

Chapter (2)

Introduction :-

2.1 The construction industry :-

2.1.1 The construction industry in general:-

Many talked about the importance of construction industry , where it has seen considerable development in the recent period, according to the evolution of man and his need for buildings that keep pace with this development.

Construction activity is an integral part of a country's infrastructure and industrial development. It includes hospitals, schools, townships, offices, houses and other buildings; urban infrastructure(including water supply, sewerage, drainage); highways, roads, ports, railways, airports; power systems; irrigation and agriculture systems; telecommunications etc. Covering as it does such a wide spectrum, construction becomes the basic input for socio-economic development. Besides, the construction industry generates substantial employment and provides a growth impetus to other sectors through backward and forward linkages. It is, essential therefore, that, this vital activity is nurtured for the healthy growth of the economy.

Where different construction industry from other industries in the physical nature of their products as a product of the magnitude scale and the need to be manufactured at the site of his investment, which requires transmission of workshops and implementation to the construction site (Khairallah and Eid , 1990). The construction industry can best be described as a collection of industries, because a completed building is generally composed of an assembly of building materials, components and equipment produced by other industries (Kwakye , 1998). What we see today from a humanitarian cultural heritage clearly evident through the products of this industry through different historical

phases (Jalali , 2000) .

Moreover, construction has unique characteristics deriving largely from the physical nature of the product and consists of a group of activities interconnected by the nature of their products, technologies and institutional settings.

2.1.2 The Importance of the Construction Industry:-

Construction is an important industry due to the variety of demand for the essentials project in the life of any nation, which the industry must satisfy:

- The demand for housing construction
- The demand for building construction such as commercial social uses etc
- The demand for heavy engineering construction
- The demand for industrial construction including factories etc.

The construction industry has single characteristics, which are shared by other industries, but in combination they appear in construction alone, making it worthy of different treatment. These characteristics fall into four main groups, which are:

- The physical nature of the product,
- The structure of the industry together with the organization of the construction process.
- The method of price determination. (Turin; 1973).

2.1.3 The nature of the construction industry:-

Construction process is the whole series activities between the initiating point of a client needs and the production of a building to fulfill these needs. There are certain characteristics that distinguish a project from a production process.

The most important of these are:

That it is a non -repetitive on in operation of bulding. Although the

organization may be repeating the same job, every project is a unique exercise, that it has a clearly identifiable beginning and end and that significant changes in its environment and internal operating conditions take place through its duration.(Tavistock Report ,1963).

The nature of the construction process is labour-intensive. Construction, as an important factor in development, is comparatively less dependent on fixed capital even in developed countries. (Strassmann , 1970) quoting M. Arthur Lewis:

"Roads, viaduct, and irrigations canals can be created by human labour with hardly any capital to speak of. Following Ragnen Nurkse and writers of general development book, (Strassmann , 1970) argues that under-employed or surplus labour could be used with little capital in buildings community development projects or self-help dwelling.

As has often been noted, construction tended to be labour-intensive actually even in industrialized countries (Strassmann , 1970).

Construction is relatively labour-intensive in the sense that it uses a larger number of workers per unit of output than that of most other industries.

2.1.4 The role of construction in economic development:-

The construction industry in both developed and developing countries may be viewed as that sector of the economy which, through planning, design, construction, maintenance and repair, and operation, transforms various resources into constructed facilities. The types of public and private facilities produced range from residential and nonresidential buildings to heavy construction, and these physical facilities play a critical and highly visible role in the process of development.

The major participants from the construction industry include the

architects, engineers, management consultants, general contractors, heavy construction contractors, special trade contractors or subcontractors, and construction workers, along with the owners, operators, and users of the constructed facility. Building finance and insurance agencies, land developers, real estate brokers, and material and equipment suppliers and manufacturers, among others, are also involved in construction but are generally considered as distinct from but ancillary to the construction industry. The government interacts with the industry as purchaser, financier, regulator, and adjudicator. The regulatory environment within which the construction industry operates is also important and includes, for example, building and related codes, licensing requirements, safety legislation, and financial institution operating rules. Most developing, as well as developed, countries put over 55 percent of their gross domestic investment into the creation of the physical facilities, including infrastructure, so necessary for development (10,26). Moreover, the construction industry plays a key role in satisfying a wide range of physical, economic, and social needs and contributes significantly to the fulfillment of various major national goals. The industry's size, the nature of its operation, and its presence in every developmental activity have made construction an attractive area for experimentation in enhancing the effectiveness of international assistance and cooperative works .

Construction is the only sector of economic, which appears twice in the national accounts presented according to the United Nations recommendations. It is one of the eleven sectors of analysis of Gross Domestic Product (GDP) at the factor cost by industrial origin; but construction is also a component of fixed capital formation in the composition of Gross Domestic Capital Formation (GDCF) by the type of assets. Finally, construction appears as a separate entry in labor statistics reported by the International Labor

Organization.

A major difficulty in doing a quantitative study of the construction industry is a lack of accurate, detailed, and comparable data. In large part, this is due to the diverse nature of the industry in terms of, for example, its large size; fragmentation; geographic and product-type dispersion; reliance on a labor force, materials, and equipment which are widely used by other industries; and its association with numerous ancillary industries. In developing countries in particular a fluctuating demand market, which may be distorted by single but large projects and construction's sensitivity to political and economic uncertainty, impair statistics, along with the fact that it is difficult to determine the contribution of the non-monetary sector of construction. These difficulties are further compounded by the general lack of statistics on developing countries and the problem of incomparability of data collected on different countries.

2.2 The Project :

2.2.1 Definitions of the Project :

According to Ntamere, (1995) a Project is a discrete package of investment or endeavour, policy measures and institutional and other activities designed to achieve a specific objective or set of objectives within a designated period and involving the commitment of resources. To Osuagwu,(1997) a project simply means a series of related activities with a goal, a beginning, and an end. Hemuka, in his wisdom in an unpublished lecture, described a project as a form of investment or development which entails the injection of scarce resources, and other materials including land with the aim of realizing its latent potentials in form of yield, or for satisfying other social or economic benefits. A project is simply defined as any sequence of events or process which entails

the putting together of different resources towards the attainment of a particular goal. A project can be distinguished by the following characteristics:

- There must be a well articulated aim, goal or screened objective.
- A life cycle with a starting and ending points.
- It must have a network of timed and cost activities to produce a specified product.
- The endeavour must be unique and nonrepetitive and one time program.
- It may cut across many organizational lines.
- Lastly, it may require the establishment of a special organization for its execution.

2.2.2 Definitions of construction building project :-

Building work Construction work and include residential and commercial complex educational Recreational facilities hospitals and hotels, warehouse and marketing facilities building constitutes the largest segment of construction business. The building business serves mankind providing shelter and services for it habitation, educational recreational, social and commercial needs. The building works are mostly designed by architects engineering firms and financed by public and privet sector and individual.

2.3 Building contract:-

2.3.1 Definitions of building contract :-

A contract is an agreement between two parties whereby one of them undertakes to do something in return for a reward or consideration by the other. It is the element of consideration that in law identifies building contract as “simple” contract.

A simple contract results when an offer made by one party is accepted by

the other.

FIDIC define building contract as the general conditions, the supplementary conditions, the specifications, the drawings, the bill of quantities, the tender, the letter of acceptance, the contract agreement, and such further documents as may be expressly incorporated in the letter of acceptance or contract agreement.

A variety of factors make a construction contract different from most other types of contracts. These include the length of the project, its complexity, its size and the fact that the price agreed and the amount of work done may change as it proceeds.

The structure may be a new building on virgin ground. It may involve the demolition of an existing building and its full reconstruction. It could involve partial demolition and rebuilding, or the refurbishment and extension of an existing building or structure. This may be mostly below ground (in which case it is engineering) or above ground (in which case it is building). Building, however, includes foundations and other underground works. A building contract can consist of activities and services carried out both above and below ground.

2.3.2 Types of building contracts :-

(i) Lump sum contracts:

It is where the price to be paid is fixed in advance, and is subject to it being increased or diminished by consideration of the value of variations ordered in accordance with the contract.

Lump Sum typically used with Design-Bid-Build method of project procurement

a. A lump sum contract, sometimes called stipulated sum, is the most basic

form of agreement between a supplier of services and a customer. The supplier agrees to provide specified services for a specific price. The receiver agrees to pay the price upon completion of the work or according to a negotiated payment schedule. In developing a lump sum bid, the builder will estimate the costs of labor and materials and add to it a standard amount for overhead and the desired amount of profit.

b. Most builders will estimate profit and overhead to total about 12-16 percent of the project cost. This amount may be increased based on the builder's assessment of risk. If the actual costs of labor and materials are higher than the builder's estimate, the profit will be reduced. If the actual costs are lower, the builder gets more profit. Either way, the cost to the owner is the same. In practice, however, costs that exceed the estimates may lead to disputes over the scope of work or attempts to substitute less expensive materials for those specified.

c. The Stipulated Sum contract may contain a section that stipulates certain unit price items. Unit Price is often used for those items that have indefinite quantities, such as pier depth. A fixed price is established for each unit of work.

d. Contractor free to use any means and methods to complete work

e. Contractor responsible for proper work performance

f. Work must be very well defined at bid time

g. Fully developed plans and specifications required

h. Owner's financial risk low and fixed at outset.

i. Contractor has greater ability for profit

j. Requirements:

1) Good project definition.

2) Stable project conditions.

3) Effective competition essential when bidding.

- 4) Much longer time to bid and award this type of project.
- 5) Minimum scope changes due to higher mark-ups than occurred at bidding.

(ii) Measurement contracts:

Where the price to be paid for the whole work is ascertained by measurement and valuation related to a schedule of prices included in the contract. The Re-measurement Contract contains a Bill of Quantities (BQ) provided by the employer or its consultants, however the BQ quantity is estimated and not final . The contractor will quote against each BQ item and enter a unit rate or unit price to build up the total contract price on basis of those BQ quantities . During the construction period , the actual quantity of works executed under each BQ item will be jointly measured and valued at the quoted rate for interim payment purpose . At completion of contract , the exact quantity of works finally executed under each BQ item will be again re-measured (ie. the final measurement) and valued at the quoted rate to evaluate the final account . In case of instructed variation or additional works that are without basis of BQ rate(s) , the contractor can build up new rates or star rates for those works for valuation . Arguably , this type of contract is more fair to both the client and the contractor because the final contact sum is based on a final re-measurement rather than being based on preliminary quantities set at tender.

(iii) Unit Price:

a. In a unit price contract, the work to be performed is broken into various parts, usually by construction trade, and a fixed price is established for each unit of work. For example, painting is typically done on a square foot basis. Unit price contracts are seldom used for an entire major construction project, but they are frequently used for agreements with sub-contractors. They are

used for maintenance and repair work. In a unit price contract, like a lump sum contract, the contractor is paid the agreed upon price, regardless of the actual cost to do the work.

b. Requires:

- 1) Adequate breakdown and definition of work units
- 2) Good quantity surveying and reporting system
- 3) Sufficient design definition to estimate quantities of units
- 4) Experience in developing bills of quantities
- 5) Payment terms properly tied to measured work completion
- 6) Owner-furnished drawings and materials must arrive on time
- 7) Quantity sensitive analysis of unit prices to evaluate total bid price for potential quantity variations.

c. Time and Cost Risk are Shared:

- 1) Owner at risk for total quantities.
- 2) Contractor at risk for fixed unit price

d. Large quantity changes (>15-25%) can lead to increase or decrease in unit prices.

(iv) Cost reimbursement contracts:

a) Main aspects of cost reimbursement contract:

1. The contractor will be reimbursed for all actual costs plus an agreed fee to cover his services (overhead and profit).
2. The contractor must make all his records and accounts available for inspection by the client or by some agreed neutral third party.
3. The fee can be designated as:
 - A fixed percentage of the cost of the work.
 - A fixed fee.
 - A fixed fee with a guaranteed top price.

- A fixed fee with bonus.
- A fixed fee with an arrangement for sharing any cost saving.

4. Suitable:

- when the requirements of the client are vague,
- when it is desirable for design to proceed concurrently with construction
- for emergency projects, repairs, maintenance work, and alterations.
- for project with unknown technologies or major changes.
- where the contractor possesses a special ability.
- when the client wishes to be involved in contract management.
- Confidential processes. .

5. Topics that should be negotiated between owner and contractor before signing a cost reimbursement contract include:

- Subcontract-letting.
- Determination and payment of fee.
- Accounting methods.
- Overheads (site and office).

2.3.3 Documents of construction projects :

(i) Paper Contracting:-

The paper contractor agrees to manage that project in exchange for a specific contractual fee. This fee may include a financial incentive for controlling costs. The contract may or may not include a guaranteed maximum price (GMP).

The trade contracts are prepared by the paper contractor; however, it's the owner, not the paper contractor, who actually signs contracts with trade

contractors. The paper contractor may advise on pre-construction issues such as design and cost control.

The paper contractor will make recommendations on all the issues normally handled by a general contractor: selection of trade contractors, scheduling, approval of payments, resolving claims, and project closeout.

(ii) Contract documents:-

The set of documents traditionally used in UK engineering contracts is:
- drawings , specification. , conditions of contract. and agreement.

The basis of a successful construction contract is established by the tender documents and any subsequent negotiation prior to the award of the contract. The contract is defined by the contract documents, which for a conventional engineering ad measurement contract may include:

- form of agreement , special conditions , general conditions , specifications , drawings , priced bills of quantities or schedule of rates and pre-contract minutes or correspondence.

2.4 participants in construction projects:

2.4.1 Definition of any participant in the project :-

(i) Project manager:

- Shall ensure that information concerning the work is obtained.
- Plans, directs and monitors the activities of the project team.
- Shall ensure required resources – personnel, equipment and materials are present on-site and are in the right quantity and condition.

(ii) Clint's/owners:

This is the individual, the firm, or the organization that funds the construction project and will own the completed facilities. The owner, perhaps assisted by consultants, specifies the scope of the construction project. In some

instances, the owner may specify the detailed layout of the facility, the type of materials to be used, and so forth. The owner, perhaps assisted by some of the parties described below, and depending on the technical expertise of his or her own staff, may inspect the project work as it is being performed and on its completion. The golden rule in the construction process is: "He who has the gold makes the rules." Because the owner controls the purse strings, he or she dictates the kind of contract that will be used and selects the other parties to the project.

(iii) The designer:

They may be employees of the owner, but are more often recommended by the project manager. In addition to designing a building facility that meets the expressed needs of the owner and that complies with applicable building codes, the Architect may be retained by the owner to act as his or her representative in inspecting the project work to review and approve materials that the contractor proposes to use in the work, to review and recommend contractor requests for progress payments, and to perform other functions on behalf of the owner especially where there is no trained project manager.

(iv) The main contractors:

Duties are to deliver the project to the Client's requirements- that is to the brief, budget and to programme. The Main Contractor will subcontract various parts of the construction works, and will be responsible for their performance, and will co-ordinate the work of all the subcontractors accordingly. They are also responsible for Health and Safety on site and ensuring that all persons on site are aware of their responsibilities.

(v) The Subcontractors:

Deliver their selected work packages, in co-ordination with the Main Contractor and other subcontractors particularly in the case of Electrical and

Mechanical subcontractors whose work is generally inter-related.

(vi) The Suppliers:

Responsibility to provide goods and/or services to the Client as per the requirement and to their timescale and budget. This category could include furniture supply, audio visual equipment, IT equipment etc.

2.4.2 Role of each party involved in building project :-

There are three participants to the Construction Contract: the Contractor, the Engineer and the Employer. Briefly, the role of each one of these participants and their interfaces are as follows:

The Contractor or general contractor shall, with due care and diligence, execute and complete the works, and remedy any defects therein. He shall provide all superintendence, labour, plant, equipment and all other necessary things specified in or reasonable to be inferred from the Contract. Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of construction and responsible for providing all of the material, labor, equipment (such as engineering vehicles and tools) and services necessary for the construction of the project. The general contractor hires specialized subcontractors to perform all or portions of the construction work.

Responsibilities may include applying for building permits, securing the property, providing temporary utilities on site, managing personnel on site, providing site surveying and engineering, disposing of or recycling construction waste, monitoring schedules and cash flows, and maintaining accurate records.

The Contractor shall work in strict accordance with the Contract to the satisfaction of the Engineer.

He shall comply and adhere strictly to the Engineers instructions except where

the Contract expressly provides for instructions to be given by the Employer. During the Contract, the Contractor will not have any interface with other contractors or other. A general contractor must first assess the project-specific documents (referred to as tender documents). In the case of renovations, a site visit is required to get a better understanding of the project. The contractor will then calculate a price, also called an estimate. The general contractor considers the cost of materials and equipment as well as the cost of labor to provide the owner with an approximate price for the project. Contract documents include a budget, any general and special conditions, and blueprints and specifications prepared by a design professional such as an architect. In many instances the general contractor is the project engineer or project manager for construction projects.

General contractors often run their own business. They hire subcontractors to complete specialized construction work and may manage a team of plumbers, electricians, builders, carpenters and other specialists. General contractors build their business by networking with potential clients, buying basic construction tools, and ensuring that their subcontractors complete high-quality work. General contractors don't usually complete much construction work themselves, but they need to be familiar with construction techniques so they can manage workers effectively.

The architect assembles a design team of consulting engineers and other experts to design the building and specify the building systems. Today contractors frequently participate on the design team by providing pre-design services such as providing estimations of the budget and scheduling requirements to improve the economy of the project. In other cases the general contractor is hired at the close of the design phase. The owner, architect, and general contractor work closely together to meet deadlines and budget. The

general contractor works with subcontractors to ensure quality standards.

The engineer shall be responsible for the enforcement and proper administration of the contract and shall, with due care and diligence, carry out:

(i) the supervision of construction.

(ii) the testing and commission of the works.

(iii) the periodic and final account of the works, and (iv) the resolution of disputes (first instance).

The Engineer shall also be responsible for all communications to the Contractor except where the contract expressly provides for instructions to be given by the employer.

The Employer (Civil Engineering Group) shall be responsible for the Engineer's performance in the enforcement and correct administration of the contract. He shall be responsible for the commitment of the Organizations' funds, i.e., he shall be responsible for the certification and payment of the Contractor's invoices and the issue of variations to the contract. The Employer shall be also responsible for the limitation and eventual management of interfaces between all other groups and the Engineer and/or Contractor.

Stakeholders in Project:

Project stakeholders are those who can impact the project and those who can be impacted by the project. From the perspective of project management literature, it is important to identify the key stakeholders for project success (Sutterfield et al, 2006, Milosevic 2003). Project managers need to identify all stakeholders, determine which are most important, develop relationships with at least the important stakeholders, and communicate effectively with all of the stakeholders. One way to identify stakeholders is to determine who can impact the project and who the project can impact. These impacts can be positive in the sense of helping the project achieve success or negative in the sense of

making it more difficult to achieve project success. These impacts can be to either the process or the results of the project. Some researchers such as Milosevic (2003: 331) break the impact upon project process down further into providing or withholding resources, defining project requirements, and people and communication issues.

2.5 Project life cycle :-

2.5.1 definition of Project life cycle :-

Projects follow a predictable pattern or life cycle. A project life cycle consists of several stages during which deliverables are created and end with approval of the deliverables. The simplest way to envision this is that a project must somehow start – therefore, there is an initiating stage that starts with the germ of an idea for a project and culminates in a decision to perform the project (or at least a decision to plan it in more detail and then make the decision whether to perform the project. In the vast middle time on most projects there is a combination of planning and executing of project work. The most deliberative approach would have all of the planning completed before beginning any project execution. The last stage in a project life cycle, closing, begins when the project's customers formally accept the project deliverables and ends when all the books are closed, documentation is complete, resources are reassigned, etc.

2.5.2 Delay and extension of time in project life cycle :-

The contractor will be liable for damages if the actual completion date of the works occurs after the agreed completion date unless the delay is caused by a matter for which an extension of time is available and the contractor complies with the notice and other requirements under the contract. The contractor may

be entitled to an extension of time where there is:-a variation or additional work instructed; -exceptionally adverse weather; - unforeseeable shortages in the availability of personnel or goods; - delay caused by the employer; - a cause of delay under any other clause in the contract; - unforeseeable delay caused by complying with public authority procedures. The contractor must strictly comply with the notice requirements under the contract, including giving all necessary information required in relation to the claim. Note that minutes of a meeting or a contractor's progress report are unlikely to constitute proper notice.

2.5.3 Time and cost overrun project life cycle:-

(i) Time overruns:

Time overruns is defined as the extension of time beyond planned completion dates traceable to the contractors (Kaming , 1997). Delays are incidents that impact a project's progress and postpone project activities, delay causing incidents may include weather delays, unavailability of resources, design delays, etc. In general, project delays occur as a result of project activities that have both external and internal cause and effect relationship (Vidalis , 2002).(Choudhry , 2004) and (Chan , 2001), defined the time overruns as the difference between the actual completion time and the estimated completion time. It was measured in number of days. Project delays are those that cause the project completion date to be delayed(Al- Gahtani and (Mohan , 2007). From above, time overruns is defined as the time increased to complete the project after planed date which caused by internal and external factors surrounded the project. (Murali , 2007) argued that contractor related factors and client related factors such as inadequate contractor experience and owner interference have impact on time overrun. On the other hand, (Aibinu

and Jagboro , 2002) studied the effects of construction delays on project delivery in Nigerian construction industry. They identified time overrun as one of the major effects of delay.

(ii) Cost overruns:

Cost overrun is defined as excess of actual cost over budget. Cost overrun is also sometimes called "cost escalation," "cost increase," or "budget overrun." (Zhu , 2004). Also cost overrun is defined as the change in contract amount divided by the original contract award amount .This calculation can be converted to a percentage for ease of comparison (Jackson , 1990) . Cost overrun = Final Contract Amount – Original Contract Amount (Choudhry , 2004) defined the cost overruns as the difference between the original cost estimate of project and actual construction cost on completion of works of a commercial sector construction project. Regarding cost overrun (Koushki , 2005) identified three main causes that were contractor related problems, material-related problems, and owners" financial constraints, whereas (Wiguna and Scott , 2005) identified the most critical factors included: high inflation/increased material price; design change by client; defective design; weather conditions; delayed payment on contracts and defective construction work.

2.6 delay in building projects :-

2.6.1 Definition of delay:-

Delay in construction projects can be defined as the time difference between the date of project completion stated in the contract and the date of actual completion.

Also, delay could be defined as the time overrun either beyond completion

date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases. Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it is rarely happen that a project is completed within the specified time.

Known delay that (the period is not used where the contractor cadre of workers and technicians ability of actual and normal and which depend on the nature and volume of work, may be delayed portion of the work or the entire work (Twort , 1975 ,). While en P et delay that (Contractor fails to complete the work

To delay an adverse effect on the success of the project in terms of time, cost, quality and safety, but not limited impact on the construction industry, but also extends to affect the entire national economy of the country. Delay classified as a deviation from within the timeframe following deviations (Karkhi , 2000), namely:

1. Deviations of time: a lack of achievement in the deadline for many reasons which lead to an imbalance in the timetable for the implementation of the project.
2. Deviations Quantity: a failure to achieve and accomplish the required units

and contrary to what is planned.

3. Deviations quality: do not match the specifications and technical conditions required for the work carried out and is this deviation is of particular importance and need attention to it by the administration

4. Deviations planning: are deviations that can be observed when comparing actual results with planned and stand on how to achieve those results. Which can be diagnosed, the delay is a negative condition in the construction industry caused by the failure of one or more members of the project team in achieving the goals set contract between the contractor and the employer within the time limit specified. In light of this study should delay-related reasons with respect to the project team (contractor, employer, Eng).

2.6.2 Types of delay:-

The type of delay falls into two major categories, excusable and non-excusable . (Terry Williams , 2003) revealed that there are three basic ways to classify delays:-

I. Excusable delay with compensation , Excusable delay without compensation and. Non-excusable delay

(i) excusable:-

1-1 Excusable delay is “a delay to completion which is caused by matters deemed to be outside the control of the contractor” (Pickavance , 1997). It excuses a contractor from performing within the contract period and justifies an extension of time to perform.

This type of delay can also have an impact on non-critical activities which need more detailed analysis to determine whether additional time extension is warranted or if the reduction of float time can be justified. Generally, whether delays are excusable depends on contract provisions. Acts of God, unexpected weather, labour disputes, owner design problems, owner-intiated changes and

similar factors may cause excusable delays.

Excusable delays, also known as “force majeure” delays. These delays are commonly called “acts of God” because they are not the responsibility or fault of any particular party. Most contracts allow for the contractor to obtain an extension of time for excusable delays, but not additional money (Alaghbari , 2005).

The main consideration is whether the factors were beyond the contractor's ability to control or foresee. In other words, delays are generally excusable when another party caused but could have avoided them, or when they were due to environmental factors beyond the control or foresight of anyone. Excusable delays can be further classified into compensable and non-compensable.

1- Compensable Excusable Delays:

Excusable compensable delays are caused by the owner or the owner's agents. A compensable delay usually leads to a schedule extension and exposes the owner to financial damages claimed by the contractor. However, “in some special circumstances a compensable delay does not always mean that additional time is due. Sometimes only additional costs will be compensable” (Callahan , 1992).

Examples of this would be the late release of drawings from the owner's architect, failure of the owner to hand over the site to the contractor or major changes in the scope of work.

Excusable with compensation are caused by the client's actions or inactions. When contractors encounter this type of delay, they are entitled to time extension as well as monetary compensation due to the delays. An example of an excusable delay with compensation would be when an owner denies access to the site once the notice to proceed is given.

This delay is because come sometime unexpected situation and it not from mistake of the contractor. The external factor is something hard to make sure because it refer to the future and event In addition to the compensable delays that result from contract changes by Change Notice, there are compensable delays that can arise in other ways. Such compensable delays are excusable delays, suspensions, or interruptions to all or part of the work caused by an act or failure to act by the Owner resulting from Owner's breach of an obligation, stated or implied, in the contract. If the delay is compensable, then the Contractor is entitled not only to an extension of time but also to an adjustment for any increase in costs caused by the delay.

Owner-issued contracts specifically address some potential compensable delays and provide equitable adjustments. The usual equitable adjustment clauses in Owner issued contracts that apply to delay are: Changes, Differing Site Conditions, Suspension .

2- Excusable non-compensable delays:

Excusable non-compensable delays are caused by third parties or incidents beyond the control of both the owner and the contractor. In this case “the contractor is entitled to a time extension without the recovery of associated cost of damages” (Leon , 1987). Each party (owner and contractor) must pay his own part of the delay cost. Examples typically include acts of God, unusual weather, strikes, fires and acts of government in its sovereign capacity.

Excusable without compensation are delays where neither the client nor the contractor is deemed responsible. When this type of delay is encountered, only a time extension will be warranted since there are no grounds for damages. This delay is allow to the extends of time to finish construction without give any compensation to the contractor. The factor that include of this delay is:-
i-Protest from the labour.

- ii- Unexpected whether.
- iii- Unexpected of late delivery equipment.
- iv- Unexpected of late delivery material.

Non-compensable delays are caused by third parties or of both the owner and the contractor.

Examples typically include acts of God, incidents beyond the control unusual weather, strikes, fires, acts of government in its sovereign capacity, etc. In this case, the contractor is normally entitled to a time extension but no compensation for delay damages. owner or the owner's agents. An example of this would be the late release of drawings from the owner's architect. An excusable, compensable delay usually leads to a schedule extension and exposes the owner to financial damages claimed by the contractor. In this case, the contractor incurs additional indirect costs for both extended field office and home office overhead and unabsorbed home office overhead.

(ii) non-excusable:-

Non- Excusable delay are caused solely by the contractor or its suppliers. The contractor is generally not entitled to relief and must either make up the lost time through acceleration or compensate the owner. This compensation may come about through either liquidated damages or actual damages, providing there is no liquidated damages clause in the contract. Liquidated damages are generally expressed as a daily rate that is based on a forecast of costs the owner is likely to incur in the event of late completion by the contractor.

This delay cause by avoid the contract agreement by contractor and it was identify by construction contract. Client can claim their loss if had in the contract agreement. These delay had to identify by client because they rarely to check the schedule of the construction. The factor that contribute to the non-

excusable delay:-

1. The usual weather and as expected whether.
2. The inefficiency of contractor to manage the construction site.
3. The financial of contractor.
4. The lack of labour.
5. Failure to manage their work according to the contract schedule.
6. Always make mistake or failure to fulfil of owner specification.
7. Prosecute the work in a timely manner.
8. Properly staff the job.
9. Order materials or equipment on time.
10. Submit shop drawings for approval on schedule.
11. Coordinate the work of its subcontractors.

2.6.3 Causes of delay:–

The researchers identified a variety of categories and causes of delays, using methods appropriate to their particular studies. As the field has developed, it has become easier to conduct studies into construction delay, since many categories of delay factors have already been identified. Consequently, most recent studies have relied on the categorisation of causes identified in the existing literature.

Many studies have also been carried out to assess the causes of such delays.

The main causes of delay in large building projects and their relative importance 56 causes of delay exist in Saudi construction projects and conclude that contractors, consultants, and owners generally agree on the importance ranking of delay factors. Contractors considered the most important delay factors to be the preparation and approval of shop drawings, delays in payment by the owner, and design changes. The most important delay factors for the consultants were cash problems, the relationship between different

subcontractor schedules, and slow decision making by the owner. The owners considered the most important delay factors were design errors, excessive bureaucracy in project-owner organization labour shortages and inadequate labour skills. Delay factors were categorised into nine groups, of which financing was unanimously ranked highest (Assaf and Al-khalil ,1995).

From 12 high-rise building construction projects in Bangkok founded the most projects suffered delays because materials were in short supply or were overstretched. Demands from construction owners for frequent changes also technical personnel created design and coordination problems for field staff (Jearkjirm , 1996)

conducted a survey into the causes of time overruns in Hong Kong construction projects, finding that all three major groups of industry participants (contractor, consultant and client) felt that the five most significant sources of overrun were site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client-initiated variations and necessary variations of works (Chan and Kumaraswamy , 1997).

In SA founded that the most important cause of delay is cash flow and other financial difficulties. Difficulties in obtaining permits is the second most important, followed by the government practice of awarding contracts to the lowest bidder without regard to qualification and the tendency of clients to underestimate project duration. They also found that the contractor is most commonly responsible for project delay (44%), followed by the client (22%) and the consultant (14%) (Khalil and Al-Ghafly , 1999).

From 130 public building projects constructed in Jordan during the period 1990-1997 founded the main causes of delay in construction projects relate to designers, user changes, weather, site conditions, late deliveries, economic

conditions and increase in quantities (Al-Moumani , 2000).

2.6.4 Factors causing delay :

It has been shown above that a large number of causes may lead to delays in construction projects, arising from different parties and resources. These causes are in a sense countless, since each construction project has its own characteristics and environment. Efforts have therefore been made by many authors to identify the most significant causal factors of delay in construction projects.

The researcher select the causes most appropriate to the present survey from a number of previous studies, with a high probability of covering all significant sources of delay. In addition, the major categories of causes of delay are identified, based on several previous studies, to match the purpose of this study.

The causes of construction delay as defined for this study will be discussed in a wide perspective. In order to obtain full understanding of the subject, major categories of construction delay will also be considered on a case by case basis.

Many causes of delay were identified, based on the literature review. These causes were grouped into five major categories show in figure 2.1 below

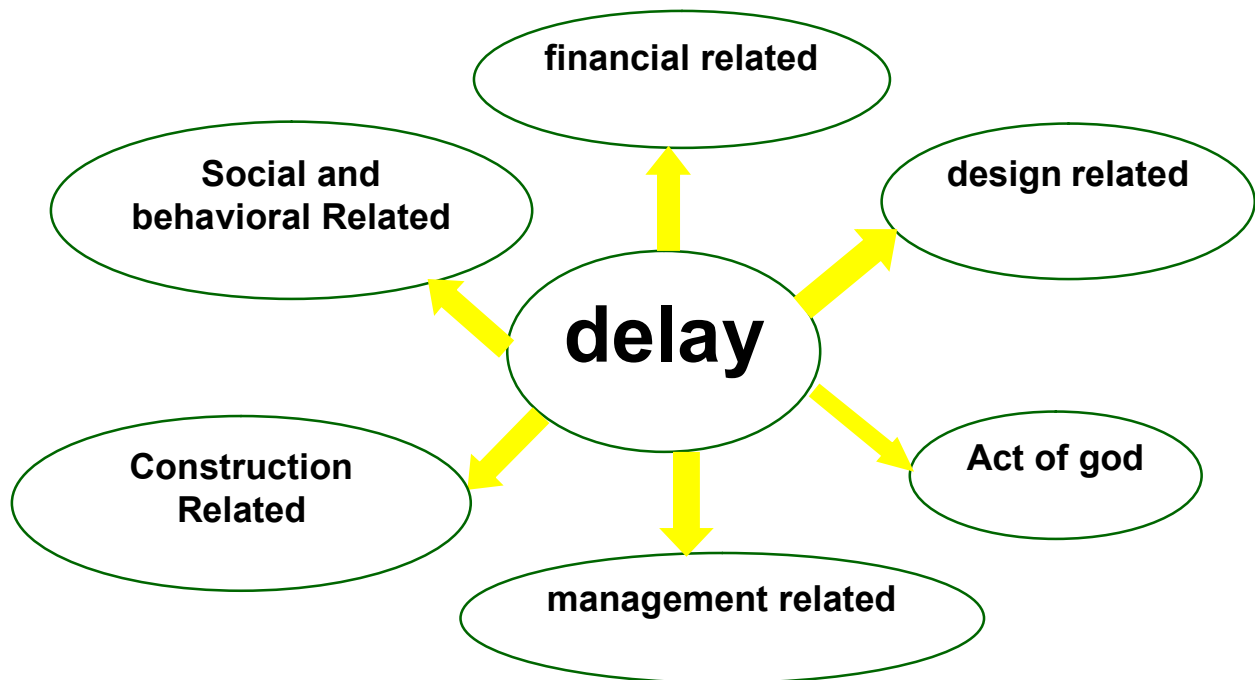


Figure: 2.1 Type of causes of delay

A. Project finance:

The methods used to finance building and construction projects is one of the most dynamic and complex areas in the modern industry. Where clients used to pay for work done, today it is increasingly common for the construction contractor or consortium to arrange the finance necessary for the projects they are responsible for.

These methods, first employed on infrastructure projects in the transport and energy industries, are now being applied to building work (Best and Valence, 2002). Thus, not only owners but also contractors may face problems in financing the project.

Difficulties that may be faced are delay or inability to pay the direct and indirect costs. Direct costs include materials, labour, and subcontract expenditures, while indirect costs are the expenditures that support the direct activities, such as supervision and warehousing. Also, the complexity of construction cash flow,

disputes with suppliers with regard to payment, and other problems common construction projects, all may contribute to delays in completion. The contractor in should make sure that he has sufficient capital to enable him to undertake a specific project, and put all financing processes under control by adopting an effective project financing method. Also price rises are beyond the control of the contracting parties, they may also create disputes between contractors and clients, which will further increase the project duration.

B- Design related factors:

The quality of early planning and design affect the whole life cycle of the project.

Accurate planning can secure smooth progress of work and deliver a successful project on time. However, it requires a great deal of information about the project and related matters. “The purpose of the provision of information and the use of the various planning tools is to enable the parties to put their respective contract obligation into effect. It can be reduced to a single question: How are we going to deliver this project on time and within budget?” (Carnell, 2000).

Completed and clear documents, specification and design ease the contractor’s obligations, create a pleasant atmosphere for work, and do not give the constructor excuses for delays.

It must be recognised that drawings are a means of communication rather than an end product and hence, should be carefully detailed and coordinated to provide good production information. Adequate information on the planned shape, size, location and constituent parts of building; and on materials, jointing and fixing methods and so on must be provided in order to convey the designer’s intentions adequately to the constructor. Ambiguities, mistakes and

inconsistencies in the specifications and drawings will lead to many stoppages during construction, and therefore a longer project duration. Furthermore, unclear specifications and drawings may not give the owner a clear picture of the project, and increase his surprise at the construction stage, which in turn will result in adversarial disputes and changing orders. In actual fact, spending enough time at the early planning and design stage can speed the progress of production and avoid sinking into a ‘disputes and blame’ culture. Basically, paying careful attention to the early stages of the project will result in completing the project earlier than planned or on time.

C. External factors

There are some factors beyond the control of contractors and owners that cause construction delays. The occurrence of these factors gives the contractor the right to an extension of time.

Such as the rise in extreme temperatures in summer as usually happens in Sudan. If there are then exceptionally adverse weather conditions for the time of year, the contractor may be entitled to an extension of time. This can happen even though it is the contractor's own delay that has caused the work to be affected by the adverse weather conditions (Birkby and Brough , 2002).

D. Project management performance

Contractors’ responsibilities involve many tasks that contribute to project management performance. Planning and scheduling the project, communication and coordination with project parties, controlling suppliers and sub-contractors are the main issues that impact on project duration.

“As in many other walks of life, if we start off by doing things wrong, one bad practice leads to another, and we end up in a vicious downward spiral” (Horner and Duff , 2001). Planning is a vital issue in any project, and success or failure of construction projects can be primarily ascribed to the planning.

Planning for a contractor begins with the selection of the most appropriate procurement method for the project; the final, detailed plan demonstrates what each one has to do, when, and how, and comprises all major decisions necessary.

The plan becomes a vehicle for communication with all project participants and is a prerequisite for detailed scheduling of the work and for the preparation of a definitive cost estimate (Kimmosons and Loweree , 1989). Scheduling is a vital part of planning; it develops a timetable for the implementation dates of the plan. The lack of an appropriate project plan usually results in poor project implementation. Project planning must obviously take place at an early stage of the project, but there should be a planning revision at any appropriate time during the project because of the changes that commonly happen in construction. In order to handle the project and ensure that all things are under control, contractors should build coordination and communication routes with all parties involved: subcontractors, suppliers, owners, the administration team, the local authority, etc. Regular meeting between parties involved can create an effective atmosphere for solving all difficulties that result from the interface of the different parties in a project. Project quality control can also affect the duration of a project. Completing work without achieving the desired quality standards may lead to having to do it again. To avoid such costly mistakes, quality control is required, to ensure that the project will satisfy the needs for which it was undertaken, which involves proceeding in three stages. Once the client has identified the desired quality standard, the contractor needs to determine how to achieve it. Secondly, he must carry on the process of quality assurance, which involves evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the desired quality. Finally, he

must monitor specific project results to determine if they comply with the desired quality and identify ways to eliminate causes of unsatisfactory performance.

E- Construction Related:

Sometimes, contractors face difficulties with subsurface condition on site. These difficulties include very strong rocks below the site, many utility lines (electricity gas, and so on) and/or a water table in the vicinity of the site; and these may not be marked on available maps. Unexpected subsurface conditions may not only delay the work but also require redesign of the project master plan.

Some reasons for delay in the adoption of samples and charts:

1. Failure to adopt the necessary measures by the contractor in a timely manner or submission of samples is Suitable or incomplete schemes.

And you need the process of bringing samples to a large prior effort must be exerted by the Contractor before submission to the consultant to take approval Such as liaison with the manufacturing and business negotiation on the price agreed upon and provide different samples and coordination with subcontractors Sample was related to one of them, all this and other calls that cares contractor this matter before sufficient time, but since the beginning of the project but Many of the contractors do not think of these things but when near its implementation or in the time they are not allowed to work the desired action. And the contractor is also trying to provide samples or schemes may not be in the required level of quality or lacked some of the information or the necessary details and takes the field supervisor in the give and take with him even newcomers to solve the satisfaction of both parties, which takes And time-consuming.

2. Inefficient device field supervisor:

If the device is not the supervisor of the required technical level of experience and knowledge he is not able to convince the contractor point of view

In the adoption of the plan or reject the sample as it is in some cases may be lost considerable time to accept work or the adoption of a sample or reject scheme For reasons that are assigned or not substantial .And for this we believe that the field supervisor efficient system is one of the most important factors to help

Speed can solve problems that might hinder the adoption of a sample or accept employment or improve the scheme and vice versa.

3.Duplication and multiple levels of oversight:

Cause some quarters to hinder the adoption of the samples, drawings and accept these actions to suspend these things by more than one hand, without specifyingClear Sometimes samples are accepted by the consultant and the

other by the Central coaching staff and a third time by the highest official

In the device and may take twice the time or tripled and in some cases turning to another external party or participate in Reliance and acceptance of non-professional actors (in a large medical complexes Subscribe eleven physicians to accept to cover materials

Umbrellas parking lots) and each level of these levels takes a few time to give his approval or acceptance and removed his objection.

The such a way that confuses work and Tak and not offer or improvement of the level of quality as some think, but lead to failure to achieve

The first goal and that there will be a regular meeting attended was necessary and useful presence of specialists and Different parties and are in it, and thus provide feedback and dialogue and discussions until everyone reaches the conviction adoption.

The work required.

4-Delay in materials delivery and changes in material types and specifications during construction.

F- Social and behavioral related factors:

The human resources of the most important factors affecting the construction industry the labor Which converting resources to engineering work is complete and visible.

So is labor productivity of the most important factors that contribute to the success of the project and completed it on time, and productivity factors different from one country to the other, and so Because number of social and cultural factors which vary from one country to another, we find for example, that worker productivity in developed countries Increase than labor productivity in developing country and that Sudan from developing countries is due to several reasons, including economic factors, we find that working in developed countries dealing with healthy and nutritious foods so find that working on the largest production capacity of than the worker live in developing countries.

In the developed countries, the proportion of skilled labor is somewhat greater than that of unskilled labor and is many times that of semiskilled labor, while for the developing countries unskilled and semiskilled labor largely comprise the labor force. workers in developed countries, be a graduate apprenticeship institutes that qualify. the labor need for more efficient that it lacks developing countries where workers are learning by doing construction work Which increases the error rates. and the role of apprenticeship programs has largely become one of producing the key workers who rise to supervisory and training positions. Illiteracy is also a problem in construction in that this necessitates special training programs and means that few of the workers can read blueprints. It appears that in most developing countries there is a need both

for additional and better qualified workers in construction. The common reasons cited for these shortages are a lack of training facilities, shortage of instructors, and low job status and pay. These conditions and the fact that workers are less able, due to their lack of training, to move up to the position of site supervisor/foreman also have created a general shortage of qualified foremen.

It also factors affecting productivity in the construction sector that the majority of workers are steadfast and workers are treated daily wage system, which leads to go some to work in other areas, such as going to the areas of the harvest season, for example, all available labor may be needed on the farms, while during the slack seasons there is a surplus of labor . There are also social factors affecting the construction industry in Sudan, of which dealing with the sub-contractor is within a verbal agreement is not written in the contract, because the subcontractor has a good social relationship with contractor.

And there is a difference in cultures if the government used the multinational companies Multi-national firms It generally engage in projects and activities .

Types of construction that are beyond the abilities of the local industry. generally include infrastructural projects, such as transport, communications, and utilities, where the client is usually the government , Professional services rendered by multi-nationals include feasibility studies, planning, design, supervision and management of construction. This multiplicity of cultures may lead to problems happen because of a delay in the time to complete the project.

And also of the social factors that affect the course of work on the project a few production worker in the holy month of Ramadan in which he be less productive than the other months of the year, which affects the time specified to complete the project.