



T.C.

ALTINBAŞ UNIVERSITY

Institute of Graduate Studies

Civil Engineering

**THE FAIR PROGRESS OF THE CONSTRUCTION
PROJECT AND THE CONFLICT SETTLEMENT
BETWEEN THE CLIENT AND THE
CONTRACTOR**

ZAINAB ALI HUSSEIN

Master of Science

Supervisor

Prof. Dr. TUNCER ÇELİK

Istanbul, 2021

**THE FAIR PROGRESS OF THE CONSTRUCTION PROJECT AND THE
CONFLICT SETTLEMENT BETWEEN THE CLIENT AND THE
CONTRACTOR**

by

ZAINAB ALI HUSSEIN

Civil Engineering

Submitted to the Graduate School of Science and Engineering

in partial fulfillment of the requirements for the degree of

Master of Science

ALTINBAŞ UNIVERSITY

2021

his is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Academic Title Name SURNAME

Prof. Dr. TUNCER ÇELİK

Co-Supervisor

Supervisor

Examining Committee Members (first name belongs to the chairperson of the jury and the second name belongs to supervisor)

Academic Title Name SURNAME Faculty, University

Academic Title Name SURNAME Faculty, University

Academic Title Name SURNAME Faculty, University

Academic Title Name SURNAME Faculty, University

Academic Title Name SURNAME Faculty, University

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Prof. Dr. TUNCER ÇELİK

Head of Department

Approval Date of Graduate School of
Science and Engineering: ____/____/____

Prof. Dr. Çağrı Erhan

Director

I certify that the information contained in this document was gathered and presented in line with academic standards and ethical behavior. Additionally, I declare that, in accordance with these rules and guidelines, I have properly attributed and referenced all materials and results that are not unique to this work.

ZAINAB ALI HUSSEIN

DEDICATION

I commit and pledge this thesis work to my professors, who have been instrumental in guiding me during the thesis process, and my family, who has been a constant encouragement throughout this trying period.



ACKNOWLEDGEMENTS

I want to express my gratitude to my supervisor for guiding and aiding me throughout the thesis writing process. Discussions with my supervisor regarding my accomplishments, challenges, and values aided me tremendously in comprehending the logic of this report. It aided in my knowledge of the research project's technical parameters. He assisted me independently by integrating all technical and network-based data and approaching based information holistically, rather than only from a productivity perspective. He explained to me many theoretical nuances about theories, such as how to approach problem-solving and contextualize the outcomes. Without his time and cooperation, this research would not have been feasible, and I am indebted to him for providing me with the opportunity to work on such an intriguing subject. Additionally, I am indebted to my Family for their constant support during this journey.

ABSTRACT

THE FAIR PROGRESS OF THE CONSTRUCTION PROJECT AND THE CONFLICT SETTLEMENT BETWEEN THE CLIENT AND THE CONTRACTOR

ZAINAB ALI HUSSEIN

M.S., Civil Engineering Department, Latinas University,

Supervisor: Prof. Dr. TUNCER ÇELİK

Date: 06 / 2021

Pages: 107

Because of their effectiveness, Engineering Contracts (EC) are considered by both parties to be the project execution plan that serves the goal for which the contract is formed. However, there are some conflicts that the contract does not fundamentally resolve, causing the two parties to resort to the judiciary, dispute resolution panels, and other alternative remedies.

This study aims to clarify most of the solutions that are included in the contract stage as it is the most critical stage in the project until its perfection according to what is required to limit the outbreak of disputes between the contracting parties, which may develop into a conflict by dividing the study into two frameworks, the first is theoretical and includes a comprehensive study of the stages. To complete the project from feasibility to delivery and documentation and information about conflicts, their causes, how to avoid them, disagreements, their divisions, and how to settle them. The second framework is practical. It consists of a questionnaire data from the field of study and the reality of the problem, as well as research hypotheses, where the data was reviewed and

discussed to arrive at some conclusions that will aid in the solution of the problem. To avoid the occurrence of disputes from the stage of concluding the contract and therefore obtain recommendations to support the research, reducing disputes in the Construction Industry (CI) and designating decision-makers in the general policies of the profession represented in it is essential.

When signing contracts without consulting legal departments, there is a significant impact, as it is the cause of problems in the project stages. After the bid is sorted, the contracting contract is well formulated due to the importance of the contract language and formula, as it must be following the law, and the contract form differs depending on the type of contract.

The engineering contract's clauses define each party's role and responsibilities and state that there will be no contractual problems unless there is a lack of suitable and thorough project study with comprehensive preliminary drawings before signing the contract and failing to give the essential measures for extra work. The reason for a contract dispute's occurrence.

Keywords: Conflict, Relationship, Contractor, Dispute, Hypothesis

TABLE OF CONTENTS

	<u>Pages</u>
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF ABBREVIATIONS	xvii
1. INTRODUCTION	1
1.1 GENERAL OVERVIEW	1
1.1.1 Construction Industry	1
1.1.2 The Construction Industry's Characteristics.....	2
1.1.3 Changes Affecting the Construction Industry's its Development Environment. .	2
1.1.4 The Primary Purpose of Technological Progress	3
1.1.5 The Advantages of Technological Advancement	4
1.1.6 The Rate of Inflation	5
1.2 FIELD OF RESEARCH.....	5
1.3 PROBLEM TO BE RESEARCHED.....	6
1.4 RESEARCH ASSUMES.....	6
1.5 METHODOLOGY OF STUDY.....	6
1.6 THE AIMS AND VALUE	7
1.7 THESIS LAYOUT	7
2. CONFLICTING ASPECTS AND PROJECT PHASES: A LITERATURE REVIEW .	9
2.1 INTRODUCTION.....	9
2.2 LITERATURE REVIEW	10
2.3 STAGES OF CONSTRUCTION PROJECTS.....	15
2.3.1 The Planning Stage.....	17
2.3.2 The Feasibility Study.....	18
2.3.3 Design Stage	18

2.3.4	The Tender Stage.....	19
2.3.5	Contract Stage.....	21
2.3.5.1	The Engineering Contract's Parties.....	23
2.3.5.2	Conditions of The Engineering Contract's Validity.....	23
2.3.6	Engineering Contract Types.....	25
2.4	CLASSIFICATION BASED ON THE METHOD USED TO DETERMINE THE CONTRACT PRICE [56].	27
2.4.1	Implementation Stage.....	33
2.4.1.1	Engineer's Responsibilities and Powers.....	34
2.4.1.2	Owner's Responsibilities.....	35
2.4.1.3	Contractor's Responsibilities and Authority:	35
2.4.2	The Stage of Supervision.....	39
2.4.2.1	The Contractor's Supervision.....	39
2.4.2.2	Quality Control and Testing	39
2.4.2.3	Quality's Definition and Concept.....	40
2.4.2.4	Quality Management and Control Methods.....	40
2.4.3	Management of safety	45
2.4.4	The Receiving and Documenting Stage	46
2.4.5	Obtain the Completed Works.....	46
2.4.6	Period of Maintenance	54
2.4.7	Training in Operation and Maintenance.....	55
2.4.8	Receipt of The Final Payment	56
2.5	AFTER YOU'VE RECEIVED YOUR FINAL RECEIPT (AUTHENTICATION):.....	57
3.	METHODOLOGY OF CONFLICTS AND DISPUTES	58
3.1	INTRODUCTION.....	58
3.2	FACTORS THAT ASSIST CONFLICTS	58
3.3	CONFLICT CAUSES	59
3.4	PROCEDURES FOR FILING A CONFLICT.....	61

3.5	WAYS TO AVOID CONFLICT.....	62
3.5.1	To avoid disputes, it must have the following items:.....	63
3.5.2	Manage the Contract to Avoid Conflicts.....	64
3.5.3	Avoid Conflicts by Contractor Actions and Applications	65
3.5.4	The Employer's Conduct at The Supplementary Stage.....	65
3.6	CONFLICTS SETTLEMENT.....	66
3.7	CONTRACTUAL DISPUTES IN ENGINEERING AND CONSTRUCTION.....	67
3.8	TYPES OF CONFLICT	68
3.8.1	A Financial Disagreement.....	69
3.8.2	Dispute Over the Schemes' Intellectual Property.....	69
3.8.3	The Dispute Between One of The Parties and The Arbitrator or Arbitration Panel 70	
3.9	METHODS OF CONFLICT RESOLUTION	70
3.9.1	Engineer Decision	72
3.9.2	Friendly Settlement	73
3.9.3	Arbitration Is a Method of Resolving.....	74
4.	TECHNIQUES AND PROCESSES FOR CONDUCTING RESEARCH	75
4.1	OVERVIEW.....	75
4.1.1	The Study Sample.....	75
4.1.2	Statistical Treatment Used in The Study.....	76
4.2	THE STUDY'S RESULTS AFTER APPLYING STATISTICAL ANALYSIS.	76
4.2.1	Distribution of samples according to personal variables	76
4.2.2	Administrative Part.....	78
4.2.3	Law Section	82
4.3	HYPOTHESIS TEST	87
4.3.1	The First hypothesis	87
4.3.2	The Second hypothesis	88
4.3.3	The Third hypothesis.....	89

4.3.4	The Fourth Hypothesis.....	89
5	CONCLUSION AND FUTURE WORKS.....	90
5.1	CONCLUSION	90
5.1.1	The study's findings confirmed the First hypothesis.....	90
5.1.2	The study's findings confirmed the Second hypothesis.....	91
5.1.3	The study's findings confirmed the Third hypothesis.	91
5.1.4	The study's findings confirmed the Fourth hypothesis.	92
5.2	FUTURE WORKS	92
6.	References.....	94
	Appendix A.....	100

LIST OF TABLES

	<u>Pages</u>
Table 2-1 Reconstruction or/and Construction Work Rights and Duties	15
Table 3-1 the distinction between various Alternative Dispute Resolution (ADR) technologies	71
Table 4-1 General Information from the Questionnaire.....	77
Table 4-2 Contract Types.....	88

LIST OF FIGURES

	<u>Pages</u>
Figure 1.1 Construction disputes and conflicts	1
Figure 1.2 Project's Life Cycle.....	2
Figure 1.3 Construction Site Technology.....	3
Figure 2.1 Construction stakeholder	10
Figure 2.2 Stages of Contract Management	16
Figure 2.3 The Planning Stage.....	17
Figure 2.4 The Feasibility Study.....	18
Figure 2.5 Design Stage	19
Figure 2.6 Tender Stage	21
Figure 2.7 Contract Stage.....	21
Figure 2.8 Institute of Civil Engineers	22
Figure 2.9 International Federation of Consulting Engineers.....	23
Figure 2.10 Engineering Contract Types.....	25
Figure 2.11 Turnkey Contract Project	32
Figure 2.12 Implementation Stage.....	33
Figure 2.13 Management of safety	46

Figure 3.1 Conflict Causes	59
Figure 3.2 Steps to Stop the Conflicts	62
Figure 3.3 Positive and Negative Consequences of Conflict	63
Figure 3.4 Disputes Settlement in Business Contracts	67
Figure 3.5 Dispute Triangle	67
Figure 3.6 Methods for Resolving Conflicts and Disputes	71
Figure 4.1 Technical works	79
Figure 4.2 Project's quality audited	80
Figure 4.3 Laboratory tests approved.....	80
Figure 4.4 Quality of Implementation.....	81
Figure 4.5 Monitoring the Implementation.....	81
Figure 4.6 Impact on contracts when signed without legal review.....	82
Figure 4.7 Preparing a feasibility study for a project.....	83
Figure 4.8 The Project Contract is Carefully Drafted.....	83
Figure 4.9 Oral directives are followed to make notes on work.	84
Figure 4.10 Are you satisfied with the performance of the legal department.	84
Figure 4.11 The design and implementation stage.....	85

Figure 4.12 The possibility of signing a contract with a subcontractor.....	86
Figure 4.13 The specialty of the members of the arbitration committees	86
Figure 4.14 Lack of Training	87



LIST OF ABBREVIATIONS

ADR	Alternative Dispute Resolution
CI	Construction Industry
CPA	Certified Public Accountant
CPFF	Cost plus fixed fee
CPIF	Cost plus incentive fee
CPPF	Cost plus percentage fee
CT	Construction technology
EC	Engineering Contracts
FIDIC	International Federation of Consulting Engineers (Fédération Internationale Des Ingénieurs-Conseils)
FPI	Fixed price incentive
ICE	The Institute of Civil Engineers
LC	Life Cycle
LSFP	Lump sum / fixed price
TLC	Total Landscape & Construction
TQM	Total Quality Management
UK	United Kingdom
UPM	Unit price method

1. INTRODUCTION

1.1 GENERAL OVERVIEW

1.1.1 Construction Industry

like the rest of the financial industries, a service industry provides products in response to specific requests and objectives. These items range from easy to be sophisticated projects[1] that require the most advanced technology and knowledge. They include all activities on-site, including design, planning, construction, alteration, demolition, and repair in civil, mechanical, architectural, and electrical engineering. The construction business is unique in that it has many distinct industries and specialties with which it interacts. Construction disputes and conflicts[2] are a de facto reality that arises from various causes and conditions, and they are dealt with as promptly as possible to avoid any complications and potential losses (Figure 1.1).

- This industry must address the following demands: - Housing construction needs.
- Commercial building, social, entertainment, and other applications are in high demand.
- Heavy engineering constructions are in high demand.
- The demand for industrial construction

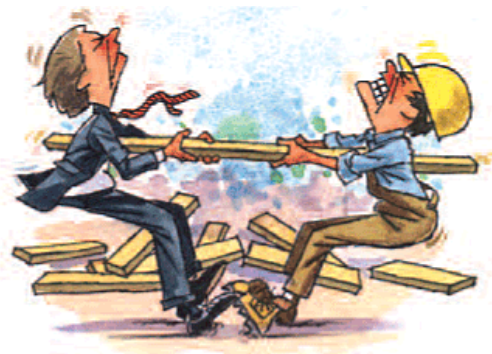


Figure 1.1 Construction disputes and conflicts

1.1.2 The Construction Industry's Characteristics

Although the construction sector shares some traits with other industries, it differs from them in the following ways[3].

- The product's physical characteristics.
- The industry's structure and the organization of the building process.
- Method for determining to price.
- Production has changed.

1.1.3 Changes Affecting the Construction Industry's its Development Environment.

Any development effort to improve people's quality of life will inevitably have positive and bad consequences[4]. The development project should be planned in such a way that it has the greatest beneficial influence on the environment and the least negative impact. Predicting the environmental implications of construction early in the project's Life Cycle (LC) [5], Figure 1.2, may result in improvements to the environmental performance of construction projects and locations.

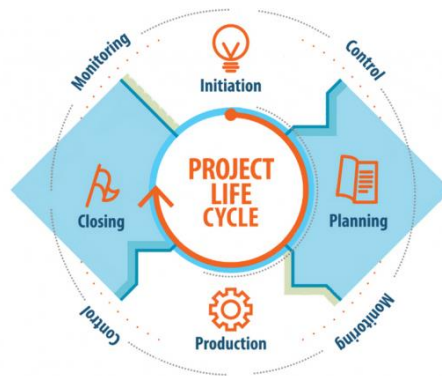


Figure 1.2 Project's Life Cycle

Construction is projected to have a detrimental effect on the fragile ecosystem due to the harmful effects of construction. This includes resource depletion, biological diversity loss because of raw material extraction, landfill issues because of waste generation, decreased worker productivity, bad human health effects from poor indoor air quality, global warming, acid rain, and smog

because of emissions caused by building product manufacturing and transportation that uses energy. Environmental consequences are classified[6] into three protective categories: ecosystems, natural resources, and public, and can be categorized in the following:

- Materials that are new and sophisticated.
- The mechanical mechanism that is used in the work process.

1.1.4 The Primary Purpose of Technological Progress

The “collection of new equipment, machines, modifications, software, and other items used during the construction phase of a project” is referred to as construction technology. Construction technology (CT) aims to help move the industry forward by promoting advancement, innovation, and efficiency, as shown in Figure 1.3 below. CT [7] is a separate technical category that is sometimes referred to as CT [8]. Manufacturing, medical, energy, transportation, agriculture, and construction are the key categories of technology. The fact that construction technology has its own category demonstrates how valuable and distinct a sector it is. When the internet became widely available in the 1990s, it ushered in a whole new era. From dial-up internet to today's smartphone, technology has advanced at a breakneck pace. Accessible software, user-friendly databases, and information access are enabling people to work in new ways today and can be listed in two types:

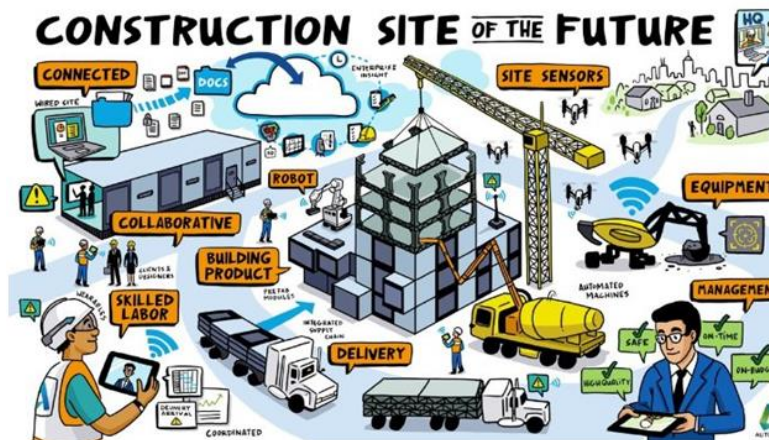


Figure 1.3 Construction Site Technology

- Technological progress differs per country since it is dependent on favorable social and economic conditions.

- Administrative support and organizations that use technology indicate financial resources and economic conditions. Adequate physical infrastructure and a supportive culture are also represented.

1.1.5 The Advantages of Technological Advancement

We live in the age of advanced technology and observe the biggest innovations and thrilling changes in technology. Every industry is transforming itself from a manual work process to complete automation[9]. But the construction industry is still struggling to get the benefit of the latest innovative technologies. There are many opportunities from lots of newest construction techniques and ideas for automating the construction work. Innovative software solutions & the use of technology in construction are increasing each year for construction companies to get perfect benefits and change design and build completely. Construction companies adopt the latest technologies and tools to succeed in the market, streamline their business and keep their business alive in the competitive industry. New Technologies in Construction Industry[10]: There are some latest and effective technologies that the construction industry should adopt to get exciting benefits from them. These types of construction technology are:

- Process efficiency is high.
- With a high production capacity, increase the intensity of activity.
- The goods are manufactured with extreme precision.
- In the building industry, technological advancements are important.
- Customers' demands for changes in buildings and enterprises because of economic transformation.
- Increase scientific and technical knowledge of new materials, equipment, and technology-application methods.
- The cost of resources rises or falls.
- Construction firms strive to improve their competitiveness by embracing new technologies (competition within the industry).
- Trade groups are attempting to increase the amount of activity among their members.
- Efforts by the government to elevate the building industry's status.
- Iraq's building industry and the issues and challenges that it encounters.

- The construction business has suffered because of civil wars and conflicts.

1.1.6 The Rate of Inflation

Iraq, like many other developing countries, is plagued by excessive inflation and economic insecurity[11]. Inflation has become a persistent issue with ramifications across the whole building industry. Because of the uncertainty of inflation and its side effects, owners are paying for higher facility and capital costs and premiums on construction prices. Contractors are dealing with a lot of uncertainty when it comes to bidding and financing projects. Contractors' productivity suffers due to their inability to effectively anticipate long-term returns on their investments, forcing them to redirect cash to cover resource expenses[12]. Owners and contractors must prepare for these consequences and strive to mitigate the dangers. The right allocation of economic risks in contracting should cut costs in the long run; however, this would necessitate a significant adjustment in construction industry operations.

- They are changing economic policies and interrupting economic programs before they are completed.
- Relationship issues or dispute between the professional, the client, and the contractor.
- Technical illiteracy.
- Traditional labor is used instead of craftsmen and skilled labor.
- On Nimrod, documenting changes and expectations was a failure.
- There was a violation of the building code.
- Use of poorly written contracts between the owner and the contractor, as well as between the contractor and his subcontractors.

1.2 FIELD OF RESEARCH

From the initial concept stage to project completion, through the document preparation phase, and the role of each party in completing the project in the required manner, this research examines the causes of disputes in engineering contracts in Iraq, the causes of conflict between the parties to the contract, and the extent to which each party's responsibility and role in completing the project in the required manner, from the initial concept stage to project completion, through the document preparation phase, and the role of each party in completing the project in the required manner.

1.3 PROBLEM TO BE RESEARCHED

Many construction contracts do not fundamentally address conflicts between the parties, necessitating recourse to the judiciary or alternative dispute resolution methods, which poses a problem to contract management firms in Iraq.

Questionnaires for research

- a. To what extent should the provisions of the engineering contract be clarified in terms of each party's role and responsibility?
- b. Will the appearance of some issues during the project's early stages prevent contracts from being signed without the involvement of expert legal departments?
- c. Has the proper contract type been chosen to meet the project's objectives?
- d. How extensive is the engineering contract, and how capable is it of resolving unforeseen challenges that may arise between the contracting parties?

1.4 RESEARCH ASSUMES

- a. The provisions of the engineering contract spell out each party's responsibilities and roles.
- b. There is a link between the engineering contract's comprehensiveness and its ability to resolve conflicts.
- c. There is a link between selecting the appropriate contract type and meeting the project's objectives.
- d. Signing contracts without consulting legal departments resulted in complications during the project's early phases.
- e. There is a link between fulfilling the project's objectives and progressing through the sequential stages of concept development, document preparation, engineering drawings, bidding, contract signing, and implementation until the final handover.

1.5 METHODOLOGY OF STUDY

The study is based on the following two frameworks:

- a. Theoretical foundation: This framework was created using numerous programs connected to the topic, as well as existing research in the subject.
- b. The second framework is the practical framework, in which the researcher relied on the descriptive-analytical method to collect data from the reality of practice in the construction industry, identify the study population of engineers (architects, civilians, and technicians

specialized in the construction industry), and select a model in a statistical programmed. The search method, on the other hand, was created with the research challenge and theories in mind.

1.6 THE AIMS AND VALUE

- a. Due to the variety of types of engineering contracts completed between the contracting parties, the types of conflicts and their resolutions in engineering contracts are various.
- b. They are improving the procedures and paperwork required at each stage of the project, from the initial concept to the final handover, to avoid contract parties clashing.
- c. Identifying each contracting party's responsibilities and the challenges they face that contribute to the dispute.
- d. The findings of this study may aid in identifying the reasons and regions of conflict in engineering contracts so that they can be avoided or addressed if they do occur.

1.7 THESIS LAYOUT

- a. **Chapter One:** The core qualities of the suggested thesis's major parts. It gives a description of the construction business and how the features are crucial for the business to grow without conflicts between management and contractors.
- b. **Chapter Tow:** On themes relating to the work developed in the thesis, a complete view of the literature and background studies is offered, along with an assessment of state of the art, based on an academic thesis, industry reports, and research standards.
- c. **Chapter Three;** The most crucial and useful models for the presented procedures. It is made up of models and assumptions for a variety of different methods and elements, including detection, segmentation, and throughput estimates, as well as classification. This chapter also covers the implementation, including routine inputs and outputs, as well as classification procedures. Finally, essential elements are evaluated to ensure that the results are accurate and correct for future investigation.
- d. **Chapter Four:** The scenarios to be examined in the questionnaire, as well as the model reference parameters in terms of detection, selecting the models' recognition and classification-related metrics for models that were used to discover the best strategy to try to make conflict breakable and solved without going to court to resolve it and stopping projects until the dispute was resolved.

- e. **Chapter Five:** The primary conclusions drawn from the questionnaire results are compared to those drawn from other previously conducted studies, with the most relevant and important findings and a brief analysis presented. In addition, several recommendations for future work are offered, based on information that has yet to be disclosed as well as several critical assumptions made during the model's development.



2. CONFLICTING ASPECTS AND PROJECT PHASES: A LITERATURE REVIEW

Building projects are subject to conflict[13]. To give an impression of issues increases expenses, delays, reduce productivity or destroys profits in a project. Analyze the construction industry's conflict and can be classified into three sources of conflict: behavioral, contractual, and functional concerns. Factors that might lead to conflict include unwillingness to conduct check and compile unclear or incomplete design and complexity. Meanwhile, the contractual considerations (delays, delayed payments, and vagueness) are responsible for these issues. At the same time, they are opposed to non-technical issues such as architectural or engineering delays. This was expected to be relevant to future building projects[14].

2.1 INTRODUCTION

The complexity of today's construction projects is increasing. Construction is a process in which disputes are nearly guaranteed due to the complicated, interrelated, and prolonged process of designing and building. Furthermore, using multidisciplinary teams in a building project can lead to disagreements between the participants. The conflict appears to be an unavoidable part of the construction industry, especially when most building projects are fraught with unknowns. As a result, it's not surprising that many construction stakeholders [15] still regard conflict as an unpleasant experience that should be avoided or addressed as quickly as possible, Figure 2.1 show it. Many scholars, however, have pointed out that conflict is a phenomenon that can have both constructive and dysfunctional impacts on individuals, groups, and organizations. As the number of conflicts and disputes rises, the construction industry struggles to find equitable and cost-effective solutions to handle them. Because disagreements in construction projects are widespread and must be resolved quickly on the job site, controlling conflicts should become a component of normal project management during project operation.

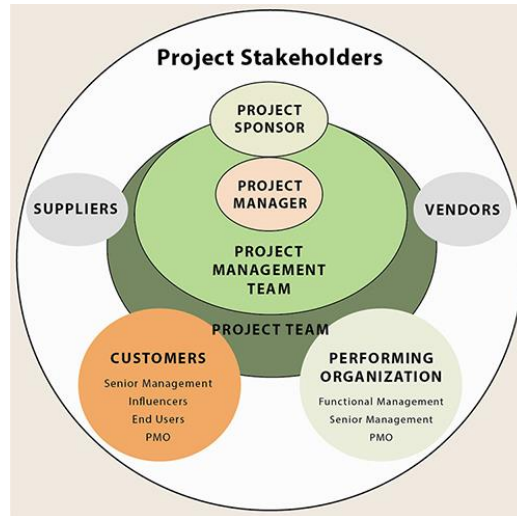


Figure 2.1 Construction stakeholder

2.2 LITERATURE REVIEW

- a. According to a study by Kumaraswamy & Yogeswaran [16], variations, extensions of time, payment, quality of technical specifications, availability of information, administration, and management, exceeding client expectations, and determination are all key causes of construction disputes. According to other studies, conflicts might emerge due to a lack of resources such as time, money, labor, materials, and/or equipment.
- b. According to Smith, conflict and conflicts are endemic problems in the construction industry. Conflict can make it difficult for people to interact with one another, lead to the breakdown of personal and professional relationships, and reduce productivity. Conflict produces tension and takes focus away from the task at hand. According to Cheung & Suen [17], if a conflict is not managed properly, it can result in project delays, a loss of team spirit, increased project costs, and, most importantly, the destruction of long-term strategic partnerships.

- c. Brown et al. define conflict as, among other things, doubt or questioning, hostility, incompatible behavior, dispute or antagonistic involvement, and conflicts. According to Kumaraswamy & Yogeswaran [16], a dispute occurs when one party's argument or argument is rejected by the other side, and that rejection is not accepted. This shows that when opposing parties' express actions or arguments in reaction to a disagreement, conflicts are more likely to occur.
- d. A dispute that, according to Vorster [18], is a disagreement over two or more parties' perceptions of the situation that usually emerges from a disagreement over two or more parties' perceptions of the circumstance. Deutsch's definition of conflict as "incompatible activities; conflict emerges when one person's behavior interferes with others or obstructs the activity of another" backs up this claim.
- e. According to Hohns [19], construction disputes have their own instinctive nature and traits; hence the genesis of disagreements will vary from one project to the next. According to his research, contract document defects, defects, or omissions, failure of someone to count the expense of activity at the start, altered condition, consumer reaction, and persons involved are the five main drivers of construction conflicts. According to Williamson [20], behavioral concerns, contractual concerns, and technological challenges arising from ambiguity and a lack of experience are three key underlying causes of disagreements.
- f. According to a survey conducted by Semple et al., the most prevalent reasons for conflict are scope revisions, weather, and restricted site access. Multiple studies have shown that multicultural teams are more prone to produce conflict, according to Pelled [21]. Diekmann and Girard [22] later established the factors that contributed to contract disputes. They discovered that numerous project variables, such as people, procedure, and project features, had an impact on the occurrence of contract conflicts. The outcomes of this study were based on a logic regression analysis of data on the incidence and intensity of conflicts from 200 construction projects. All three issues were found to have an impact on the likelihood of contract conflicts, but the people issue was found to be the most essential in avoiding contract disputes.

- g. Kumaraswamy [23] has compiled a list of 100 common causes of construction disputes, including construction speed, cost and quality control, technological advancements, strict building codes, and economic challenges, which will serve as the basis for many future studies on construction conflict and disputes. Fenn et al. identify failure to respond in a timely manner, poor team communications, insufficient tracing mechanisms for information requests, poor project management, supervision, and coordination efforts, lowest price mentality in contractor and designer engagement, and the absence of team members as causes of construction disputes caused by clients. According to Kumaraswamy & Yogeswaran's [16] study, construction disagreements are caused by variations, extensions of time, payment, quality of technical specifications, availability of information, administration, and management, exceeding client expectations, and determination.
- h. According to Shin, project participants such as architects, engineers, contractors, and other project-related expertise might cause issues. Disagreements are caused by a lack of communication, distrust, misinterpretations of contracts, uncertainty about roles and responsibilities, and a "us versus them" mindset based on risk allocation inequalities, as per Thompson et al. [24]. Overdesigning and underestimating the expenses involved, late information delivery and a laborious approach to requests for information, design and specification oversights, and errors or errors were stemming from uncoordinated civil, structure, and utility work; the reasons for conflict and project aspects can be used to identify dispute in a construction project, according to a study by Cheung et al. [25]. According to the researchers, budget overruns, outstanding payments, varying percentages of dispute filing and certification, number of days behind schedule, liquidated damages, and percentage change from the original design are all key sources of disagreement.
- i. Inadequate contractor management, supervision, and coordination, delay or suspension of work, failure to plan and execute changes of work, failure to understand as well as correctly bid or price the works, general ignorance and agreement in cost estimation, reluctance to seek clarification, and inadequate contractor management, supervision, and coordination, according to Carmichael [26].

- j. According to Chua & Song [27], when project schedules created by several project players are put together, they frequently expose difficulties. This is because the implicit interfacial linkages that exist between project tasks are the principal barrier to effective communication among contractors. Kathleen outlines how a scarcity of funds, such as time, money, labor, materials, and even equipment, can lead to bad conflicts.
- k. According to Camicheal [26], construction problems and confrontations arise because the parties involved have requirements. The contractor's requirements are usually monetary or profit oriented. The designer has the ideas, the building or design that might be used as a memorial to himself, his reputation, his artistic temperament, his money, his insurance premium, and other similar criteria. The owners, too, have political ambitions, corporate ambitions, and a need for space on a certain day. Goals and security are jeopardized when something unexpected or poorly recognized disrupts the fulfilment process, communications are strained, and strains are always followed by demands, refusals, other more intense strains, hard, then tougher postures, and financial losses. These problems arise when there is a lack of team spirit and communication within project teams. People are the primary cause of construction problems [28], yet they are also the only solution to these conflicts. The rise of present cultural ideals that everyone has rights has resulted in an overabundance of conflict-related activity.

- l. Construction issues and conflicts emerge, according to Camicheal [26], because the parties involved have requirements. Typically, the contractor's demands are monetary or profit oriented. The designer has the ideas, the building or design that might be used as a memorial to himself, as well as his reputation, creative temperament, money, insurance premiums, and other comparable variables. The owners, too, have political aspirations, business aspirations, and a desire for space on a particular day. When something unexpected or poorly recognized disturbs the fulfilment process, communications become strained, and these strained communications are invariably followed by demands, refusals, other more intense strains, hard, then tougher postures, and financial losses. When there is a lack of team spirit and communication among project teams, several issues develop. People are the root of all building issues [28], but they are also the sole way to resolve them. The growth of current cultural beliefs that claim that everyone has rights has resulted more than conflict-related activity.
- m. A constant cause of contention is someone who fails to count the cost at the start when the cost should have been defined. On projects [31] that come in close to or under budget, only a few contractors submit disagreements. Few owners demand liquidated damages when projects are completed on time or close to it. When designers are waterproof, and the products the designer specified fit the sales representative's conflicts, disputes are rare and far between. Contrary to widespread opinion, only a small minority of contractors deliberately create friction. Most supervising project staff who work for the project's parties have little technical experience of disputes or what is involved in litigation and arbitration; however, most of those involved in getting a task done has solved complex problems daily for so long that they assume they know everything. As a result, they prefer to argue amongst themselves and write what they think to be great letters to set a record, and most of them hate and despise lawyers. Contractors who have profited from a job are less likely to manufacture or pursue false allegations. If the task has turned out good enough to live with, most contractors will ignore a situation where they are clearly entitled to a legal contract modification via a disagreement.

This section provides a comprehensive summary of the sources of conflict in the construction business[32], with the goal of providing a clearer picture to all project teams. The conflict

issues in this paper were primarily divided into three categories: behavioral problems, contractual challenges, and technical challenges. Conflict may emerge because of behavioral issues such as inadequate project team communication, multicultural team issues, and a reluctance to verify for constructability, clarity, and completeness of the project. Furthermore, conflict happens because of contractual issues such as client delays in making interim payments, client failure to reply in a timely manner, application of time extensions, and incorrect project timelines. Aside from that, the contractor's quality of work, price or costing errors, and late instructions from the architect or engineer are also considered conflict reasons owing to technical issues.

2.3 STAGES OF CONSTRUCTION PROJECTS

Engineering projects go through numerous stages during their life cycle[33], beginning in the cradle as a concept envisaged by the owner to achieve his aims, and then developing to pass through numerous stages until it reaches the stage of operation, and the benefit that continues until it achieves liquidation, and the life cycle varies from one project to another depending on the type and size of the project, table 2.1 for Reconstruction or/and Construction Work Rights and Duties. There is no one-size-fits-all cycle for all projects; nonetheless, it all begins and ends with the owner, and it is inevitable that any error made in the early stages of the project would be reflected in later stages, making repair difficult, if not impossible, and the project life cycle varies.

Table 2-1 Reconstruction or/and Construction Work Rights and Duties

Stage	Description	Responsible	Support
1	Description of requirements	Management*	
2	Study of Feasibility	Operation	Engineers
3	Implementation plan	Management*	Engineers
4	Design Documents (drawing, scope of works, etc.)	Engineers	Operation Management*
5	Methodology and strategy for implementation	Management* Procurement	Operation Engineers
6	Processes of procurement and contracting	Procurement	Management* Operation Engineers
7	Construction operations on the physical level	Engineers	Management* Operation Finance
8	Contract completion and handover	All above	
9	Maintenance	Government/Beneficiaries	
10	What I have learned	All above	
Management: the project manager or coordinator in charge of the project.			

Construction projects differ from other courses in that the justification for the construction project differs from that of other projects, but in general, construction projects have a life cycle

with a clear and distinct beginning and end. Every engineering task (a project consisting of procedures by which the job is performed)[34] can be divided into stages (i.e., each step can be broken into partial stages) so that the transition from one stage to the next may be made Figure 2.2. To achieve continuous improvement by improving the processes and procedures that regulate the change process, from one to another with a change in the current condition:

- a. The Planning Stage.
- b. Design Stage.
- c. The Tender Stage.
- d. Contract Stage.
- e. Implementation Stage.
- f. The stage of receipt and documentation.



Figure 2.2 Stages of Contract Management

2.3.1 The Planning Stage

Defining the terms "planning" and "feasibility study"[35] Prior to beginning any implementation activity, you must first plan. The goal is the starting point, and the endpoint is the achievement of the goal; thus, the goal is the starting and ending point, and planning is drawing the framework that includes the type of activity and work that must be done, as well as the method that must be followed to achieve the goal and the time it takes to accomplish the goal. Thus, planning is a systematic, methodical mental process that involves analyzing and assessing environmental variables, picturing future trends, setting future visions and goals, defining activities, events, resources, budgets, and operational and tactical plans to finish the job and activities, among other things. Following the owner's crystallization of the project's idea, he begins planning, and studies for the project, some of which are completed by the owner or individuals associated with him, or he appoints a specialist advisory body to do some or all the studies, as shown in Figure 2.3.

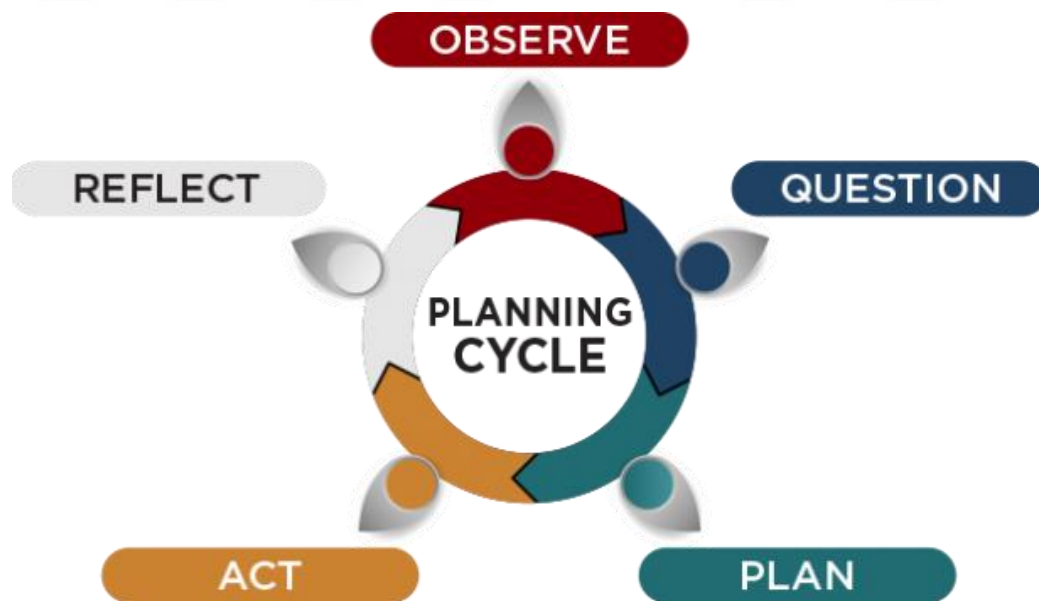


Figure 2.3 The Planning Stage

2.3.2 The Feasibility Study

Three fundamental components comprise the feasibility study[36], Figure 2.4:

- A. Technical feasibility and feasibility analysis of the project from a technical standpoint, considering site conditions, climate, soil conditions, and so on.
- B. Financial feasibility and analysis of required financial resources and raw supplies.
- C. Economic feasibility and analysis of the project's expenses and advantages.

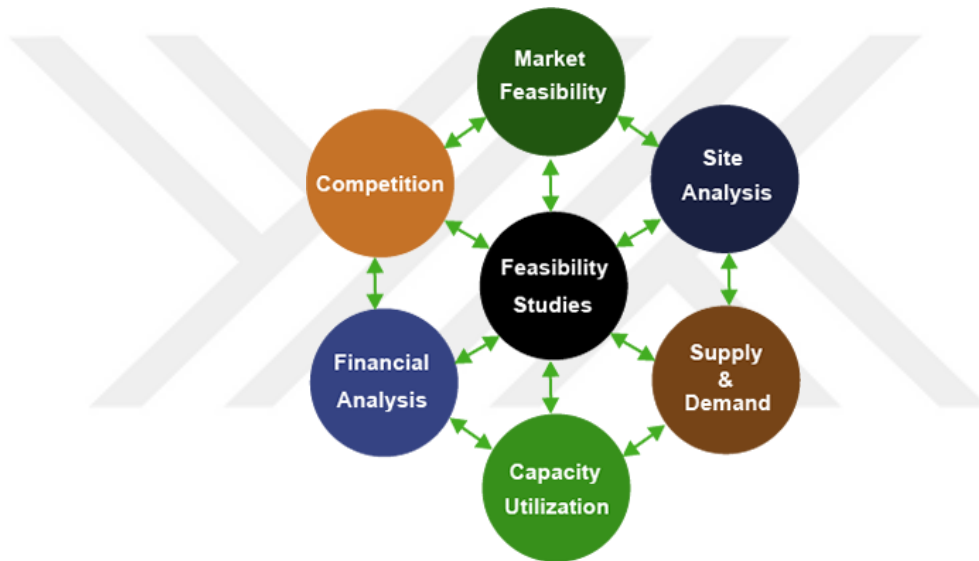


Figure 2.4 The Feasibility Study

2.3.3 Design Stage

The design process is as follows[37], Figure 2.5 below:

- a. Initial design stage: Stage one of design: At this stage, the architect plans the proposed site and creates the necessary divisions, then discusses them with the owner. Additionally, the architect conducts a preliminary analysis of building materials, an estimate of the quantities required for these materials, and an estimate of the project's initial cost.
- b. Detailed design: After initial agreement on the preliminary drawings, the architectural design of the project (interior details, interfaces, and facilities) is completed, as are the structural, mechanical, and electrical details for all components of the project, to develop

an integrated concept of the project's components and the means available for implementation.

- c. Final design: After the initial designs and details have been studied and an agreement reached between the owner and the designer, the engineer prepares the final comprehensive designs for all the details necessary for the construction and installation of the project's equipment, as well as the specifications for materials and construction methods, in addition to the schedules.



Figure 2.5 Design Stage

2.3.4 The Tender Stage

Bid on the contract These bids are announced 30-60 days prior to the date of the tenders[38] in the media (newspapers or magazines), and all contractors interested in the project are expected to submit their bids by withdrawing and studying the project documents, and then submitting an offer to do so via sealed envelopes and asking delivery at a certain location and time. Among the documents are the following, Figure 2.6 show the tender processes:

- Official documents and registration with the Engineering Council of the institution making the proposal.
- The project is backed by a bank guarantee.
- A contract templates.

- Illustrations (architectural and construction).
 - Quantification bills.
 - Furthermore, business specifications are required.
- a. Bid Submission[39]: When a contractor interested in submitting a bid acquires the project materials, he evaluates the feasibility of execution, the costs of individual items, and the total costs, and then submits his bid in sealed envelopes on the stated date.
 - b. Envelops Opening[40]: The envelopes holding the contractors' bid forms are opened on a predetermined date (day and hour) in the presence of representatives from each company submitting bids, and the firms' proposals are read in terms of the total value of each bid, as well as the implementation duration, payment terms, letter of guarantee, and any other criteria.
 - c. Bid Evaluation[40]: The sealed bids are evaluated by a special committee, which maintains the confidentiality of its members who have extensive experience in these matters. The committee records the prices submitted by each bidder with reference to the lowest price that meets the required specifications, as well as the provision of financial guarantees confirming the contractor's intention to complete the project if it is awarded. While the committee considers the contractor's expertise and performance on similar previous projects, it also considers the contractor's other equipment and capabilities that contribute to the project's success. If an offer is not received by the evaluation committee within the stipulated time frame, it will be rejected.
 - d. Practice (after the bid): The owner or contractor may consider doing a practice, or discussions, to discuss the terms and pricing, clarify some aspects, or acquire better terms before the two parties sign the final contract, and these negotiations take place between the owner and the nearest contractors to win the bid and make the comparison.
 - e. Tender Award Notification[41]: Notification of the award of the tender: Transfer of the site
When guests select the executing firm, they are needed to sign the contract and pay the letter of guarantee, at which point the site is formally turned over to the company. The implementation term begins on the date of site handover to the outlet or on the date indicated in the contract.



Figure 2.6 Tender Stage

2.3.5 Contract Stage

The contracting[42] contract is prepared with the terms and conditions it contains and the parties it includes from the project's primary component. Therefore, it was up to the competitor to explain the contracting contract's objective and identify its parties and obligations of each party to limit the emergence of conflicts between them that may lead to a dispute. Contracts for large projects differ from contracts for industrial projects (as well as contracts for buildings), and contracts for single group projects differ from one another, while contracts for single branch projects within the group (such as airports) differ from one project to the next, Figure 2.7.



Figure 2.7 Contract Stage

There is a distinction to be made between the government and commercial contracts. Government contracts are those in which one of the government departments or institutions is a party. Government contracts must be based on open competition, and the lowest-cost competitors' bids are usually awarded unless there is a compelling reason to reject it and pick Jealous. In private contracts, there is no necessity that the competition is open, and one of the applicants is usually picked without regard to the whole amount of his bid, even though the whole value of the bid is an important consideration in any engineering contract whether governmental or private. Contracts with the government have been reported. The increase, reduction, or shift in business represents one facet of the distinction between government contracts and private contracts. Unlike the private contract, which allows the owner to make changes by increasing or decreasing the bid value as needed, the government contract specifies a percentage of the original bid value within which the increase, decrease, or adjustment must be made.

A contracting contract is defined as an agreement that defines the technical, financial, and legal relationship between two or more parties to complete a certain task for a certain fee if the task is not illegal. For the contract to be legally enforceable, the contract's conditions must meet the standards of common law for the contract's validity. A business, according to the Arabic Language Academy, is an agreement between two parties in which one of them agrees to perform a certain task for the other for a certain fee (2) for a set period.

Contract forms that incorporate all financial and technical requirements must be comprehensive for everything that is required to coordinate the contract implementation process, and contracts and laws that define the contracting parties' duties and rights are prepared by international and local agencies such as:

- The Institute of Civil Engineers (ICE) [43], Figure 2.8, is a professional association of civil engineers based in the United Kingdom. ICE is an acronym that stands for International Cooperation.



Figure 2.8 Institute of Civil Engineers

- International Federation of Consulting Engineers (FIDIC) [44] the global representative body for national associations of consulting engineers and represents over one million engineering professionals and 40,000 firms in more than 100 countries worldwide, Figure 2.9.



Figure 2.9 International Federation of Consulting Engineers

In addition to the approval of the instructions for the implementation of government contracts No. (1), Iraq uses the general conditions, the standard formula issued by the Ministry of Planning, the general conditions for civil engineering contracting works in its first and second sections), which is a container for all the general conditions required by almost every engineering contract, in addition to the approval of the general conditions, the standard formula issued by the Ministry of Planning, the general conditions for civil engineering contracting works in its first and second sections), which is a container for all the general conditions.

2.3.5.1 The Engineering Contract's Parties

A contractual agreement is made up of two contracts: one for the employer and one for the contractor. Each of them can be a single agent or a group of agents[45], and they can be a single agent or a group of agents, or one of them can be a single agent and the other a group of agents.

2.3.5.2 Conditions of The Engineering Contract's Validity

Legally acceptable, an engineering contract must comply with local and international legislation; otherwise, it becomes worthless and cannot be executed or authorized as a judgement or evidence in legal proceedings[46]. The contract must also have the following essential clauses:

- a. Accept and Offer[47]: There must be a genuine offer from one of the parties, given with full permission and freedom, and that offer must be accepted by the party or parties. It is

expected that the purpose is reasonable, and that the owner can accomplish it, and it is common for the offer to be written and signed by the authority's owner until the offer becomes legally binding, and the acceptance must be specific, explicit, and unconditional, and the contract is not legally binding until the offer is accepted.

The offer can become void for a variety of reasons, including: -

- a. Expiration date: The offer was not accepted within the given time frame.
 - b. The bidder's demise.
 - c. When he issues his denial, the deal comes to an end.
-
- b. The Presence of a Consensus[48]: In order for a legal contract to exist, the parties must have mutual and clear knowledge of the terms of the agreement, and from here, the contract language was crucial, as it had to be written with clarity and correctness, as agreed upon by the parties, or the parties concerned. It is common for the two parties, or parties, to sign the agreement as a means of demonstrating their comprehension and acceptance of the contents. If it is proven that there was no proper agreement, the contract might be voided.
 - c. The legality of the contract's subject matter[49]: If a contract is guaranteed that breaches public law or rules, it may be declared void and unlawful. Contracts that incorporate crimes, fraud, or fraud are examples of void contracts.
 - d. The concerned parties' ability to enter into the agreement: Persons who are not adults or who are mentally ill, whether permanently or temporarily[50], are not permitted to enter into contracts, and if a contract is signed between two people who are not of legal age, the contract becomes non-binding to the parties or to third parties, and if an official sign a contract on behalf of a governmental or private institution, the contract becomes non-binding to the institution.
 - e. The formula of the contract [51]: Given the importance of contract language and its formula, that formula must be legal, and in government contracts (those in which one of the government departments is a party), it is vital to include provisions that ensure the transfer of state funds. It is permissible to write the contract wording and terms for private contracts. Within the legal boundaries, the contracting parties will express themselves in the language of their choice.

2.3.6 Engineering Contract Types

Engineering contracts are prepared in a variety of formats depending on the type of contracted work and its conditions, and they range in complexity from a simple agreement in which they are offered and accepted to a long, complex contract containing many documents that specify the legal, financial, and other aspects of the contractual relationship. The clearer and more exact the contract, its terms, specifications, drawings, and the rest of its documents are in specifying the contractual parties' duties, responsibilities, and rights, the less likely there will be disagreements over how those documents should be interpreted, and thus the fewer the chances of any problems occurring during implementation. Contracts for engineering construction can be classified into the following categories, Figure 2.10:



Figure 2.10 Engineering Contract Types

- A. Contract types based on the contractual arrangements[52].
 - a. Contract for one-time payment: A contract in which the contractor commits to execute the task entrusted to him in its whole and receives the agreed-upon price in full and not in part, and these costs encompass all the project's direct and indirect costs, including the value of materials, workers' wages and fees, and the rest of the direct and indirect costs, and the agreed-upon price may fluctuate. Suppose there is a change in terms of the agreement. When adopting this sort of contract, the terms, specifications, drawings, and contract provisions must be precise and exact, with no opportunity for different interpretations.

- b. Agree to a contract that includes the actual cost-plus additional costs: It is an agreement in which the contractor commits to pay for supplies, labor, and subcontractor costs, in addition to the contractor setting precise fees that he takes in advance to cover general expenses and profits.
 - c. Actual cost contract plus a percentage of additional expenses: It is a contract in which the contractor commits to pay all material, labor, and subcontractor costs, as well as a percentage that will be paid in advance to cover general expenses and profits.
 - d. Arrange for the schedules to be priced: It is in this document that a price plan for commodities used in a building is agreed upon. It also contains tables of negotiated profit rates and public expenditures, as well as classifications of construction stages such as material supply, brick construction, supply, and installation pricing for casting frames (hour/day), supervision and carpentry (hour) and so on.
 - e. Only a contract of employment: The arrangement is to offer labor solely at an agreed-upon price for each construction phase, with the agreed-upon price covering overheads and profits, while the materials are normally provided by the customer.
 - f. Contract for work completion, then pricing: The agreement does not have a set price; instead, the work is valued and priced (labor value fees), which frequently leads to disagreements.
 - g. Contract creation and execution: The contractor is responsible for designing, building, and implementing the project in accordance with the owner's criteria.
- B. Contracts are classified according to their form[53].
- a. Bilateral contracts consist of a contract, a promise, and a promise.
 - b. Unilateral contracts consist of a contract, a promise, and a promise to work contract.
 - c. A written or verbal pact (explicit).
 - d. The implied contract denotes the contract's conclusion based on the parties' actions.

- e. A quasi-contract is a legal contract used to avoid illegal enrichment.
 - f. The conclusion of a formal contract necessitates the use of a certain form or process.
 - g. An informal contract is one in which no specified form or requirements are required.
- C. Contract classifications based on their enforceability[54].
- a. A valid contract is one that satisfies all the contract's key requirements.
 - b. The contract is null and void. There is no agreement in place.
 - c. Is a contract subject to one of the parties invalidating it? He has the choice of either cancelling the contract or refusing to enforce it.
 - d. A contract that cannot be enforced due to defensive law is known as an unenforceable contract.
- D. Contract classifications based on performance[55].
- a. A contract that has been confirmed for implementation is a contract that both parties can completely enforce.
 - b. An enforceable contract is one in which one or both parties have not fully executed it.

2.4 CLASSIFICATION BASED ON THE METHOD USED TO DETERMINE THE CONTRACT PRICE [56].

A fixed-price contract is also included in the complete contract; this contract is at a fixed price and agreed upon in the name of the contract signing time, and this price does not vary with the passage of time unless the specifications mentioned in the contract conditions change, as well as any risks of rising costs due to inflation or taxation. Higher or because of higher material prices, the contractor bears the cost. Costs are set, which benefits the client. It does not necessitate a lot of information. - Quickness, which allows for obvious actions.

Appropriate for supplying and installing equipment (certain tasks that do not require many phases of implementation, as they are less susceptible to inflation).

Disadvantages –

Issues arise if changes are required later.

If there are issues with a certain aspect of the job and the tasks are not clearly defined at the time of contract signing, the contract may be terminated. The auction might be expensive. - There's a chance you will end up paying a lot for a subcontractor.

A. Contract for a fixed fee (settlement contract) [57]

This contract contains a price adjustment clause known as (settlement prices), under which the contract price is increased or decreased because of a change in the contractor's specific expenses, as determined by some recognized statistics or indicators.

B. Contract additional cost [58]

It reimburses the contractor for the actual expenditures spent as well as a set amount of money.

Benefit: The contractor faces no dangers. When it comes to the technical components of the project, this is quite helpful.

Disadvantages

- There is a conflict of interest between the owner of the business and the owner of the business. The engineer is overburdened with the task of maintaining tight control.
- Negotiations must be precise.
- They are creating the necessary safeguards to ensure that the employer's interests are protected.

- Salary costs may become a major stumbling block.

C. A fixed-price contract [59] can take the following form:

- The price is raised by a proportion of the original price.
- Increase the price by charging fixed fees.
- Increase the cost by charging fixed fees that incorporate all possible expenses. Fees in the form of incentives are used to increase the cost (fees that are adjusted according to the cost of the contract).

D. Target cost contract [60]

there are incentives, so the contractor should be efficient - based on the guarantee, the contractor pays a cost that is higher than the actual cost.

Benefit: A monetary reward for the contractor. It is a reasonable incentive because the contractor may make a profit in any case. Its downside is that determining the target cost is challenging. The engineer must keep a close eye on it.

E. Quantity tables for contracts [61]

It is a common type of contract in engineering (especially civil engineering and building projects) for projects that are designed by the business owner, as determined in the bid phase, where the works are divided from the bottom of the excavations into parts or activities, and the time is determined according to the implementation stages (drawings), and everything is put together. The contractor was submitting the bid inputs the price of each item based on its quantity and cost, as well as the total value of the item, and when the values of the items are added together, the entire contract value is determined. The contract's terms must explicitly state whether these quantities will be fixed or subject to re-evaluation.

F. Lists of contract price tables [62]

A unit pricing contract is another name for it. If there is a contract, it is used. Because of the high number of units and the small number of types of those units, the size of the company cannot be established accurately before the contract is signed.

The following are some of the benefits of this form of contract:

- It is typically used in contracts where the owner is a private enterprise, and it allows the business to grow or shrink in size. In the case of public institutions, this type of contract is rarely used because there is a certain amount of space that the owner cannot surpass in terms of raising or decreasing the volume of business.
- Alternatives to a bill of quantities contracts and their applications, and these alternatives are owing to one of them.
- At the time of the bid, it is not possible to compile tables of quantities for the items with reasonable precision. The amount of each item is specified in broad estimations, and the contractor enters its prices appropriately.
- The engineer's job is measured in terms of the employer's name. And classification in a way that is not the same as the process for determining the contract price.

G. Competitive contract [63]

Several contractual bidders compete in a formal bidding process to award the contract (in front of the common specifications). In public sector contracts, a government department or institution's plan to create a project is publicized along with a brief explanation of the project, and contractors interested in entering a construction tender are required. Fill out qualification forms, provide documents demonstrating their technical and financial ability, as well as a record of previous work, and the owner chooses a group of the best-qualified applicants and invites them to purchase a copy of the project's conditions, specifications, and drawings, as well as the rest of the contract documents, and study them. Their bids are given on a certain day and hour in the invitation letter, and the financial guarantee and other relevant legal documents must be provided with the bid. The owner then opens the bid envelopes, studies them, and chooses the best one, as most contracts indicate that the employer is not bound to accept the lowest bid. In other words, the business owner has the authority to reject any bid without providing justification.

H. A deal that is being negotiated [64]

It is the contract that is reached between the business owner and the contractor who is most likely to be chosen for the project, and it may be accepted for the following reasons:

- When the requirements are not crystal clear.
- When only one resource is available (such as an equipment supplier).
- If the employer is unable to reach an agreement with the contractor who is most likely to be selected, a new attempt is made with a different contractor; however, time may be lost in this scenario, and part of the material discussed in prior talks must be kept confidential, so negotiation time must be factored into the timetable. It is critical to keep track of the project's progress.

Advantages

- We may be able to guarantee the quality (we may be able to guarantee the quality).

Disadvantages

- The contractor's technical snafu. If the initial negotiation fails, there will be a loss of time. It is possible that the contract will not be confirmed (guaranteed at a cheap cost).

I. Contract packages [65](packages)

Each of these functions can form a separate node, but they can be integrated with one contract, such as design and implementation.

Advantages

- The project's technical and administrative responsibility is maintained.
- It is lessening the number of contractors on the job site.
- To persuade the contractor to combine two offers, one of which he finds suitable and the other which he does not.

Disadvantages

- The contract must be clearly spelt out, with tasks specified and who is responsible for the redesign if the initial attempt at combining jobs fails to satisfy the employer's expectations.

J. Turnkey contract [66]

The only contract in which the contractor has the freedom to appoint another contractor to a subcontractor and from there to another subcontractor is the packet contract, which is divided into three disciplines: mechanical, electrical, and civil. There may be issues with the contract's terms, such as their complexity, which need careful drafting with additional requirements imposed for the usual terms Figure 2.11. The benefits of a labor monitoring agency and its development are that it relieves the business owner of a lot of coordination and technicalities.

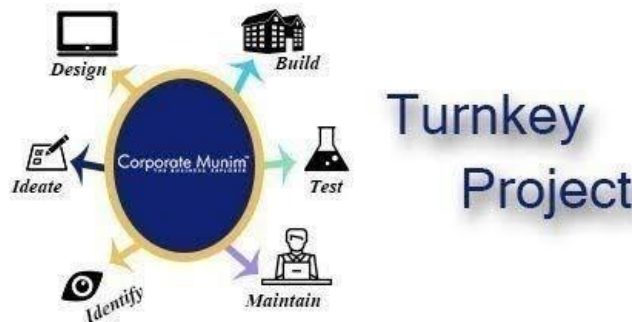


Figure 2.11 Turnkey Contract Project

K. Continuous contract [67]

It is a negotiating contract for a new project with the first project contractor based on the terms and circumstances of the previous project.

Advantages

- The technical and administrative work is consistent.
- It enables speedy machine and equipment change between two identical projects, saving both time and money.

Disadvantages

- Negotiating the price may be difficult since the contractor understands the strength of his financial position, and it is better for the business owner to gain from the speed with which the work is completed.

L. An operating management contract [68]

A contract for the provision of products or services over a predetermined length of time, or as required from the time of another, is known as an operating (management) contract. Pricing Arrangements are an example of this Certified Public Accountant (CPA).

M. Service Contract [69]

A service contract is one that is solely for the provision of services, such as consulting contracts with a client for designing and drawing up drawings, supervising, and seeking advice, or a station maintenance contract, or contracts for public utility firms that provide services such as electricity, water, and gas.

2.4.1 Implementation Stage

The implementation stage [70] of an engineering project is considered one of the most important stages since it is an actual translation on the ground of what has been agreed upon between each of the parties to the engineering contract (the owner, the engineer, the consultant, and the contractor), in which the main objectives of the owner's perceptions about the project are achieved after completion, Figure 2.11.

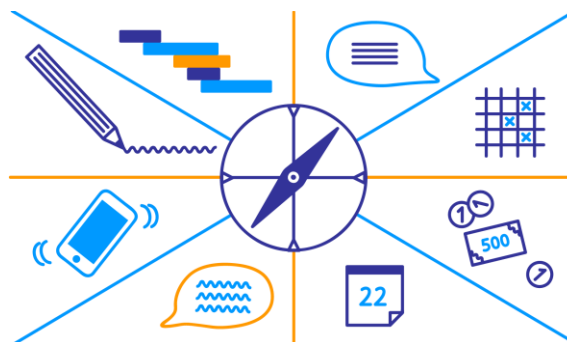


Figure 2.12 Implementation Stage

The following are the responsibilities of the parties to the engineering contract in the implementation of the project:

2.4.1.1 Engineer's Responsibilities and Powers

- a. The engineer must perform the obligations assigned to him in the contract if he has the employer's approval [71], particularly in the following areas:
 - a. I am creating and issuing change orders.
 - b. We are approving the work period extension and enforcing the conditions of the agreement's delay compensation clause.
 - c. Approval of subcontractor appointments.
 - d. We are issuing a stop-work order.
 - e. The contractor delegated some of the jobs to third parties.
 - f. Calculate the costs of the items.
- b. Except as expressly stipulated in the contract, the engineer does not have the right to release the contractor from any of the contract's duties.
- c. The engineer may choose a representative who will be accountable to him, perform tasks, and exercise the engineer's powers.
- d. The engineer may transfer any of the tasks and authorities entrusted to him to his agent from time to time, and he may revoke this authority at any moment). The authorization or cancellation must be in writing, and it will not be carried out until a copy has been delivered to the employer and the contractor. What the engineer's representative issues to the contractor in accordance with the mandate has the same effect as if it had been issued by the engineer himself, provided that:
 - a. The engineer's representative fails to refuse.
 - b. If the contractor objects to the information provided by the engineer's representative, the contractor may refer the problem to the engineer, who may affirm, cancel, or amend the content of the notification.
- f. The engineer or his agent may appoint any number of people to help him in carrying out his responsibilities, and he must tell the contractor of their names, responsibilities, and powers.

These assistants have no authority to provide the contractor instructions unless they are required to do so to execute their duties, and they must accept the materials, machinery, or workmanship if they follow the contract.

- g. The engineer offers written instructions. Nonetheless, if the engineer believes it is necessary to issue them orally for some reason, the contractor must follow these instructions, and the engineer's written confirmation of these oral instructions sent to him is considered an instruction, as is the contractor's confirmation in writing to the engineer within seven days of the verbal instructions issued to him. It was deemed an engineer's instruction for another seven days.
- h. The engineer must be objective in his actions.

When the contract calls for the engineer to use his discretionary authority to:

- a. Decide, provide an opinion, or approve something.
- b. His acceptance or approbation is expressed.
- c. Calculate the price.
- d. It is engaging in any other action that jeopardizes the employer's or contractor's rights or duties. The engineer must use impartiality when exercising this discretionary power in accordance with the contract's provisions, considering all the project's conditions.

2.4.1.2 Owner's Responsibilities

- a. Prior to submitting a conflict based on the execution guarantee, the employer must notify the contractor in writing, describing the nature of the violation for which the conflict will be made.
- b. Prior to the contractor submitting bids, the employer must have made available to him information about hydrogen conditions and subsurface layers obtained directly from the employer's surveys connected to the works.

2.4.1.3 Contractor's Responsibilities and Authority:

- a. The contractor must design the works (within the scope of the contract), implement, and complete them, and repair any deficiencies in line with the contract's

stipulations with due diligence and diligence. The contractor must provide supervision, labor, materials, machinery, equipment, and all other things, whether temporary or permanent, that are required for the design, implementation, and completion of the works, as well as to repair any defects, to the extent that the need for the foregoing has been specified in the contract or can be inferred from the contract, as necessary. Any inaccuracy, omission, error, or another flaw in the design or in the work specifications, that the contractor uncovers during his evaluation of the contract or during the execution of the works shall be immediately reported to the engineer, with a copy to the employer.

- b. The contractor is fully responsible for the validity, stability, and safety of construction activities and procedures at the job site, except for the design or specifications of permanent or temporary works that the contractor has not prepared. Regardless of any approval provided by the engineer in this regard, the contractor (where the contract expressly provides for the design of any portion of the permanent works) bears complete responsibility for that element of the permanent works.
- c. The contractor shall ensure that the installations are only loaded to their design capacity and that no materials or loads are piled up in a way that jeopardizes the facility's safety.
- d. The Contractor is responsible for keeping the temporary works in good working order. If the contract requires a guarantee from the contractor for proper contract implementation, he must obtain this guarantee in the bid appendix and provide it to the employer within twenty-eight days of submitting the acceptance letter, and the contractor notifies the engineer to submit the guarantee to the owner Work.
- e. The implementation guarantee is in place until the contractor completes and finishes the work, as well as corrects any errors, as specified in the contract. After the issue of the certificate of expiration of liability for rectifying flaws, this guarantee is no longer valid. The contractor receives this assurance fourteen days

after the certificate of expiration of responsibility for rectifying deficiencies is issued.

- f. The contractor believes that he has personally investigated the site, examined it, examined the areas surrounding it, and studied all available information about it before submitting his bid (to the extent practical, considering cost and time factors) for the following matters:
 - a. The site's shape and nature, as well as subterranean breeding circumstances.
 - b. Climate and hydrological conditions.
 - c. The scope and nature of the task, as well as the supplies required to accomplish and sustain it.
 - d. The method of reaching the place, as well as any facilities he would require.
- g. It is assumed that the contractor has satisfied the validity and adequacy of the bid, the classes, and the prices included in the schedules of quantities and that all of them (unless where the contract expressly states otherwise) will fulfil all his contract obligations, including those relating to the supply of goods, materials, and machinery, services, or inside.
- h. If the contractor finds natural obstacles or natural conditions other than the climatic conditions at the site during the execution of the works, and these barriers or circumstances, in his judgement, are something that the experienced contractor would not expect, he must immediately tell the engineer in writing and provide a picture to the employer. In addition, the contractor has the authority to make the following decisions:
 - a. Any right to a time extension that the contractor has.
 - b. The contractor's expenditures incurred because of these barriers or conditions, which will be added to the contract value. The engineer shall notify the contractor in writing of his decision, as well as sending a copy to the employer, and of any directions that the engineer may issue to the contractor that are

relevant to the decision's subject matter. He also considers what the contractor would do in the absence of specific instructions from the engineer regarding sound and reasonable practices that the engineer can perform—accepting it.

- i. The contractor shall carry out, complete, and repair any flaws in the works in accurate conformity to the contract accepted by the engineer unless doing so is legally or physically impossible, and the contractor must comply with the engineer's instructions and follow them precisely in any matter linked to or pertaining to the works. Whether or not it is indicated in the contract, and whether the contractor receives his orders from the engineer alone or from whoever assigns him within the boundaries of what is provided.
- j. The contractor shall submit to the engineer a programmer to carry out the works in the form and detail that the engineer reasonably specifies within the time stipulated for the date of the acceptance letter, and the contractor shall also, whenever the engineer so requests, inform him in writing of the general description of the arrangements and methods that the contractor proposes to follow.
- k. The engineer has the right to hold frequent meetings to monitor the implementation and ensure that the contractor is adhering to the agreed schedule; if the engineer notices at any time that the actual progress of the works does not match the approved program, the contractor must produce a prepared systems analyst at the engineer's request. They were explaining the changes that must be made to the preceding program to guarantee that the task is done within the time frame set.
- l. In accordance with the contract and the schedule for implementation with its changes, the contractor must provide to the engineer a detailed estimate of cash flows at quarterly intervals, including all payments to which the contractor will be entitled, and the contractor must thereafter give revised estimates of cash flows in quarterly periods as a maximum if the engineer ordered him to do so.
- m. The contractor's presentation of these programmed, broad descriptions or cash flow estimates to the engineer, as well as his approval of them, shall not relieve him of any of his contract-related obligations or responsibilities.

2.4.2 The Stage of Supervision

All superintendent relationships begin somewhere, and all supervisors and supervisees have comparable concerns about the relationship's future from the start. New managers may question their skills and expertise. Supervisory staff will be concerned about their treatment. Will I be understood and heard? Will my capabilities be recognized? Will I be safe? Will this be a worthwhile endeavor? Reaction to these needs is necessary for the early stages of supervision. Supervisors must include in all collaborative relationships from the start. To provide a positive supervising experience, supervisors must commit significant time and effort to create the supervisory connection. Even a seasoned supervisor could not know why he/she is there and what is expected of them. Therapists must also convey the therapeutic process to clients to convey the therapeutic process to supervisees to minimize client apprehension and get client goals. To achieve this, supervisors must build understanding and agreement from the beginning and help employees feel safe and reduce fear.

2.4.2.1 The Contractor's Supervision

The contractor must provide all necessary supervision during the execution of the works that the engineer deems necessary for the contractor to properly fulfil his contract obligations, and the contractor must appoint a qualified engineer registered with professional engineering organizations as his appropriate authority, which must be approved by the engineer.

2.4.2.2 Quality Control and Testing

In the construction sector, obtaining quality has economic ramifications, such as lowering production costs by avoiding the expenses of fixing flaws and errors, the costs of re-implementing some rejected works, attaining user contentment and satisfaction, and lowering maintenance costs over the period of use, all of which contribute to the facilities' economic life. It also gives the implementing agency more confidence in its operations, boosts its labor market share, and allows it to compete and grow.

2.4.2.3 Quality's Definition and Concept

- Quality is derived from the Latin word qualities, which indicates the essence of a thing, a person, or the degree of his virtue, and deciphering the meaning of the word quality is a difficult task since it has multiple interpretations.
- Quality refers to a product's suitability for its intended application.
- Quality that meets or exceeds the requirements and criteria.
- Quality is defined as the sum of a product's features and attributes that consistently meet the needs and expectations of the consumer. The degree of difference is defined as quality.

The following main features and concepts are associated with high-quality content in construction:

- a. Purpose: Does the establishment serve its intended purpose?
- b. Economic: Is the value of money based on origin?
- c. Age: Is the structure long-lasting and stable?
- d. Aesthetic: Does the origin have a pleasing appearance and is proportional to the surrounding amenities?
- e. Is origin a worthwhile investment in terms of consumption and economic strength?

2.4.2.4 Quality Management and Control Methods

In terms of quality management and control procedures, there are four degrees of advancement.

- a. First: examination or inspection. There's examination or inspection, which encompasses all operations involving measuring, testing, and determining the qualities and characteristics of a product or service, as well as comparing them to the requirements. Non-conforming work is completed.
- b. Second: Quality Control. Refers to the actions and strategies utilized to meet quality standards. The following are examples of quality control in construction projects:

Specific implementation guidelines (for the construction process) are established by:

- a. Each phase of the construction process is described by plans, specifications, and technical conditions.
- b. I measure deviations from the standards by ensuring that the building work is carried out in accordance with the plans, specifications, and technical requirements.
- c. It is taking remedial action to decrease negative disparities to the smallest permissible and technically acceptable levels that do not jeopardize the safety, durability, or usefulness of the construction work.
- d. It is making plans to improve standards and increase conformance to them by utilizing the negatives and errors that arise during implementation to avoid them in the following phases of implementation and in other building projects.
- c. Third: Quality Assurance. Assurance refers to all the systematic and planned operations that must be completed to have sufficient confidence that the product or service will meet the specified quality standards. The quality assurance process in construction projects entails more than the use of standards and procedures to guarantee that the product meets the specified specifications, which may include:
 - a. Permission or approval from a third party (the consultant engineer) to inspect the quality of the completed works, evaluate them at each stage of the project, and then accept, alter, or reject them.
 - b. It is verifying the system's ability to reach the needed level of quality, as well as its compatibility with the construction work conditions and available capabilities.
 - c. Quality advanced planning, which necessitates the establishment of specialist frameworks with quality management expertise and experience. The construction work establishes the operational programs and practical measures

to be followed during the various phases of the construction project to achieve the specified quality level.

- d. For each stage of the construction project, the use of quality costs, which calculate and compare the costs of quality assurance activities and works to the results in the event of failure.
 - e. Socializing non-production processes, i.e., generating enthusiasm for the task that supports the implementation process (such as supplying materials and equipment, calculating costs, and developing plans).
 - f. They are using statistical process control by conducting tests throughout construction to assess the number of deviations that occur at each step of the project, allowing for early treatment before all flaws exceed the allowable limits. Throughout the construction process, quality assurance is a critical component.
- d. Fourth: Total Quality Management. is an integrated management strategy to meeting customer expectations and achieving continuous performance improvement by incorporating personnel at all levels at a reasonable cost and employing effective strategies and processes to solve problems.

Total Quality Management (TQM) [72] is defined as: "Achieving the best use of available resources via the pursuit of continuous improvement in performance, and it necessitates the use of quality management concepts" for building projects. The thorough quality procedure covers the following at all levels of work:

- a. Constant effort to develop business requirements, spread quality concepts, and acquire the necessary competencies to complete high-quality construction projects.
- b. Involvement of all operations, whether productive or non-productive, because they all affect the quality of construction work.
- c. I am keeping track of my progress. That is, tracking plan implementation rates and attempting to improve them on a constant basis.

- d. The parties involved in the building project must collaborate as a single team with a same goal: to complete the project in a high-quality manner.
- e. Employee participation contributes to obtaining quality while performing their jobs by instilling quality concepts in them and inspiring them to complete tasks with high precision.

In the building sector, the fundamental principles of comprehensive quality management Total Quality Management (TQM) [72] are a term used TQM, or total quality management, is a novel concept in building projects, as its application was previously limited to industrial projects. However, after seeing the remarkable success gained by industrial businesses in the United States, construction businesses in the United States began to implement it. The use of the entire quality management concept, which is founded on the pursuit of two key principles:

- a. Satisfaction of Customers The construction industry's main goal is to supply clients with ready-to-use projects, facilities, and services that satisfy their needs. Total quality management is an administrative philosophy based on accurately determining the customer's needs and requirements and working to secure a suitable environment and working conditions to meet these needs and requirements at the lowest possible cost through quality assurance at all stages of the construction process from concept to completion.
- b. Ongoing development Two functions must be done to accomplish continuous improvement in overall quality management: a) incremental enhancement of current methods and procedures and preservation of existing features through control of the manufacturing process. They are using creativity and innovation to direct and focus efforts to accomplish technological development in building and engineering operations.
- c. Construction projects with quality control issues Quality management in construction projects is plagued by several issues that stymie its adoption and growth.

- d. A lack of commitment on the part of top management in construction enterprises and institutions to make the necessary efforts to achieve successful quality management.
- e. Ineffective communication and coordination between members of the construction project team (owner, consultant, contractor, supervisor, subcontractor), as well as senior management and work locations.
- f. A lack of staff competency in work and in their training, followed by failure to perform their tasks correctly to effectively fulfil quality management objectives.
- g. Construction project staff pay insufficient attention to quality.
- h. Due to its link with the availability of materials, the construction industry's volume of work is insecure, and it is influenced by the stability of the national economy.
- i. A lack of adequate quality management planning, implementation, and realization.
- j. Ease of access into the construction labor market, regardless of the availability of the required circumstances and the capabilities to accomplish the requisite quality.
- k. There is a lack of clarity regarding the scope of quality duties between the stakeholders involved in the construction process.
- l. A lack of excellent legislation and rules, or flaws in their implementation.
- m. A lack of ethical values among some construction sector members (project owners, consultants, testing agencies and inspections).
- n. Ignorance of quality principles and tools, or inappropriate application of them.
- o. A lack of understanding or inappropriate application of contemporary technical equipment and processes.
- p. Inadequate preparation of project plans and requirements, as well as a lack of expertise among a class of construction contractors.

2.4.3 Management of safety

During the period of doing the works, the contractor should ensure that [73], Figure 2.12:

- a. It fully considers the safety of all persons entitled to be present at the site, and that the site maintains: (what falls under his control) and works: (if it is not completed, or the employer does not operate it), in the case of the necessary system to spare.
- b. To provide constant lighting, guarding, fencing, warning signs, and monitoring, at his own expense, wherever and whenever required, or as asked by the engineer or needed by a legally established authority for the purposes of preserving the works, or for the safety and comfort of humans.
- c. To take all reasonable precautions to protect the environment both inside and outside the site, and to avoid causing harm or inconvenience to individuals, the public's property, or others because of pollution, noise, or other causes deriving from his site operations.
 - a. If the business owner intends to work on the site using his property, he must fully consider the safety of all persons authorized to be present on the premises.
 - b. Maintaining the location in a suitable state of order to avoid these individuals' hazards. In addition, if the employer utilizes additional contractors on the job site under Article 31, he must bind them to the same safety and risk-avoidance requirements.

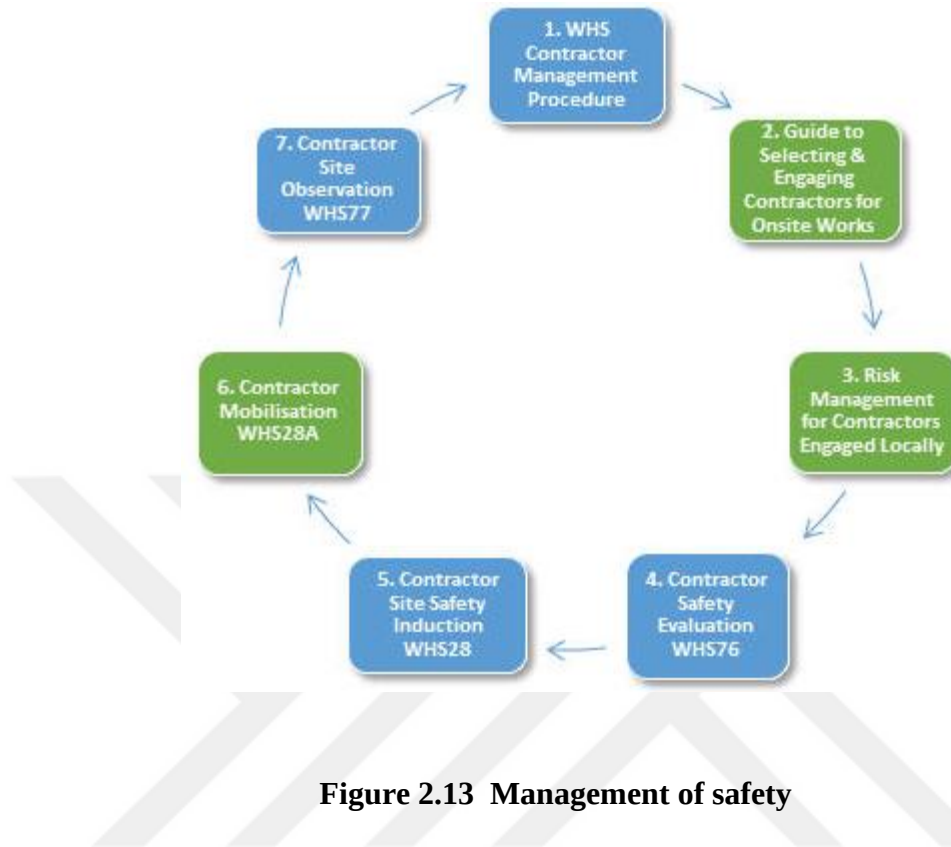


Figure 2.13 Management of safety

2.4.4 The Receiving and Documenting Stage

The stage of obtaining and documenting the project has been received, and the contract has been terminated. The project is delivered according to the contract documents; it is the conclusion of painstaking effort that may have begun years ago, and the final stage of the project is the one that the contractor had in mind when he obtained the site and began the project. The owner's receipt of the project signifies the completion of the project's works in accordance with the plan and within the stated time frame, and thus leads to a stage that is equally significant to the previous stages, such as accepting the project and liquidation the contract, in readiness for its usage for the purpose for which it was created.

2.4.5 Obtain the Completed Works

After notifying the owner by official letter prior to the expiration of the contract period for all works on the project that have been completed, the contractor shall perform the necessary tests and checks for the equipment, equipment, and works implemented for the project, in the

presence of the supervision apparatus, at the end of the contract period for the project and according to the time plan. Receipt of the project initial receipt, and the contractor provides a copy of the same letter to the project engineer on site, with the condition that he reduces the presence of his staff and equipment to the bare minimum required to finish the delivery, and begins cleaning the site in preparation for that [74].

There are a sequence of actions and procedures to follow:

Form a committee or team to inspect the project, performing detection and inspection work on project components, conducting operational tests for devices and equipment, or supervising those tests and checks. This team or committee is made up of members of the implementation oversight department, the owner's technical staff, or another technical authority hired for the job. This team must, however, extensively examine the contract documents, including any necessary additions or adjustments, to confirm that the project has been implemented with all its aspects in accordance with the contract documents and accepted engineering standards, which includes the following:

- a. Examine and inspect all aspects of the project and its components to confirm that the contract's requirements have been met, including:
 - Inspecting the site's contents, such as roads, corridors, and walkways, to ensure that they are following the approved designs.
 - Inspection and verification of the level.
- b. Inspecting the green spaces, planting projects, and ensuring the irrigation system's performance. External fences and gates are inspected. Minutes of the project inspection
- c. Establishments - Inspecting and verifying the establishments' interior and external dimensions in accordance with operational plans.
- d. Architectural finishing - checking for type and homogeneity of exterior and interior paints, straightening edges and corners, levelling floor and wall tiles, straightening joints, and supporting the fake ceiling to guarantee conformity with technical

specifications and architectural designs, inspect doors and windows, emergency exits, signboards, and handrails, among other things.

e. Experimentation and operational testing equipment and gadgets Firefighting system inspection and testing to assure proper operation. Elevator inspection and testing to ensure that they are in good working order.

- During the summer and winter, the air conditioning system is inspected and tested.
- Communication and phone systems are inspected and tested.
- Tanks,
- Treatment plants, and sewage systems are inspected and tested. If the tests and calibration are performed by a neutral and licensed organization, which also examines the equipment warranty certificates and issues a certificate.

f. Electricity

- Industrial lighting inspection and testing
- Stations that create backup energy are inspected and tested.
- Checking connections to main and subsidiary circuit breakers and feeding points on all electrical tools, such as meters and switches, for voltage and electric current intensity.

g. Mechanics are responsible for examining and testing water pipes. Feeding points, sewage systems, and fire extinguishing systems are all inspected.

- Getting a sneak peek at how sanitation pieces will be installed.
- Feeding system inspection.

h. Cleanliness - ensuring that the site is clean and free of any violations: reviewing temporary work sites, such as offices, warehouses, workshops, and fences, and

ensuring that everything except what the owner wants to maintain is removed. Ensure that the facilities are clean.

- i. Examining and counting the project's transferred items, such as furnishings. - Mobile devices and equipment, and to confirm that they meet specifications in terms of type and number, inventory them according to lists, and sign their receipt using forms for this purpose.
- j. Checklists and notes When the contractor follow the contract's conditions and the supervision department is committed to thorough follow-up, the inspection team records its observations and observations in a list, or in lists called checklists and notes. These are shorter when the contractor follows the contract's terms, and the supervision department is devoted to thorough follow-up.

The list would not have existed if all work on the project had been completed according to the contract documents and correct engineering principles in terms of type, quality, and implementation.

These views and perceptions do not depart from three scenarios:

- a. In the first scenario, there are no remarks or flaws, hence the inspection team suggests that the project be accepted.
- b. In the second situation, there are some minor points that do not preclude the project or a portion of it from being used, and it is recommended that it be received partially or conditionally.
- c. In the third instance, there are significant notes that prevent the project from being received, and the receipt is postponed until the contractor completes those observations, after which the contractor informs the owner, and the operations resume, and the contractor is regarded late, and a delay fine is assessed. The contract specifies this.
- d. The contractor and his subcontractors conducting a preliminary (pre-final inspection of the works during and shortly after implementation, and correcting any

errors if any, under supervision and follow-up by the Supervision Department for the implementation before the final inspection, will make the inspection team's task easier and faster to complete, and this will determine the results of the final inspection.

- During the execution of the work, the contractor's engineers maintain track of inadequacies and defects at their various sites to follow up on their repair.
- Nonconforming behavior must be quickly halted and corrected.
- Before leaving the job site, the contractor must persuade his subcontractors to remedy any defects.
- The contractor must check the works with representatives from the Execution Supervision Department on a regular basis.
- Representatives from the Execution Supervision Department conduct ongoing inspections of all completed projects.
- Following the initial inspection, the engineers of the Implementation Supervision Department must produce checklists, write dates on them, and sign them for the works that have not been completed according to the plans, and then ask the contractor to correct them.

These processes are part of the supervisory process, and if they are restricted, there will be no checklists, or if there are, they will be limited to calibration tests, equipment inspection and operation, and a list of notes.) Second: The Initial Receipt The first receipt is the owner's acceptance of the completed works and the transfer of responsibility for those works to him. If the inspection result falls into the first scenario, which is the lack of notes, or the second situation, which is the presence of notes that do not hinder partial or complete first receipt, the owner will receive the project in whole or in part, with signatures on the lists of transferred items, accordingly (Equipment, furniture). Minutes from the project preview notebook No. 2

- In the case of public sector projects, receipt is accomplished through the formation of a receiving committee and the signing of a special form for the initial reception,

since there is frequently a technical department responsible for the projects, which receives the project from the contractor on behalf of the beneficiary and then performs it. By transferring the project to the beneficiary and terminating the beneficiary's connection with it, or by continuing to maintain and operate it, or by providing technical supervision on it.

- In the private sector, the receipt is given to the owner directly. It is occasionally necessary, and for unique reasons, to utilize part of a project before the end of the term required for the completion of the project, especially if the project is divided into sections (many facilities), and in this case, what is known as partial initial reception is performed, as well as the transfer of responsibility for this part to the owner. The remaining items will be received in a timely manner, and this receipt will be devoid of any distinguishing features, as the contractor has no right to seek a portion of the final payment, release of guarantees, or anything else.

If the engineer issues an initial handover certificate for any section or portion of the business, the contractor's duty for that section or part of the business terminates on the date the initial handover certificate is issued. Initial Receipt Formation Decision Initial Receipt Record

- a. the project's final documents: They are project-related technical documents that the contractor must give to the owner as part of the preliminary reception requirements. They are as follows:
 - a. Business plans as implemented are all project plans (civil, structural, architectural, electrical, mechanical), and they must reflect the way and state of implementation of all project contents and sections (general site, buildings, other works). These plans are dependent on the final operational plans (workshop plans) after their approval and implementation, and these plans are considered the complete record of what has been implemented, including the creation of amendments, additions, or notes, and all necessary data, as it represents the reality of implementation in all its details, little and large, and these plans are considered the complete record of what has been implemented.

- b. Operation and maintenance manuals are all technical manuals and brochures issued by the manufacturer or supplier for all equipment and devices installed or received in the project, and these manuals and pamphlets offer technical and operational information for such equipment, devices, and machines, including dimensions, weights, strength, power, and vibration. The sanitary installation techniques, necessary precautions, correct operating assets techniques, and other essential information for these devices, as well as the methods and instructions for operating assets of these equipment and devices, preventive and corrective maintenance, numbers of consumable spare parts, and the manufacturer and supplier's addresses. These manuals and technical bulletins are delivered in one original and multiple copies, if they are classified, signed, indexed, and archived in publications according to function or type, such as mechanical and electrical equipment.
- c. Device and equipment guarantee the manufacturer's or supplier's guarantee that the device or equipment is free of manufacturing flaws, as well as his responsibility to maintain or repair such device for a specific period following the project's delivery, which is usually one year, is the intended guarantee in the declaration and construction contracts.
- b. The guaranteed requirements and basic criteria are usually specified without detail in most of these contracts, and the manufacturer's guarantees in this respect are frequently referred to as a reference for those promises. The implicit guarantee, which signifies that the equipment or machine can perform the work or function for which it was discovered in typical circumstances, is separated into two sorts.

The blatant warranty is the guarantee written with certain devices and equipment, and it indicates the extent of the manufacturer's or supplier's obligation towards the machine, as well as the restrictions that apply to that guarantee, which vary from manufacturer to manufacturer and supplier to supplier, thus some guarantees are absolute, while others are limited.

These constraints make the guarantee a topic that is not as simple and clear as the language of these guarantees are phrased, making their literal application extremely problematic, and they include the following:

- a. The warranty duration begins on the date of purchase or installation, which may not always correspond to the date of putting the device into operation in building projects, in the case of project delivery delays, or in the case of purchasing and installing the device early for any cause that may result in the warranty period or a portion of it expiring. This guarantee will not be used if it is not used.
- b. The requirement that no action or action be taken by the contractor or the owner towards the equipment or machine unless the manufacturer or supplier has given their approval. And if something like that happens without permission, the guarantee may be terminated, which opens the way for the manufacturer or supplier to avoid warranty duties, making it very difficult to benefit from the guarantee, given that it requires proof of not doing anything that violates this condition. It also necessitates the preservation of all installation, operating, and other documents as evidence in the conflict.
- c. The need that the operation, maintenance, and consumption of resources be carried out in strict conformity with the manufacturer's or supplier's specifications. Otherwise, the guarantee will be cancelled, and showing that the instructions in this regard have not been broken is a difficult task.
- d. The necessity that the equipment or machines be operated and serviced by specialists who have been approved or overseen by the manufacturer or supplier, for the guarantee to be valid. The contractor is responsible in front of the owner for providing and obligating manufacturers or suppliers with these guarantees, which are part of the project receipt documents. However, one of the most significant obstacles to fully benefiting from these guarantees is that they are difficult to pursue and rely on the extent of the manufacturer's or supplier's professional commitment, save in the case of defective workmanship. For all these reasons, guarantees clauses are formulated in some building and construction contracts so that the contractor is

fully responsible for ensuring the devices, equipment, and materials that he supplies to the project, including repair and replacement, and other things that require Total Landscape & Construction (TLC).

- e. Spare parts lists are lists submitted to the owner by the contractor and include all equipment, devices, and materials supplied or installed in the project.

The contractor must submit these lists according to a specified organization, clear classification, and particular classification, and they must include the names of consumable and semi-consumable spare parts that the equipment and devices require to ensure that their ongoing performance is practicable. These lists must contain information that is clear and thorough enough to be used for the purpose for which it was discovered.

When equipment or devices are idle for longer than the minimal duration, the existence of these lists helps the availability of necessary spare parts and saves time searching for and acquiring them.

If the contract provides that these parts be provided to the owner with receipt lists that he signs, they will be supplied.

2.4.6 Period of Maintenance

It refers to the contractor's first receipt of the project, acceptance of the completed works, and transfer of the project from the contractor's possession to the owner, as previously stated; nevertheless, this transfer does not imply the end of the contractor's relationship with the project, but rather the end of responsibilities and the beginning of new ones that the contractor should take on [75].

These obligations begin after the initial delivery and finish when the project is finally received, which normally takes a year. These tasks handed to the contractor during this period are very particular as compared to his responsibilities prior to the initial reception, especially if the project is carried out exactly according to the contract provisions [75]. And the correct engineering concepts, as well as the contractor's responsibilities, which include:

- a. To repair, amend, create, or correct any defect or deficiency in any part of the project or any element within that appeared because of poor implementation and was not discovered during the inspection, or that these defects emerged later, as this responsibility does not include defects resulting from misuse, a change in the required function, or normal consumption of the product.
- b. Paying all repair expenses, including wages, materials, and tests, if the repair was caused by negligence or negligence, or a breach in type, or the execution of what was stated in the contract, or the correct engineering principles for implementation, whether these are true or not. If the contractor refuses to comply, the breach will be carried out by other contractors, and the costs will be taken from his dues.
- c. Pursuing the application of the manufacturer's or supplier's guarantees of devices and equipment as needed; if this is not possible for whatever reason, the contractor shall do what is necessary for the equipment and equipment at his own.
- d. Unless the contract states otherwise, the contractor is accountable for any structural error or fault for a term of ten years.

2.4.7 Training in Operation and Maintenance

Some construction projects feature sophisticated technological devices and equipment [76], and some buildings have advanced electrical, mechanical, and electronic systems that are linked to a central administrative control system that includes electronic control and monitoring devices for all building system functions such as air conditioning, ventilation, elevators, and fire suppression. Alarms, surveillance and security devices, irrigation systems, and other similar gadgets are available. To operate, maintain, and handle these systems, you will require training. As a result, some contracts demand the contractor to teach employees (assigned by the owner) to operate and maintain these devices for a set length of time, with the following goals in mind:

- a. Ensuring the operation of certain equipment and systems, as well as preventing misuse or improper use to avoid early breakdown.

- b. Performing the necessary preventive maintenance to keep the equipment and gadgets running.
- c. When a malfunction or a standstill develops, make the appropriate repairs.
- d. Extend life expectancy.
- e. Making the most of the warranties on these equipment and systems by not breaching their terms through correct operation and maintenance, as well as avoiding the reasons of disagreement between the contractor and the owner over the guaranteed issue.

Training is supplied by specialized trainers who are qualified for this role, and it must be two-fold (theoretical / practical) as follows:

- a. Delivering theoretical lectures with the aid of teaching materials such as slides, films, and books
- b. Giving these students examinations to ensure that they are aware of and understand the subject.
- c. Providing hands-on training on these machines and systems and ensuring that the trainees are competent.

2.4.8 Receipt of The Final Payment

It is the owner's ultimate approval of the project's work, relieving the contractor from all liability and obligations (save for the ten-year commitment for the safety of the construction work, unless the parties agree otherwise, and the expiration of the maintenance period, as well as the release of the amounts). The final receipt processes begin with a letter from the contractor requesting that the owner schedule a final inspection in advance of the project's final receipt, provided that this letter reaches the owner in sufficient time before the end of the maintenance year (the guarantee that followed the original receipt). Refers to the formation of an inspection team with the participation of the contractor's representative to carry out the final inspection work, in which this team evaluates the project, inspects its components and parts, examines the operation and maintenance records, and evaluates them from the date of first

reception to find out what difficulties the project users may experience, and then this is released. The team is ready for it, and the project is eventually received, either by a committee constituted for the purpose, or directly by the owner, or by the inspection team. After that, the final guarantee shall be released, and if the inspection reveals the existence of a defect, defects, or deficiencies that fall within the responsibility of the contractor, the contractor shall be requested in writing to fix the defect or defects and complete the deficiencies. If the specified period for repair expires, and the contractor does not fulfill his duty, then the owner has the right to assign someone to do so and deduct the costs from the value of the guarantee according to the price clauses in the contract documents. Request to release final guarantee, final receipt record.

2.5 AFTER YOU'VE RECEIVED YOUR FINAL RECEIPT (AUTHENTICATION):

The project manager takes over all project activities once the final payment and withholding amounts have been given to the contractor [77], and the resident representative, in most companies, fades away completely. Among the many vital tasks that must be completed at that time, we discover that the following are the most crucial:

- a. Financial accounting for the entire project, including a summary of all costs, expenditures, general expenses, and profits, as well as all cost-related things across the project's lifespan.
- b. Writing the final project report, which will be presented to the architect or the owner management team.
- c. Gathering, arranging, and evaluating the project's comprehensive records and storing them in the project's master file, which is critical since the legal department may need them in the event of subsequent conflicts.

3. METHODOLOGY OF CONFLICTS AND DISPUTES

3.1 INTRODUCTION

A conflict is a request for payment of project costs, or an increase or decrease in the implementation time from either side, which could be due to a discrepancy in advance payments or anything else. Any party to the contract has the right to make a conflict, and the contract also specifies the processes for the contractor to make legal conflict s for:

- a. The occurrence of circumstances that were not anticipated by the contractor.
- b. Obtain additional compensation or additional time.

3.2 FACTORS THAT ASSIST CONFLICTS

- a. The contracting technique that was agreed upon (Bidding method). Bid is the term used to describe the process of making construction data publicly available. Project owners can submit project specifications for contractor bids using various channels, including government institutions and private plan rooms. Project owners can use services to distribute project information to a wide range of contractors, general contractors, and subcontractors to solicit bids. Many of these services are available for a price or on a subscription basis.
- b. The role of the engineer in the design process. A work engagement occurs when individuals disagree about the objectives to be accomplished or the substance to be completed. It entails disagreements about points of view, ideas, and views. Conflicts over resource allocation, processes, policies, judgment, and fact interpretation are all examples of task conflicts.
- c. Political considerations
- d. Legal and contractual considerations. The consideration, which is one party's gain from the contract (receiving money), and it is the other party's responsibility (paying money). Without each party to the deal providing consideration so the

contract cannot be legally binding, and this pointing to a result, gratuities are not legally enforceable and not legal in any contract.

3.3 CONFLICT CAUSES

Conflicts between contracting parties have grounds [78], which are most often related to the contract itself, or a violation by one of the parties of what he committed to the other, and the meaning of the conflict s here is that one party to the contract provides adequate compensation for the loss he experienced as a result of the other party's breach of the contract ,Figure 3.1.

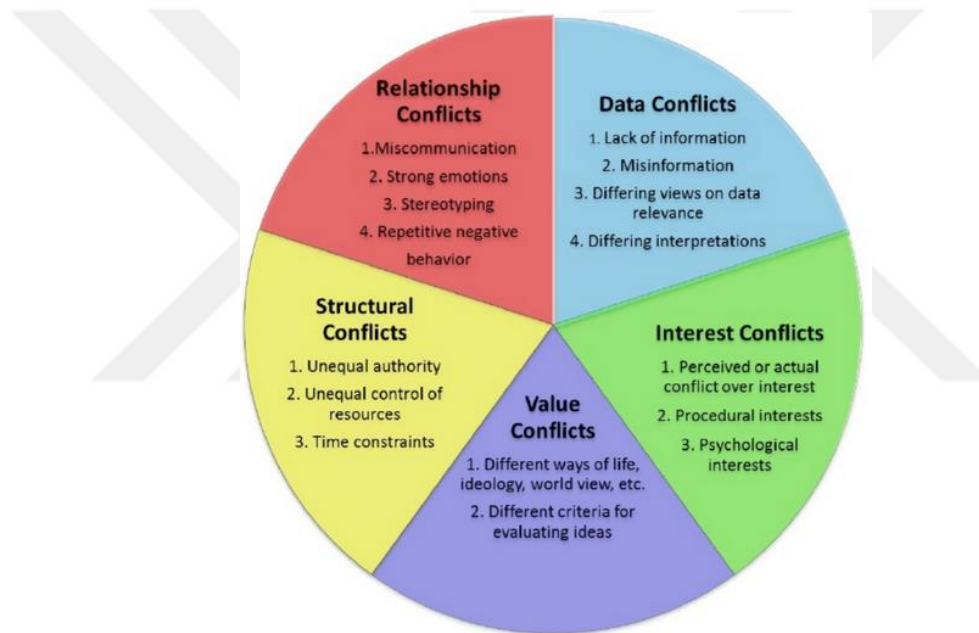


Figure 3.1 Conflict Causes

- a. In the sphere of building and construction, the most common reasons for obtaining conflict s to lift or compensate for damage are:
 - a. Reasons relating to the consulting engineer, when he fails to adhere to the technical assets that every architectural specialist must know and respect when generating plans, drawings, and measurements under which the construction will be done. The boss and the designer

- b. Contractor-related reasons: for example, if he breaches his commitments to the employer, or if he executes construction work in violation of the agreed-upon specifications and conditions, or if he infringes or exaggerates in maintaining the building materials provided by the employer, or if he brings them in poor condition without what was agreed upon. Without consulting the employer, make changes or additions to the building of poor quality.
- b. reasons relating to the employer: for example, to refuse to accept the construction after it has been completed by the contractor, or to delay receiving it even though he is able to do so.
- c. Or that it raises the contractor's costs if he delays acquiring the building permit until after the specified start date for construction has passed, or if the contractor has employed people or hired construction equipment's.
- d. Or to put off paying the rent to the contractor, especially if it was paid in instalments and the completion of the building phases was contingent on the employer's payment.
- e. Contractual reasons: when the contracting contract does not include a description of the building to be built, or the materials and machinery to be used in construction, or it fails to state the payments due to workers, or the way of paying the wages if the wages are paid in instalments, or there is uncertainty in the contract's provisions. Or, failing to clarify the obligations and responsibilities of each party to the contract, which indicates the possibility of conflict s arising between the parties to the contract.
- f. Inability to recognize all hazards, as well as a failure to communicate effectively between the two contracting parties.
- g. Risks that have been overlooked or dealt with in a haphazard manner.
- h. Employers' proclivity to assign all risk liabilities to the contractor alone.

- i. Inadequate studies and haste in attempting to build the project without first conducting a full risk assessment.
- j. Failure of the contract's effective parties to perform their responsibilities in a timely manner, as well as the responsibility to do so in accordance with the contract's terms.
- k. Unforeseen circumstances and force majeure are the tenth and eleventh points on the list.
- l. 11 Inefficiency on the side of the employer in contract administration.
- m. Lower the bid or contract rate and wait for an opportunity to demand a higher bid rate, which will result in a disagreement.

3.4 PROCEDURES FOR FILING A CONFLICT

- a. Notification of conflict s to the contractor, regardless of other contract provisions, if he intends to demand any additional payment, pursuant to any of these conditions, or otherwise, to notify the engineer of his intent, together with sending a copy of this notification to the employer, within 28 days of the first occurrence of the incident giving rise to the conflict. The contractor must keep records of the facts necessary to support any conflict that he may desire to bring later, and the engineer must examine these documents as soon as he receives notification, and he may provide instructions to the contractor to retain further documents that are reasonable, and the contractor must allow the engineer to review these documents. By inspecting all the contractor's records as required by this clause, he must also submit a copy to the engineer whenever requested.
- b. Demonstration of the allegations' validity. The contractor shall send the engineer an account providing complete information on the amount conflict ed and the reasons on which the conflict is based within 28 days of receiving the notification, or within any reasonable timeframe agreed upon by the engineer. If the event that causes the conflict has a continuous effect, the account is considered a temporary account, and the contractor is obligated to send additional temporary accounts,

which clarify the accumulated amounts of the conflict and indicate any other grounds on which this conflict is based, to the engineer in the periods that the engineer deems reasonable, and to the contractor in the cases where the conflict is based on a conflict that is based on a conflict that is based on a conflict that is based on a conflict.

If the contractor fails to comply with the provisions of this article in relation to any conflict he wishes to submit, his eligibility to receive the conflict's value will be limited to the amount determined by the engineer or any arbitrator or arbitrators selected, as evidenced by current documents (whether the engineer is notified of this Records or not).

3.5 WAYS TO AVOID CONFLICT.

When the employer, the contractor, and the consultant engineer agree on the construction of a building, it means that the parties to the contracting contract have interests in the building. For example, the employer is often an investor looking to develop his money, and the consultant engineer and the contingency engineer are both looking to develop their money, Figure 3.2.

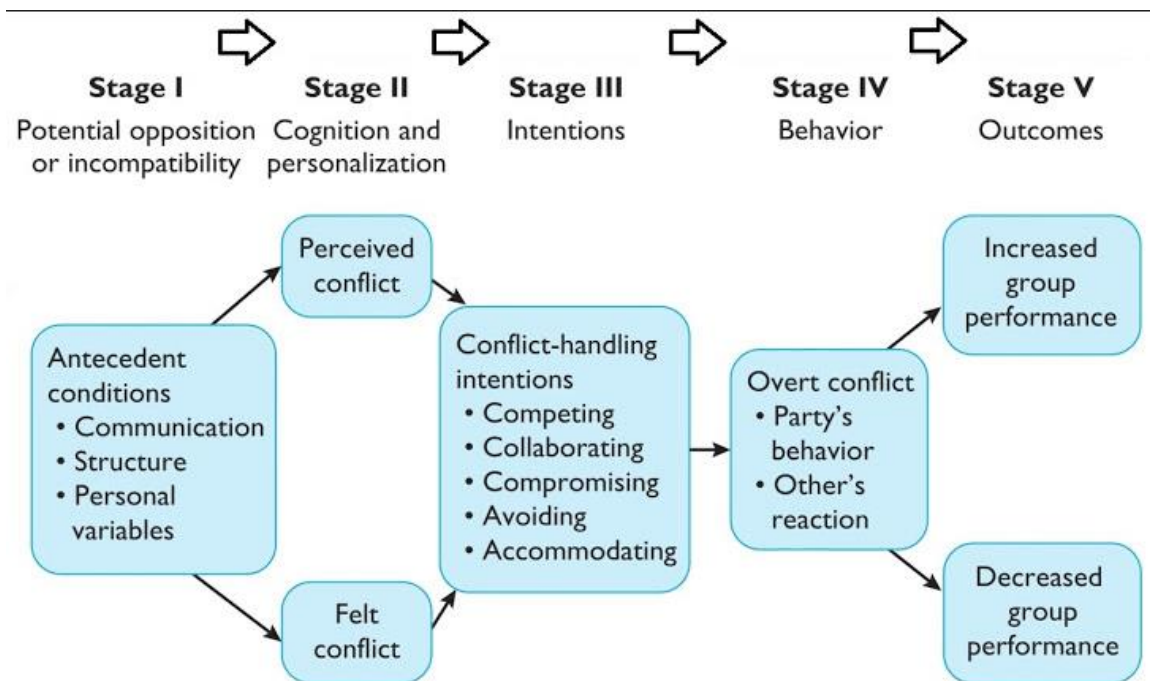


Figure 3.2 Steps to Stop the Conflicts

Whereas the formation of a disagreement between those parties can result in the suspension or cancellation of building activity, this prevents the attainment of the goal; hence, it is necessary to describe how to minimize the appearance of disputes, as well as the conflicts that should be made between the contracting parties [79]s, as follows, figure 3.3:

- a. The contractual parties must be aware of the necessity of fulfilling the contracts, according to the terms set forth in them, and following through until the deal is completed. It is said that if it is in each party that it is contracted upon and abides by its conditions, then this would restrict the rise of disputes and conflicts.
- b. The parties must recognize that they are equal partners in contract sovereignty, and that the law is what organizes and governs the relationship between them.

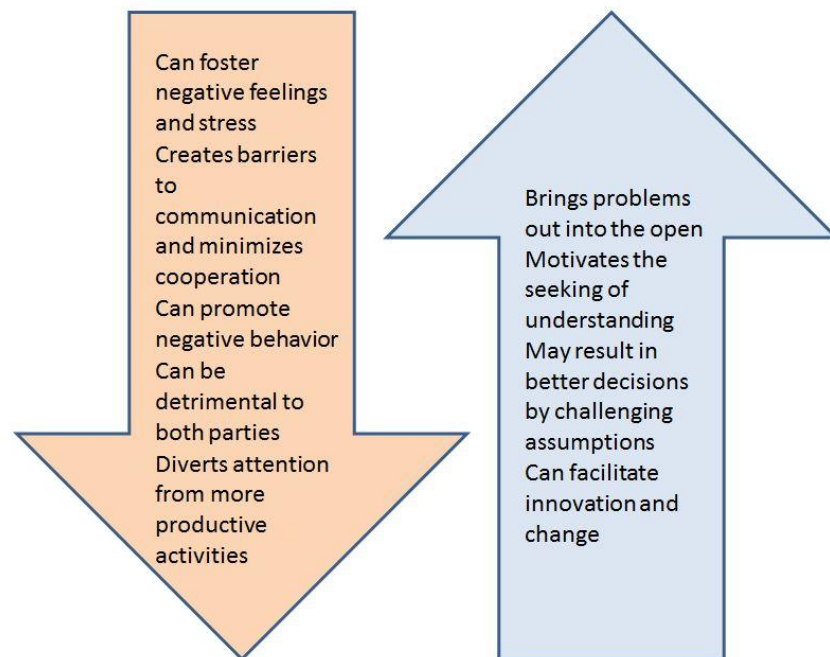


Figure 3.3 Positive and Negative Consequences of Conflict

3.5.1 To avoid disputes, it must have the following items:

- a. Every contract is different.
- b. The contract's introduction states the contract's date, the contract's two parties, and their legal ability.

- c. The place where the contract is produced, by describing the building in such a way that the area of the building, its lengths, measurements, the number of stores, and so on, as well as the level of the materials and machinery employed, are all displayed.
- d. Determine each party's responsibilities for implementing the contract, as well as what each party must undertake to reach the contract's aim of completion.
- e. Determining the salary for the job, the manner of payment, and whether it is based on time or on the task performed, as well as who will be responsible for the wages for the materials or machinery if their costs rise. 6. Determine the amount of time required to finish the task; force the contracting parties to stick to it, keeping in mind that the stipulated timeframe is proportional to the project's size. 7. Explaining the terms under which each party expects the other to comply and is bound by them, including the penalty clause under which one of them agrees to reimburse the other for any damages he may cause if he fails to fulfil his commitment or delays in doing. Clarity and understanding of the contract's paragraphs and clauses, as well as the avoidance of ambiguity and contradiction in its wording.

3.5.2 Manage the Contract to Avoid Conflicts.

- a. Drawings and filling in the blanks.
- b. The engineer must create detailed illustrations of the project elements, such as columns, bridges, and bases, as well as bill of quantities for raw materials and the specifics required for sanitary, electrical, air conditioning, and internal drainage.
- c. the land (ensuring that the site is in good shape)
- d. Relationships between the consultant and the contractor.
- e. The consultants' performance. Additionally, there is transportation (access to the site).
- f. Payments

- g. Public authorities and authorities
- h. The way issues and dangers are addressed early on.
- i. The performance of the subcontractors who were nominated.

3.5.3 Avoid Conflicts by Contractor Actions and Applications

- a. Examine all tender documents thoroughly, including drawings and specifications.
- b. Thoroughly examine business prices to ensure a reasonable profit.
- c. Contract management and implementation with due diligence.
- d. according to the directions and requirements.
- e. Ensure that the materials are used in the facilities according to the specifications.
- f. Taking suitable measures to look after the work that has been completed. with all applicable laws, including safety restrictions.
- g. Notify the business owner ahead of time of any events that are likely to increase the cost of the project or lengthen the time it takes to complete it.
- h. Before the warranty term expires, take care of the faults. The conflict, if any, will be refunded in a timely manner.
- i. The contractor's chain of work program depicts the sequence of work, contains resources and other constraints, contains contract stages, and expresses its needs in a straightforward manner.

3.5.4 The Employer's Conduct at The Supplementary Stage

- a. Educating and guiding bidders on how to prepare and submit bids.
- b. A description of the standards that must be met.
- c. Make the bidders aware of the requirements for submitting bids.

- d. To educate the bidders that the knowledge and capacity to implement are the only factors that determine the winning proposal.
- e. At the business stage, specific reports must be provided, the site must be checked, and the business owner must have access to additional site-related information.
- f. Decide on the contract's conditions as well as the payment method.
- g. The methods for accepting the final products are described.
- h. Adding to the contract with changes.
- i. Define quality control methods clearly.
- j. Reporting the two parties' rights and responsibilities, as well as default.
- k. Providing a method for settling conflicts, whether amicably or through litigation, as well as an arbitration system.

3.6 CONFLICTS SETTLEMENT

The contractor has the right to include any temporary payments approved by the engineer, such as the amount for any conflict that the engineer considers important, after appropriate consultation with the employer and the contractor, and owed to the contractor, provided that the contractor has provided enough detailed data to enable the engineer to determine the amount due, and if these data are accurate. Any decision made by the engineer must be communicated to the contractor and a copy must be sent to the employer, Figure 3.4.

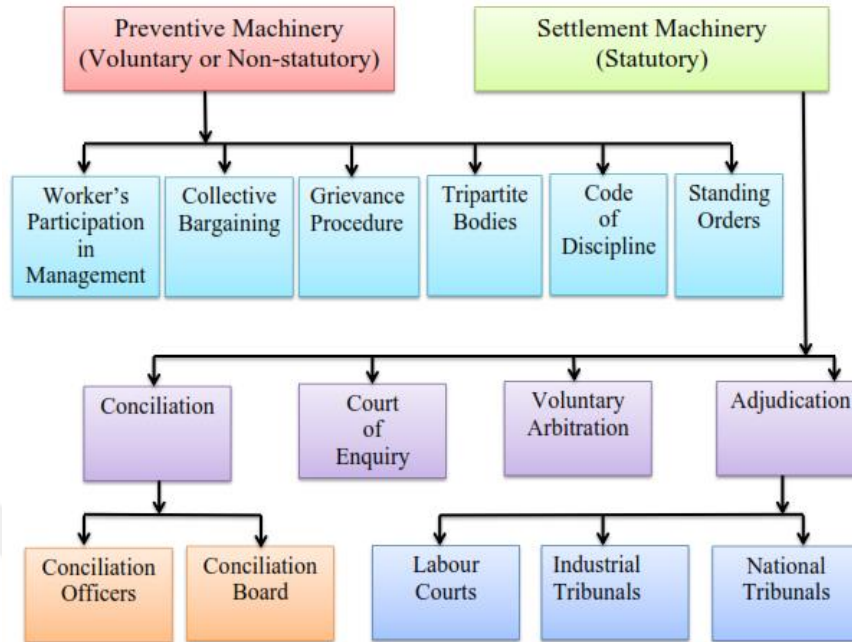


Figure 3.4 Disputes Settlement in Business Contracts

3.7 CONTRACTUAL DISPUTES IN ENGINEERING AND CONSTRUCTION

Dispute's language is a subset of conflict, which is free in the notables and refers to legal action. Term disputes are conflicts that emerge between a worker and an employer, or between a group of workers and an employer, over what happens when the labor law and the work contract are applied, Figure 3.5.

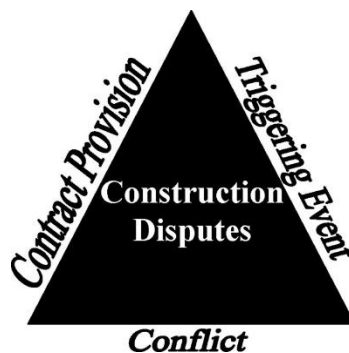


Figure 3.5 Dispute Triangle

The following is a general definition of conflict:

It is a type of litigation that occurs when two parties have opposing viewpoints on a particular issue and the dispute cannot be resolved through the courts.

When one party sends the other a letter and the other party does not react or responds negatively, it is termed a quarrel in the artistic sense.

3.8 TYPES OF CONFLICT

The contract dispute between the contracting parties [80]. It is divided into sections.

- a. A contractual dispute is one that arises because of a misinterpretation of one of the contract's terms, and this type of conflict frequently arises when contracts are completed quickly, often without fulfilling the conditions, because of the speed with which a certain work is completed, and then the contract is ambiguous in some of its texts, and afterwards there is a difference. These disagreements require legal experts to explain them, after which technicians examine these interpretations and provide a technical opinion on them, in accordance with established practice, as well as how to carry out the various acts related to them, and the conflict is then presented to the opposing party.
- b. A practical dispute is one that emerges during the business's implementation. This sort of dispute begins technically and ends with financial conflicts deriving from events that occurred during the implementation, such as:
 - a. Implementation delay.
 - b. Differences in how specifications are interpreted.
 - c. Disputes over the selection of subcontractors.
 - d. Disputes regarding the project's implementation time being extended.
 - e. Disputes over the owner's (and consultant engineer's) failure to meet his responsibilities.
 - f. Licensing for the entire company.

- f. Deliver the materials that the owner agreed to provide.
- g. Execution of the original and revised plans.
- h. Delays in approving contractor requests and responding to them.

Due to the consultant's (or owner's) non-approval of the contractor's conflict s, and attention that submitting the conflict s must take place within the time limit specified in the contract, and if the reasons have a continuous effect (such as t) the contractor must inform the consultant engineer (or owner) of the accidents that led to his submission of the conflict, which later turned into a dispute.

3.8.1 A Financial Disagreement

It is a dispute over financial compensation, and the financial dispute usually develops because of one of the parties violating a contract, causing damage to the other party, who then requests that the other party reimburse him for the damages, such as:

- a. The contractor's conflict s for actual expenses incurred because of the outage. The owner is responsible for the project.
- b. the contractor's conflict s for central and reasonable administration expenses, as well as the loss of profit because of the owner's request to extend the project time.

3.8.2 Dispute Over the Schemes' Intellectual Property

The dispute over the intellectual property of the plans is seen as a significant problem because it is criminal, not civil, and thus carries a punishment of imprisonment rather than monetary compensation, and it also involves ambiguous questions [81]. This is because the laws governing the protection of intellectual property in general, and in most countries, are ambiguous with regard to the intellectual property of plans, particularly because there is no precise technical definition of the word (plans) in the laws, leading to confusion between architectural idea plans, advanced plans, and final plans for the purpose of The t Only in another legislation, and in a third law, is it suggested that there are three sorts of law.

3.8.3 The Dispute Between One of The Parties and The Arbitrator or Arbitration Panel

The term "conflict" does not relate to a disagreement with the arbitrator over a specific action or the application of a principle [82], but rather to a disagreement that leads to the arbitrator's or arbitral tribunal's unwillingness to act (if the reasons for the response are available). Special circumstances are outlined in the legislation.

The disagreement centered on the arbitrator's decision's credibility.

This disagreement indicates that one of the parties has discovered a flaw in the judgment's procedures, such as:

- a. He has surpassed the time limit for issuing the decision.
- b. Disobedience to the law.
- c. Inequitable treatment of the parties or anything similar. Due to the lack of integrity of the arbitration procedures, this party's attorney takes actions to cancel the arbitral award and put a stop to its implementation.

3.9 METHODS OF CONFLICT RESOLUTION

Everyone is familiar with the most traditional form of resolving disputes in our legal system: lawsuits and trials before a judge or jury. However, further options are available. The most well-known are conciliation, mediation, and arbitration, collectively referred to as ADR. When thousands of dollars are at stake, these actions should be followed, Table 3.1 show the distinction between various Alternative Dispute Resolution (ADR) technologies. Occasionally, these techniques to conflict resolution are more suited and result in a fair, equitable, and reasonable decision for both parties. Historically, the judicial system has favored compromise and settlements. Indeed, practically every court case concludes in a settlement. Only 5% of all cases proceed to trial. ADR is advantageous for you since it enables you to resolve a problem more quickly and at a lower cost than litigation. Numerous courts require parties to pursue alternative dispute resolution prior to proceeding to trial. Listed below are several strategies for resolving conflicts. And there are many methods to resolve the construction conflicts, some says that those methods

are eight and other says 5, all of them are rights in their fields that try to solve the conflicts, the Figure 3.6 Shows one type of resolver of conflicts.

Table 3-1 the distinction between various Alternative Dispute Resolution (ADR) technologies

ADR Techniques	Negotiation	Mediation	Arbitration	Conciliation
Third-Party Neutrality	Facilitator	Facilitator	Adjudicator	Facilitator, Evaluator
The Nature of the Case	Not legally binding	Not legally enforceable	Legally enforceable	Not legally enforceable
The formality level	Informal	Informal	Formal	Informal
Confidentiality Level	Confidentiality established based on trust	Confidentiality established based on trust	Confidential in the legal sense	Confidentiality in the legal sense



Figure 3.6 Methods for Resolving Conflicts and Disputes

and notify the employer and contractor within 56 days of the decision to refer the disagreement to him.

c. If the two parties agree to the engineer's decision, or if he received any notification from either party that he was not to make a decision within a period of 28 days from the date of his delivery of a decision, as in this case it is considered by virtue of a decision, then this decision becomes in any case in any case

- c. If the two parties agree to the engineer's decision, or if he received any notification from either party that he was not to deliver his decision within a period of 28 days from the date of his delivery of his decision, as in this case it is considered by virtue of a decision, then this decision becomes in any case in any case

judgement, either party may refer the matter to arbitration, without prejudice to any other rights he may have.

3.9.2 Friendly Settlement

- a. If any party gives notice of his willingness to settle the dispute by an amicable settlement, the other party must respond in writing to the notification prompt accepting or refusing the invitation to the friendly settlement within the 28-day period from the date he received the notice.
- b. When the opposite side agrees to invite the friendly settlement, the amicable settlement procedure begins.
- c. If the other party rejects the friendly settlement, or if the party who gave the notification does not get a response within 28 days, the party who requested the amicable settlement has the option of going to arbitration.
- d. One or more arbitrators, as agreed upon by the two sides, will conduct the peaceful settlement.
- e. At any time during the friendly settlement process, the arbitrator may require that any of the two parties produce any information, facts, explanations, documents, or other evidence he thinks necessary to support his requests, and the arbitrator will help the two parties in finding an amicable resolution of the dispute in an independent and unbiased way. And to act in accordance with the ideals of objectivity, integrity, and fairness.
- f. The parties and the arbitrator must keep the contents of the amicable resolution proceedings, including the settlement agreement, confidential unless publication is required for implementation and enforcement.
- g. If the two parties agree to settle the disagreement amicably, they prepare and sign the agreement, and the amicable settlement agreement becomes binding on both parties when they sign it.

- h. The amicable settlement proceedings will cease when the two parties sign the agreement, or when 84 days have passed since the date of the agreement on the arbitrator or his appointment without reaching an amicable settlement agreement, with a written notification from one of the parties saying that there is no need to continue the friendly settlement efforts. or the amicable settlement process will be terminated by a written notification made by the two parties, or by one of them, to the other party and the arbitrator. It is possible to extend the term to find an amicable resolution if both parties agree.
- i. Neither party may commence any arbitration or court processes during the engineer's procedures to issue his conclusion within the given term, or during the friendly settlement procedures.

3.9.3 Arbitration Is a Method of Resolving

Any dispute relating to [83]:

- a. The engineer's conclusion (if any) not becoming final.
- b. that no peaceful agreement was reached within the time frame set.

It must be resolved in the end through arbitration in accordance with the norms and procedures for arbitration set forth in Iraqi law. Neither party shall comply with the processes before the courts or arbitrators with respect to the evidence or arguments provided to the engineer to acquire his decision, and this decision shall not limit the engineer's right to summon witnesses or present evidence before the courts or arbitrators on any issue relating to this dispute. Arbitration may begin before or after the conclusion of the works, if the employer's, engineer's, or contractor's obligations are not altered because of the beginning of the arbitration procedures while the works are in progress.

4. TECHNIQUES AND PROCESSES FOR CONDUCTING RESEARCH

4.1 OVERVIEW

Planning the field study, precisely identifying the components of the study, indicating the sources of information and methods for collecting them from the research population, selecting the technique of proof of the hypotheses utilized in the investigation, and finally arriving at data that support and verify the research's hypotheses.

4.1.1 The Study Sample

Modern methodologies were used, and the selection was based on the following criteria, which explain how the study samples were chosen.

- a. First, the research community on engineers and technicians specialized in the field of building and construction at all stages, whether it is a field or office study community, or both, is included in the study community.
- b. Second, the research sample the study sample was drawn from a subset of the study population to get data to support its assumptions on the reasons of engineering contract disputes in Iraq. The research sample consists of 200 questionnaires, which were published as an internet questionnaire. Civil engineers, architects, lawyers, and building contractors from the private and public sectors, with ages ranging from less than 30 to more than 50, and years of experience ranging from 5 to more than 15 years.
- c. Third, Designing the Research Form is the third step. To assess the causes of engineering contract conflicts in Iraq, a questionnaire form was constructed to collect the essential data for the study and was delivered to selected samples of engineers, technicians, and administrators from various construction companies. And then it was given to the supervisor to evaluate if the statements of this questionnaire were compatible with the study hypotheses, till the final version was reached. The questionnaire was distinguished by its basic vocabulary and lack of influence.
- d. Fourth, the distribution of sample members based on personal characteristics. The frequency and percentage of the variables were computed and allocated to the groups stated in the

questionnaire after getting the results of the questionnaires that were published on the research sample, where the target sample was dispersed according to the personal variables.

4.1.2 Statistical Treatment Used in The Study.

- a. First: The questionnaire was analyzed using the Statistical analyses, which is one of the most extensively used programs for analyzing statistical information in sociology and used by researchers in many other fields, including marketing, money, government, and education, to name a few. I used the frequency distribution method to gather the features of the study population and it is a form of descriptive statistical methods that aids in reaching general conclusions about the study population's features and composition, as well as the way of their distribution.
- b. Second, the arithmetic mean technique is a statistical property that aids in the simplification of mathematical operations and statistical analyses. It is employed in analyzing test results. The next point to consider is the application of the (chi-squared) test: chi-squared: a scale that uses an accurate statistical mathematical calculation to determine if the real phenomena point under examination is distributed randomly or in a stylized distribution.

4.2 THE STUDY'S RESULTS AFTER APPLYING STATISTICAL ANALYSIS.

The form for the electronic questionnaire was created to collect the study's data. The questionnaire was distributed to the public of engineers, jurists, consultants, and contractors to find and collect information in an easy and smooth way that will aid in future scientific research and apply it in the field to resolve disputes. There is 104 specialist people on work fields answers the questionnaire that used to get the information for our work to find the good way to solve the disputes with minimum loses, **Appendix A**.

4.2.1 Distribution of samples according to personal variables

The first part of general information is done by. After obtaining the data for the electronic questionnaire and obtaining the result, the target sample was distributed according to the personal changes, then the frequency rate and percentages for each case were calculated and then analyzed

statistically. The following table 4.1 illustrates part of the questionnaire data that has been worked on.

Table 4-1 General Information from the Questionnaire

Type	Questions	Result	Percentages
Experience	Less than 5 Years	15	14.4
	Between 5-10	24	23
	Between 10-15	30	29
	Over Than 15 Years	35	33.7
Age	Less than 30 years	18	17.3
	Between 30> 40 years	38	36.5
	Between 40> 50 years	36	34.6
	Over 50 years	13	11.5
Academic Achievement	Higher Diploma	4	3.8
	Bachelor	50	48
	Master	36	34.6
	PhD	13	12.5
General Specialty	Civil	76	73
	Legal	11	10.6
	Architectural	9	8.7
	Other	8	7.7
Field Of Work	Office	27	26
	Site Field	13	12.5
	Both	64	61.5
Specialization of the Institution or Company	Governmental	59	56.7
	Consulting	11	10.6
	Construction	32	30.8
	Communication	2	1.9

The data extracted from the questionnaire was analyzed by several statistical tools that are based on finding the necessary schemes to show random regressions or uncorrelated mutations to solve the crises to be solved.

These statistical tools are:

- a. Frequency distribution: in statistics, a chart or data set that shows the probability of each potential outcome occurring multiple times. Test scores and election results are all reported by percentile. Frequency distributions can be plotted as histograms or pie charts. For big data sets, a histogram's stepped graph is sometimes approximated by a smooth curve distribution function (called a density function when normalized so that the area under the curve is 1). This iconic bell curve or normal distribution is the graph with one such function. When making predictions on huge data sets, frequency distributions are invaluable.
- b. Standard Deviation: A standard deviation measures the amount of variance or dispersion in a set of numbers. The closer data are to the expected value, the lower the standard deviation, while the farther values are from the expected value, the higher the standard deviation.
- c. Normal Distribution: that statistics classifies many natural events makes it the most important probability distribution. People generally own specific distributions that they share for various metrics. It is also known as the Gaussian distribution and the bell curve. represents the probability distribution of a variable's values. Most observations will tend to cluster around the central peak, while probability in both directions taper down equally. Both distribution tails are packed with extreme values.
- d. Arithmetic Mean: The arithmetic mean is a measure of a mean, or average. It is simply the sum of a set of numbers, then dividing by the members in the series.

4.2.2 Administrative Part

The second part is the administrative part discuss the organization of project and how its work dependent on some techniques such us, technical works performed in your organization or

company in a standard way, projects quality audited, laboratory tests approved, project progress timeline, quality of implementation, and monitoring the implementation of the project paragraphs.

A. Technical works performed in your organization or company in a standard way.

The 37 individuals from the specialist answer have consistently been in that A Technical task performed in your organization or company in a standardized way, and their percentage is 35.6 percent for technical works performed in your organization or company in a standard manner. 44 individuals respond frequently, representing a 42.3 percent response rate. Occasionally, 23 people respond, and their percentage is 22.1. all these responses as illustrated in figure 4.1 below.

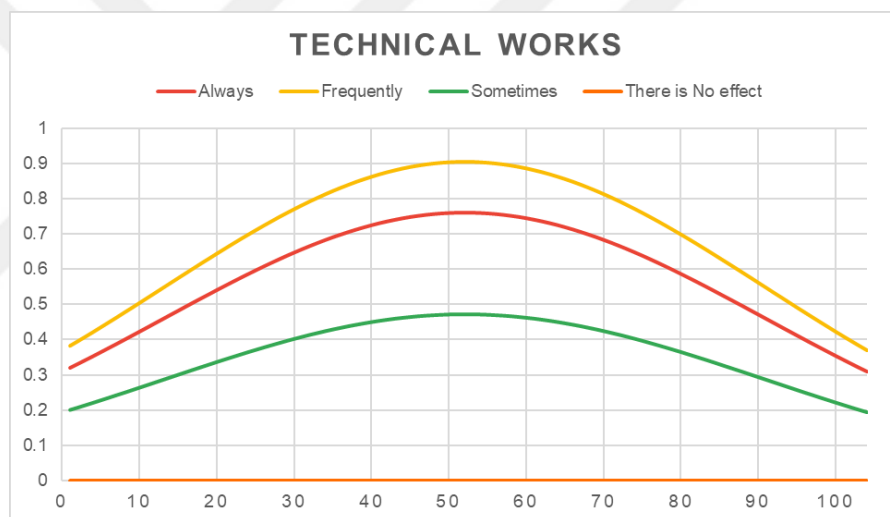


Figure 4.1 Technical works

B. Project's quality audited

From the questioner 43 people from the specialist answer, always are found in that A Project's quality audited and their percentage is 41.3% for quality audit in your organization or company in a standard way. 44 people answer Frequently and those percentage is 42.3%. Sometimes answered by 13 people and their percentage is 12.5. 4 persons are answered not completed and their percentages are 3.8%. all these answers Show in figure 4.2 below.

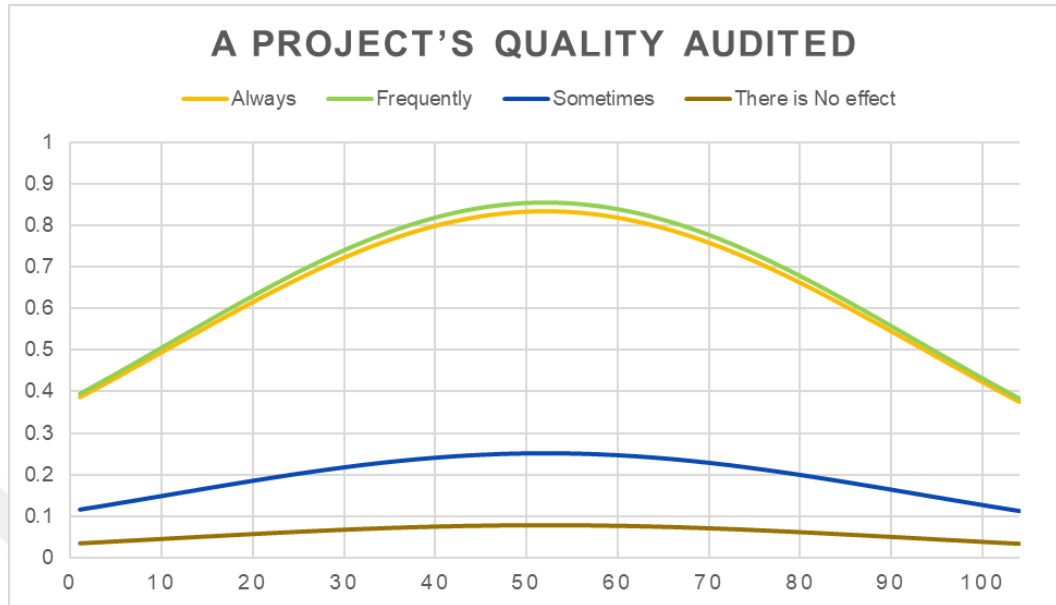


Figure 4.2 Project's quality audited

C. Laboratory tests approved.

In the Laboratory tests approved 61 people from the specialist answer, always are found in that and their percentage is 68.7% for other in your organization or company in a standard way. 33 people answer Frequently, and those percentage is 31.7%. Sometimes answered by 7 people and their percentage is 6.7. 3 persons are answered not completed, and their percentages are 2.9%. All these answers Show in figure 4.3 below.

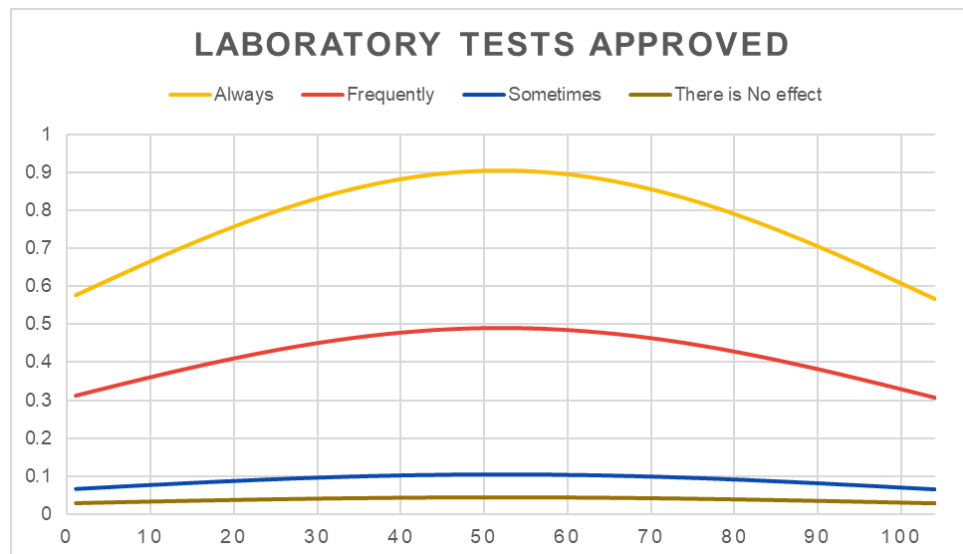


Figure 4.3 Laboratory tests approved.

D. Project progress timeline, quality of implementation

In this test 46 answer, always and their percentage is 44.2% for other in your organization or company in a standard way. 41 people answer frequently, and those percentage is 39.4%. Some of the audience answers sometimes and there are 13 people with percentage is 12.5. At the last 4 persons are answered not completed, and their percentages are 3.8%. All these answers display in figure 4.4 below.

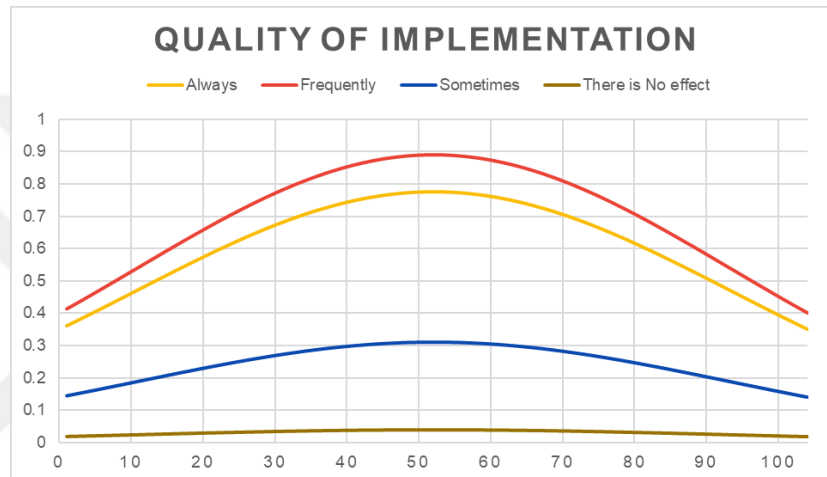


Figure 4.4 Quality of Implementation

E. Monitoring The Quality of Implementation

The answers that got it from the audience are listed as the following for the Monitoring the implementation, 39 answered for Always, the 43 answers for Frequently, 19 for Sometimes, and 3 for Not complete.

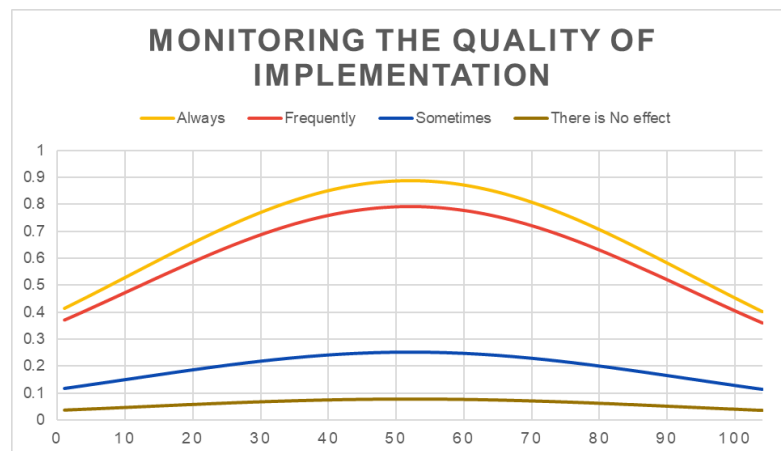


Figure 4.5 Monitoring the Implementation.

4.2.3 Law Section

This section is very important to prevent the conflict and reduce it. There are many questions that give a good detail from the questionnaire, and this listed in the following:

F. Impact on contracts when signed without legal review.

You run the danger of committing to obligations you cannot keep, hurting your company's brand and reputation, and losing time and money addressing conflicts that could have been avoided if you conduct a thorough contract review. There is an impact on contracts when they are signed without legal assessment in this question. 76 specialists chose "Very much impact", 17 voted "Expected effect", 9 voted "Limited impact", and the remaining 7 voted "There is No Effect," as shown in figure 4.6.

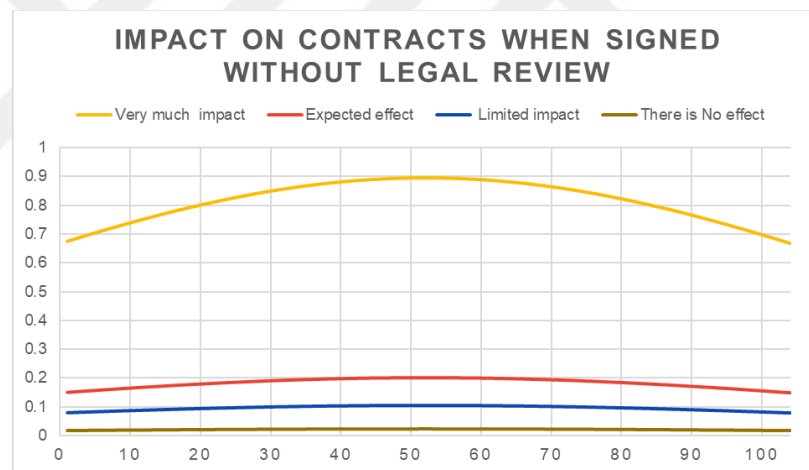


Figure 4.6 Impact on contracts when signed without legal review.

G. Preparing a feasibility study for a project

A feasibility study examines all a project's pertinent aspects, including economic, technical, legal, and scheduling issues, to determine the likelihood of the project's successful completion. Before investing a lot of time and money into a project, project managers conduct feasibility studies to determine the benefits and drawbacks of doing so. Feasibility studies can also provide essential information to a company's management, preventing it from entering dangerous enterprises irresponsibly. In this instance, there are 62 experts who say "Always" while preparing a feasibility assessment for a project. 30 people said

"Frequently," 9 said "Sometimes," and 3 said "There is No Effect." Figure 4.7 displays all these points of view.

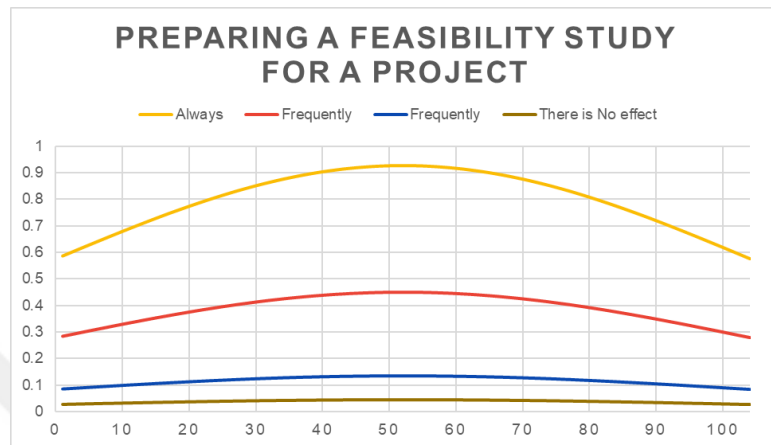


Figure 4.7 Preparing a feasibility study for a project.

H. Is there the referral decision for the project contract is carefully drafted?

project managers and other project participants must be clearly explained the important contract clauses by those who prepared and drafted the contract, ensuring that they completely grasp what is expected of them and how they must act to protect the company's interests. Anything less risks rendering all the above-mentioned good work and traits useless, potentially resulting in the loss of vital rights. The project contract in this case has been carefully designed, and there are 38 specialists voted "Always," 42 voted "Frequently," 17 voted "Sometimes," and the remaining 7 chose "There is No Effect," as illustrated in figure 4.8.

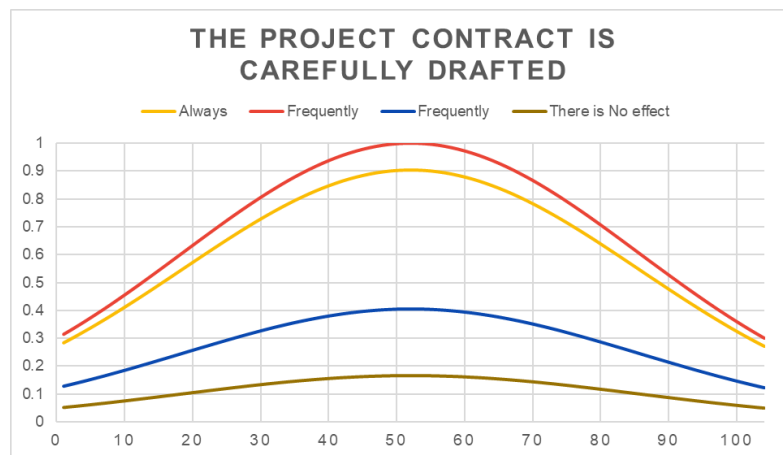


Figure 4.8 The Project Contract is Carefully Drafted

I. Oral directives are followed to make notes on work.

Most construction site managers may discover certain flaws or new hurdles, prompting them to issue an oral order to resolve such issues, which must be written down in a note and presented to the construction owners later, making the work much easier. this issue can be Oral orders are followed to produce work notes, with 28 specialists voting "Always," 46 voting "Frequently," 22 voting "Sometimes," and the remaining 8 voting "There is No Effect," as shown in figure 4.9.

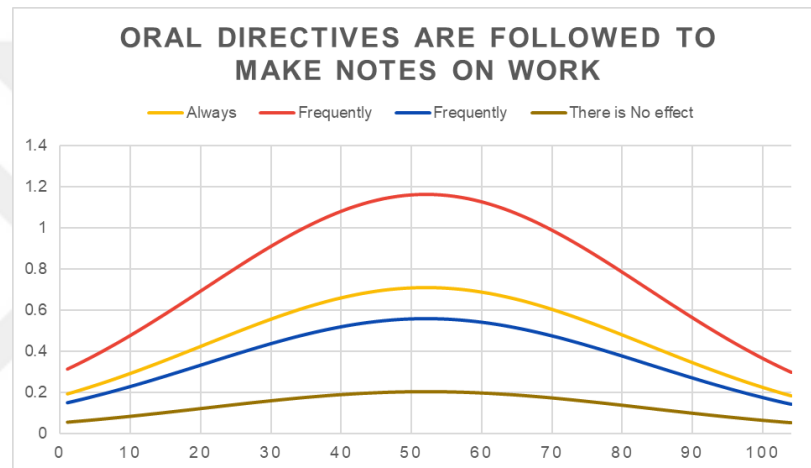


Figure 4.9 Oral directives are followed to make notes on work.

J. Are you satisfied with the performance of the legal department in your institution?

The answer to the about question is shown in picture 4.10. Are you satisfied with the legal department's performance at your institution? 59 people answered "Yes," while 45 chose "No."

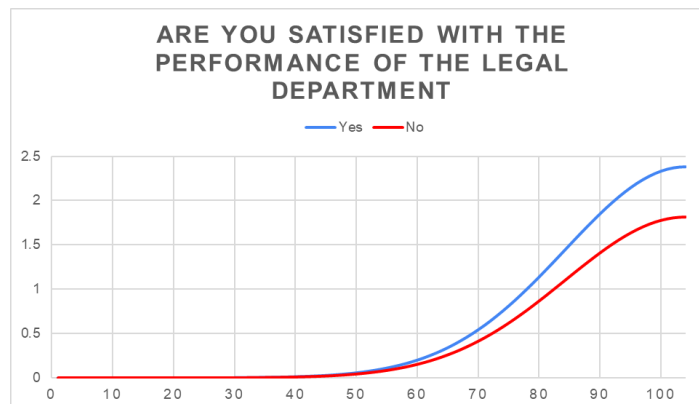


Figure 4.10 Are you satisfied with the performance of the legal department.

K. One of the causes of contractual disputes during the design and implementation stage

There is a stage of "pre-project planning" that might be crucial for project success even before the design and construction procedures begin. The project scope is established during this step. Because construction and design professionals are frequently not involved in this stage of the project scope, the term "pre-project" has emerged. Determining the project scope is just another step in the process of acquiring a built facility from the owner's perspective. the responding about this question from the questionnaire “The design and implementation stage is One of the causes of contractual disputes’, 45 persons voting "Agree," 51 voting "I absolutely Agree," 8 voting "I do Not Agree," and no one voting "Strongly Disagree." All these viewpoints are represented in figure 4.11.

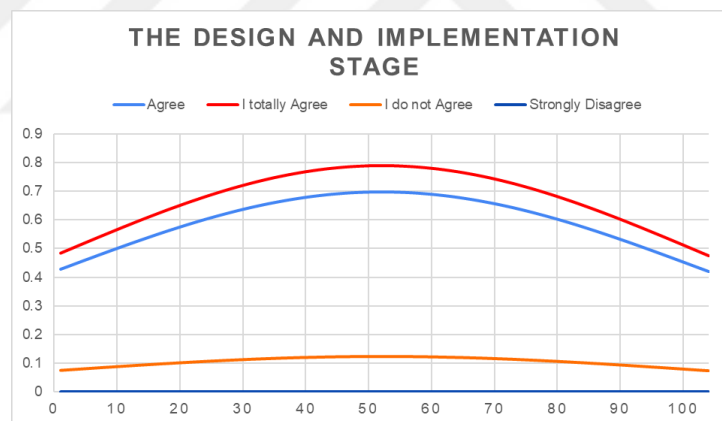


Figure 4.11 The design and implementation stage

L. The possibility of signing a contract with a subcontractor.

The expected benefits from the contract can easily turn into big losses for the organization if risk mitigation is not taken. To ensure the benefits of a contractor partnership, the employing business must plan for the entire contract process, paying specific attention to the subcontractor candidates' documents and developing a good risk response plan. In response to the question "The possibility of establishing a contract with a subcontractor," 18 persons voted "Always", 32 voted "Does Not include", 18 voted "Sometimes", and 20 voted "Often frequently" as indicated in figure 4.12.

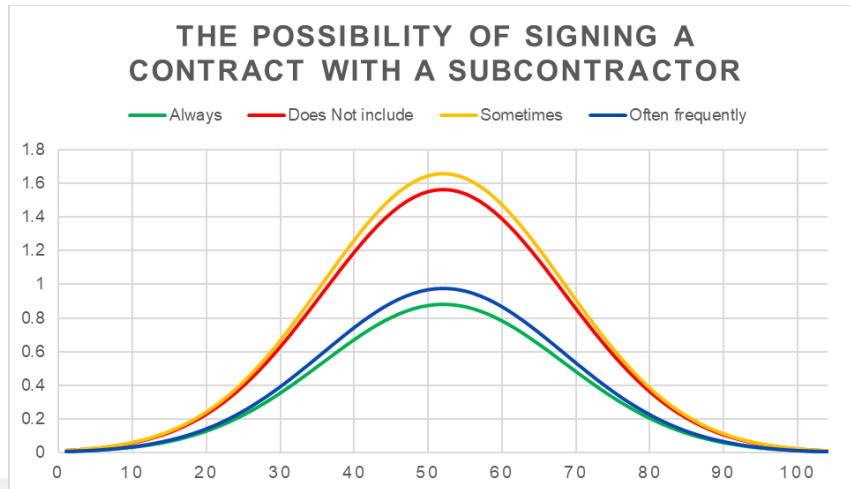


Figure 4.12 The possibility of signing a contract with a subcontractor.

M. The specialty of the members of the arbitration committees

The members of this arbitration commission will be appointed in advance by the Reparation Commission for a specific amount of time. Figure 4.13 depicts the points of view. For the question "The specialty of the members of the arbitration committees," there are 43 votes for "Engineers," 46 votes for "Legal," and 15 votes for "Both."

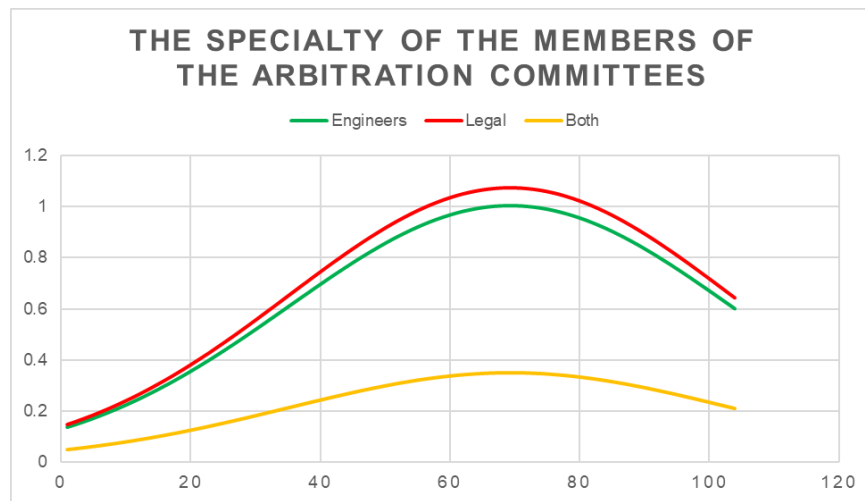


Figure 4.13 The specialty of the members of the arbitration committees

N. The lack of training of engineering cadres by specialized departments has an impact on the failure to appreciate the importance of contracts.

The conflict reduced by making the training for the staff of the construction area and those are engineers and a new contractor. Figure 4.14 shows the responses to the question "The lack of engineering cadre training by specialized departments has an impact on the inability to grasp the importance of contracts," with 90 persons voting "Yes," 2 voting "No," and 12 voting "Maybe."

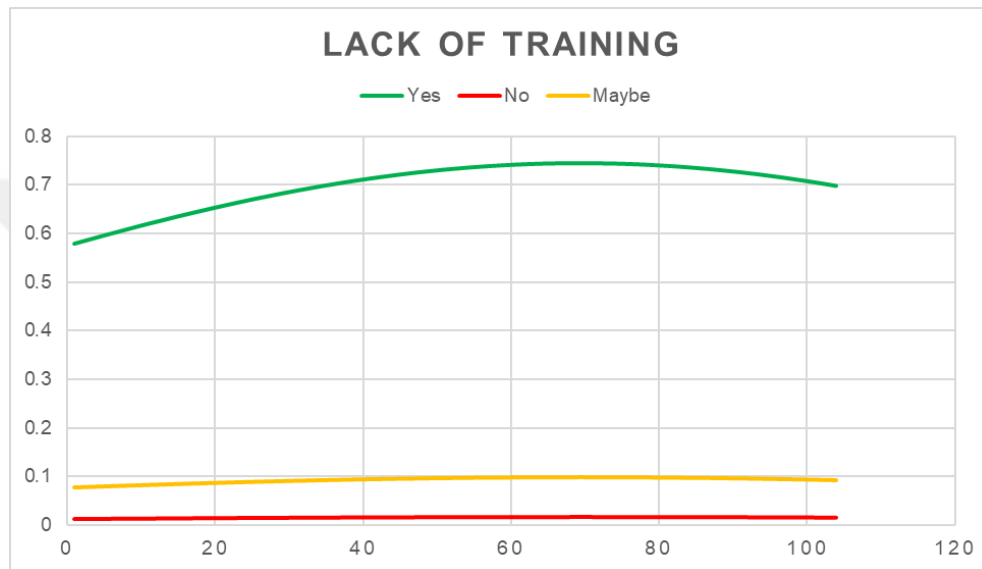


Figure 4.14 Lack of Training

4.3 HYPOTHESIS TEST

4.3.1 The First hypothesis

there is a relationship between the comprehensiveness of the engineering contract and its ability to resolve disputes. Engineers should be involved in every stage of a construction project, and they should be. They have every potential to aid in the avoidance of disputes by becoming more knowledgeable about the contractual relationships between parties and the project method. There should be no need for the engineers to pursue any further degree or training to accomplish this. Engineers, on the other hand, play a critical role in the dispute settlement process whenever a disagreement arises. They can be factual witnesses to establish the sequence of events that occurred, expert witnesses to assist the court or tribunal in comprehending technical concerns, and they are also well-positioned to judge the parties' rights and wrongs due to their technical backgrounds in project management.

4.3.2 The Second hypothesis

There is a relationship between choosing the right type of contract and achieving project objectives, Table 4.2 shows the contract types and their description. For various public works contract types and the method of remuneration, the assessment of their success in terms of the final cost, length, and quality of the resultant project. This method compares the Client's criteria in terms of the project's maximum cost and time to completion with the contractors' bids, which include cost and time discounts.

Table 4-2 Contract Types

Type of Contract	Benefits
Fixed price incentive (FPI) The contractor gets paid his real costs plus a fee, and he promises that the overall cost to the customer will also not reach the total amount.	Protects the client from rising costs and gives them the opportunity to take advantage of c Contractor is more efficient in achieving benefits, i.e., gets more bang for his buck. Since the two parties have a same purpose, their working relationships have improved. Project account for early settlement.
Cost plus incentive fee (CPIF) All costs that are justifiable are covered. The final charge is determined by the actual cost as compared to the goal cost, delivery, and/or performance results.	Makes contract management between the client and the contractor more equitable.
Lump sum / fixed price (LSFP) Regardless of the actual cost, the client pays a predetermined amount to the contractor.	All cost risk is assumed by the contractor. A cost-effective way to get the most bang for your buck. I have an incentive to cut down on time to cut costs. Total cost is understood because of the most time-consuming contract administration.
Incentive/ Disincentive for time reduction (ID/T) If the project is completed early, the contractor is paid a bonus (motive fee), and if it is completed later, the contractor is punished (deterrent fee).	It is virtually always possible to reduce building time. Contractor with a less adversarial relationship. As the contractor does not have to redo the work, the quality of the work is guaranteed.
Unit price method (UPM) For pre-specified quantities of materials or work necessary for the project, the contractor commits to	When there is a question about the scope of a project, this is a good option.

Type of Contract	Benefits
fixed costs. The total of the profit margins and the real units used is the payment.	
Cost plus fixed fee (CPFF) The customer pays a predetermined sum for the contractor's services and pays back the contractor across all audited costs.	The project costs as a result are as low as possible and equivalent to the real cost. They cannot make a lot of money. The negative consequences of a potential contractor's loss are numerous.
Cost plus percentage fee (CPPF) The client pays an extra percentage fee and pays back the contractor by all audited expenditures.	

4.3.3 The Third hypothesis

The result of signing a contract without consulting with legal counsel. A legitimate contract satisfies the above-mentioned criteria and standards. The avoidable contract would generally be legitimate unless one of the parties lacked capacity or one of the required criteria was missing. This contract, however, is not necessarily void if one of the parties wishes it to be. The parties to choose whether to be bound by the contract if it is voidable. A void agreement, such as a contract mandating the performance of an illegal act, could be enforced in court at all. As a result, the legal team must review the contract to keep both parties out of trouble.

4.3.4 The Fourth Hypothesis

Engineering contract clauses define each contracting party's responsibilities and roles. The contract is to be interpreted as mutually explanatory. If there are any ambiguities or discrepancies, the Engineer shall explain them to the Contractor and issue instructions to the Contractor clarifying the ambiguities or discrepancies. If the Contractor requests instructions under this sub-clause in writing, the Contractor shall react within 14 days from the date of such request.

5. CONCLUSION AND FUTURE WORKS

This chapter examines the data obtained via the primary research tool, the questionnaire, to answer the research questions and accomplish its aim.

5.1 CONCLUSION

5.1.1 The study's findings confirmed the First hypothesis.

- a. The development of standard technical works in engineering institutions, which are carried out by quality conditions and specifications, is due to the institution's sound technical structure, which includes mechanisms for auditing engineering works, as well as control and monitoring during implementation, by previously established planning and scheduling programs, with a few Adequate project reasoning for the task agreed upon throughout implementation, taking into account the variables that may arise throughout the implementation period, followed by contract selection and implementation, as it cannot, therefore, allow a dispute to exist at any stage of the project as it is. It is detailed in the researcher's study in the second chapter (the stages of project implementation/planning and implementation). In most cases, officials avoid the trouble of pre-planning the work, believing it is a waste of time. They do not rely on scientific and mathematical techniques, such as the network analysis method, but rather on mental reasoning.
- b. The existence of an inspector to monitor the quality of work is deemed important to ensure the qualities of the materials used in their execution and their conformance to the requisite standards.
- c. The study's findings indicated that legal issues are not created by a lack of follow-up and supervisory processes. According to the researcher, the result is incorrect, as the follow-up and supervision process is a critical stage of the project life cycle (as explained in detail in the second chapter / the supervision stage), and it is the contractor's responsibility to provide complete supervision of the project to avoid and contain risks that could obstruct the project's progress. The project, and to ensure that operational work is completed as planned and agreed upon until the final delivery stage, the

dedication to the process of documenting the works through construction documents guarantees that the project records are kept comprehensive and easily accessible when needed.

- d. The term (comprehensive) refers to the completion of the terms of the engineering contract from a technical standpoint, which includes clauses governing material specifications and their conformity with technical and standard specifications (quality control, quality assurance, inspection, and inspection), as well as clauses governing equipment specifications and their compliance with technical and standard specifications (quality control, quality assurance, inspection, and inspection).
- e. From a legal standpoint, it establishes each party's responsibilities and obligations toward the project's completion, including the completion of the engineering drawings approved by the contract parties, which are applicable during implementation, and the completion of the project's required initial documents, from the bidding stage to the project's final delivery, to accomplish the project's objectives. For the project, the defined specifications, the cost, and the rights of each of these parties toward the other, as a breach of one of these provisions becomes one of the possible causes of conflict.

5.1.2 The study's findings confirmed the Second hypothesis.

That following the conclusion of the bid, the contracting contract is well written, given the critical nature of the contract language and formula (as previously explained in the second chapter), as the contract formulation must be consistent with the law and not exceed the general principles of the applicable regulations. Contract wording varies according to the type and complexity of the contract.

5.1.3 The study's findings confirmed the Third hypothesis.

There is a major impact when contracts are signed without consulting legal departments, as they are frequently the source of problems during the project's development stages.

5.1.4 The study's findings confirmed the Fourth hypothesis.

The terms of the engineering contract define each party's role and responsibilities and ensure that no contractual differences exist that could result in a dispute, unless there is a lack of a thorough and thorough study of the project, with insufficiently detailed drawings before contract signing, and a lack of an integrated and well-drafted contracting contract with others.

5.2 FUTURE WORKS

- a. The need for engineering firms to establish a dedicated section tasked with thoroughly studying the project's plans and all associated documents, including general and private specifications, as well as engineering contracts and their requirements, for the company to fully comprehend the project's nature, analyze its data, and determine its objectives.
- b. The importance of coordination between contracting companies and everyone else involved in the construction and building industry and coordination among them through their affiliation with official associations such as the Sudanese Engineers Association or the Sudanese Contractors Association to exchange experiences and study issues that arise during implementation.
- c. The importance of developing suitable quality charts that demonstrate the critical nature of obtaining quality in construction work and the concepts and actions associated with it.
- d. It is necessary to scrutinize the process of the preliminary study of the project in terms of accurately describing it and determining the requirements associated with it, particularly the legal requirements, because the detailed and organizational study of the project frequently begins with a discussion of the best methods of implementation without addressing the legal requirements and adhering to them completely.
- e. Due to contractors' inefficiency resulting from random entry into the construction field, this frequently lacks focus when selecting contractors with prior experience performing similar work. The site owner must select the contractor based on technical evaluation rather than financial evaluation.

- f. The importance of acquiring construction supplies and equipment promptly, not ignoring the need for continuous monitoring and follow-up, and executing all essential tests during implementation rather than relying solely on tests after implementation and upon delivery.
- g. The importance of using scientific engineering management methods before initiating the implementation process, such as time programming and programming resources, ensures that the project is completed on time, within the specified budget, and with the required quality, thereby avoiding risks and mitigating the impact of conflict.
- h. The emphasis is on the proper execution of the project stages through coordination, effective communication between contracting parties, and strict adherence to contractual terms, which inevitably reduces the likelihood of conflict.

6. References

- [1] V. Smachylo, O. Shumilo, and V. Khalina, “ANALYSIS OF THE PERSONNEL IN THE CONSTRUCTION AREA,” *Mark. Infrastruct.*, no. 41, Mar. 2020, doi: 10.32843/infrastruct41-25.
- [2] A. Surahyo, “Construction Disputes,” in *Understanding Construction Contracts*, Springer International Publishing, 2018, pp. 215–224.
- [3] V. MIN, N. Leungbootnak, K. Srinavin, P. Aksorn, and W. Deewong, “Cambodian Construction Industry’s Issues in the ASEAN Economic Community,” *J. Constr. Eng. Proj. Manag.*, vol. 6, no. 1, pp. 1–10, Mar. 2016, doi: 10.6106/jcepm.2016.6.1.001.
- [4] D.-I. Kang and S.-Y. Yoon, “A Study on Development of Construction Industry’s Accounting Information System,” *J. Digit. Converg.*, vol. 13, no. 3, pp. 127–135, Mar. 2015, doi: 10.14400/jdc.2015.13.3.127.
- [5] X. Zheng, “Study on the cost management of the construction project’s life cycle,” in *Proceedings - 2013 4th International Conference on Digital Manufacturing and Automation, ICDMA 2013*, 2013, pp. 1308–1310, doi: 10.1109/ICDMA.2013.312.
- [6] I. T. Osazee and B. Sen Gupta, “Environmental Consequences of Poor Landfill Management,” *Eur. J. Environ. Earth Sci.*, vol. 2, no. 2, pp. 8–14, Mar. 2021, doi: 10.24018/ejgeo.2021.2.2.117.
- [7] M. Thorpe, “Construction Technology,” in *Brickwork Level 2*, Routledge, 2021, pp. 95–154.
- [8] P. K. Jayasree, K. Balan, and V. Rani, “Building Construction Technology and Management,” in *Practical Civil Engineering*, CRC Press, 2021, pp. 129–148.
- [9] Miller Architects and Builders, “How Technology is Changing the Construction Industry,” *Millerab.Com*, 2018. <http://constructionexec.com/article/how-technology-is-changing-the-construction-industry%0Ahttps://millerab.com/how-technology-is-changing-the-construction-industry/> (accessed May 19, 2021).
- [10] M. Zavari, M. M. Mortaheb, and H. Kashani, “BARRIERS TO NEW TECHNOLOGY DISSEMINATION IN THE CONSTRUCTION INDUSTRY,” *Proc. Int. Struct. Eng. Constr.*, vol. 3, no. 1, Feb. 2020, doi: 10.14455/isec.res.2016.23.
- [11] I. Jaya, W. S. Alaloul, and M. A. Musarat, “Role of inflation in construction: A systematic review,” in *Lecture Notes in Civil Engineering*, 2021, vol. 132, pp. 701–708, doi: 10.1007/978-981-33-6311-3_80.
- [12] K. Furuuchi, N. J. Jobu, and S. Naik, “Extra-Natural Inflation (De)constructed,” 2020. https://www.researchgate.net/publication/341039859_Extra-Natural_Inflation_Deconstructed (accessed May 19, 2021).
- [13] N. Jaffar, A. H. Abdul Tharim, and M. N. Shuib, “Factors of conflict in construction

- industry: A literature review,” in *Procedia Engineering*, 2011, vol. 20, pp. 193–202, doi: 10.1016/j.proeng.2011.11.156.
- [14] A. T. W. Yu, E. H. W. Chan, D. W. M. Chan, P. T. I. Lam, and P. W. L. Tang, “Management of client requirements for design and build projects in the construction industry of Hong Kong,” *Facilities*, vol. 28, no. 13, pp. 657–672, Oct. 2010, doi: 10.1108/02632771011083694.
 - [15] S. Sankaran, “Construction Stakeholder Management,” *Australas. J. Constr. Econ. Build.*, vol. 10, no. 1/2, p. 117, Jun. 2010, doi: 10.5130/ajcebv10i1/2.1581.
 - [16] K. Kumaraswamy, M., & Yogeswaran, “Significant sources of construction claims,” *Int. Constr. Law Rev.*, vol. 15, no. 1, pp. 144–160, 1998.
 - [17] S. O. Cheung and H. C. H. Suen, “A multi-attribute utility model for dispute resolution strategy selection,” *Constr. Manag. Econ.*, vol. 20, no. 7, pp. 557–568, 2002, doi: 10.1080/01446190210157568.
 - [18] M. . Vorster, “Dispute Prevention and Resolution,” *Virginia Polytech. Inst. State Univ.*, p. 1080, 1993.
 - [19] H. M. Hohns, “Preventing and solving construction contract disputes,” *New York Van Nostrand Reinhold.*, 1979.
 - [20] O. E. Williamson, “Economics : the Governance of Contractual Relations *,” *J. Law Econ.*, vol. 22, no. No. 2 (Oct., 1979), pp. 233–261, 1979.
 - [21] L. H. Pelled, K. M. Eisenhardt, and K. R. Xin, “Exploring the black box: An analysis of work group diversity, conflict, and performance,” *Adm. Sci. Q.*, vol. 44, no. 1, pp. 1–28, 1999, doi: 10.2307/2667029.
 - [22] J. E. Diekmann and M. J. Girard, “Are Contract Disputes Predictable?,” *J. Constr. Eng. Manag.*, vol. 121, no. 4, pp. 355–363, 1995, doi: 10.1061/(asce)0733-9364(1995)121:4(355).
 - [23] M. Kumaraswamy and K. Yogeswaran, “Significant Sources of Construction Claims,” *Int. Constr. Law Rev.*, vol. 15, no. 1, pp. 144–160, 1998.
 - [24] R. M. Thompson, M. C. Vorster, and J. P. Groton, “Innovations to Manage Disputes: DRB and NEC,” *J. Manag. Eng.*, vol. 16, no. 5, pp. 51–59, 2000, doi: 10.1061/(asce)0742-597x(2000)16:5(51).
 - [25] S. O. Cheung, T. W. Yiu, and S. F. Yeung, “A Study of Styles and Outcomes in Construction Dispute Negotiation,” *J. Constr. Eng. Manag.*, vol. 132, no. 8, pp. 805–814, 2006, doi: 10.1061/(asce)0733-9364(2006)132:8(805).
 - [26] D. G. Carmicheal, “Disputes and International projects,” *A.A.Balkema Publ.*, p. 452, 2002.
 - [27] D. K. H. Chua and Y. Song, “Application of component state model for identifying constructability conflicts in a merged construction schedule,” *Adv. Eng. Softw.*, vol. 34, no.

- 11–12, pp. 671–681, 2003, doi: 10.1016/S0965-9978(03)00105-4.
- [28] R. A. Gordon and J. C. Santos, “An Interesting Construction Problem,” *Am. Math. Mon.*, vol. 125, no. 3, pp. 207–221, Mar. 2018, doi: 10.1080/00029890.2018.1408357.
- [29] J. L. Farr, “Designing Complex Organizations (Book),” *Pers. Psychol.*, vol. 27, no. 2, pp. 331–334, 1974, [Online]. Available: <http://content.ebscohost.com/ContentServer.asp?T=P&P=AN&K=6260925&S=R&D=bth&EbscoContent=dGJyMNLe80Sepq84wtvhOLCmr0meprBSsqy4TLeWxWXS&ContentCustomer=dGJyMPGuslGvqrdKuePfgeyx44Dt6fIA>.
- [30] Q. B. A. I. Latif, R. K. M. Gopang, and I. A. Rahman, “Substantial factors of construction management causes budget overrun in construction industry of Oman,” *Int. J. Sustain. Constr. Eng. Technol.*, vol. 11, no. 2, pp. 196–203, 2020, doi: 10.30880/ijscet.2020.11.02.024.
- [31] A. A. Hussin, A. Omran, and O. S. Hoe, “Claims in Construction Industry: From Nominated Subcontractor’S Perspective.,” *Journal of Academic Research in Economics*, 2010. <https://elib.tcd.ie/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=59732841&site=ehost-live> (accessed May 19, 2021).
- [32] D. Tjosvold and M. Tjosvold, “Managing Conflict Constructively,” in *Building the Team Organization*, Palgrave Macmillan UK, 2015, pp. 120–137.
- [33] “IDENTIFICATION OF DESIGN STAGES FOR CONSTRUCTION PROJECTS IN NATIONAL AND INTERNATIONAL STANDARDS | Request PDF.” https://www.researchgate.net/publication/287201240_IDENTIFICATION_OF_DESIGN_STAGES_FOR_CONSTRUCTION_PROJECTS_IN_NATIONAL_AND_INTERNATIONAL_STANDARDS (accessed May 19, 2021).
- [34] J. W. Connell and A. A. Cairncross, “Engineering Task,” in *Dictionary Geotechnical Engineering/Wörterbuch GeoTechnik*, Berlin, Heidelberg: Springer Berlin Heidelberg, 1981, pp. 13–28.
- [35] I. de León, “The Planning Stage,” in *Moving to Responsive Web Design*, Apress, 2016, pp. 1–22.
- [36] G. John, “The Feasibility Study,” in *Systems Analysis in Business*, Routledge, 2018, pp. 52–60.
- [37] M. S. Ray and M. G. Sneesby, “The Detailed Design Stage,” in *Chemical Engineering Design Project*, CRC Press, 2020, pp. 177–183.
- [38] H. Herrmann and H. Bucksch, “tendering stage,” in *Dictionary Geotechnical Engineering/Wörterbuch GeoTechnik*, Springer Berlin Heidelberg, 2014, pp. 1379–1379.
- [39] D. Lowe and M. Skitmore, “Bidding,” in *Commercial Management of Projects: Defining the Discipline*, Blackwell Publishing Ltd, 2008, pp. 356–389.
- [40] D. A. KOBLYNIK, “Open bidding as a public procurement procedure,” *Law Innov.*, no. 4

- (28), pp. 68–73, 2019, doi: 10.31359/2311-4894-2019-28-4-68.
- [41] B. Maidl, L. Schmid, W. Ritz, and M. Herrenknecht, “Tendering, Award, Contract,” in *Hardrock Tunnel Boring Machines*, Wiley-VCH Verlag GmbH & Co. KGaA, 2008, pp. 243–264.
 - [42] Z. Da Fang, “New engineering contract and traditional engineering contracts,” *Chongqing Jianzhu Daxue Xuebao/Journal of Chongqing Jianzhu University*, 2001. https://www.researchgate.net/publication/293744664_New_engineering_contract_and_traditional_engineering_contracts (accessed May 19, 2021).
 - [43] Institution of Civil Engineers, “ICE: The home of civil engineering | Institution of Civil Engineers,” 2016. <https://www.ice.org.uk/> (accessed May 19, 2021).
 - [44] FIDIC, “International Federation of Consulting Engineers | The Global Voice of Consulting Engineers,” *Website FIDIC*, 2020. <http://fidic.org/> diakses tanggal 12 Oktober 2020 (accessed May 19, 2021).
 - [45] R. M. Uribe, “Contract’s review by parties: The renegotiation’s duty caused by excessive onerousness of new circumstances,” *Contract’s review by parties: The renegotiation’s duty caused by excessive onerousness of new circumstances*, 2010. https://www.researchgate.net/publication/292005217_Contract%27s_review_by_parties_The_renegotiation%27s_duty_caused_by_excessive_onerousness_of_new_circumstances (accessed May 19, 2021).
 - [46] N. J. Ringland, “Contracts: Validity of ‘No Damage’ Clause,” *Mich. Law Rev.*, vol. 48, no. 6, p. 874, Apr. 1950, doi: 10.2307/1284441.
 - [47] J. Keilson, “A Simple Algorithm for Contract Acceptance,” *Opsearch*, 1970. https://www.researchgate.net/publication/267442540_A_Simple_Algorithm_for_Contract_Acceptance (accessed May 19, 2021).
 - [48] J. D. Moreno, “Consensus, contracts, and committees,” *J. Med. Philos. (United Kingdom)*, vol. 16, no. 4, pp. 393–408, 1991, doi: 10.1093/jmp/16.4.393.
 - [49] S. Baker and A. Choi, “Contract’s role in relational contract,” *Virginia Law Review*, 2015. https://www.researchgate.net/publication/279318885_Contract%27s_role_in_relational_contract (accessed May 19, 2021).
 - [50] “Concerned Parties,” in *The Moral Wager*, Springer Netherlands, 2007, pp. 175–196.
 - [51] F. Berenguel-Felices, A. Lara-Galera, B. Guirao-Abad, and R. Galindo-Aires, “Contracting formulas for large engineering projects. The case of desalination plants,” *Sustain.*, vol. 12, no. 1, 2020, doi: 10.3390/SU12010219.
 - [52] R. L. Kimmons, “Contract Considerations and Contract Types,” *Proj. Manag.*, pp. 235–248, 2018, doi: 10.1201/9780203741771-29.
 - [53] E. B. Lease, “Contracted forms of the perfect in quintilian,” *Classical Rev.*, vol. 13, no. 5, pp. 251–253, 1899, doi: 10.1017/S0009840X00078616.

- [54] A. Wakelam, “Coercive contract enforcement,” *Credit Debt Eighteenth-Century Engl.*, pp. 85–114, 2020, doi: 10.4324/9780429028212-4.
- [55] P. A. Alces, “Contract Performance Doctrine,” *A Theory Contract Law Empir. Insights Moral Psychol.*, pp. 115–153, 2011, doi: 10.1093/acprof:oso/9780195371604.003.0005.
- [56] S. Curtis, I. Gaunt, and W. Cecil, “Article III—Adjustment of Contract Price,” *Law Shipbuild. Contract.*, pp. 59–79, 2020, doi: 10.4324/9780429428166-7.
- [57] C. A. Stone, “The Supply and Demand for Life Settlement Contracts,” *J. Struct. Financ.*, vol. 15, no. 2, pp. 101–111, 2009, doi: 10.3905/jsf.2009.15.2.101.
- [58] R. Knowles, “Loss and Expense/Additional Cost,” *200 Contract. Probl. their Solut.*, pp. 185–237, 2012, doi: 10.1002/9781118257050.ch10.
- [59] S. Atanasijevic and T. Atanasijevic, “Project management: the challenge of fixed-price contracts,” 2019, doi: DOI: 10.13140/RG.2.2.31299.55840.
- [60] S. Laryea, “Risk apportionment in target cost contracts,” *Proc. Inst. Civ. Eng. Manag. Procure. Law*, vol. 169, no. 6, pp. 248–257, 2016, doi: 10.1680/jmapl.15.00046.
- [61] J. Rueda-Benavides and D. Gransberg, “Indefinite delivery-indefinite quantity contracting,” *Transp. Res. Rec.*, no. 2408, pp. 17–25, 2014, doi: 10.3141/2408-03.
- [62] W. Godwin QC, “Variations and Adjustments to the Contract Price,” *2017 Fidic Contract.*, pp. 129–142, 2020, doi: 10.1002/9781119514619.ch11.
- [63] M. Considine, J. M. Lewis, S. O’Sullivan, and E. Sol, “Australia’s Competitive Contract Model,” *Get. Welf. to Work*, pp. 32–45, 2015, doi: 10.1093/acprof:oso/9780198743705.003.0002.
- [64] P. Russell, “Negotiating the Contract,” *Act. Make It Your Bus.*, pp. 298–312, 2020, doi: 10.4324/9781315145648-11.
- [65] H. Forcinio, “Contract packaging grows,” *Pharm. Technol.*, vol. 43, no. 5, pp. 54–56, 2019.
- [66] M. João Mimoso, “The Turnkey Contract and the Globalization Era,” 2021, doi: 10.33422/8th.mah.2020.02.17.
- [67] D. Kim, “Comparative Law Study on Long-Term Continuing Contract,” *Adm. Law J.*, vol. 61, pp. 85–114, 2020, doi: 10.35979/alj.2020.05.61.85.
- [68] A. A. Ananyeva, “Operator Management Services Contract,” in *Вестник Пермского Университета. Юридические Науки*, 2017, no. 37, pp. 303–311, doi: 10.17072/1995-4190-2017-37-303-311.
- [69] C. Paniagua and J. Delsing, “Service Contract Definition Analysis,” in *IECON Proceedings (Industrial Electronics Conference)*, 2020, vol. 2020-Octob, pp. 4525–4532, doi: 10.1109/IECON43393.2020.9254403.
- [70] M. A. Ajam, “Delivery Phase – Implementation Stage,” in *Project Management beyond*

Waterfall and Agile, 2019, pp. 153–162.

- [71] H. Ferguson and M. Chrimes, “The Consulting Engineers,” *Consult. Eng.*, 2020, doi: 10.1680/tce.64003.
- [72] M. M. Glesk, “Total quality management,” *Flexo*, vol. 21, no. 1, p. 31, 1996, doi: 10.1097/00004010-199523000-00003.
- [73] J. C. Edison, “Contracts and contract management,” in *Infrastructure Development and Construction Management*, 2020, pp. 130–158.
- [74] A. Pal, “Contractivity, Complete Contractivity and Curvature inequalities,” 2014.
- [75] Y. Li, J. Chen, X. Cai, and F. Tu, “Optimal manpower planning with temporal labor and contract period constraints,” *Lect. Notes Comput. Sci.*, vol. 3521, pp. 350–359, 2005, doi: 10.1007/11496199_38.
- [76] P. W. Taylor, “Report to Management TRAINING OF OPERATING AND MAINTENANCE PERSONNEL,” *Ind. Eng. Chem.*, vol. 48, no. 2, pp. 36A–39A, 1956, doi: 10.1021/ie50554a004.
- [77] I. S. Nwoye, “Paper Series III – Company’s Contract, Authentication and Service of Documents on a Company,” *SSRN Electron. J.*, 2020, doi: 10.2139/ssrn.3727232.
- [78] K. Poledníková, A. Kranz, L. Poledník, and J. Myšiak, “Otters causing conflicts: The fish farming case of the Czech Republic,” *Environ. Sci. Eng. (Subseries Environ. Sci.)*, no. 9783540347880, pp. 81–106, 2013, doi: 10.1007/978-3-540-34789-7_5.
- [79] W. M. Bernstein, “Approach-avoidance conflict,” in *A Basic Theory of Neuropsychanalysis*, 2018, pp. 73–82.
- [80] T. K. BenDor and J. Scheffran, “The History and Types of Conflict Modeling,” *Agent-Based Model. Environ. Confl. Coop.*, pp. 43–60, 2020, doi: 10.1201/9781351106252-4.
- [81] E. A. Waldman, “Disputing over embryos: Of contracts and consents,” *Rights Resour.*, pp. 123–166, 2018, doi: 10.4324/9781315194356-10.
- [82] I. Dubinsky, “Disputes, Arbitration and Compliance,” *Acquir. Card Payments*, pp. 171–177, 2019, doi: 10.1201/9780429329937-7.
- [83] I. Corona, “The management of conflict: Arbitration in corporate e-Releases,” *Linguist. Insights*, vol. 191, pp. 355–384, 2014, doi: 10.3726/978-3-0351-0725-8/26.

APPENDIX A

Questioner

THE FAIR PROGRESS OF THE CONSTRUCTION PROJECT AND THE CONFLICT SETTLEMENT BETWEEN THE CLIENT AND THE CONTRACTOR

Each engineering project has desired goals, and to achieve these goals, a contracting contract is signed between the project parties, and plans, schedules of quantities, guarantees, letters and other documents, pledges, and general and private conditions are fixed.

This research deals with the dispute that occur between the project owner and the contractor, their causes and solutions, the factors that led to them, the extent of their influence in causing these discounts, and their role in resolving them to complete the project.

This questionnaire was created for the purpose of studying the above research axes by relying on the results of the survey and benefiting from opinions and suggestions. We inform you that all data related to this questionnaire will remain confidential.

A. General Information

1. Workplace
2. Years of Experience

Less than 5 years old

Between 5> 10 years old

Between 11> 15 years old

Over 15 years old

3. Age

Less than 30 years old

Between 30> 40 years old

Between 40> 50 years old

Over 50 years old

4. Educational level

High School

Higher Diploma

Bachelor

Master

PhD

B. Administrative

5. Field of specialization at work

Civil

Architectural

Legal

6. Professional specialization of the institution or company in which you work.

Governmental

Construction, Contracting

Consulting

7. Work Nature

Office

Site, Field

Both

C. Works

8. Are technical works performed in your organization or company in a standard way

Always

Frequently

Sometimes

9. Are engineering projects quality audited?

Always

Frequently

Sometimes

Not Do it

10. Are laboratory tests approved for acceptance of technical works?

Always

Frequently

Sometimes

Not Do it

11. Are activities being completed according to the project progress timeline?

Always

Frequently

Sometimes

Not Do it

12. Is there a supervisory authority responsible for monitoring the quality of implementation?

Always

Frequently

Sometimes

Not Do it

13. The extent of the commitment to document the work through the records of monitoring the implementation of the project paragraphs.

Always

Frequently

Sometimes

Not Do it

D. Law Section

14. Is there an impact on contracts when signed without legal review?

Very much impact

Limited impact

Expected effect

There is no effect

15. Is preparing a feasibility study for a project?

Always

Frequently

Sometimes

Not Do it

16. Are the general and private contracting conditions prepared under legal supervision?

Always

Frequently

Sometimes

Not Do it

17. After issuing the referral decision for the project, the contract is carefully drafted

Always

Frequently

Sometimes

Not Do it

18. Oral directives are followed to make notes on work, amend it, and suggest variables when supervising and following up on the project

Always

Frequently

Sometimes

Not Do it

19. Is there a legal department in your organization

Yes

No

20. Are you satisfied with the performance of the legal department in your institution

Yes

No

21. What is the size of the role played by the legal department in companies?

A big role

Limited role

It has no role

22. Are the current laws sufficient to regulate the profession?

Yes

No

23. If your answer was No, do you see the solution?

Law's re-review.

Abolish some of the current legislation.

Explanation of laws, instructions, and controls

24. A contracting contract is a legal document that organizes the relationship between the parties to the contract by the laws and legislation in force. Contractual and cause disputes. In your opinion, what are the reasons behind contractual disputes.

	Agree	I totally agree	Strongly Disagree	Disagree
a) Failure to formulate the contract in a good legal and technical way				
b) Failure to properly study the terms and paragraphs of the contract before signing it.				
c) Bad and lack of planning				
d) Administrative problems				
e) Financial Problems				
f) Not familiar with the laws				
g) The material does not conform to the technical specifications				

25. Has there been a dispute with your institution?

Yes

No

Maybe

26. How was the solution? And how many times did this happen?

--

27. One of the causes of contractual disputes during the design and implementation stage

	Agree	I totally agree	Strongly Disagree	Disagree
a) The plans and drawings do not comprehend the details of the project				
b) Failure to consider the possibility of additional work being required				

28. What are the legislation and provisions that are adopted when drafting construction contracts?

FIDIC

General contracting conditions for engineering work in its divisions

Civil Law

More than one legislation and protocol is adopted according to the nature of the work

29. Do the terms of the contract include the possibility of signing a contract with a subcontractor

Often Frequently

Always

Sometimes

Does Not Include

30. The functional specialty of the members of the arbitration committees shall be.

Engineers

Legal

31. The effect of social and tribal norms on arbitration of disputes in engineering projects

Always

No

Some Extent

32. How many projects have been implemented by your organization during the past five years (approximate)?

5-10

10-15

15-20

More Than 20

33. When there is an increase in the cost and the duration of the project, the percentage increase in the cost was?

5-10 %

10-15 %

15-20 %

More Than 20 %

34. The percentage increase in the project period?

5-10 %

10-15 %

15-20 %

More Than 20 %

35. Do you think that the general contracting conditions for engineering works meet the requirements of the construction industry in your country?

Yes

No

Maybe

36. Do you think that the lack of training of engineering cadres by specialized departments has an impact on the failure to appreciate the importance of contracts by the engineers?

Yes

No

Maybe

37. What are the reasons behind the decline in the construction industry, according to your opinion?

--

Thank you for your cooperation and interest in completing this questionnaire. And thank you very much for taking the time to fill out the useful information.