaws provide the regulations and standards that architects, builders and owners must meet while designing , constructing or remodeling buildings. It specify the minimum acceptable level of safety for constructed objects such as buildings and non- building structures.

Objectives of bylaws

- To design & construct the building as per climatology, topography, acoustic & thermal aspect
- To develop necessary physical infrastructure
- To use new land for future expansion
- To maintain & show civilization
- To create comfort living standards
- To conserve & develop socio economic, cultural, architectural & historical values

Basic components of building bylaws

a) Building b) Planning c) Enforcement

Elements of the building bylaws in Building segment

- Right of Way(ROW)
  A **right-of-way** is a right to make a way over a piece of land, usually to and from another piece of land. A right of way is a type of easement granted or reserved over the land for transportation purposes, such as for a footway, carriageway, trail, driveway, rail line or highway. A right-of-way is reserved for the purposes of maintenance or expansion of existing services with the right-of-way. In the case of an easement, it may revert to its original owners if the facility is abandoned.
- Set Back
  In land use, a **setback** is the distance which a building or other structure is set back from a street or road, a river or other stream, a shore or flood plain, or any other place which is deemed to need protection. Depending on the jurisdiction, other things like fences, landscaping, septic tanks, and various potential hazards or nuisances might be regulated. Setbacks are generally set in municipalordinances or zoning.
- Floor Area Ratio(FAR)
  Floor area ratio (**FAR**), **floor space ratio** (**FSR**), **floor space index** (**FSI**), **site ratio** and **plot ratio** are all terms for the ratio of a building's total floor area to the size of the piece of land upon which it is built. The terms can also refer to limits imposed on such a ratio.
  As a formula: **Floor area ratio = (total covered area on all floors of all buildings on a certain plot)/(area of the plot)**
- Ground Coverage Ratio(GCR)
- Height of the building
- Guidelines for cultural heritage zone
- Clearance required for important sites and from other elements

Elements of Building bylaws in Planning segment

- Land use
- Size of the plot
- Area and its depth and width ratio
- Length of cul-de-sac (impasse/dead end)
- Area of open space
- Public facility requirement

Elements of Building bylaws in Enforcement process segment

- Designing of building stages
- Construction stage
- Issuance of completion certificate
- Use of constructed facility

Business Law:

Business : It is the human activities that are related with production of goods and services or sales and purchase of goods and services or exchange of goods and services with profit making objectives.

Law : It is the norms that are drafted and enforces by a state or local government in order to regulate the activities within the state or locality. All the laws that regulate the business are known as business law. Ignorance of law will not be excused.

Sources of business law in Nepal:

- English business law
  - common law of England
  - Law of merchants
  - Principal of equity

    - Statute of legislature
    - Custom and usage
- Nepalese statutory act
- Judicial decisions
- Writing and opinions of scholars &Commercial treaties and agreements

Types of business enterprises:

- Sole business concern
- Partnership business organization
- Company : a) Private b) Public

Sole business:In this type of business organization, single person establishes, manages, organizes and control the whole business and also singly liable towards the profit and loss of the business. It is registered under private registration act 2014.

Characteristics of sole business:

- Sole ownership
- Sole management and control
- Unlimited liability
- Limited areas of operation
- Less legal formalities
- Voluntary origin and end

Limitations of sole business:

- Unlimited liability
- Limited capital
- Uncertain future
- Absence of legal status
- Chances of impractical decisions
- Lack of specialization
- Loss in absence of a key person

Partnership business organization: In this type of business organization, more than one people join their hands to earn profit by investing collectively. This type of business organization is registered under partnership Act 2020.

Characteristics of partnership business:

- Joint ownership
- Unlimited liability
- Sharing of profit and loss
- Established on the basis of agreement between persons
- Members do not have separate existence
- Joint management and control
- Joint agent slip
- Partnership right cannot be transferred.

Limitation of partnership business:

- Unlimited liability
- Uncertain existence
- Possibility of misunderstanding and friction between the partners
- Limited capital
- Difficulty in transferring ownership
- Lack of prompt decision

- Lack of public faith

Company business organization: In this type of business organization, company is established under the Act of the country and has limited liability. Finance is collected through issuance of shares. Company is considered as an artificial legal person. Act 2053 regulates the incorporation of a company in Nepal. Company can be further divided into two as private limited company and public limited company. As per company Act 2053, private limited company has less than 50 shareholders and public limited company shall have minimum 7 shareholders and no upper limit.

Characteristics of company business organization:

- Legal artificial person
- Perpetual existence
- Limited liability
- Common seal
- Voluntary associations of persons
- Capital collected by issuing shares
- Transferability of shares
- Management by representatives/effective management
- Publication of financial statement
- Unlimited capital
- Public faith
- Unlimited business capability

Limitation of company business organization:

- Difficulty in formation
- Lack of personal interest
- Lack of secrecy
- Possibility of fraud
- Exploitation of shareholders
- Group formation for power
- Conflict of interest
- Absence of prompt decision
- Lack of closeness

Comparison between Private company & Public company

S.N.	Subject matters	Private company	Public company
1	No. of Shareholders	Minimum 1 Maximum 50	Minimum 7 Maximum no limit
2	Company naming pattern	Pvt. Ltd.	Limited
3	No. of directors	1	Minimum 3 & maximum 11 directors
4	Article of association	can use schedule I of company act	Must have own
5	Offer of subscription of share / debenture	Do not offer to subscribe	Offer subscription to public to sell its shares & debentures
6	Transfer of share	Cannot transfer	Transfer easily
7	Legal formalities	Less	More
8	Publication of financial statement of trimester of each fiscal year	Not required	Must publish
9	Commencement of business	After getting certificate of incorporation	After getting the certificate of commencement of business
10	Financial strength	Financially less strong	Financially strong

Cyber Law:

Cyber law provides the legal framework related to the use of computer, information and communication and the governing technology. Therefore, it regulates the computer based activities including business (e-commerce) and the government (e-government). Nepal has enacted the electronic transactions act 2063 (ETA 2063), which comes into effective from December 8, 2006 and electronic transactions rules 2064(ETR 2064) also came into force in 2007.

Important terminology defined in ETA 2063

a) **Asymmetric Crypto System** – It is a system that creates a securedkey-pair consisting of a private key creating a digital signature and apublic key to verify the digital signature.

(b) **License-** It is alicense obtained pursuant to Sub-section (3) ofSection 18.

(c) **Originator** – It is a person who generates, stores or transmitselectronic records, and this term also includes a person who causes anyother person to carry out such functions:Provided that it shall not include an intermediary.

(d) **Computer**- An electro-magnetic, optical or other high-speed dataprocessing device or system, which performs logical, arithmetic andmemory functions by manipulating electro-magnetic or optical impulses,and also includes all acts of input, output, processing, storage andcomputer software or communication facilities which are connected orrelated to the computer in any computer system or computer network.

(e) **Computer Database** - An information, knowledge and concept orpresentation of instructions, which are being prepared or have alreadybeen prepared in word, image, voice or audio visual form in aformalized manner or which have been produced by a computer,computer system or computer network, with a view to use in acomputer, computer system or computer network.

(f) **Computer Network**- An interrelationship between two or morethan two computers having interconnection with each other or in contactof communication.

(g) **Computer System** - A device or a group of devices, containing allcomputer programmes including input and output support devices,electronic instructions, input and output data that performs logical,arithmetic, data storage and retrieval, communication includingcontrolling functions.

(h) **Computer Resource** - A computer, computer system, computernetwork, data, computer database or software.

(i) **Subscriber** - A person who has obtained a certificate under Subsection(3) of Section 31.

(j) **Key Pair** - A private key in an asymmetric crypto system and ofpair of public key, interconnected in a mathematics form with theprivate key which has a code to verify digital signature by the public keyto be created from the private key.

(k) **Data** - The presentation of information, knowledge, fact andconcept or instructions in any form, which are kept in a formalizedmanner in a computer system or computer network and is intended forprocessing the same, or processed or stored in a computer memory.

(l) **Tribunal** - The Information Technology Tribunal formed pursuantto section 60.

(m) **Private Key** - A key of any key pair used to create a digitalsignature.

(n) **Controller** - The Controller appointed or designated pursuant tosection 13.

(o) **Digital Signature** - A signature made in any electronic form to beincluded in the transformation of electronic record by a person having anon- transformed initial electronic record and the public key of signatoryby using a type of asymmetric crypto system that may clearly ascertainthe following matters:

(1) Whether or not transformation of electronic record wascreated by using a type of private key keeping a logical consistency withthe public key of signatory; and

(2) Whether or not the initial electronic record has beenchanged after the transformation of electronic record.

(p) **Access** - An opportunity of gaining entry into, logical,arithmetical or resources of memory function of any computer,computer system or computer network, giving instructions to suchresources or making communication contact with such resources.

(q) **Appellate Tribunal** - The Information Technology AppellateTribunal formed pursuant to section 66.

(r) **Certificate** - A Digital Signature Certificate issued by theCertifying Authority under Section 30.

(s) **Certification Practice Statement** - Any statement issued by aCertifying Authority to specify the practices to be applied by theCertifying Authority while issuing a Digital Signature Certificate.

(t) **Certifying Authority**- A certifying authority which has obtaineda license to issue a Digital Signature Certificate under Sub-section (3) ofSection 18.

(u) **Addressee** -A person receiving the processed electronic record asintended by the originator.Provided that it shall not include an intermediary.

(v) **Electronic Record** - The data, record, image or sound transmitted,received or stored in an electronic form by generating the same throughany means.

(w) **Electronic Form** - A form of information transmitted, received orstored by generating the same through the means of magnetic, optical,computer memory or similar other devices.

(x) **Public Key** - A key of any key pair used to verify digitalsignature.

(y) **Information** - The data details of the scripted texts, images,sounds, codes, computer programmes, software and computer databases.

(z) **Information system** - A system to generate, produce, transmit,receive, store and display information or to process the same by othermethod.

(aa) **Software**- Any specific part of computer system such as systemsoftware and application software having the capacity for operatingcomputer hardware.

(ab) **Computer Accessory** – It is a technology such as computer resource,the information used by any institution in its business, a software-likeitem produced or purchased by such an institution, hardware andcomputer network.

<u>Important provisions of ETA 2063</u>

- Provision for electronic record and digital signature
- Provision for transmission, receipt, and acceptance of electronic records
- Provision for controller and certifying authority
- Provision for digital signature and license
- Provision for role, duty and responsibility of a subscriber
- Provision for the government use of electronic record and digital signature
- Provision for network service
- Description of computer crimes and provisions for punishment
- Provisions for information technology adjudication and information technologyappellate adjudication

6) Contemporary Issues in Engineering

Globalization & Cross Cultural Issues
Public Private Partnership
Safety, Risk& Benefit Analysis
Development & Environment
Conflict & Dispute Management

Globalization and Cross-Cultural Issues

What Is Globalization?

Globalization is a process of interaction and integration among the people, companies, and governments of different nations, a process driven by international trade and investment and aided by information technology. This process has effects on the environment, on culture, on political systems, on economic development and prosperity, and on human physical well-being in societies around the world.

Globalization is not new, though. For thousands of years, people—and, later, corporations—have been buying from and selling to each other in lands at great distances, such as through the famed Silk Road across Central Asia that connected China and Europe during the Middle Ages. Likewise, for centuries, people and corporations have invested in enterprises in other countries.

But policy and technological developments of the past few decades have spurred increases in cross-border trade, investment, and migration so large that many observers believe the world has entered a qualitatively new phase in its economic development. Since 1950, for example, the volume of world trade has increased by 20 times, and from just 1997 to 1999 flows of foreign investment nearly doubled, from $468 billion to $827 billion. Distinguishing this current wave of globalization from earlier ones, author Thomas Friedman has said that today globalization is "farther, faster, cheaper, and deeper."

This current wave of globalization has been driven by policies that have opened economies domestically and internationally. In the years since the Second World War, and especially during the past two decades, many governments have adopted free-market economic systems, vastly increasing their own productive potential and creating myriad new opportunities for international trade and investment. Governments also have negotiated dramatic reductions in barriers to commerce and have established international agreements to promote trade in goods, services, and investment. Taking advantage of new opportunities in foreign markets, corporations have built foreign factories and established production and marketing arrangements with foreign partners. A defining feature of globalization, therefore, is an international industrial and financial business structure.

Technology has been the other principal driver of globalization. Advances in information technology, in particular, have dramatically transformed economic life. Information technologies have given all sorts of individual economic actors—consumers, investors, businesses—valuable new tools for identifying and pursuing economic opportunities, including faster and more informed analyses of economic trends around the world, easy transfers of assets, and collaboration with far-flung partners.

Globalization is deeply controversial, however. ***Proponents (supporters) of globalization argue that it allows poor countries and their citizens to develop economically and raise their standards of living, while opponents of globalization claim that the creation of an unfettered(unrestricted) international free market has benefited multinational corporations in the Western world at the expense of local enterprises, local cultures, and common people.*** Resistance to globalization has therefore taken shape both at a popular and at a governmental level as people and governments try to manage the flow of capital, labor, goods, and ideas that constitute the current wave of globalization.

Summary:

- Globalization is a ***process*** of ***interaction*** and ***integration*** among the people, companies, and governments of different nations.

- It is a process driven by ***international trade*** and ***investment*** and aided by ***information technology***
- This process has effects on the environment, on culture, on political systems, on economic development and prosperity, and on human physical well being in societies around the world
- Thomas Friedman has said that today globalization is "***farther, faster, cheaper, and deeper***."
- A defining feature of globalization, therefore, is an ***international industrial*** and ***financial business structure***.
- An attempts to '***make worldwide***' & to ***extent to other parts of the globe/world***

Globalization in economics :

- Some automobiles use parts from other countries, as in a car being assembled in the United States with the parts coming from Japan, Germany, or Korea.
- The Free ***World Trade Organization*** supervises world trade.
- The European Union is an economic and political union of **28** countries that are located primarily in Europe.
- One shirt sold in the **United States** could have been made from **Chinese cotton** by workers in **Thailand**. Then it could have been shipped on a **French freighter** that had a **Spanish crew**.
- A **KFC & Pizza Hut** in Nepal and other countries shows the growth of companies over the entire world.

Globalization in the blending of culture :

- Greek culture spread across Africa, Europe and Asia through Alexander the Great. This is the reason there are cities named for Alexander in Africa, Egypt and Turkey.
- The Silk Road was a trade route between China and the Mediterranean Sea area and it allowed the exchange of not only goods, but culture and knowledge.
- Improved travel facilitated the growth of globalization, as people moved for a better job, a better life, or fled from danger or oppression.
- Food is one factor of globalization. One can find people eating sushi in Peru or Indian food in Europe.
- Satellite television allows shows from one country to be broadcast in many others, adding to cultural globalization.

Globalization in technology:

- The Internet is a major contributor to globalization, not only technologically but in other areas as well, like in cultural exchanges of the arts.
- Global news networks, like BBC, CNN, contribute to the spread of knowledge.
- Cells phones connect people all over the world like never before. Around 60 percent of all people in the world use cell phones.
- Environmental cooperation has spread to help reduce *chlorofluorocarbon emissions* to slow the depletion of the ozone. One example is the *Montreal Protocol*.

Other example of Globalization :

- The Olympics began in ancient Greece and continue today.
- The FIFA World Cup has more viewers than any other sporting event from around the world.
- Travel and tourism allows globalization of many things, like the exchange of money, cultures and knowledge.
- The United Nations is an intergovernmental organization that promotes cooperation in many areas including human rights, peace and economic development.
- Organizations such as the Red Cross respond quicker to disasters around the world.

Benefits of Globalization :

1. Increase in innovation
2. Rich cultural exchange
3. Improved living standards
4. High average income
5. Global marketthe world.

Effects of Globalization :

1. Permanent economic shift
2. Increasing homogeneity
3. Job insecurity in developed countries
4. Fluctuation in price due to competitive market
5. Cultural degradation due to influence of modern culture

Cross culture - Identification

The meaning of cross-cultural lies in the impact that culture has on an individual and his community, and the effects of this impact when different cultures are combined. The culture in which a person is raised plays a significant role in shaping his values, morals, behaviors and attitudes. These characteristics impact how a person thinks, and what his overall mind-set is toward the world around him. ***When a person is met with the principles and ideals of a different culture, a cross-cultural interaction takes place.***

Cross culture - Definition

- Culture refers to the ideas, customs and social behavior of the particular people or society.
- Cross culture is defined as the initiative to increase understanding of different group or society so as to develop effective communication and marketing efforts to reach out customers outside its traditional market.
- It refers to the forms of interaction between members of different cultural groups.
- The successful international trade depends upon the smooth interaction of employees from different cultures and regions. So, positive cross cultural experience is very important.
- Cross cultural competence helps the individuals to adapt effectively in cross cultural environments.

Cultural Differences

Cultural differences can become most apparent when people from different cultures interact socially or in circumstances involving business. Personal space, demeanor, time, forms of address and gestures are possible areas where cross-cultural differences can come into play. For example, norms surrounding personal space can vary from culture to culture. Personal space has to do with the acceptable distance that exists between one person and another during conversational exchanges. While an American may have a one- to two-foot comfort zone, someone of a different culture may consider six inches to be an acceptable personal area.

Cross-Cultural Communications

Cross-cultural communication exists when people from differing cultures have reached a certain degree of understanding regarding their differences. For understanding to take place, both people must have some form of knowledge or awareness regarding the norms or customs that exist in each other's culture. Verbal and nonverbal communications can contain implied meanings, as well as certain degrees of symbolism. For successful communication to take place, background knowledge concerning values, norms and perceptions is necessary in order for clear, effective communication to take place.

Cross-Cultural Psychology

The impact different cultures have on people's behavior, emotions and thought processes is the focus of cross-cultural psychology. The norms and values within a culture go a long way toward shaping a person's psychological make-up and how she interacts with her environment. The social structures, manners and values within a culture determine what types of experiences a person has had. These experiences work to shape perceptions, expectations, as well as a person's sense of identity within the context of society.

Cross-Cultural Research

Cross-cultural research examines how different cultures compare in terms of human behavior. The purpose of this research is to address the growing conflicts and global concerns that arise as a result of cultural differences. Statistical data is compiled to determine how prevalent particular norms or customs are within a culture. This helps with determining how influential particular customs are within

the workings of a society. Steps to bridge communication differences are addressed by understanding how customs develop and how they affect the behaviors that take place within a society.

PPP – Background & Experiences in Nepal

Poor infrastructure has been one of the hindrances in Nepal's competitiveness as the Global Competitiveness Report 2009/10 produced by the World Economic Forum put Nepal's position in infrastructure at 131 out of 133 countries surveyed throughout the world. There is clearly a need for increased investment in infrastructure and other basic services. However, only the government's investment and involvement in infrastructure and public services is not enough implying the need for a greater role of the private sector. The Government of Nepal (GoN) has already accepted public-private partnerships (PPP) as an alternative source of procuring assets and services, including the private sector's financial participation for meeting the increasing demand for infrastructure and services in the country. Notwithstanding a decade of experience in the area of PPP, Nepal's approach to it has had limited success.

At the local authority level, the Kathmandu Metropolitan City (KMC) pioneered private sector involvement in the municipal sector with the Private Sector Participation (PSP) programme as far back as 1999/2000 for institutional strengthening of KMC. Several projects or ventures were identified for implementation such as the Gongabu bus park, construction of foot-bridges at different locations, operation and management of Dharahara and its surroundings. KMC entered into several PPP arrangements but not without controversy.

At the central level, the Ministry of Physical Planning and Works made public calls to the private sector to invest in four large projects. Of these the only project to reach Expression of Interest (EOI) & Request for Proposal (RFP) stage was the "fast track" road project from Kathmandu to the terai. As the latest development in major PPP arrangements in service delivery, the call and subsequent selection of a private sector partner in Kathmandu's waste management is a significant step.

Realizing the importance of PPP, the GoN intervened in this area by introducing the Public-Private Partnerships for Urban Environment (PPPUE) project in 2002 with the support of UNDP. Since the project's launch, PPPUE together with its partners have worked towards raising awareness of the potential of PPPs at both local and national levels and creating an enabling environment for PPPs in local urban service delivery with continued capacity building and policy/legislative interventions. Up till now, PPPUE has initiated local level projects.

In spite of the acceptance of the PPP concept within the country, and progress with PPP projects at the local level, national level PPP projects and major PPP infrastructure projects are yet to emerge in Nepal[1]. Existing legal arrangements for private financing of infrastructure (as provisioned in the Private Financing in Build and Operation of Infrastructures Act) have to date not been successfully used. The positive overtures from the Government, the Nepali business community, and the international community with regard to PPPs are not being
translated into tangible PPP projects.

The Government believes that there are several reasons why PPP projects have been slow to develop to date. These include Nepal's recent emergence from conflict and the establishment of a new governance system which have had their effects on both the Nepalese economy and private sector confidence in it. The private sector has also pointed to the lack of clear policy guidelines on PPP by the government.

The Government acknowledges that both the public and private sectors in Nepal lack experience with structuring, procuring and managing PPP projects, and that the market for such projects is at an early stage. It further recognises that it needs to incrementally build the PPP market in Nepal to achieve market conditions and levels of confidence in which significant PPP projects can be implemented involving potential domestic and international operators and investors.

Vision and Objectives of PPPs in Nepal

Realizing the fact that the involvement of the private sector enhances cost effectiveness, the Government of Nepal has accepted the private sector as a development partner in the social and economic development sectors. In the same stride, the Government has laid strong emphasis on the public-private partnership (PPP) approach especially in the physical infrastructure and service delivery sectors. In the present context of transition in the country, the private sector may notbe motivated as expected because of political instability and lack of predictable investment climate. Moreover, the weak security situation, low productivity of labour and the difficulties in the transport and communication sectors dueto geographical remoteness are equally important factors to deter fast-paced private sector development.

Concept and Definition of PPPs in Nepal

PPP refers to the blending of resources and assets from both public and private sectors with an objective of providing a more efficient and cost effective means of infrastructure and service delivery representing better value to people than traditional direct public delivery. Such partnerships potentially include the design, construction, financing, operation, and maintenance of public infrastructure and
facilities or the operation of services to meet public needs. Benefits potentially include more innovative delivery approaches, better quality of service, greater productivity and better use of public resources, better leverage of limited government resources to meet high need infrastructure and service delivery projects. Remuneration of the private party may be directly from user charges, by payments from public agencies in the case of availability based PPPs, through exploitation of other assets or rights, or through some combination of these. By definition, the remuneration and returns of private parties in PPP projects should be linked to their performance thereby exposing them to appropriate opportunity and risk so as to stimulate their innovation, efficiency and effectiveness.

Definition of PPPs

As there can be considerable misunderstanding about the concept of PPPs, the Government of Nepal intends to introduce a clear definition of PPPs to which this policy and the related institutions, procedures and provisions apply. The Government defines PPPs as:

- A contractual agreement between a public entity and private entity
- For the delivery of infrastructure or services in the public interest
- Where the public partner focuses principally on the output and allows the private partner to determine the input
- In which a substantial transfer of appropriate risk takes place to the private party
- Where the private party or parties have investments at risk, although capital investment may not be required in all PPPs
- Where better Value for Money can be demonstrated than traditional public provision

All PPP projects conforming to this definition will be conducted through the institutional framework and the procedural process.

Public Enterprises, Joint Ventures and Privatization are not considered to be PPPs as contemplated (anticipated) in this White Paper and the related institutions and procedures since:

- Public Enterprises and corporatized entities are not private parties as defined in this White Paper
- Joint Ventures or public enterprises with partial private ownership do not conform to the definition of private parties, and/or do not conform to the requirement for risk transfer to private parties and/or the requirement for a contractual agreement. However, some functions of these enterprises may come under PPPs, like repair and maintenance and billing and collection functions etc.
- Privatization is the one time disposal of public interests in a business /industry, after which the public sector will have limited or no control of the enterprise and will not conform to the definition of PPP.

In private financing in build and operate of infrastructure act 2063(amended on 2073) the project may be implemented on private investment by any of the following modes:

(a) Build and transfer (BT)
(b) Build, operate and transfer (BOT)
(c) Build, own, operate and transfer (BOOT)
(d) Build, transfer and operate (BTO)
(e) Lease, operate and transfer (LOT)
(f) Lease, build, operate and transfer (LBOT)
(g) Develop, operate and transfer (DOT)
(h) By other methods of similar kind

Risk Issues

Risk transfer is one of the major components through which PPP projects can generate better value-for-money. Without sufficient transfer of appropriate risks from the public to the private sector, it is unlikely that a PPP project will achieve better value for money than traditional public procurement and delivery. In principle, risk in a PPP should be allocated to the party who is best able to
mitigate and manage that risk. As PPP projects normally last for a long period of time (full lifecycle), the project and project parties are exposed to different risks over a considerable period. As such, risk should be correctly identified and allocated between parties during the procurement of the PPP project with consideration of the implications of these risks over the full project life. Typical risks related to PPPs include:

- Public risks: political, administrative practices, change in laws and regulations, dispute resolution and enforcement;
- Economic and financial risks: interest rate levels, macro events and development;
- Market risks: demand forecasts, technology change;
- Construction risks: timely completion, hazards, geology, force majeure;
- Operations and maintenance risks: operation and life cycle cost;
- Environmental risks;
- Exchange rate and interest risk;
- Acceptability of user fees: e.g. price elasticity and willingness to pay.

The specific nature and allocation of risks is strongly related to the particular PPP project concerned. As such, the Government of Nepal cannot provide a single, standard overview of risks that it will typically retain, share or transfer to private parties. However, the Government will follow the principle that sufficient transfer of appropriate risk should take place to the private party to ensure that the private party is correctly in centivised to deliver the infrastructure and services required over the full duration of the PPP project. This identification and allocation of risk is one of the key criteria the Government, and the Ministry of Finance in particular, will consider when approving PPP projects.

Requirements of PPPs

The Government of Nepal wishes that PPPs for infrastructure and services represent both better values for money for Nepal, and are sustainable to the country and focus over time. To this end, the Government requires that PPPs introduced in the country should be:

- Able to demonstrate better Value for Money, reflecting inter alia appropriate risk allocation between parties
- Financially affordable and sustainable to the Nepali fiscus over the full lifetime of the PPP arrangement
- Defined as much as possible on an output basis to allow private innovation in delivery approach
- Competitively procured through a transparent and open procurement process
- Managed and monitored in a responsible fashion by the public partner concerned over the full life of the PPP arrangement

Advantage of PPPs

- It could increase & provide greater infrastructure solutions
- It will offer faster project completion and reduced delays on infrastructure projects
- Return of investment (ROI) is greater when compare to traditional methods , due to innovative design and financing approaches
- Reducing government budget and budget deficits
- High quality standards should be obtained and maintain through expected life cycle of the project
- Public private partnership allows a reduce tax payment from users

Main Types of PPP Arrangements in Nepal

The Government of Nepal introduces three main models of PPPs in the country, namely revenue based, availability based and hybrid types.

a) Revenue PPPs

Revenue-based PPPs are PPPs where the private party receives revenues solely from the direct collection of user charges. Revenue-based PPPs are expected to be applied in sectors where direct and clear user charges can be applied and collected, such as transport and similar infrastructure and services.

b) Availability PPPs

Availability-based PPPs are PPPs where the private party receives revenues from payments from the public partner or other government body. Availability-based PPPs are expected to be applied in sectors where direct user charges are eitherimpossible or undesirable (social sectors like health or education) or where thegovernment itself is effectively the user (such as accommodation projects forgovernment buildings, etc.).

c) Hybrid PPPs

Hybrid PPPs are PPPs where the private party receives revenues through some combination of user charges and availability payments, and/or may obtainrevenues by exploiting other assets or right.

Eligible Partners and their Roles in PPP

The public and private partners that are eligible to enter into PPP arrangementsas defined in this White Paper are indicated below. This defines the public bodiesof the Government of Nepal which may procure PPP projects under this policy, aswell as what are considered eligible private partners to enter into PPP contracts.The important role of citizens and civil society is also defined.

a) Public Partners

PPP arrangements under this White Paper are to be applied at the central andlocal levels in Nepal. As such, the public partners that are eligible to enter intoPPP arrangements are:

- Central or National level ministerial and government departmentsindividually or in inter-ministerial arrangements
- Public bodies, namely entities having majority shareholding of thegovernment, e.g. Civil Aviation Authority, Electricity Authority etc.
- Federal/Regional level offices of the Government of Nepal
- Local level public bodies, specifically district, municipal and VDC levelgovernment entities

b) Private Partners

PPP projects require private partners to cover the multiple aspects of a project,potentially including design, construction, project management, financing,operation and maintenance. The Government of Nepal recognises the fewdomestic private parties in Nepal have experience in covering all project relatedactivities, and that experience with fully-integrated life cycle PPP projectsis limited. It is also recognised that PPP projects are often undertaken byconsortiums of private partners who collectively mobilise the capacity requiredfor the project.

Private partners who are eligible for PPPprojects must have appropriate experience, capacity and financial resources toundertake a PPP project of the nature required in a responsible fashion for theduration of the PPP project lifetime. Such private partners may be domestic orinternational, although the Government encourages the involvement of Nepalibusinesses wherever possible. Private parties should be appropriately registeredlegal entities complying with all relevant requirements of Nepal and legallyentitled to enter into such arrangements. Private partners eligible to enter intoPPP arrangements include:

- Private enterprises: domestic or foreign
- NGO/INGOs
- Community based organizations, cooperative organizations

A private enterprise will normally be a company or a firm registered under the prevailing rules and regulations of Nepal. However, the specific eligibility criteria defined for a project will take into account the nature and size of the projects and will encourage wherever possible small entrepreneurs or community organizations to take part in smaller local PPP projects.

c) Citizens and Civil Society

Civil society refers to the arena of un coerced collective action around shared interests, purposes and values. The role of civil society in PPP therefore is very crucial as they are primarily concerned with the project. They are the ones who share the benefits and losses from the project or the ones who lose their exclusive rights over natural resources.

Civil society or different sections of it have various roles at different stages of PPP. During the phase of project identification, their role is to ensure that their demand for a particular service is met. It is essential to ensure that the specific project components and strategies for their implementation are acceptable to all stakeholders and follow participatory processes during the phase of project structuring and formulating. This also provides the opportunity to know about the level of willingness to pay and the actual demand for services. During the post implementation phase as well, civil society monitors and supervises the quality and level of service provided by the private operator of the service.

Most significantly, as all stakeholders are involved in the decision making process, this improves the sense of ownership of the project and can minimize any conflicts that may arise among the affected parties.

Another important aspect of PPP is to provide maximum benefit to the civil society especially in projects where natural resources are utilized. The benefit could be provided in various forms, for example, in terms of shares in the equity, in terms of development support activity, direct revenue sharing, and subsidized rates for service delivery, etc.

Sectoral Coverage and Priorities of PPPs

The Government of Nepal believes that PPP arrangements can in principle be applied in the infrastructure sector and the provision of services in the country, however with some considerations. The Government therefore wishes to define general sectorial eligibility and also to indicate priority sectors.

a) Eligible Sectors

PPP arrangements may be introduced in any infrastructure or service sector in Nepal and for which the government has responsibility. This includes physical infrastructure, services and social services, as well as the facility and service needs of the Government itself. However, the following considerations are raised:

- For PPPs in sectors which are concerned with immediate matters of national defence or public safety, for example, military or policing, additional assessment must be undertaken to ensure that national or public safety issues are adequately addressed.

- PPPs should not be applied in sectors for which the government is not responsible and in which it is generally considered that the sector is more appropriately delivered by the private sector on its own, such as sectors falling under privatization.

b) Priority Sectors

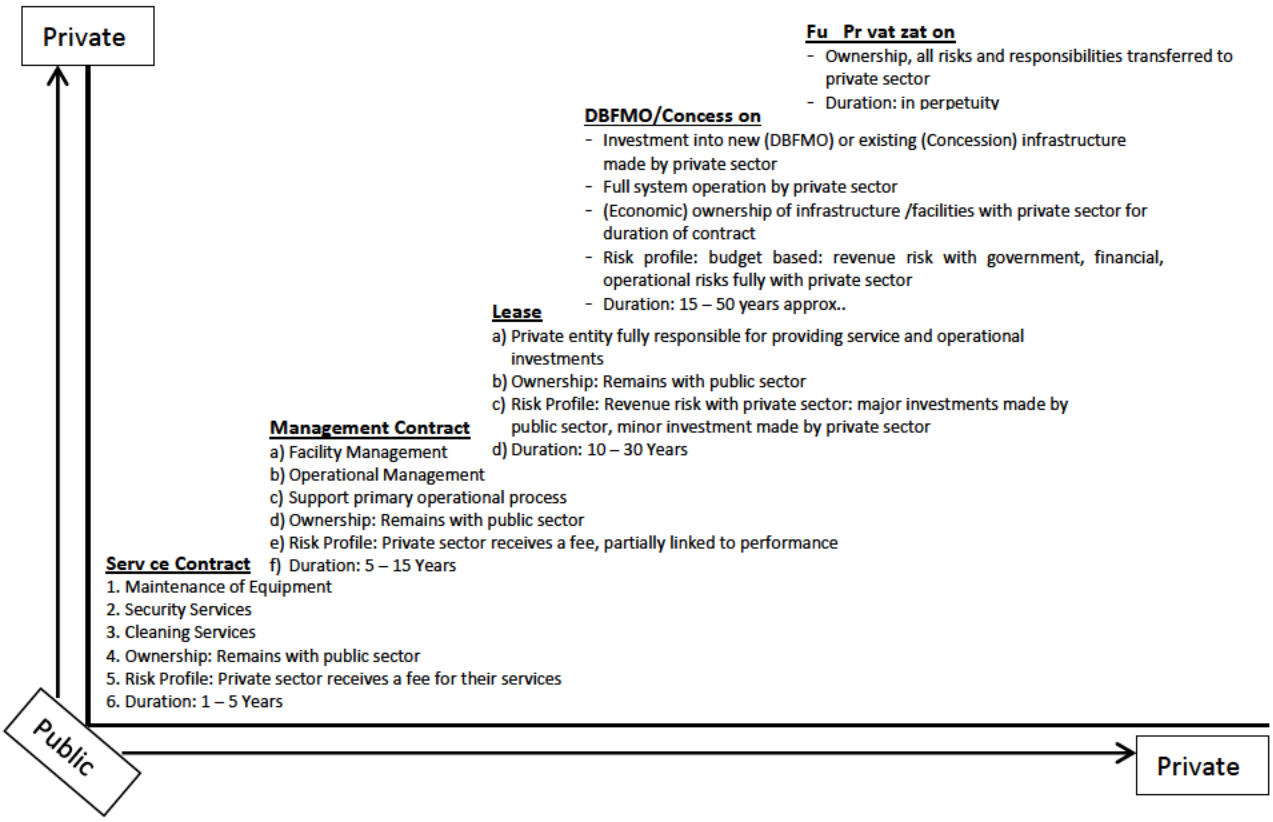
The Government of Nepal prioritizes PPPs in a number of sectors. This prioritization implies that the Government will focus its resources and efforts on introducing PPPs in these sectors and will also prioritize PPP arrangements defined in these sectors. The Government may specify new priority sectors in future. The current priority sectors are as follows:

- Physical infrastructure and transportation (roads, bridges, ports of all types)
- Energy sector, both large scale hydro-power, rural energy and renewable energy
- Information and communication sector
- Environment sector like solid waste management and water and sanitation
- Basic services sector like health and education

The Government, as part of implementing this PPP White Paper, will seek to identify priority PPP projects within the priority sectors identified above.

PPP Contracts and Contractual Requirements

As defined, PPPs are contractual agreements between a public partner and a private partner. The specific nature and content of such contracts will relate to the specific PPP project concerned. Different forms of PPP contracts have emerged from international and regional practice. The graph below describes several forms of PPP contractual arrangements. Although the graph includes full privatization as an option, this option is not under consideration of the PPP policy.



The Government of Nepal requires, in line with international practices, that PPP contracts should address at minimum the following:

Clear and measurable outputs

PPP contracts should be as much output based to the extent possible, defining clear and measurable output specifications for services to be delivered to the Government or to the public. For each project, specific service levels (quantities and quality) will have to be defined.

Clear definition of assets, asset-ownership and responsibilities

PPP contracts should clearly define the fixed assets (land, buildings, equipment, etc.) related to the project, ownership during and after the project period, usage rights, maintenance responsibilities, investment requirements and ownership of new assets created within the project.

Contract duration

The contract should be clear on the duration of the agreement and the possibilities, if any, of extending or shortening the contracts duration.

Performance based payments

When there is a need for a government financial contribution, e.g. for PPPs in

Development and Environment

In developing countries like Nepal, there is a remarkable need for development of physical infrastructure like roads, hydropower projects, telecommunication tower etc. While developing infrastructures, it is equally important to minimize or mitigate the adverse effects /impacts likely to be caused from environmental degradation on human beings, wildlife, plants, nature and physical objects: so as to protect environment with proper use and management of natural resources taking into consideration that sustainable could be achieved from the inseparable inter-relationship between the economic development and environment protection.as far as possible (Preamble of Environment act 2053)

Engineers and architects as development workers, have to work in developing infrastructure as well as they have to consider the nature and environment. Furthermore, their decisions and conducts should reflect sustainable development approach.

The **environment protection act 2053** has tried to protect environment. Clause 7 of EPA 2053 states that nobody shall create pollution in such manner as to cause significant adverse impacts on the environment or likely to be hazardous to public life and people's health, or dispose or caused to be disposed sound, heat, radioactive rays and waste from any mechanical devices, industrial enterprises or other places contrary to prescribed standards.

The engineer's/architects need to be aware of the provisions of the environment act 2053 and environment protection rules 2054 while practicing engineering profession.

There is provision of two important examinations which are to be carried out before initiating infrastructure projects in EPA 2053 viz. Initial environment examination (IEE) and environment impact assessment (EIA).

Initial Environmental Examination (IEE)

A report on analytical study or evaluation to be prepared to ascertain as to whether, in implementing a proposal, the proposal does have significant adverse impacts on the environment or not, whether such impacts could be avoided or mitigated by any means or not. Construction of district roads, city, rural and small feeder roads proposals requires IEE.

Environmental Impact Assessment (EIA)

It is a report on detailed study and evaluation to be prepared to ascertain as to whether, in implementing a proposal, the proposal does have significant adverse impacts on the environment or not, whether such impacts could be avoided or mitigated by any means or not. For construction of national highways and main feeder road.

Environmental Impact Assessment (EIA) - Process

1. Screening (Determining whether EIA is needed or not)
2. Scoping (Determining the scope for EIA)
3. Prediction and Mitigation (Prediction and mitigation of various environmental impacts)

4. Management and Monitoring (Plan for managing and monitoring environmental impacts)
5. Audit (audit of EIA process is carried out after implementation)

6.5 Conflict and Dispute Management

Conflict, in general is understood as something which is not good for organizational health. This approach to conflict is considered as **traditional approach**. Under this approach, conflict is viewed as harmful. This is a negative approach and therefore, the tradionalists try to avoid conflict. They enforce organizational rules or norms for avoiding conflict.

After 1940s,**behavioral approach** influenced the conflict theory. The behavioral approach to conflict views it as natural because, conflict is the inevitable outcome of behavioral interactions. Since, organizations and project do have a group of people, conflict cannot be avoided in an organization and project setting. Therefore, this approach suggests us to accept it.

The third approach to view conflict is the **interactionist approach**. This view not only regards conflict as necessary but also encourages having conflict for effectiveness of the operation. According to this approach, conflict within manageable limit is beneficial.

It is to be noted that, all conflicts may not be good and positive. Therefore, conflict may be classified as

a) **Functional (constructive)**–The conflict supporting goals of the group that helps in performance improvement

b)**Dysfunctional (destructive)**-The conflict hindering group performance

Levels of conflict

a) **Intrapersonal** – Conflict occurring within the self

b)**Interpersonal** – This conflict may arise because of differences in goal and role of an individual. This conflict occurs between two or more persons basically because of communication gap and perceptual differences.

c) **Intergroup** – It is occurred between groups because of difference between them. In sharing resources and implementation of conflicting reward and punishment system may be taken as examples.

d)**Inter organizational** – It occurs between organizations because of various issues related to organizations functioning such as competition.

Sources of conflict

a) Personal differences
b) Goal and role incompatibility
c) Organizational climate and change
d)Gender and other social differences
e)Availability and access to resources and o
f)Communication gap

Resolution of conflict

a) **Avoidance** – This method suggests avoiding conflict by ignoring it or by suppressing

b) **Diffusion** – Conflict is tried to deactivate through diffusion.

c) **Containment** – Conflict is allowed to bring into notice in a controlled manner and for resolution discussions and bargaining take place.

d)**Confrontation** – Conflict related issues are brought out and tried to resolve the issues adopting necessary measures by addressing the needs of the parties in conflict. A face to face meeting is conducted to find out the mutually agreed solutions.

Dispute

By nature, construction is a risky and complicated task. Construction experiences many unforeseen and unpredictable conditions such as different sub-soil conditions or price rise in construction materials or natural calamities. Because of its very nature, disputes in construction (in commercial transactions,

procurement of good for the specifications as well) cannot be avoided completely. Hence we find clauses mentioning procedures for dispute settlement in general conditions of contract (GCC).

Public procurement act 2063 and public procurement rules 2064 (2068) have provisions of dispute settlement. As per PPA and PPR, disputes arouse between the public entity and contractor/supplier or consultant in connection to the implementation of agreement is to be settled through mutual consensus i.e. **amicable(harmonious) settlement.** For the disputes that cannot be resolved through mutual consensus, a mechanism for settlement of disputes may be included in procurement agreement and for the settlement of disputes related to construction work following procedures may be followed.

- For the value upto NRs. 100 million, disputes shall be settled by sole adjudicator and for the works of value above 100 million, disputes shall be settled by Dispute Resolution Board (DRB) consisting of three members.
- If a party did not agree with the decision awarded by the adjudicator or DRB, the party has to start procedure to settle such dispute through arbitration following the process as mentioned in the agreement (if any) or as prevailing law.

Arbitration act 2055 section 3(1) states that disputes are to be resolved following the procedures as mentioned in the agreement and in the absence of such provision in the agreement the dispute shall be resolved following the procedure mentioned in the arbitration act.

Resolution of disputes

- **Litigation (Hearing)**
  It is a simply the term used to describe the resolution of disputes through the Courts. The nature and level of damages sought will generally determine what court an action will be heard in, which can have a significant impact on the speed and cost of the action. Litigation will also allow parties to an action to join other parties in, either as co-defendants or as third parties.
- **Arbitration –** Mechanism for settlement of dispute outside the formal court
  It is supported by a statutory framework and is commonly used in construction disputes. The arbitrator, who usually has a construction background, effectively sits as the judge and follows procedures akin (similar) to those applied by the Courts. However, either of the parties to the arbitration is unable to force others to be joined into the arbitration unless specific provision has been made in the relevant contracts. The arbitrator's award is a binding decision which can only be challenged before the Courts in very limited circumstances.
  It follows more or less similar procedures a in the formal court but arbitration is supposed to be more effective than litigation. Arbitration is preferred over litigation on following features.
  - **Private alternative**
  - **Technical experts are available**
  - **Less time consuming**
  - **Less expensive**
  - **No public hearing, low publicity**
  - **More convenient and suitable**

  Currently arbitration is governed by arbitration act 2055. PPA 2063 has also recognized the arbitration as a means for settlement of disputes. Nowadays, all contracts do have provisions for settling disputes through arbitration. Currently arbitration is considered to be a final means of settling disputes. However, the practice has not been refined in this extent in our context and as a consequence, majority of disputes are referring to the court after arbitration or negotiated outside court. As an institution providing specialized service for arbitration, there is Nepal Council of Arbitration (NEPCA), which was established in 1991.
- **Mediation and conciliation**

These are terms which are often used interchangeably but the difference between them is not always clear. Both are based on being a without prejudice (bias) process which involves a neutral third party facilitating the parties to reach an agreed resolution to their dispute. However, in mediation, the mediator's role is purely a facilitative role. The mediator does not provide any evaluation on what the solution to the dispute should be. A conciliator on the other hand, if the parties are unable to settle the dispute, may make proposals to the parties to resolve it, usually described as a "recommendation". Generally, the recommendation will become final and binding on the parties if it is not rejected within a limited timeframe.

- **Expert determination**
  It also results in a binding decision but differs from arbitration in that there is no statutory framework governing expert determination. The contract will generally identify the type of dispute that an independent expert will determine. It is worth noting that, unless the contract so provides, an expert is not bound by the rules of natural justice. Once the expert has rendered his decision, there are very few grounds on which it can be appealed, even if he gets it wrong! Expert determination though can work particularly effectively in resolving technical disputes.
- **Adjudication**
  It is very similar to expert determination and in many cases may actually be that, save under a different name. However, statutory adjudication is considered as being distinct from expert determination as such adjudications are subject to the rules of natural justice. Adjudication allows decisions to be made promptly which are enforceable and is to be complied with, pending any final determination of the dispute by arbitration or litigation.
  In Nepal, the public works directives (PWD) published by the government of Nepal in 2002 has mentioned about the adjudication and public procurement act 2063 has clear provision of adjudication. By this provision, adjudication has been considered as one of the intermittent and/or alternative mechanism for resolution of disputes related to construction contract I Nepal.

  Main features of adjudication
  - Quicker mechanism for resolving disputes
  - Independent third party
  - Adjudication process will be completed within 30 days
  - Less expensive process as compared to litigation and arbitration

Mediation, Adjudication, Arbitration & Litigation – A Comparison sheet

S.N	Particulars	Mediation	Adjudication	Arbitration	Litigation
1	**Definition**	Negotiation with assistance of thrd party	Consensual agreement to a third party	Consensual agreement to third party (Arbitration act 2055)	Process of making a civil claim in a court of law
2	**Duration**	1 to 2 days	30 days to decide	Make extent over a long period	Longest period because of backlog of cases in court
3	**Cost**	Lower than arbitration	Do	Higher than mediation	Expensive because it takes a long period
4	**Formation**	Very informal	Les formal than arbitration	Les formal than litigation (NEPCA-1991)	Formal, rigid strict evidential & procedural rules are prescribed
5	**Involvement of third party & control by parties**	Third party	Third party (Adjudicator)	Third party (Arbitrator)	Third party (Judge), parties have no control

6	**Degrees of parties satisfaction with outcome**	High	Low	Medium	Low
7	**Effect on relationship of parties**	Preserves relationship	May destroy	Do	High chances of destroying relation

Risk, safety & cost benefit analysis

Webster defines **Risk** as "the chance of injury, damage, or loss; hazard." Therefore, software development project risk may be defined as the "potential realization and cumulative effect of unwanted negative consequences effecting project objectives."

Risk is not entirely bad. Every major work effort involves risk. However, with risk comes knowledge and opportunity – the opportunity for planning to overcome potential threats to project success. Every project is at risk to fail. The opportunity comes with the project team's knowledge and understanding of the risk factors and the preparation of a risk management plan to mitigate the risk.

Project risk assessment activities must be periodically updated throughout the project system development life cycle. Continuous risk management is essential for several reasons:

1. To monitor and measure progress in risk management,
2. To provide management with visible target dates and milestones in risk management activities,
3. To identify new risk items and issues, and
4. To establish new risk management priorities.

Risk Management Process Methodology

The risk management process methodology involves five (5) basic steps:

1. ***Identify the risks*** - Understand the typical problems that might adversely affect the project.
2. ***Assess the risks*** -Rank the risks in order of importance based on probability of occurrence, impact of occurrence, and degree of risk certainty.
3. ***Plan the risk response*** – Analyze risk assessment alternatives and modify the project management plan and project schedule to adjust for the risk.
4. ***Monitor the risks*** – Throughout the project, continue to revisit the risk profile, re-evaluate major risks, and update the risk profile with action taken.
5. ***Document lessons learned*** – Learn from the risk identification, assessment, and management process. Use the risk database from past projects to plan current projects, and, use your risk management experience to update the organization risk database.

Risk Categories

The following types of risk categories may be used as a high level view of potential risk areas. The major **risk categories** are defined in table:

CATEGORY	***EXAMPLES***
Financial	Cost overruns, budget constraints, funding issues
Resource	Availability of people and facilities, attrition, skills limitations
Schedule	Completion date slippage, target date constraints
Technical	Failure to meet performance requirements, new or untested technologies
Management	Inexperienced project manager, project complexity
Communication	Failure to satisfy user requirements / expectations
Operational	Failure to meet usability, trainability, and/or maintainability requirements
Political	Impact of loss of service to citizens, possible exposure and liability to state / region
Organizational	Alignment to strategic goals / vision

As a key factor in project planning and project outcome, risk management must be included in all project planning activities. At a minimum, the software development project management plan should reflect:

- Relationship and contribution of project management to risk management - This section should summarize the key contributions made by various project management components to the reduction of project risks.
- Risk management process - This section summarizes the risk, identification, assessment, analysis, documentation, handling, and reporting process at the overall project and individual function levels.
- Overview of risk management methods and techniques - This is a summary of the methodologies to be used in the project risk management process.

Risk Management Responsibilities

Risk management is the responsibility of the Project Manager. However, all project stakeholders should participate in the risk identification and analysis process. Overall the extended project team carries out risk management and mitigation activities.

Basic project risk management responsibilities table

RISK MANAGEMENT TASKS	***RESPONSIBLE PARTY***
Overall direction of risk management plan	Project Manager
Plan development and execution of risk management plan	Project Manager
Provide counsel and assistance regarding risk identification/assessment/analysis/handling	Business Analyst, Development Team, Quality Assurance
Risk Watch List	Project Manager
Preparation and issuance of risk reporting	Project Manager as part of normal project status reporting

Safety engineering

Safety engineering is a field that focuses on preventing accidents and lessening opportunities for human error in engineered environments or in engineering design. It can be applied to many disciplines, including aerospace, manufacturing, public works, and product design. Some projects apply safety engineering principles to existing products or within completed environments to improve safety and ensure code compliance. Others design features into the system engineering that make safety an integral consideration from the start.

Most engineering work is done within a framework of guiding specifications and codes. These guidelines develop as engineers and users find out what works and what does not work. Small-scale product designs and large-scale transportation infrastructure projects alike apply safety engineering principles based on what is learned from early development through usage. Testing and modeling a product in development can provide clues to what needs improvement. While reliability engineering will determine the likelihood that a product or system itself may fail, safety engineering may identify hazards or dangers for the intended users.

Learning from mistakes can bring hard lessons when health and safety are involved. While major accidents and catastrophes such as plane crashes, industrial fires, medical equipment malfunction, and bridge collapses are bound to happen, safetyengineering professionals use these instances to study what went wrong. Utilizing lessons learned in these instances has led to the ongoing development of safetyengineering. As preventative measures are identified, products and systems can be improved and risks can be lessened before accidents occur. Documenting testing failures and successes can assist engineers across disciplines to improve overall safety.

Compliance is typically a complementary concern of safetyengineering. If a hazard or unsafe practice is found in an industrial process, for example, a safety engineer may be tasked with reviewing and updating procedures and instructing employees on how to perform their jobs more safely. Measuring compliance

can come in the form of tracking injuries and equipment or work flow failures. Making adjustments by monitoring and enforcing compliance also may fall within safetyengineering. This role can be complicated by the need to follow governmental, industry, and company-specific specifications and standards.

Opportunities for engineers who specialize in safety are varied. Working with an engineering or industrial company as the safetyengineering lead is one option. Consulting as a contractor for corporations looking to improve their safety record also is a possibility. Insurance companies may employ safety specialists to consult on risk assessment and potential costs before providing insurance coverage. Assuming as little risk as possible is generally easier when safety is engineered and opportunities for human error are minimized.

The primary goal of safety engineering is to manage risk, eliminating or reducing it to acceptable levels. Risk is the combination of the probability of a failure event, and the severity resulting from the failure. For instance, the severity of a particular failure may result in fatalities, injuries, property damage, or nothing more than annoyance. It may be a frequent, occasional, or rare occurrence. The acceptability of the failure depends on the combination of the two. Probability is often more difficult to predict than severity due to the many factors that could lead to a failure, such as mechanical failure, environmental effects, and operator error.

Safety engineering attempts to reduce the frequency of failures, and ensure that when failures do occur, the consequences are not life-threatening. For example, bridges are designed to carry loads well in excess of the heaviest truck likely to use them. This reduces the likelihood of being overloaded. Most bridges are designed with redundant load paths, so that if any one structural member fails, the structure will remain standing. This reduces the severity if the bridge is overloaded.

Ideally, safety engineering starts during the early design of a system. Safety engineers consider what undesirable events can occur under what conditions, and project the related accident risk. They may then propose or require safety mitigation requirements in specifications at the start of development or changes to existing CAD designs or in-service products to make a system safer. This may be done by full elimination of any type of hazards or lower accident risk. Far too often, rather than actually influencing the design, safety engineers are assigned to prove that an existing, completed design is safe. If the engineer discovers significant safety problems late in the development process, correcting them can be very expensive. This type of error has the potential to waste large sums of money and likely more important, human lives and environmental damage.

The exception to this conventional approach is the way some large government agencies approach safety engineering from a more proactive and proven process perspective, known as "system safety". The system safety philosophy is to be applied to complex and critical systems, such as commercial airliners, complex weapon systems, spacecraft, rail and transportation systems, air traffic control system and other complex and safety-critical industrial systems. The proven system safety methods and techniques are to prevent, eliminate and control hazards and risks through designed influences by a collaboration of key engineering disciplines and product teams.

Cost Benefit Analysis(Simple Method)

Cost benefit analysis is one of the ways business decision makers can avoid making poor strategic decisions in an unforgiving economic climate. Learning to do a simple cost benefit analysis allows business leaders to decide whether making a capital investment or failure to make that capital investment represents more risk to the company.The key to executing a correct cost benefit analysis is rooted in quantifying foreseeable cost as well as the expected quantifiable positive cash flow over a set period of time. These costs include "hard costs" (actual dollars spent) and "soft costs" (indirect dollars spent in other areas to support a change in business model, equipment or practices).

Preparation

Even if you are the decision maker, you may not be the right person to estimate financial impact on every effected business unit. Consider building a team to do your cost benefit analysis. Assemble a business unit subject matter expert group to brainstorm potential costs and benefits of the change under consideration.

Step One: Calculate All-Inclusive Cost

It is critical for managers to calculate an all-inclusive cost for project analysis. These costs include, but should not be limited to:

Direct Costs

- Actual capital investment
- Any change in tax or licensing costs
- Consulting fees (if applicable)
- Subscription fees
- Annual Maintenance Costs

Indirect Costs

- Initial and ongoing training
- Changes in space or facility requirements (leasing costs)
- Labor hours for implementation
- Changes in utilities rates or transportation costs
- Other downstream or cross-unit costs

These costs should be calculated at current rates plus projected inflation/expansion costs and collated into a simple cost benefit analysis template.

Step Two: Calculate Benefits

Similar to the cost calculation, it is critical to be all inclusive in your approach to project benefits. A solid cost benefit analysis with a positive material return provides a Return on Investment (ROI) period. Some types of benefits are harder to quantify than others.

Some examples of benefits may be:

- Increased output
- Reduced inventory costs
- Reduced labor cost
- Reduced supply chain costs
- Reduced taxes or fees

Step Three: Incorporate Time to the Equation

Cash flow is king in today's business world. The key is collecting the discrete cost and benefit numbers, then place it in a template, generally in a spreadsheet such as Microsoft Excel, and determine the net result on cash flow over time.

In Summary

The most manageable way to complete your cost benefit analysis on a project is to use a simple cost benefit analysis template. Some of these models just have cumulative cost and savings/increased revenue for the period of ROI under consideration. Others include the "buckets" or itemize the areas that will experience significant cost or benefit over time. The most complete will incorporate a full 10-year model to accommodate the depreciation/amortization schedule of a capital investment, even if the horizon for the ROI is much shorter than 10 year.Whichever model you choose, the key is doing the right preparation to ensure the numbers feeding your analysis bear a strong resemblance to actual cost.

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