

University of Bahrain
College of Engineering

**Mechanical Engineering
Department**



Disputes in Public Construction Projects: A Case Study on Ministry of Works in Bahrain

Thesis submitted in partial fulfillment of the requirements for the degree
of Master of Science in Engineering Management

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Abstract

Construction projects include two parties or more for a shared interest, often get tainted by a "conflict". If conflicts are not resolved immediately, the affected party has no option but to "claim". Unresolved claims escalate into "disputes". Thus, disputes are one of the inevitable problems that any construction project could face any time through the project process.

The research investigates the significant causes and effects of disputes in public construction projects in the Kingdom of Bahrain, in order to avoid and at least mitigate disputes. It also recommends the suitable dispute resolution (DR) method based on the public project's nature. Ministry of Works (MOW) in Bahrain was selected to represent the public sector in this field.

The research adopted multi method approach, which is both qualitative and quantitative research. Qualitative research includes data collected from scholarly materials, personal interviews and case studies. The outcome of this research helped to craft the questionnaire for the quantitative research. The survey sample consisted of the client represented by MOW and both contractors and consultants that has been involved in disputes in some recent projects.

The statistical analysis of this study was carried out using the statistical package of social sciences (SPSS). The methods used are the Relative Importance(RI) and the analysis of one variance (ANOVA) for the hypotheses. The results of the main survey of the three categories of respondents -client, contractors and consultants - revealed that the most significant causes of disputes in the public construction projects in Bahrain related to the project process are (delay in the authorities approval), (lack of proper planning) and (misinterpretation for terms of contract).While the causes related to project uncertainty are (variations), (scope change) and (unexpected site conditions).And the most significant causes related to personnel engaged are (lack of communication between project parties), (ineffective management control) and (improper coordination).

The research also revealed the most significant effects of disputes in the field, which are (slow work progress), (waste of efforts and time), and (delay of public benefit). (Mediation) came in the first place as the most widely used method of dispute resolution, followed by (ad hoc arbitration) and (institutional arbitration).

Finally, it recommends proactive corrective actions to be considered by all project parties in order to avoid pitfalls that lead to future disputes. It also provides solutions to the main causes and especially recommends a Dispute Avoidance and Adjudication Board (DAAB) as an alternative dispute resolution. Which consists of qualified and independent experts, who follow up the project at early stages through site visits in order to solve any problem. DAAB has a judicial role as well to avoid arbitration - as much as possible - which is costly and tends to be as complex as litigation.

Dedication

This dissertation is dedicated to my parents and especially my mother Aysha Mohamed, for always believing in me and encouraging me. This dissertation is also dedicated to my husband Engineer Mohamed Alisa and to my precious girls Dana and Aysha, for their love and patience.

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List of Abbreviations

DR	Dispute Resolution
ADR	Alternative Dispute Resolution
MOW	Ministry of Works
CED	Cost Engineering Department
RI	Relative Importance
SPSS	Statistical Package for Social Sciences
ANOVA	Analysis of Variance
G.D.P	Gross Domestic Product
PMO	Project Management Office
PMS	Project Management System
KMS	Knowledge Management System
PESTEL	Political, Economic, Social, Technological, Environmental and Legal
FIDIC	International Federation of Consulting Engineers
BCDR	Bahrain Chamber for Dispute Resolution
QA	Quality assurance
QC	Quality control
GOYS	General Organization of Youth and Sport
GCC	Gulf Corporation Council

Chapter One

Introduction to the Study

1.1 Introduction

1.2 Research Problem

1.3 Research Questions

1.4 Research Objectives

1.5 Research Significance

1.6 Research Setting

1.7 Definition of Terms

Chapter One: Introduction to the Study

1.1 Introduction

There are Beneficiaries of any business. It includes a relationship between two or more parties seeking a shared interest or a tradeoff and like any relationship it often gets tainted by a “conflict”. This disagreement might occur any time through the relationship regarding cost, time, quality or quantity of the expected output. If conflicts are not resolved immediately, the affected party has no option but to “claim”. Unresolved claims escalate into “disputes”.

Dispute resolution methods (DR) are available to address these situations. To start with “negotiation” or "conciliation"; trying to set out what the affected party wants and resolve the dispute within them. A second preference –if the negotiation or conciliation does not reach to an agreement- is “mediation” which involves a mediator trying to understand what is important to each party, clarifying what is negotiable, exchanging information and exploring possible solutions. If no one of both above mentioned non-adversarial methods worked, the resolution is sought by either “adjudication”, “arbitration” or “litigation”. Those last mentioned adversarial methods must comply with the parties’ initial agreement if any exist –usually on a form of a contract-. These dispute resolution methods get complicated and cost the parties a lot. However, the solution sought might be contented to one party only, it is important to continue the tradeoff. Otherwise, halt the relationship.

Solving disputes has management-related perspectives which it may occur to any sector such as communication, transportation and others. Thus, it is the intension of this research to shed the light on these disputes in the “construction industry” and investigate its engineering-

perspectives as well. Construction industry is divided into two major sections; private and public. This study will focus on public construction projects in particular, which accomplish large scale outcomes for the community benefit with limited resources under critical time constraints. Public construction projects include multiple interconnected parties, such as project owners, contractors, subcontractors, suppliers, government authorities and stakeholders. With such nature, disputes are common to arise out of distance between parties.

Bahrain public projects presented in this research by Ministry of Works (MOW) attempt to reduce the total cost of the project -like any client- while the contractor tries to maximize his profit. And since bids are presented to numerous contractors in the market creating a field of a competition to win the tender and get the project, some contractors bid less and claim more amounts later. That's usually done utilizing some gaps or unclear specifications in the contract.

1.2 Research Problem

MOW is the construction arm of the government in Bahrain. It has huge key projects, some current projects got pending because of dispute arisen and some projects had been completed while their dispute settlements are still in the process of resolution.

Daily newspapers published news about huge amounts that construction contractors claim MOW and about disputes in courts and arbitration cases.

The Cost Engineering Department (CED), concerned about the dispute resolution in MOW, confirmed in a preliminary interview that a dispute in any project is a waste of valuable time and efforts, beside the possible financial losses to resolve it.

A Dispute in a public project indirectly causes delay to the community public benefits. It negatively affects the project progress and often disturbs the flow of project process and completion due date. The delay in dispute settlement has manifold effects as well. It can reach to dissolve the contract and harm the relationship between the parties for good.

Considering the nature of public construction projects, a dispute usually arises, and yet no serious efforts have been undertaken to mitigate this problem. “Litigation (use of court to resolve a dispute) is still the common method in Bahrain” said the team leader of Road Projects in CED. Whereas there are other common dispute resolution methods over the world, that neither fully utilized nor promoted yet in Bahrain.

Therefore, the aim of this research is to analyze and identify the causes and effects of disputes in public construction projects in Bahrain in order to rank the significant causes to suggest solutions and to recommend proactive corrective actions to be considered to avoid any pitfalls that lead to future disputes and recommends suitable DR method related to the public project's nature.

1.3 Research Questions

The problem statement raises the following questions:

- What are the characteristics of public construction projects, particularly in Bahrain ? How it relates to disputes?
- What are the causes and effects of disputes in the public construction projects, particularly in Bahrain ?
- What are the significant causes of Disputes in the field of study in Bahrain?

- How dispute causes can be classified?
- How disputes can be avoided or at least mitigated?
- What are the disputes resolution methods (DR) generally used in the field of study.

1.4 Research Objectives

The aim of this research is attained through the following objectives:

1. Identify causes and effects of construction disputes in the public sector projects from multiple viewpoints (parties involved).
2. Discuss the causes, effects and DR methods of public construction projects disputes.
3. Make a comprehensive analysis related to causes and effects and DR in public projects in the field of study, using the Relative Importance (RI) to rank the factors.
4. Recommend proactive corrective actions -to be considered by the parties involved in the public construction project- to avoid any pitfalls that lead to disputes .Thus, minimize the probability of dispute occurrence.
5. Promote ADR method beneficial to the field of study.

1.5 Research Significance

Bahrain government relies mostly on oil income revenues to support its projects and with the recent drop of barrel price it has adopted financial policy to face challenges ahead. In September 2015, it formed a mini government reducing the number of ministries and budget allocated to each to cut cost. The research main case study, MOW has been recently merged with another ministry to become the Ministry of Works, Municipal affairs and Urban Planning. Thus, the aim of this research -to

minimize disputes- totally supports the government recent policy of utilizing the fund available efficiently and cutting cost.

On the other hand, each project has an allocated budget and disputes occurrence may negatively affect other project's budget. Hence, it may delay the whole community benefit.

Completing projects within its time line and allocated budget -with no disputes- are positive indicators of an efficient construction industry.

Moreover, There are other available resolution methods professionally utilized to settle construction disputes over the world that is not utilized locally yet. The field of this study is unique and its outcome has practical benefits.

1.6 Research Setting

Bahrain economic strategy outlooks toward economic diversification away from oil by accelerating the growth of other sectors. Construction is one of those main sectors that Bahrain focuses on (EDB, 2008). Based on Bahrain national accounts reports (CIO, 2014), the construction sector contributes to 7% to Bahrain total Gross Domestic Product (G.D.P) through the last 8 years (2008-2015). All mentioned above indicating the importance of the construction sector to the economy of Bahrain.

The results and recommendations of this research will benefit Bahrain economy in general and all parties involved in the construction project and its stakeholders.

Since the study will be limited to public construction projects in Bahrain, the government, consultants and contractors deal with dispute settlement reports and cases as confidential data. Because of the nature of the public

projects it usually needs a long time to finalize the disputes, which may negatively effect on information gathering process.

The information collected from the government sector is for the educational research only and cannot serve other purposes.

1.7 Definition of Terms

It is important to define the main terms that appears in the field of study, as follows:

Project:

A project is a temporary endeavor undertaken to create a unique product, service or result (Project Management Institute, 2008).

Construction Project:

When an idea is indented to convey by the owner, processed by designers, came into existing by the contractor or owner; it is called Construction Project (Gould et al, 2009).

Public Project:

When a government funds a project, operates with its ownership for the public benefit is named as Public Construction Project. Even though some government agencies might have a role in providing loans and any another financial help, they are not meant as to be public projects.

Disputes:

Disputes are discrepancies, disagreements or conflicts about a single issue, or may comprise any number of issues within it (Construction blogs, 2017). To avoid construction disputes from becoming formal claims, it is important to solve disputes as soon as they emerge in the workplace (Gebken, 2006).

Dispute Resolution (DR):

DR are the methods of resolving disputes. It is important for parties sharing an interest to understand their options of methods, and to ensure that contracts which they enter into contain appropriate dispute resolution clauses (Cook, 2016).

Project Management Office (PMO):

It is the center of excellence for project management within the Ministry. It provides project oversight and manages the Ministry's project portfolio (MOW, 2017).

Risk Management Plan:

It is a document that identifies how project risks will be controlled. It describes the processes of risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control. The Risk Management Plan is a subset of the Project Execution Plan (MOW, 2017).

Lessons Learned (or Learnt):

They are documents deliverable that contains all the learning gained from the process of performing the project. Lessons may be collected at any point during the project lifecycle through formal meetings. They are project records that are forwarded to the PMO to be included in the lessons learned knowledge base (MOW, 2017).

This chapter has given an overall picture about the research by identifying the field of study, statement of problem and research objectives. It also presents the research justification, benefits and

limitation. Relevant terminologies that help understood the next chapters are defined as well.

Next chapter is the literature review. It is an overview of theories, scholarly materials and case studies concerning disputes in the public construction industry.

Chapter Two

Theoretical Framework and Literature Review

2.1 Public Construction Projects

2.1.1 Parties Involved and their Roles

2.1.2 Project life cycle and Delivery Phases

2.1.3 Main Case Study: Ministry of Works (MOW)

2.2 Disputes in Public Construction Projects

2.2.1 Types and nature of Disputes

2.2.2 Causes and effects of Disputes

2.2.3 Dispute Resolution in Construction projects (DR)

Chapter Two:

Theoretical Framework and Literature Review

This chapter studies and exemplifies the various scholarly materials about the causes and effects of disputes in the construction industry of Bahrain as well as review viable methods of resolutions. Any formal arrangement in the contemporary world is subject to conflicts of interest due to differences in quality, costs, performance and resources. The various elements involved in the construction industry in Bahrain raise a lot of opinion and interests leading to the emergence of high disputes. Such differences create a retrogressive impact on the progression of a project and may sometimes stunt the project totally. The inevitable challenges caused by the differences bring forth a reduction in quality of favorable outcomes.

The literature review is divided into two main parts. The first part addresses the nature and characteristics of the public construction projects in Bahrain. The second part explores the various disputes pertained the construction sector as well as the causes and effects in an attempt to explain possible solutions.

2.1 Public Construction Projects

One of the purposes of the government is to provide public services such as roads construction and maintenance and alike. Public owners range from federal government to the bottom part of the state such as local bodies of municipalities and authorities. Ongoing public project must have an accordance with the bids that was advertised in applicable status and construction process supervised by directives of administration and designers, subcontractors.

By definition, a project refers to a collaborative undertaking requiring optimal effort and resource management to succeed (Mitkus et al, 2014). It is subject to a working schedule given a particular life span. And like all projects, successful public construction projects are those who achieve their objectives within the limited time frame, allocated budget and expected quality. Hence, to achieve the objectives, parties shall understand the characteristics of the public construction industry.

Based on a preliminary meeting with the Director of Roads projects and maintenance in MOW, there are factors that attract contractors and consultants to deal with the government in the construction industry in Bahrain. It also explains the characteristics of the public construction projects, as follows:

1-The government owns the biggest projects in the kingdom, in terms of the cost allocated to each project. Thus, MOW is one of the biggest client in the country.

2-Continuity of construction projects creates an attractive work environment as the contractors keep their resources, suppliers and capabilities engaged in projects.

3- Certainty of business and cash flow.

4-Timely payment to business partners. Bahrain is well-known of quick payment based on historical track record in comparison with other GCC despite the humble economical capabilities of Bahrain.

5-Construction industry in Bahrain is small. Thus, the communication is easy and knowledge base is widely open that allows relationships with other important partners.

6-Governance element, which is the facilitation to business partners to reach the decision maker and reach a quick decision. MOW is a semi-projectized organization that depends on projects to offer its services to the community, Thus, such type of organization has a variety of stakeholder's effecting on the project which needs absolute decisions on time.

2.1.1 Parties Involved and their Roles

Gould et al, (2009) explained construction project as a circle which is defined by the owner, developed by designers, and produced by the contractors that's entered into fulfillment of the owners' definition. Then under the explanation of this, there are many parties involved in the work such project managers, design and technology consultants, contractors, site managers, supply managers, quality managers, transportation contractors and those managing the supply chain.

A construction project is an initiative of the owner who becomes responsible for every operation engaged in the project. The owner acquires design consultants, contractors and once they agree to the terms of the contract, the project is due to start and end on a specified date (Jaffar et al, 2011). The project implementation and completion processes progress of five phases after which the project is deemed successful.

2.1.2 Project life cycle and Delivery Phases

Project Management Institute's "Body of Knowledge" defined a project life cycle as "a collection of generally sequential and sometimes overlapping project phases" (PMI, 2008). Which are initiation, planning, executing, monitoring and controlling, and closing. The construction project phases are mainly as follows:

-Phase 1: Planning and Pre-design phase

The owner of the project identifies a need that pushes him to initiate construction. Based on the nature of the identified need, the owner assesses how viable his resources can be in fulfilling the requirements of the project. The owner also known as the client engages in risk assessment to identify possible risks and opportunities likely to arise from the project undertaking. Vital aspects of the project are to be assessed, which include technological and economic feasibility, legal issues concerning the construction, site evaluation as well as selecting the most appropriate team for the design and building operations (Mitkus et al, 2014). According to Jaffar et al, (2011) careful planning and risk management procedures preserve the quality of the project making its successful completion more likely.

-Phase 2: Design phase

In this stage, professional expertise and project undertaking are to be selected for the design. The proposed design is sketched and presented for assessment. Professional firms usually have their expertise that is familiar with machinery, electricity among other site activities. The project manager is appointed (Klinger, 2009).

-Phase 3: Procurement (Pre-construction) phase

Construction companies are invited to place their bids. The best group is selected for contract negotiation, responsibilities documentation and final agreement (Ministry of Works Kingdom of Bahrain, 2017). This phase is the framework through which the project is obtained in line with the owner's strategy. According to Kelly, J (2004), It is very important for the parties to develop and implement a procurement strategy, organize

project delivery, allocate and manage risk and agree how problems will be solved.

-Phase 4: construction phase

The main construction process takes place. the project which involves most of the practical work Depending on the nature of the contract, every member of the development team has their role to play which they are required to undertake seriously. The architects and engineers monitor the work in progress as the owner ensures sufficient delivery of building material to the site. This phase is subject to a lot of changes since construction needs are dynamic and will normally be affected by external factors.

-Phase 5: Operation and maintenance (post construction) phase

This phase starts when all the construction work is over. Evaluation of the project completed is done by the relevant authorities as stipulated by the law. The contract is terminated after everything is assured of quality and performance.

However, it is important to mention that monitoring and controlling are carried out all through the project process to track, review and identify discrepancies in the project plan at an early stage. This helps in solving problems as soon they are identified.

2.1.3 Main Case Study: The Ministry of Works

The ministry of works in Bahrain (MOW) is considered a project-based organization that depends on projects to provide services. MOW initiate public infrastructure developments and various building projects. It represents the public construction sector in this field of study as it is

considered to be the construction arm of the government of the Kingdom of Bahrain.

In order to improve economic vibrancy, infrastructural developments emerge as a vital aspect of polishing the quality of life of Bahrain's residents. Infrastructural projects include road networks, buildings, and drainage systems. MOW draws up strategic plans of infrastructural development, designs working plans as well as ensuring proper project management. Based on National Strategic Master Plan of Bahrain, The MOW plays an important role in making infrastructure development a very forthcoming sector. The government spends a significant amount of money on the development and maintenance in order to maximize the outcomes.

The services of reputable consultants are considered as the best way to manage competence risks and ensure high-quality project results. According to Acharya et al, (2006), currently, such massive projects are assumed by multinational companies with necessary technology and resources. However, recent studies show a growth tendency towards the local construction firms showing that in future, the economy may seize depending on the expertise of other companies and exploit its own. As stated by MOW, the mission and vision and its involvement in its projects are as follows:

-MOW mission and vision:

- A leading, professional and socially responsible organization.
- A leading customer-focused organization.
- A key contributor to the development of the kingdom of Bahrain.
- The structure is flat, fully networked on-line, internally and with stakeholders.

- A high quality performance and knowledge management culture.

MOW evolvement in its projects:

MOW often acts not only as the client in wanting the project, it also:

- Produce the report defining the objectives.
- Produce a design meeting those objectives.
- Use their own employees to build the works (direct labours)

-MOW Organizational Structure

The following figure clarifies the organization structure.

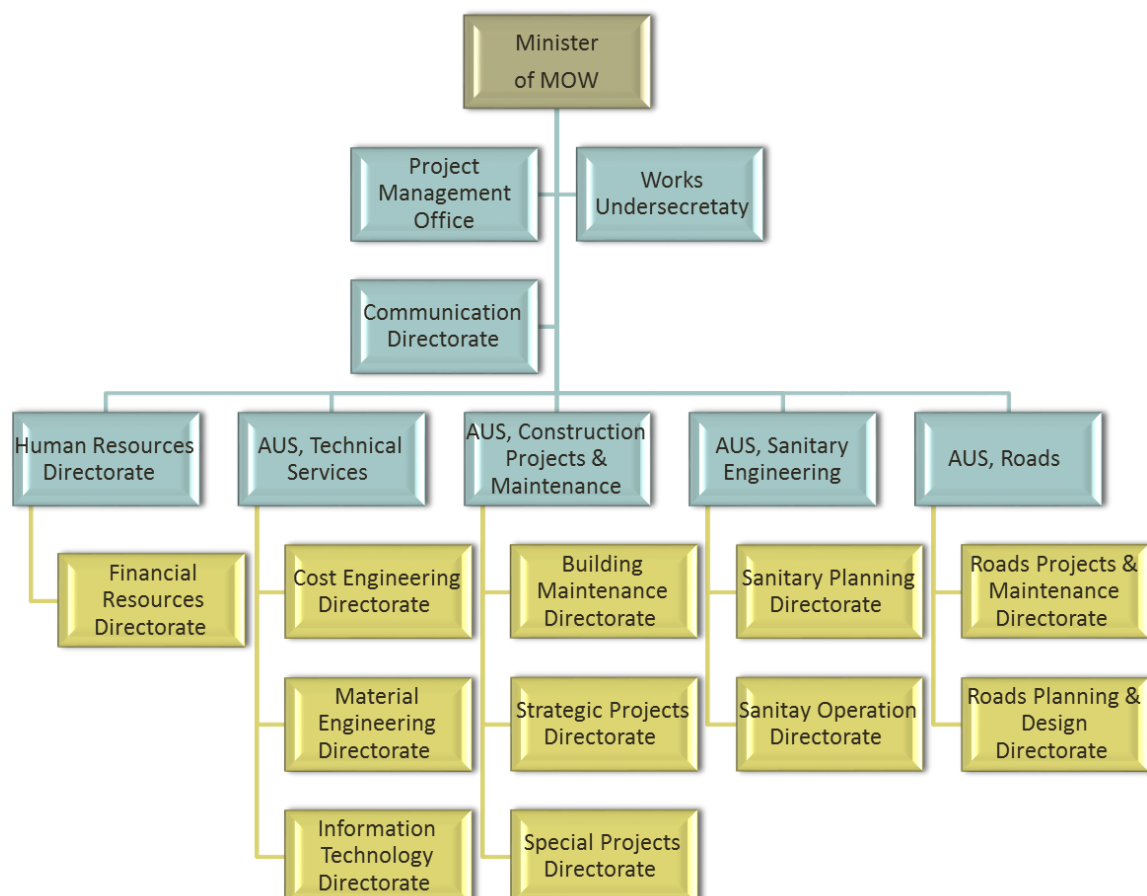


Figure 2.1 MOW Organizational Structure (MOW,2017)

- MOW construction project's procedures:

MOW proposes to execute a project for a public benefit. Scope and feasibility study (site, costs and etc...) is done by the concerned directorate. Then, an Invitation to tender is declared based on Tender Board procedure in Bahrain. First, the consultant is assigned to review and revise the studies and project specifications. Secondly, the contractor is appointed. The MOW contract awarding has strict policies. "In the case of public contracts, however, the bidding process must follow strict rules set forth in federal, state, and local laws and regulations" (Reuters, 2017).

As stated by Jaffar et al, (2011) MOW receives tender applications from various companies and after critical analysis; they chose the best company for their projects. Every bidder is screened for eligibility which includes considering aspects such as technological and economic feasibility as well as ethical consideration. The selected contractors sign up legal documents detailing their working relationships and regulations. Modified (customized) FIDIC is the conditions of contracts followed in MOW(International Federation of Consulting Engineers).

After that, the project goes through the construction phases referred to earlier.

According to meeting with senior Engineer in the SPD (Strategic Projects Directorate), It is relevant to the research issue to mention that Interim quality assurance (QA) and quality control (QC) is done through the project delivery process. It is done by two teams; a team is the consultant of the project itself and the other team is the client. It is based on peer review method.

Lessons learned are required by Project Management Office (PMO) section in the MOW. It is linked by a Knowledge Management System (KMS), managed by another section.

The PMO in MOW is facing challenges and obstacles that hinder the section from its intended purpose(alkhaja,2014).

For project performance reporting, Project Management Information Software (PMIS) has been promoted. Yet, Project Management System is not used from early stages of project delivery process. As stated by PMO.

2.2 Disputes in Public Construction Projects

Like every other business sector in the economy, the public construction industry is subject to immense volatility bringing in a lot of risks, conflicts, claims and disputes.

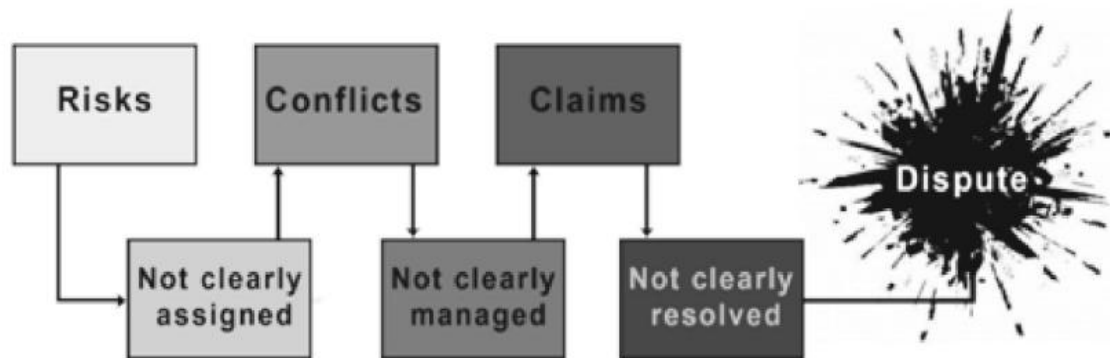


Figure 2.2: Risk, conflict, claim and dispute continuum model. Acharya et al, (2006)

2.2.1 Types and Nature of Disputes

Disputes arise as a result of the uncertainties in each stage, contractual problems and the behaviors exhibited by stakeholders which

in one way or another undermine the dignity of the project (Sambidge, 2013). Dispute sources can be classified as follows (KPP Law,2017):

1. Disputes arising from the failure of the owner:

These are disputes caused by the delays and disorientation of the owner towards the project. Such as lack of delivery of the site to work, lack of documentation, delay of authorities approvals, design changes, changes in specifications and materials and non-payment of funds required to work.

2. Disputes arising from failure of the contractor:

These are disputes arising from the incompetence, disorganization or conflicting ideas of the various contractual stakeholders. Such as design errors, operational errors, delays in achievement, poor performance and increased costs, in case of contract is not fixed price.

3. Disputes arising from the failure of third party:

There are various third parties involved in the construction project and some of their actions or behaviors may not be consistent with the smooth running of the construction project. Such as bad conditions at the site, bad weather conditions, Change the prices of materials, wars, armed conflicts and strikes.

4. Disputes arising from the contract and nature of the industry:

Some projects are very complex leading to difficulties along the way which give rise to disputes. The nature of the industry may be volatile and easily affected by external factors which may cause defectiveness of the terms of contract.

Characteristics of disputes:

Along with personnel interviews with specialists in the field, the following characteristics of the disputes are based on the nature of the project.

- Technically complex and interrelated facts: It requires technical experts (engineers and lawyers).
- The parties to the dispute: It includes more than two parties to the conflict such as multiple subcontractors, suppliers, financiers, and advisory.
- Contains many interlocking contracts between contractors and suppliers, and maintenance contracts and operations
- Disputed amounts are very large

2.2.2 Causes and effects of Disputes

Disputes arise from different elements which vary with the nature and characteristics of the project. One of the most important causes for severe disputes is project change triggered by a variety of reasons that are involved, such as owner-acknowledged changes, construction changes, design errors, other types of mistakes and unexpected circumstances (Revay,1984) .

Aspects of the causes of disputes:

The construction industry faces immense disputes due to significant conflicts of interests among the various stakeholders. Diekmann et al, (1994) established that there were three main aspects of the causes of disputes: process, people, and product. The process aspect entails contractual matters like inadequate information that causes performance to suffer. The people aspect is associated with a lack of

adequate skills and qualifications among the contributors of a project. The product aspect lies in the nature of construction projects and uncertainty that occasionally results in confusion and changes.

Theoretical background:

Various theories according to scholarly materials explain the causes of disputes in any setting. Four theories are as follow:

-Social conflict theory:

This is a sociological theory depicting disputes as a result of horizontal inequalities exhibited when two parties interact. The horizontal variations refer to the social differences as a result of various cultural, ethnical, and economic and gender. Social factors create different personalities in people causing them to relate differently to others. Stereotyping and discriminatory characters may, therefore, overwhelm the construction of a secure infrastructure, limiting its progress. According to Jaffar et al, (2011) factors in the project develop negative attitudes towards each other making it difficult for them to communicate and work together. Communication is vital for the proper operation of routine operations in the construction since there is assured coordination and control. Communication breakdown as a result of social differences, therefore, cripples the progression of any project leading to poor outcomes.

-Realist theory:

This theory explains the defensive actions from a community that feels threatened by a foreign company as a primary source of conflict in projects. Most of the construction in Bahrain is done by foreign corporations, and local stakeholders may act defensively to the new ideas

brought in by the foreign company causing lack of coordination (Klinger, 2009).

Local stakeholders feel threatened by the international stakeholders who may create different goals and ideas. the local personnel may attempt to force homogenous power in control of the project leading to the occurrence of disputes.

-Relative Deprivation theory:

This theory explains economic conditions of an organization as a major source of conflict among members. According to Mitkus et al, (2014) when members feel that the economic conditions prevailing are below what they deserve, then negative attitudes and behaviors develop leading to disagreements. The theory relates to a perceived economic inequality caused as a result of poor economic providence. Financial providences include remuneration, human resources, and raw material provisions. If any of these factors fall short of what the people in the construction sites expect, people think that a company is trying to exploit them. Such factors lead to the development of strikes and aggravated disputes.

-Grievance theory:

This theory explains preference and constraint as a primary source of conflicts in organizations. According to Jaffar et al, (2011) different goals and ideas shape unique interests and objectives for various parties. When such parties have to work together, then the different ideas cause a lot of problems and disagreements among the parties.

Causes of disputes in the public construction industry:

Causes of disputes are interrelated to each other. It can be technical, managerial or contractual. The following examines the causes of disputes in the public construction industry.

-Project extension

The project extends due to obstacles during the implementation of the work, for many unexpected reasons like the nature of the land and its specifications (bearing soil, groundwater, access difficulties and etc) and due to problems in the plans and methods of implementation as stated by a contractor in an interview with the researcher. Therefore, the Contractor claims for administration and site expenses as a result of additional works of the subcontractors. The contractor claim for additional payments accelerates into financial dispute.

-Improper coordination:

Improper coordination arises as a factor of misinterpretation of contractual terms. The initial agreement may be too complicated to understand due to poor drafting. As stated by Mitkus et al, (2014) the contractual terms may be ambiguous and incomprehensive causing a communication failure. When the contractual terms are undefined, role definition and description become a challenge. This lack of understanding leads to cases of time and resource wastage which in turn leads to subsequent strain in resources and acceleration of time schedules. According to Sambidge (2013), Differences in interpretation of specifications sometimes lead to acceleration of working schedule. Thus

the initial lack of coordination and organization cause strain in human and technical resources. Workers develop workload pressure that creates negative behavioral attitudes that inhibit their work performance as well as the strength of relationships. Such situations cause a poor working culture that nurtures various disputes in the construction.

-Skill shortage:

Various consultants and professionals work together with different human resources so as to implement the project design and structure. The human resource is critical in ensuring the quality of outcomes which means there is a need for adequate workers in the construction. When the workers are not enough, the project develops a workload culture whereby an available human resource is assigned to much work to complete in a short time (Sambidge, 2013). The working strain causes negative working cultures which nurture disputes. The little skill provision also leads to schedule delay which also leads to conflicts between the project owner and the contractors.

-Social differences:

Demographic characteristics of project members may cause differences in opinions, beliefs, and values all which contribute to the scope and progression of the construction project. According to Mitkus et al, (2014) the diversity in the workforce means a lot of different cultures, race, gender and ethnic groups. All these social elements comprise various beliefs and values which shape the way they relate and interpret information. The construction project aims at integrating all these

elements, but when the diverse groups fail to develop a standard working culture, then this leads to conflicting goals and interests (Sambidge, 2013). This causes communication weakness as well as poor coordination of factors. Humans by nature are defined by their background. The existence of stereotypes and discrimination amongst the stakeholders leads to low-quality outcomes which in turn cripple the progress of the construction project.

-Poor communication:

Communication is imperative to any human interaction which makes it part of the essential elements of project progression. Communication facilitates the implementation of construction designs in various aspects. Poor communication is, therefore, a source of major disputes in the construction. Poor communication causes undefined project scope whereby individuals don't understand their role clearly (Klinger, 2009). Failure to give good results as a result of undefined project details leads to worker contractor disputes which ruin the working culture and relationship. Poor communication leads to delays in schedules meaning that at some point there is an acceleration of operations which causes pressure on the available human resource. The overall impact of poor communication is poor outcomes by workers and delayed project progression which also causes disputes at various levels (Sambidge, 2013).

-Project complexity:

Some projects are very complex and may also be easily affected by external factors which make them volatile and risky as they pass through the various stages of implementation. Complexity and unpredictable nature cause the need for frequent alterations regarding contract which

may lead to the emergence of disputes. Differing opinions on how emerging situations should be handled also creates a lot of disturbance scenarios. Complex projects develop resources inconveniences during the life span of the construction project which causes delays in the project. Delays are one of the leading causes of disputes in the construction projects since they involve delay in material delivery, remuneration, and communication. Developing economic and political environments may warrant the need for new contract terms and conditions raising a lot of dispute which may make project progress a challenge (Klinger, 2009).

-Macro factors:

These are elements that exists in the project macro environment and which are not defined by the contract or the nature of contractors. These factors include natural disasters which may permanently damage the progress of a project or cause delays in various ways. Such factors lead to massive losses and inconveniences which raise a lot of political and economic disputes between the different stakeholders (Sambidge, 2013). The legal environment may change from time to time leading to frequent alteration of the terms of the contract which may create a lot of discrepancies causing disagreements. According to Mitkus et al, (2014) the political atmosphere may change, and projects may be subject to political influence. When political leaders seek to use public works as a means to attack the government, it may lead to major disputes among the construction community. Political factors are surrounding the procurement process in particular cause significant delays and conflicts which affect the project negatively and give rise to differences.

Effects of disputes in the public construction industry:

Disputes create harmful elements within a construction project leading to reduced quality of outcomes. The effects range from bad to worst meaning a significant amount of time and resources are wasted. Time and resources constitute an important aspect of project management. Any cause of inconvenience absorbs a lot of time and resources causing the project to diverge from the initial budget. A massive project may cause the government to inject more money into funding the project as well as manage the disputes by bringing in mediators and arbitrators. This involves public money which is meant for other development strategies (Sambidge, 2013). Such funding can be done through government borrowing which causes a major effect on a country's economic stability.

Disputes in construction projects might also lead to loss of credibility of the MOW in Bahrain. Public trust is paramount for the motivation of ministerial works (Klinger, 2009). When the ministry loses public trust, they become ineffective causing low-quality outcomes and project management techniques.

The relationship of disputant parties has manifold effects. According to Mitkus et al (2014), the disputes in the construction might cause a major deviation to goal focus by the major stakeholders. Operations become disoriented, and people develop attitudes towards the project. The result is poor performance of elements as well as poor outcomes. Poor infrastructural outcomes lead to the non-achievement of goals and wastage of resources. Disputes might halt the project as well.

2.2.3 Dispute Resolution (DR) in Construction projects

Angus et al, (2007) defined disputes and conflicts as pathological conditions that require identification of causes and proposed remedies for their prevention.

Methods of resolution the in public construction industry

Methods of resolution can be classified in two parts: Proactive and reactive methods. The following examines techniques for anticipating disputes and identifying impending disputes (DiDonato,1993):

Proactive methods:

There exist diverse ways in which disputes can be managed in proactive measures and contingent approaches. Some related to construction disputes are as follows:

- Risk management plan:

Risk management plan involves a full market and industry analysis to determine the viability of a project. According to the Ministry of Works Kingdom of Bahrain (2017), a risk management plan enables adequate research and understanding of the Political, Economic, Social, Technological, Environmental and Legal PESTEL environment of the construction project so as to identify possible risks that would create disputes. Such early identification of risk factors enables proactive management of argument creating situations. By conducting proper research, the construction company can understand the nature of the market as to avoid the full impact of market uncertainty (Mane et al, 2012). The owner of the project can understand the complexity of the project as well as plan the sufficient amount of human resource to employ as well as the appropriate technology.

- Contracts with project management oversight:

The United States government's new focus is on issuing contracts that involve project management oversight for its public projects (DiDonato, 1993). It provides a comprehensive review for project schedules, Quality Control/Quality Assurance, scope definition and monitoring progress through the project development, delivery, and execution and reporting findings and recommendation to the owner.

-Enhancing communication:

For minimal dispute situations, there need to be adequate communication channels that allow smooth flow of information between the MOW and the various consultants, contractors, and third parties. According to Acharya et al, (2006) communication is crucial since it ensures a clear definition of the scope of the project to avoid future disputes. Proper communication enables precise definition of roles as well as robust motivation for stakeholders. It is important to ensure timely communication of perceived delays to avoid conflicts in sensitive areas of operation such as payment schedules (Mane et al, 2012).

-Keeping abreast of news laws, information and technology:

Bahrain planning strategies 2030 focus on infrastructure and transportation networks' development (EDB,2008). Therefore, MOW recently experiences growth in its construction projects to fulfill this vision. And that sometimes require adopting new technology. Changes always are taking place in the construction industry. New tools are available to manage projects, and new building techniques are being used. Each new approach spawns claims that it will save money, reduce time,

improve quality, and decrease administrative burden, to protect public owners from misleading claims, they should stay abreast of new laws and information.

-Minimizing political influences:

Political personalities and parties have a particular way of jeopardizing government projects by manipulating procurement facts and figures in an attempt to spread negative attitudes towards the government. Therefore, this can reduce the sanctity of a project causing disputes among the various stakeholders. Political propaganda creates false information which reduces trust among members causing the development of disputes (Acharya et al, 2006).

-Early Neutral intervention:

Disputes are better managed when they are still minor complaints. These minor complaints develop into major conflicts that require time and resources to manage. The best option would be for parties to deal with the differences when it is still small to prevent further spread of wrong attitudes and perceptions which escalate the conflict (Mitkus et al, 2014).Forming a Dispute Avoidance Board(DAB) by the parties as a neutral third party (e.g. a QC or lawyer). The board consist of members who are nominated by the project parties at the beginning of the project. They shall be independent, experts and qualified. They become fully familiar with issues and matters that have the potential to manifest themselves into disputes. Therefore, the board can take measures early on in attempt to nip these potential disputes in the bud(O'Leary,2016).

Reactive methods:

Once dispute occur, there are alternative means of dispute management. There are diverse ways by which disputes can be managed

without creating risky conflicts that may cause termination of a project contract. Conflict management takes various forms all which involve negotiation as the major element. Those methods can be classified in two parts: Non-adversarial and adversarial methods.

Non-adversarial methods are negotiation, reconciliation and mediation.

-Conciliation

In construction, the facilitator ends up issuing a recommendation if there is no settlement (O'Leary,2016).

-Mediation:

Mediation is a form of negotiation with an impartial third party, regulated by the law. when a third party is invited to oversee the dispute resolution acting as mediator (Acharya et al, 2006). A government chosen individual may be selected, or the conflicting parties may choose one for themselves to enhance the independence of outcomes (Mane et al, 2012). The mediator can help the parties identify their interests and build an agreement on them. The mediator listens to both parties' positions and tries to help them reach an agreement (O'Leary,2016).The mediator does not provide any decision on the issues (non-binding), but serves as an intermediary between the parties to the dispute. Most mediation sessions last only one day, but seldom may they extend into a second day.

Most dispute resolution follow the two-tier structure.Mediation then Arbitration. If the non-Adversarial methods help reach a settlement the adversarial methods are used. To start with arbitration, adjudication and last, litigation as follows:

-Arbitration:

Arbitration is a private, contractual form of dispute resolution outside of the traditional court system. It is the determination of disputes by a third party arbitrator or arbitration panel, selected by the parties to the dispute by whose decision or award they agree to be bound (binding). The parties can decide on the seat, applicable rules, the tribunal and the arbitral process allows for a detailed analysis of claims and defences

Arbitrations process may be either administered by a specialized institution “Institutional arbitration” or Ad Hoc arbitration” when parties involved are responsible for determining and agreeing on their own arbitration procedures rather than being supervised by the procedures of an arbitral institution.

Bahrain Chamber of Disputes Resolution (BCDR) is the first ADR services provider in Bahrain. It opened formally in 2010. The center administers arbitrations and mediations in Arabic, English or any language required by the parties (Gusy et al,2011).

-Adjudication:

Groton et al, (2001) defines adjudication as being the method of achieving a quick decision, using an inquisitorial approach with limited hearings, which is immediately binding upon the parties but is not a final resolution of the dispute because the parties can subsequently review or appeal by arbitration or litigation, usually after completion of the project. statutory adjudication has become a short-form quasi-arbitration process, save that, amongst other things, unlike an arbitration award, an adjudication decision is only temporarily binding(O'Leary,2016).

-Litigation:

Most of the parties fail to reach a consensus during the negotiation process and will normally proceed to court. The court assesses the situation from both sides and makes a final decision. Unsatisfied parties are allowed to appeal for a favorable verdict. This process is lengthy and very expensive and outcomes may not always favor the litigant.

Arbitration has become the preferred and most widely used mechanism for resolving disputes, due to its numerous advantages over litigation. It is quicker, cheaper and remains confidential.

The following figure simplifies the current conditions of contracts of the research case study that includes Mediation then Arbitration tire-structure and the disputes before the BCDR often reaches litigation -Appendix B-.

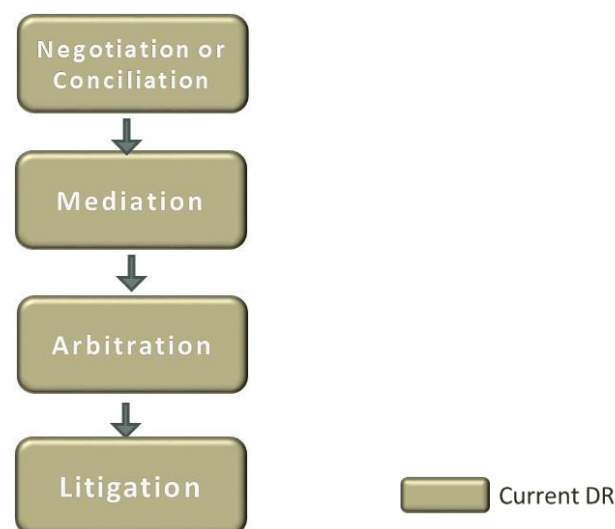


Figure 2.3: The Current DR Mechanism in MOW (Illustrated by the researcher)

And the following figure compares the dispute resolution methods in term of length, speed, management resources, control and cost.

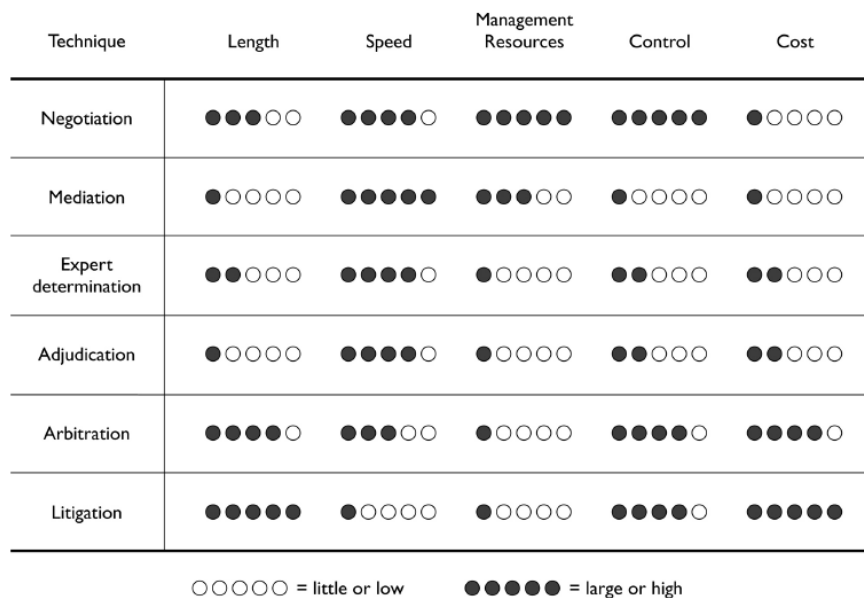


Figure 2.4: Dispute resolution method characteristics. Heriot-Watt (2014)

Related DR case studies:

The following are two real case studies addressing two different common DR methods for MOW, one is international and the other is local. Both are concluded by researcher comments.

International Case Study: Mediation (Designing Buildings Limited, 2017)

Disputants: Five parties' dispute

Project: an artificial community sports pitch

The dispute involved an artificial sports pitch that was having performance issues since during any heavy rains season, the pitch flooded. The local authorities had initially commissioned the project to a main contractor who then subcontracted to a third party. Various attempts to try and resolve the matter had been futile.

The dispute now lay between the local authorities, main contractor, sub-contractor, consulting engineer and the sports surface contractor. The

projected budget for relaying the surface which included a better drainage system was £250,000.

Mediation was suggested as a method of resolution and the local authorities agreed to pay for the whole mediation process. A mediator was selected and being independent civil engineers he was well vested with the details of the dispute to be able to influence a consensus. Each of the parties was required to forward their submissions and on the day of mediation, all the parties represented themselves. At the mediation session, each party made their oral submissions and in the evening the mediation reached a resolution.

The resolution involved waiving of claims and fees. The reconstruction of the field surface was to take place with an agreed fee divided amongst the parties. The mediator was paid a fee of £3,500.

Researcher Comments:

The settlement of this dispute was effective and consumed a short period of time compared to other DR methods, although the number of disputants is five parties. In my opinion, the Mediation was successful because of the following:

- The mediation method was well-understood by all disputants.
- The local authorities had covered the expenses of the process.
- The mediator choice was successful.

Local Case Study: Arbitration

Disputants: Three parties' dispute

Project: Khalifa Sport City (Bahrain)

Client: General Organization of Youth and Sports (GOYS)-Now Ministry of Youth and Sport

Employer: MOW – Client representative

Consultant: world class specialized international company

Contractor: GRADE AA Building contractor registered with MOW

Client representative in arbitration: Authority of state cases (According to decree-law No. (27) Of 2013.amendment to certain provisions of law No. (60) of 2006, regarding the reorganization of the Legislative and Legal Advisory Council).

Proposed completion date for the project: 2007

Actual completion date for the project: 2009

Final settlement of the disputes: 2014

The project tender was settled at 2006 with an allocated budget around five million Bahraini Dinars. The project was a stadium (football field surrounded by a tiered structure for spectators). During project execution GOYS changed the football field from artificial grass to natural grass and added a running track around the field, swimming pool and lighting structures to make the stadium a complete sport city. That change in functional and conceptual needs led to changes in scope, which needed provisions. While the project was getting executed, that decision of following the regulations of International Federation of Association

Football (FIFA) to join GCCC cup was declared. Thus, unexpected changes were due competition date. Extra buildings were designed and added to follow FIFA regulations (VIP rooms, pump rooms and equipment rooms, etc.). That scope creep increased the cost of the project. Unfortunately, that was beside the cost increment in the market. As that scope creep was concurrent with a period of abundance in projects in Bahrain. Most contractors have projects in hand, so their bidding price became higher. Due to this abundance, contractors didn't care much if they were to be awarded the contract or not. The project was tendered twice and both tenders were above nine millions Bahraini Dinars. Hence, two years extension was given to the project. The contractor was notified by variation order as change in scope is done through variation order mechanism. Disagreements started with the contractor, regarding the field's grass. The contractor failed to supply the natural grass from a subcontractor in Kingdom of Saudi Arabia (KSA). Because of a recent update in exporting regulations in KSA. The exporting this type of Saudi grass was banned due to its extra consumption of underground water. The second option for the contractor was to supply grass from Kuwait. The grass was supposed to be 98% natural, according to FIFA regulation. The contractor failed again, because the Kuwaiti grass specifications did not pass the FIFA test.

Then, seeding the football field's land was the contractor's challenge due to the time frame limit and hard land's nature. Finally, it was done and claimed for not getting his money. He lodged a case against the ministry in the court of law, and the judge appointed an arbitrator. He won the case through institutional arbitration, because the client tendered out the specifications. Some specifications concerned the dispute were changed through the project process.

The delay in the three phases of Khalifa sport city project, the design, the supervision of the implementation and the supervision of maintenance, delayed the whole project.. This extension of the contract adds court fees to the dispute.

Ad hoc arbitration was the DR method that settled the dispute between the client and the consultant. Reviewing the memorandums submitted by the parties to the arbitration, and reviewing the contract between the parties, it turns out that the disagreement between the parties revolves around the cost of the court fees owed by the court against it. The arbitrator claims that there have been changes and additional works and an increase in the cost of the project that led to its claim to increase its fees and as stated in the case law.

In order to consider the applications of the arbitrator, the dispute between the parties to the arbitration was examined. The consultant's fees were determined. The cost of the project, the actual cost and the target cost of the project was determined as well. The consultant won the case.

Researcher Comment:

Change orders were mandatory in this case study to solve some dilemma. Disputes could be avoided if the claims were accepted earlier. Change orders shall be acceptable by all parties in future.

The parties agree on an arbitrator with relevant expertise in the dispute with the consultant (Ad hoc arbitration). While the dispute with the contractor, the arbitrators award was enforced as a judgment of the court (institutional arbitration).

Political interference, unexpected scenarios and the selection of international consultant contributes to the complexity of the dispute.

The literature review chapter, enhances the understanding towards the research problem. Through reviewing the different scholarly materials concerning disputes in the construction industry, the knowledge was expanded. There are various causes of difference in the construction industry in Bahrain, some of which are controllable while others can only be limited. Learning and understanding the factors can help to apply the various methods of dispute mitigation effectively.

Chapter Three

Methods Procedures

3.1 Methodology

3.1.1 Research Framework

3.1.2 Research case study

3.2 Research Tools

3.2.1 Qualitative Research

3.2.2 Quantitative Research

3.3 Data Collection / Procedure

3.3.1 Research Hypotheses

Chapter Three: Methods Procedures

This chapter will introduce the methodology of this research, which is defined as the whole process of the study (Collis et al, 2013). The information of previous chapter are interpreted. Then explained the research approach in details and how it was carried out including the process of data collection and its limitation and the appropriate sampling method selection.

It also includes research questions and hypothesis. In addition, it clarifies the limitations of the data collection, sample size selection and determination and the survey and statistical analysis tool that have been used.

3.1 Methodology

3.1.1 Research Framework

The research framework as a whole is summarized in the steps shown in figure 3.1.

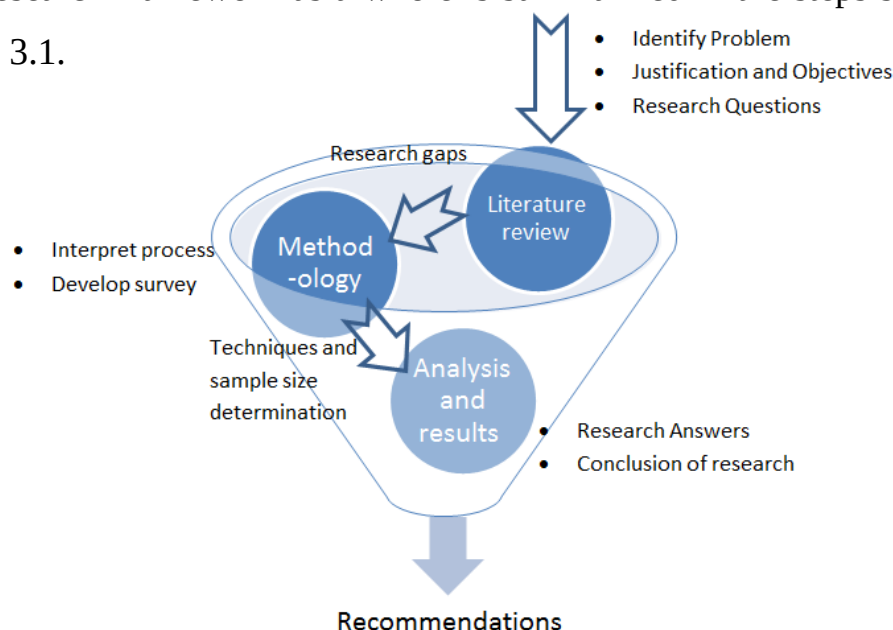


Figure 3.1 Research Framework (Illustrated by the researcher)

3.1.2 Research case study

The survey and interviews conducted targets the personnel engaged in disputes arises in the field of public construction projects only. Therefore, this research has been limited to MOW and the consultants and contractors who have been part of the construction projects. And like any government entity, information provided is considered confidential.

3.2 Research Tools

There are two approaches in conducting a research; qualitative approach and quantitative approach. Many studies combine both the approaches (known as multi method approach), which is the case in this research. Creswell (2013) explains that it is used to collect both qualitative and quantitative data in order to gain a wider knowledge of the matter at hand.

3.2.1 Qualitative Research

Causes and effects of disputes and their methods of resolution are found in the literature review through individual interviews with some the specialists in each category in the field of study and through real case studies.

- Public construction projects characteristics

The public projects have characteristics like the budget allocated and interrelationship between multiple parties seeking an interest. All contract conditions used in MOW are modified (customized).

- Causes and effects of Disputes

Many causes and effects are discussed thoroughly. Also, the dispute causes were sorted based on their source (Diekmann et al , 1994).

Causes of disputes are classified as the following:

- **Causes related to the project process:**
 1. Misinterpretation for terms of contract
 2. Unclear Language of contract
 3. Undefined project scope
 4. Lack of Planning
 5. Lack of Quality Control & Assurance
 6. Illogical stakeholder/s expectations
 7. Inadequate detailed plans
 8. Acceleration of the project
 9. Error in design
 10. Failure to account the cost properly
 11. Improper feasibility study
 12. Improper scheduling
 13. Delay in authorities approval
 14. Delay the project by owner
 15. Delay the project by contractor
 16. Delay the project by consultant
- **Causes related to uncertainty of the project:**
 17. Unclear project objectives
 18. Scope change
 19. Variations
 20. Imprecise pre-feasibility stage
 21. Inadequate investigation before bidding
 22. Discrepancy in specification

- 23. Fluctuation in price of materials
- 24. Unexpected site conditions
- 25. Suspension of work
- 26. Project stakeholders interference
- 27. Unexpected risks associated with the project's complexity

- **Causes related to personal engaged:**

- 28. Improper coordination
- 29. Skill shortage
- 30. Cultural differences
- 31. Differing goals
- 32. Lack of communication
- 33. Ineffective management control
- 34. Improper employer representative

The effects of disputes are summarized as follows:

1. Delay of public benefit
2. Project performance (slow work progress)
3. Reputation of one party
4. Relationships between parties
5. Financial losses/ Accumulations
6. Waste of efforts and time

The DR used are as follows:

- Mediation
- Ad hoc arbitration
- Institutional arbitration
- Adjudication
- Litigation

3.2.2 Quantitative Research

The qualitative research output (factors of causes, effects and DR) were utilized to craft the survey design. The expected results of the survey, support the research questions and hypotheses through ranking these factors based on the experience of the respondents under each category in order to meet the research objectives.

- Survey design

The survey is a very important tool, conducted to fill the research gaps. Criteria were considered in designing the survey. Such as clarity, simplicity and relating each question to the respondent's experience rather than asking for the opinion. The questions have ready choices of answers of 5 scales (always, often, sometimes, rare and never).

The questionnaire -shown in Appendix B- consists of four main parts as follows:

1. Part one seeks to collect information on the respondent background and the public project characteristics.
2. Part two relates to the most frequent causes of disputes that are classified as the following :
 - 2.1: causes related to the project process.
 - 2.2: causes related to uncertainty of the project.
 - 2.3: causes related to personal engaged.
3. Part three is about the side effects of disputes.
4. Part four relates for the respondent's experience in dispute resolution.

Self-administered type of questionnaire has been used with more than 15 concerned employee in MOW and 20 offices of both contractors and consultants.

This type has many advantages like:

- To interview some of the respondents, thus adding value to the qualitative part of the research through local case studies.
- To modify the questionnaire prior its last version.

- Research population

The list of population of interests is obtained from the MOW. It contains engineers and specialized personnel in the construction industry whether on site or office work. The survey was distributed between January and March 2017 to all contractors and consultants offices that deal with the ministry via electronic mail seeking those who have been in a dispute in the field of study. It is difficult to reach all the target respondents, due to the busy nature of the industry and due to limitation of disputes to some personal involved under each category.

- Sampling method and Sample size

To deliver the best results, purposive sampling method had been selected. It is used where there is a need to focus on one particular unusual issue (MacFarland, 2012). The main purpose of the questionnaire is to identify the main causes, effects and DR methods related to the characteristics of the public construction projects. Therefore, it was distributed by hand and via electronic mail to three groups of respondents, as follows:

1. The client:

The client is represented by the MOW. Thus, the questionnaire was only distributed to personnel involved in disputes in the

organization. The distribution was supported by both the minister's office and CED.

2. The contractors:

In this field of study, the questionnaire was distributed to those involved in disputes with the ministry in their projects. They are prequalified and identified by MOW.

3. The consultants:

In this field of study, the questionnaire was distributed to those involved in disputes with the ministry in their projects. It includes experts in disputes resolution.

The sampling frame consisted of specific type of respondents. Accuracy in such cases are more important than size. Based on the nature of the field, it has been challenging to the researcher in determining the sample size of each group. The sample size was based on facts. Sample size depends on projects with disputes. Referring to the ministry list of projects that contains disputes, it is very important to understand the following:

- The same contractor and consultant will be repeated in other projects. Hence, limiting the number involved.
- The survey was distributed via email to all contractors and consultants involved in disputes and all personnel in MOW.
- The researcher has been in direct contact with more than 15 concerned employee in the MOW and 20 offices of both the contractors and consultants.

3.3 Data Collection / Procedure

The collection of survey was undertaken through January and March 2017. About 120 survey has been distributed as hardcopy. The study sample consisted of (76) personnel involved in disputes. Figure 3.1 show the distribution and description of the sample.

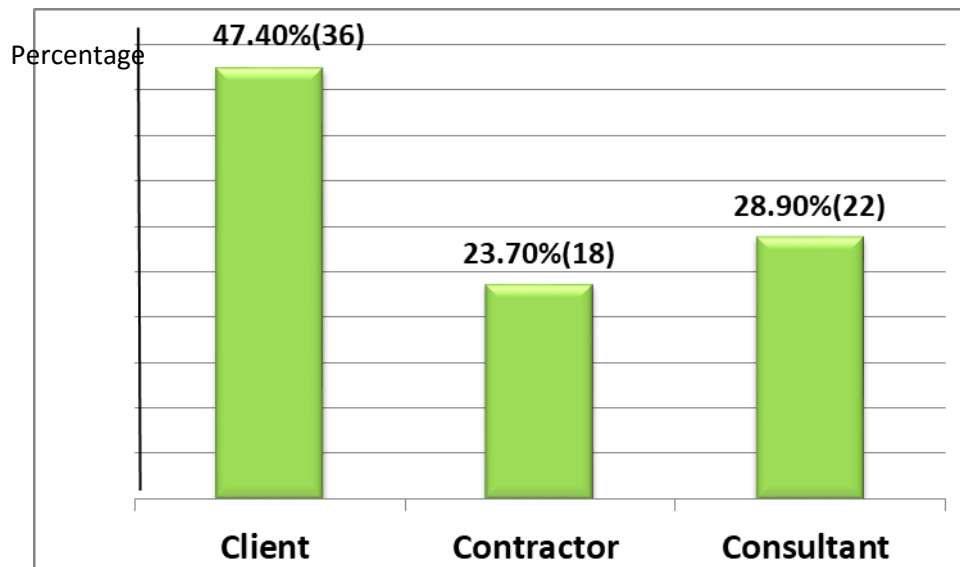


Figure 3.2 Frequencies for the Sample according to categories of organization

The response rate is 63.3%. Due to the of MOW assistance in distributing the survey in the ministry (both via electronic mail and by hand), it is very clear that the client category represents approximately half of the response rate (47.4%). Then comes the consultants (28.9%) and last, the contractors (23.7%).

Next chapter, The analysis begins with the calculating the frequencies and percentages for the General Information variables, as shown in the above figure. Secondly, means, standard deviations, Relative Importance (RI) and Ranks to be found for all causes, effects and DR for the three categories together and also means, standard deviations and RI so the ranking for each category (client, contractor and consultant) is to be found.

3.3.1 Research Hypotheses

The population of the study relates to the main case study. Thus, relationships among variables connect questions and hypotheses. "Hypothesis is a statement about the relationship between two or more variables that translates the research question into a prediction of expected outcomes (Parahoo, 1997) ."

The analysis of variance (ANOVA) is a statistical test used when a number of variations exist and there is a need to measure significant differences (MacFarland, 2012). It is used to determine whether there is a significant difference in means between more than two groups. Three groups are to be tested in this research, which are the three main categories of organizations.

The test starts by calculating the overall means, standard deviations and RI of Subscales "Causes, effects and DR of Disputes" according to the independent variables "categories of organization, Type of projects, working experience, Number of implemented projects". Then Investigates the significant differences between overall means using One Way ANalysis Of VAriance (ANOVA) .

The test selection is based on the following hypothesis:

Null Hypothesis (H_0):

There are no significant differences in the level of "Causes, effects and Methods of Resolution in Disputes of the Construction Public Sector in Bahrain" according to study independent variables (categories of organization, Type of projects, working experience, Number of implemented projects).

Alternative Hypothesis (H_{alt}):

There are significant differences in the level of "Causes, effects and Methods of Resolution in Disputes of the Construction Public Sector in Bahrain" according to study independent variables (categories of organization, Type of projects, working experience, Number of implemented projects).

$H_{0.1}$: There are no significant differences in the level of Causes of Disputes in the Construction Public Sector in Bahrain according to a variable.

$H_{alt.1}$: There are significant differences in the level of Causes of Disputes in the Construction Public Sector in Bahrain according to a variable.

$H_{0.2}$: There are no significant differences in the level of effects of Disputes in the Construction Public Sector in Bahrain according to a variable.

$H_{alt.2}$: There are significant differences in the level of effects of Disputes in the Construction Public Sector in Bahrain according to a variable.

$H_{0.3}$: There are no significant differences in the level of methods of resolution of Disputes in the Construction Public Sector in Bahrain according to a variable.

$H_{alt.3}$: There are significant differences in the level of methods of resolution of Disputes in the Construction Public Sector in Bahrain according to a variable.

The analysis comes up with 42 correlations that meet the research objectives using the variables, as follows:

1. categories of organization
 - Client
 - Contractor
 - Consultant
2. Type of projects
 - Building and Utilities (Building works)
 - Roads and Infrastructure (Civil works)
 - Both mentioned above
3. working experience
 - Less than 5 years
 - 5 to 10 years
 - 11 to 20 years
 - More than 20 years
4. Number of implemented projects
 - Less than 10
 - 10 to 20
 - 21 to 30
 - More than 30

This chapter has covered the most important aspects of the research methodology. Multi method approach is conducted. The outcomes of the qualitative research (data collected) have been an input for the quantitative research (the survey). The sample size is selected within the MOW projects' involved parties into disputes. However, the population of interest has been clarified and the appropriate sample method has been chosen. The sample size and collected data is discussed. This chapter also clarified the independent variables for the hypothesis and the dependent variables, the null and alternative hypothesis statements and defined the tool chosen for the analysis (ANOVA).

Chapter Four

Results, Discussion, and Recommendation

4.1 The study's analysis and results:

4.1.1 Survey Verification

4.1.2 General information about the respondents and projects

4.1.3 Causes of Disputes in the public construction projects

4.1.4 Effects of Disputes in the public construction projects

4.1.5 DR methods in the public construction projects

4.1.6 Hypotheses test and findings

4.2 Discussion of Results:

4.2.1 Research Summary and main findings

4.2.2 Research Conclusion

4.3 Study's recommendations:

4.3.1 Research Recommendations

4.3.2 Future Recommendations

Chapter four:

Results, Discussion, and Recommendation

This chapter presents descriptive statistics of the data collected and results of survey analysis. It starts with the verification of data collected through validity and reliability tests. Then, displays the results of the determined sequence, analysis and discussion. It consists of the results of the general information about respondents and the nature of the projects. It also addresses the causes, effects and DR to all and to each group, in order to discuss the agreement between the opinions of each respondent category. Null-hypothesis assumptions are tested and results are discussed according to study independent variables.

It also summarize the whole research and include the conclusion. Recommendations were addresses to serve as action guidelines to all stakeholders to mitigate disputes involved in the public construction industry. Finally, future researches topics are proposed to take the study findings further.

4.1 The study's analysis and results:

The research objectives were addressed using both qualitative and quantitative research. Qualitative research help develop a holistic picture based on interviews and case studies to identify the causes and effects of disputes and DR. While quantitative research process seek hypotheses, numerical data and measure frequency of occurrence to specific variables which are output of interviews and questionnaires targeting the MOW, contractors and engineering consultants involved in the field. Thus, research carry out purposive sampling method.

A deep analysis of data collected using statistical tools. Statistical package for the social sciences (SPSS) software (version 21.0) is used in the analysis of the questionnaire results. This software is commonly used for data entry and analysis. Validity and reliability are verified for the questionnaire. A 95% confidence interval reflects a significance level of 0.05 ($\alpha=0.05$). The desired level of confidence is set by the researcher as it is most commonly used for such type of researches. All correlations are considered significant if P-value (statistical term) is below 0.05. "Significant" means there is real correlation between each variable and overall subscale. Frequency and percentage are displayed according to each factor in the study. Relative importance is calculated to rank the causes, effects and DR according to the participants. The results of the overall data and the data were compared according to categories of organization. Analysis of variance (ANOVA) is used by SPSS as well to investigate significant differences between means.

Believability to the overall survey results were ensured from validity and reliability tests. These two concepts capture the measurement properties of a survey (Institute for Work & Health, 2017).

4.1.1 Survey Verification

- Validity: Content validity of the questionnaire; that is, will it actually measures what it is intended to measure (Institute for Work & Health, 2017). To verify the validity of the questionnaire, the Pearson's Coefficient of Correlation were calculated between each item and its subscale using SPSS. The results are shown in the following tables. Results in table (4.1) show that the calculated Pearson's coefficient of correlation of the subscale of "Causes of Disputes" are between (0.301) for (Misinterpretation for terms of contract) and (0.485) for (Improper employer representative). These results show that there is a statistically

significant relation ($\alpha=0.05$) between each of the causes and its subscale. This indicates that the subscale “Causes of Disputes” is valid to meet the research objectives.

Table 4. 1 Validity of Subscale “Causes of Disputes”

N	Causes of dispute	Validity*
1	Misinterpretation for terms of contract	0.301
2	Unclear Language of contract	0.425
3	Undefined project scope	0.355
4	Lack of Planning	0.390
5	Lack of Quality Control & Assurance	0.494
6	Illogical stakeholder/s expectations	0.540
7	Inadequate detailed plans	0.525
8	Acceleration of the project	0.493
9	Error in design	0.586
10	Failure to account the cost properly	0.502
11	Improper feasibility study	0.524
12	Improper scheduling	0.507
13	Delay in authorities approval	0.364
14	Delay the project by owner	0.500
15	Delay the project by contractor	0.456
16	Delay the project by consultant	0.649
17	Unclear project objectives	0.612
18	Scope change	0.417
19	Variations	0.573
20	Imprecise pre-feasibility stage	0.443
21	Inadequate investigation before bidding	0.571
22	Discrepancy in specification	0.572
23	Fluctuation in price of materials	0.273
24	Unexpected site conditions	0.526
25	Suspension of work	0.621
26	Project stakeholders interference	0.466
27	Unexpected risks associated with the project's complexity	0.498
28	Improper coordination	0.574
29	Skill shortage	0.609
30	Cultural differences	0.425
31	Differing goals	0.416
32	Lack of communication	0.453
33	Ineffective management control	0.651
34	Improper employer representative	0.485

*All Correlations are significant at $\alpha= 0.05$

Table 4. 2 Validity of Subscale “Effects of Disputes”

N	Effects of disputes	Validity*
1	Delay of public benefit	0.744
2	Project performance (slow work progress)	0.610
3	Reputation of one party	0.630
4	Relationships between parties	0.736
5	Financial loses/ Accumulations	0.782
6	Waste of efforts and time	0.815

* All Correlations are significant at $\alpha = 0.05$

Results in table 4.2 show that the calculated Pearson’s coefficient of correlation of the subscale of “Effects of disputes” are between (0.610) for (Project performance: slow work progress) and (0.815) for (Waste of efforts and time). These results show that there is a statistically significant relation ($\alpha=0.05$) between each of the effects and its subscale. This indicates that the subscale “Effects of disputes” is valid to meet the research objectives.

Table 4. 3 Validity of Subscale “Disputes resolution”

n	DR	Validity*
1	Mediation	0.200
2	Ad hoc arbitration	0.675
3	Institutional arbitration	0.606
4	Adjudication	0.652
5	Litigation	0.687

*All Correlations are significant at $\alpha = 0.05$ except for mediation (P-value = 0.084).

Results in table (4.3) show that the calculated Pearson’s coefficient of correlation of the subscale of “Disputes resolution” are between (0.282) for (Mediation) and (0.687) for (Litigation). These results show that there is a statistically significant relation ($\alpha=0.05$) between each of the items and its subscale. This indicates that the subscale “Disputes resolution” is valid to meet the research objectives.

- Reliability :Reliability concerns internal consistency among the questions (Institute for Work & Health, 2017).To verify the reliability of

the questionnaire, the Cronbach's alpha were calculated using SPSS. The results are shown in the following tables.

Table 4. 4 Reliability of scale of "Causes, effects and DR".

N	Subscale	Cronbach's alpha
1	Causes of Disputes	0.906
2	Effects of disputes	0.816
3	DR	0.772

Results in table (4.4) show that the calculated Cronbach's alpha for the subscale “Causes of Disputes” are (0.906), and (0.816) for the subscale "Effects of disputes", and for the subscale "Disputes resolution" are (0.772). This indicates that the reliability of subscales is valid to meet the research objectives.

4.1.2 General information about the respondents and projects

This section presents general information related to the respondents, who are 76 in total referred to earlier in chapter 3. The survey is answered by three main categories; 36 client (47.4%), 22 consultants (28.9%) and 18 contractors (23.7%).

1-Respondents occupation:

The results in figure (4.1) show that (20) respondents are Quantity surveyors which are the highest percentage of the sample (26.3%). The results also show that (19.7%) of the sample are Project managers, (14.5%) are Heads of the departments, and (11.8%) are Engineers. About (9.2%) of the sample work are senior engineers.

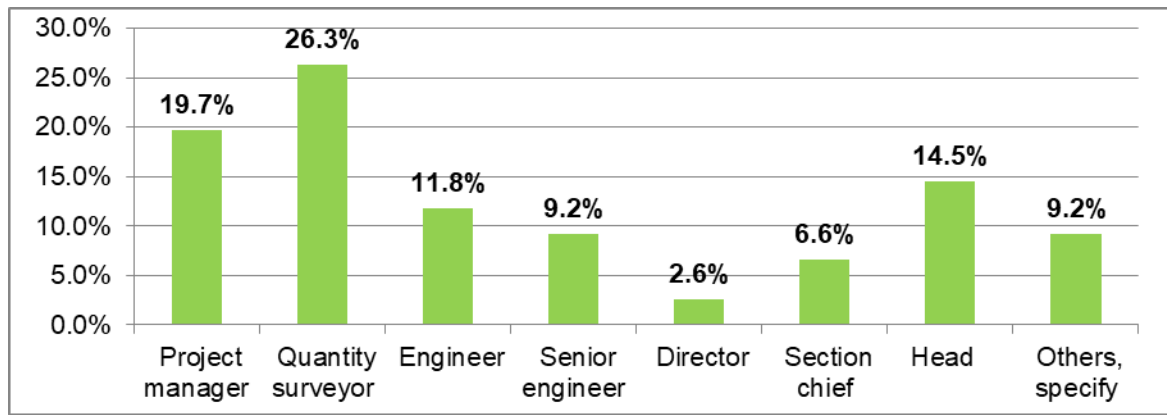


Figure 4. 1 Frequencies for the Sample according to occupation

2- Type of projects:

The results in figure (4.2) show that the highest percentage (38.2%) of the study samples their Type of projects are Roads and Infrastructure (Civil works). About (25.0%) their Type of projects are Building and Utilities (Building works), whereas (36.8%) of the study sample their projects both the above (Building works and Civil works).

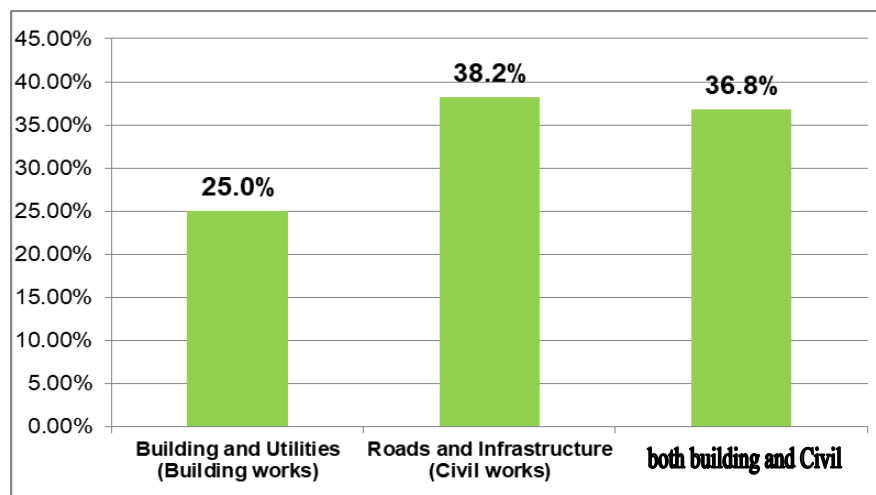


Figure 4. 2 Frequencies for the Sample according to Type of Construction projects

3- Respondents experience:

The results in figure (4.3) show that the highest percentage (32.9%) have an experience more than 20 years, and (31.6%) of the study sample have an experience of 5-10 years.

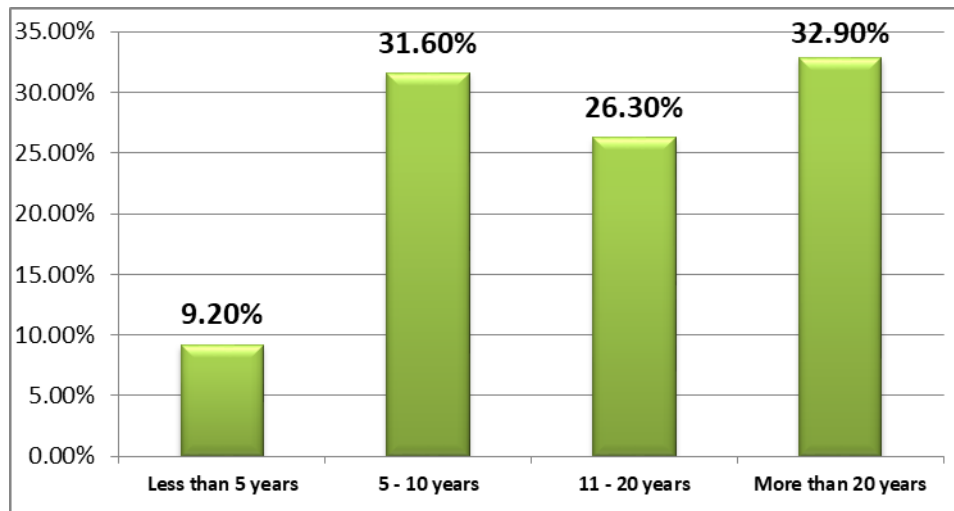


Figure 4. 3 Frequencies for the Sample according to Years of Experience

The results also show that (20) subjects of the sample have an experience of 11- 20 years which represents a percentage of (26.3%) of the sample. The results show that (9.2%) of the sample has an experience of Less than 5 years.

4- Number of implemented public Construction projects

The results in table (4.4) show that the (35.5%) of sample implemented "Less than 10" public projects through the last five years, and (27.6%) of the study sample implemented "10-20" public projects through the last five years. The results also show that (22.4%) of the implemented " More than 30" public projects. The results show that (14.5%) of the sample implemented "21-30" public projects through the last five years.

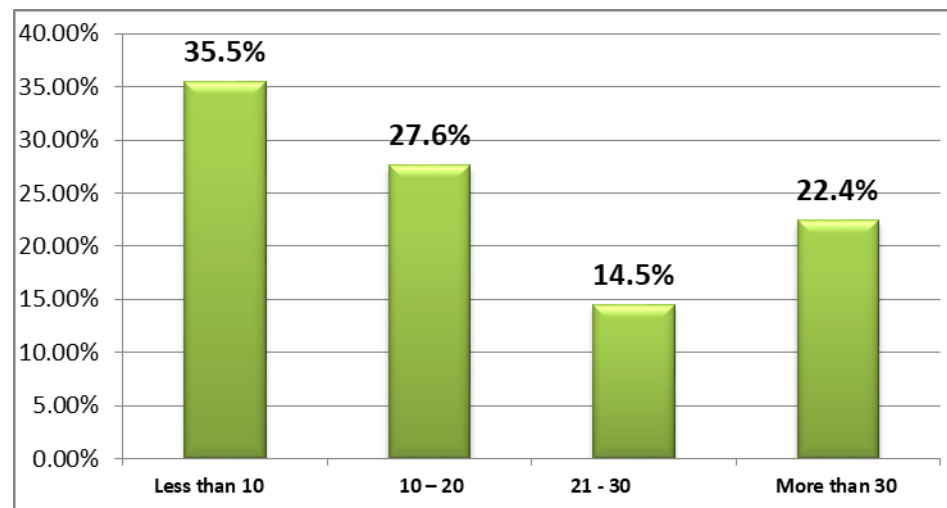


Figure 4.4 Frequencies for the Sample according to Number of implemented public Construction projects

5-The biggest public project in budget

The results in figure (4.5) show that the highest percentage (72.4%) of the study samples their biggest public project have been in term of budget "More than 1 million BD". About (14.5%) their biggest public project in budget are "700000–1000000 BD", whereas (13.2%) of the study sample their biggest public project has been in term of budget "Less than 700000 BD".

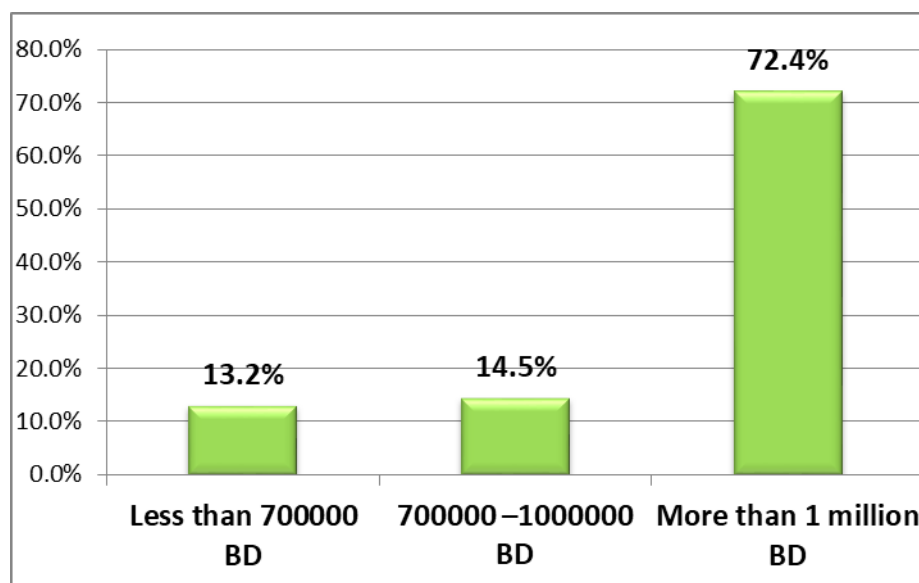


Figure 4.5 Frequencies for the Sample according to biggest public Construction project in term of budget

6-The General conditions of contract applied in a project

The results in figure (4.6) show that the (65.8%) of the study sample applied the "Customized" in General Conditions of Contract in a public project. The results also show that (28.9%) of the sample applied the "FIDIC" in General Conditions of Contract in a public project, (2.6%) applied the " NEC", and same percentage (2.6%) applied the "JCT" in General Conditions of Contract in a public project.

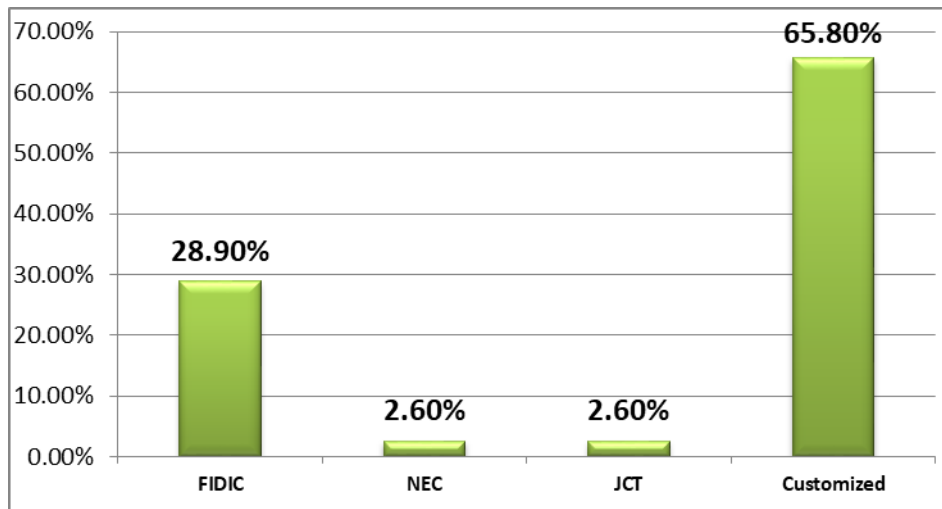


Figure 4.6 Frequencies for the Sample according to General Conditions of Contract applied in a public project

7-Times involved in a construction dispute

The results in figure (4.7) show that the (63.2%) of sample involved "1–5 times" in a construction dispute, and (22.4%) of the study sample involved "6–10 times" in a construction dispute. The results also show that (14.5%) of sample involved "More than 10 times" in a construction dispute.

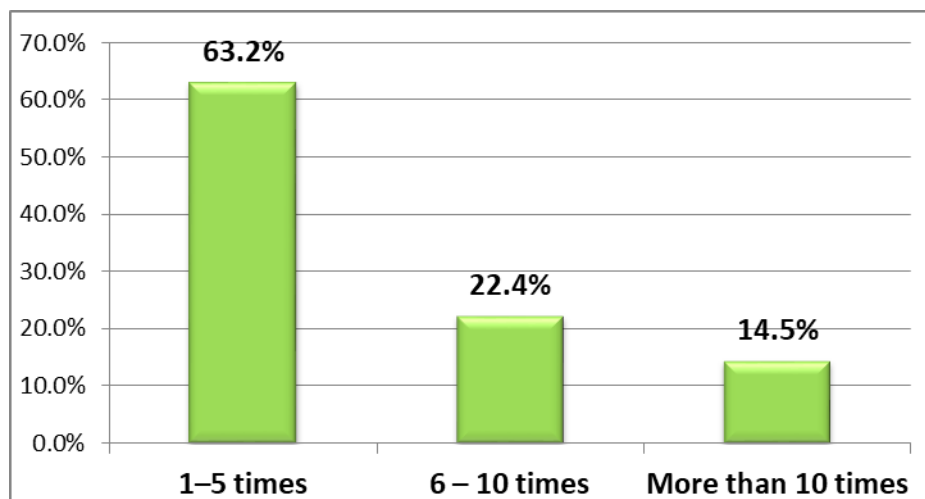


Figure 4.7 Frequencies for the Sample according to times involved in a construction dispute

4.1.3 Causes of Disputes in the public construction projects

Frequencies, percentages, means and standard deviations were calculated for the responses. RI is used to rank the causes, which causes, effects and DR methods. The results answer the research questions to verify the hypotheses.

The results are first presented for all categories then secondly repeated according to categories of organization.

Causes Related to the Project Process

- Causes Related to the Project Process for all categories of organization

The results in table (4.5) show that the Mean of "Causes of Disputes in public construction projects Related to the Project Process", was (3.084) and a relative importance of (61.7%).

The results in table (4.5) also show that the first of "Causes of Disputes in public construction projects Related to the Project Process " was "Delay in authority's approval" with a Mean (3.750) and a relative importance of (75.0%). This was followed by the Item "Lack of Planning" with a Mean (3.316) and a relative importance of (66.3%). The cause "Misinterpretation for terms of contract" ranked third with a Mean (3.303) and a relative importance of (66.1%). The cause "Delay the project by contractor" came in the fourth place with a Mean (3.250) and a relative importance of (65.0%). This was followed by "Inadequate detailed plans" ranked fifth with a Mean (3.224) and a relative importance of (64.5%).

Table 4.5 Means, Standard Deviations and Relative importance of Causes of Disputes in Public Construction Projects Related to the Project Process

n	Cause of dispute (Related to Project Process)	Means	Standard Deviations	Relative importance	Rank
13	Delay in authorities approval	3.750	0.982	75.0%	1
4	Lack of Planning	3.316	0.927	66.3%	2
1	Misinterpretation for terms of contract	3.303	0.864	66.1%	3
15	Delay the project by contractor	3.250	1.072	65.0%	4
7	Inadequate detailed plans	3.224	0.988	64.5%	5
14	Delay the project by owner	3.211	0.914	64.2%	6
3	Undefined project scope	3.197	0.980	63.9%	7
10	Failure to account the cost properly	3.197	1.046	63.9%	8
9	Error in design	3.079	1.068	61.6%	9
12	Improper scheduling	3.013	0.931	60.3%	10
8	Acceleration of the project	2.921	1.043	58.4%	11
2	Unclear Language of contract	2.829	1.025	56.6%	12
11	Improper feasibility study	2.829	0.985	56.6%	13
6	Illogical stakeholder/s expectations	2.763	0.877	55.3%	14
16	Delay the project by consultant	2.750	0.926	55.0%	15
5	Lack of Quality Control & Assurance	2.711	0.964	54.2%	16
	Total subscale	3.084	0.514	61.7%	

- Causes Related to the Project Process according to categories of organization

The results in table (4.6) show that the first of "Causes of Disputes in Public Construction Projects Related to the Project Process in Client organizations" was "Delay in authority's approval" with a Mean (3.917) and a relative importance of (78.3%). This was followed by the Item "Lack of Planning" with a Mean (3.667) and a relative importance of (73.3%). "Delay the project by contractor" ranked third with a Mean (3.639) and a relative importance of (72.8%). The results in table (4.6) also show that the first of "Causes of Disputes in Public Construction Projects Related to the Project Process in Contractor organizations" was

"Misinterpretation for terms of contract" with a Mean (3.444) and a relative importance of (68.9%). This was followed by the Item "Delay in authority's approval" with a Mean (3.222) and a relative importance of (64.4%). The cause "Unclear Language of contract" ranked third with a Mean (3.220) and a relative importance of (64.3%). The results in table (4.6) also show that the first of "Causes of Disputes in Construction Projects Related to the Project Process in Consultant organizations" was "Delay in authority's approval" with a Mean (3.909) and a relative importance of (78.2%). This was followed by the Item "Delay the project by contractor" with a Mean (3.682) and a relative importance of (73.6%). The cause "Delay the project by owner" ranked third with a Mean (3.500) and a relative importance of (70.0%).

Table 4.6 Means, Standard Deviations and Relative importance of Causes of Disputes in Public Construction Projects Related to the Project Process according to categories of organization.

n	Cause of dispute (Related to Project Process)	Client			Contractor			Consultant		
		Means	RI*	Rank	Means	RI*	Rank	Means	RI*	Rank
1	Misinterpretation for terms of contract	3.139	62.8%	9	3.444	68.9%	1	3.455	69.1%	4
2	Unclear Language of contract	2.611	52.2%	16	3.220	64.3%	3	2.864	57.3%	15
3	Undefined project scope	3.444	68.9%	5	2.664	53.2%	9	3.227	64.5%	8
4	Lack of Planning	3.667	73.3%	2	2.520	50.4%	11	3.409	68.2%	5
5	Lack of Quality Control & Assurance	2.722	54.4%	15	2.278	45.6%	15	3.045	60.9%	12
6	Illogical stakeholder/s expectations	2.778	55.6%	13	2.510	50.2%	12	2.955	59.1%	13
7	Inadequate detailed plans	3.528	70.6%	4	2.667	53.3%	8	3.182	63.6%	9
8	Acceleration of the project	2.889	57.8%	12	2.778	55.6%	7	3.091	61.8%	10
9	Error in design	3.444	68.9%	6	2.611	52.2%	10	2.864	57.3%	16
10	Failure to account the cost properly	3.278	65.6%	7	2.944	58.9%	4	3.273	65.5%	6
11	Improper feasibility study	2.944	58.9%	11	2.333	46.7%	14	3.045	60.9%	11
12	Improper scheduling	2.972	59.4%	10	2.782	55.7%	6	3.273	65.5%	7
13	Delay in authorities approval	3.917	78.3%	1	3.222	64.4%	2	3.909	78.2%	1
14	Delay the project by owner	3.167	63.3%	8	2.944	58.9%	5	3.500	70.0%	3
15	Delay the project by contractor	3.639	72.8%	3	1.944	38.9%	16	3.682	73.6%	2
16	Delay the project by consultant	2.778	55.6%	14	2.500	50.0%	13	2.909	58.2%	14

*Relative importance= (Mean/5*100)

Causes Related to Uncertainty of the Project

- Causes Related to Uncertainty of the Project for all categories

The results in table (4.7) show that the Mean of "public construction projects Related to Uncertainty of the Project", was (3.164) and a relative importance of (63.3%). The results in table (4.7) also show that the first of "Causes of Disputes in Public Construction Projects Related to Uncertainty of the Project" was "Variations" with a Mean (4.105) and a relative importance of (82.1%). This was followed by the Item "Scope change" with a Mean (3.737) and a relative importance of (74.7%). The cause "Unexpected site conditions" ranked third with a Mean (3.289) and a relative importance of (65.8%). The cause "Discrepancy in specification" came in the fourth place with a Mean (3.276) and a relative importance of (65.5%). The cause "Inadequate investigation before bidding" ranked fifth with a Mean (3.184) and a relative importance of (63.7%)

Table 4.7 Means, Standard Deviations and Relative importance of Causes of Disputes in Public Construction Projects Related to Uncertainty of the Project

n	Cause of dispute (Related to Uncertainty of the Project)	Means	Standard Deviations	Relative importance	Rank
3	Variations	4.105	0.793	82.1%	1
2	Scope change	3.737	0.900	74.7%	2
8	Unexpected site conditions	3.289	0.936	65.8%	3
6	Discrepancy in specification	3.276	0.988	65.5%	4
5	Inadequate investigation before bidding	3.184	1.029	63.7%	5
7	Fluctuation in price of materials	3.066	0.998	61.3%	6
11	Unexpected risks associated with the project's complexity	2.961	0.901	59.2%	7
4	Imprecise pre-feasibility stage	2.934	0.929	58.7%	8
10	Project stakeholders interference	2.816	0.976	56.3%	9
9	Suspension of work	2.763	0.907	55.3%	10
1	Unclear project objectives	2.671	1.051	53.4%	11
	Total subscale	3.164	0.552	63.3%	

- Causes Related to Uncertainty of the Project according to categories of organization:

The results in table (4.8) show that the first of "Causes of Disputes in Public Construction Projects Related to Uncertainty of the Project in Client organizations" was "Variations" with a Mean (4.083) and a relative importance of (81.7%). This was followed by the Item "Scope change" with a Mean (3.889) and a relative importance of (77.8%). The cause "Inadequate investigation before bidding" ranked third with a Mean (3.278) and a relative importance of (65.6%).

The results in table (4.8) also show that the first of "Causes of Disputes in Public Construction Projects Related to Uncertainty of the Project in Contractor organizations" was "Variations" with a Mean (4.111) and a relative importance of (82.2%). This was followed by the Item "Unexpected site conditions" with a Mean (3.667) and a relative importance of (73.3%). The cause "Fluctuation in price of materials" ranked third with a Mean (3.500) and a relative importance of (70.0%).

The results in table (4.8) also show that the first of "Causes of Disputes in Public Construction Projects Related to Uncertainty of the Project in Consultant organizations" was "Variations" with a Mean (4.136) and a relative importance of (82.7%). This was followed by the Item "Scope change" with a Mean (3.818) and a relative importance of (76.4%). "Discrepancy in specification " ranked third with a Mean (3.455) and a relative importance of (69.1%).

Table 4.8 Means, Standard Deviations and Relative importance of Causes of Disputes in Public Construction Projects Related to Uncertainty of the Project according to categories of organization

n	Cause of dispute (Related to Uncertainty of the Project)	Client			Contractor			Consultant		
		Means	RI*	Rank	Means	RI*	Rank	Means	RI*	Rank
1	Unclear project objectives	2.667	53.3%	11	2.389	47.8%	11	2.909	58.2%	11
2	Scope change	3.889	77.8%	2	3.333	66.7%	5	3.818	76.4%	2
3	Variations	4.083	81.7%	1	4.111	82.2%	1	4.136	82.7%	1

n	Cause of dispute (Related to Uncertainty of the Project)	Client			Contractor			Consultant		
		Means	RI*	Rank	Means	RI*	Rank	Means	RI*	Rank
4	Imprecise pre-feasibility stage	2.944	58.9%	6	2.887	57.7%	7	2.955	59.1%	10
5	Inadequate investigation before bidding	3.278	65.6%	3	2.889	57.8%	6	3.273	65.5%	4
6	Discrepancy in specification	3.111	62.2%	5	3.389	67.8%	4	3.455	69.1%	3
7	Fluctuation in price of materials	2.752	55.2%	9	3.500	70.0%	3	3.227	64.5%	5
8	Unexpected site conditions	3.194	63.9%	4	3.667	73.3%	2	3.136	62.7%	6
9	Suspension of work	2.750	55.0%	10	2.444	48.9%	10	3.045	60.9%	9
10	Project stakeholders interference	2.833	56.7%	8	2.500	50.0%	9	3.045	60.9%	8
11	Unexpected risks associated with the project's complexity	2.944	58.9%	7	2.778	55.6%	8	3.136	62.7%	7

* Relative importance= (Mean/5*100)

Causes Related to Personnel Engaged

- Causes Related to the Personnel Engaged for all categories of organization

The results in table (4.9) show that the Mean of "Causes of Disputes in public construction projects Related to Personal Engaged ", was (3.081) and a relative importance of (61.6%).

The results in table (4.9) also show that the first of "Causes of Disputes in Public Construction Projects Related to Personal Engaged" was "Lack of communication" with a Mean (3.789) and a relative importance of (75.8%). This was followed by the Item "Ineffective management control" with a Mean (3.421) and a relative importance of (68.4%). The cause "Improper coordination" ranked third with a Mean (3.342) and a relative importance of (66.8%). The cause "Improper employer representative" came in the fourth place with a Mean (3.132) and a relative importance of (62.6%). This was followed by "Skill shortage" ranked fifth with a Mean (3.000) and a relative importance of (60.0%).

Table 4.9 Means, Standard Deviations and Relative importance of Causes of Disputes in Public Construction Projects Related to Personal Engaged

n	Cause of dispute (Related to Personal Engaged)	Means	Standard Deviations	Relative importance	Rank
5	Lack of communication	3.789	1.011	75.8%	1
6	Ineffective management control	3.421	1.023	68.4%	2
1	Improper coordination	3.342	0.888	66.8%	3
7	Improper employer representative	3.132	0.984	62.6%	4
2	Skill shortage	3.000	0.952	60.0%	5
4	Differing goals	2.539	0.901	50.8%	6
3	Cultural differences	2.342	1.027	46.8%	7
	Total subscale	3.081	0.639	61.6%	

- Causes Related to Personal Engaged according to categories of organization:

The results in table (4.10) show that the first of "Causes of Disputes in Public Construction Projects Related to Personal Engaged in Client organizations" was "Lack of communication" with a Mean (3.667) and a relative importance of (73.3%). This was followed by the Item "Ineffective management control" with a Mean (3.500) and a relative importance of (70.0%). The cause "Improper coordination" ranked third with a Mean (3.361) and a relative importance of (67.2%).

The results in table (4.10) also show that the first of "Causes of Disputes in Public Construction Projects Related to Personal Engaged in Contractor organizations" was "Lack of communication" with a Mean (3.889) and a relative importance of (77.8%). This was followed by the Item "Improper employer representative" with a Mean (3.333) and a relative importance of (66.7%). The cause "Ineffective management control" ranked third with a Mean (3.222) and a relative importance of (64.4%).

The results in table (4.10) also show that the first of "Causes of Disputes in Public Construction Projects Related to Personal Engaged in Consultant organizations" was "Lack of communication" with a Mean (3.909) and a relative importance of (78.2%). This was followed by the Item "Improper coordination" with a Mean (3.727) and a relative importance of (74.5%). The cause "Ineffective management control" ranked third with a Mean (3.455) and a relative importance of (69.1%).

Table 4.10 Means, Standard Deviations and Relative importance of Causes of Disputes in Public Construction Projects Related to Personal Engaged according to categories of organization

N	Cause of dispute (Related to Personal Engaged)	Client			Contractor			Consultant		
		Means	RI*	Rank	Means	RI*	Rank	Means	RI*	Rank
1	Improper coordination	3.361	67.2%	3	2.833	56.7%	4	3.727	74.5%	2
2	Skill shortage	3.028	60.6%	4	2.722	54.4%	5	3.182	63.6%	5
3	Cultural differences	2.000	40.0%	7	2.556	51.1%	6	2.727	54.5%	7
4	Differing goals	2.389	47.8%	6	2.444	48.9%	7	2.864	57.3%	6
5	Lack of communication	3.667	73.3%	1	3.889	77.8%	1	3.909	78.2%	1
6	Ineffective management control	3.500	70.0%	2	3.222	64.4%	3	3.455	69.1%	3
7	Improper employer representative	2.972	59.4%	5	3.333	66.7%	2	3.227	64.5%	4
	Total subscale	2.988	59.8%		3.000	60.0%		3.299	66.0%	

* Relative importance= (Mean/5*100)

4.1.4 Effects of Disputes in the public construction projects

- Effects of Disputes for all categories of organization

The results in table (4.11) show that the Mean of "Effects of disputes in public building projects in Bahrain ", was (3.347) and a relative importance of (66.9%). The results in table (4.11) also show that the first of "Effects of disputes in public construction projects in Bahrain" was "Project performance (slow work progress)" with a Mean (3.618) and a relative importance of (72.4%). This was followed by the effect "Waste of efforts and time" with a Mean (3.566) and a relative importance of (71.3%). The effect "Delay of public benefit" ranked third with a Mean

(3.487) and a relative importance of (69.7%). The effect "Financial losses/ Accumulations" came in the fourth place with a Mean (3.481) and a relative importance of (69.6%). The effect "Relationships between parties" ranked fifth with a Mean (3.053) and a relative importance of (61.1%).

Table 4.11 Means, Standard Deviations and Relative importance of the Responses of the Sample on the Effects of disputes in public construction projects in Bahrain

n	Effect of Dispute	Means	Standard Deviations	Relative importance	Rank
2	Project performance (slow work progress)	3.618	0.879	72.4%	1
6	Waste of efforts and time	3.566	0.998	71.3%	2
1	Delay of public benefit	3.487	1.052	69.7%	3
5	Financial losses/ Accumulations	3.481	1.000	69.6%	4
4	Relationships between parties	3.053	0.922	61.1%	5
3	Reputation of one party	2.868	0.900	57.4%	6
	Total subscale	3.347	0.693	66.9%	

-Effects of disputes in public construction projects in Bahrain

according to categories of organization:

The results in table (4.12) show that the first of "Effects of disputes in public construction projects in Client organizations in Bahrain" was "Project performance (slow work progress)" with a Mean (3.694) and a relative importance of (73.9%). This was followed by the effect "Delay of public benefit" with a Mean (3.556) and a relative importance of (71.1%). The effect "Waste of efforts and time" ranked third with a Mean (3.528) and a relative importance of (70.6%).

The results in table (4.12) also show that the first of "Effects of disputes in public construction projects in Contractor organizations in Bahrain" was "Delay of public benefit" with a Mean (3.224) and a relative

importance of (64.5%). This was followed by the effect "Waste of efforts and time" with a Mean (3.222) and a relative importance of (64.4%). The effect "Financial losses/ Accumulations" ranked third with a Mean (3.167) and a relative importance of (63.3%).

The results in table (4.12) also show that the first of "Effects of disputes in public construction projects in Consultant organizations in Bahrain" was "Project performance (slow work progress)" with a Mean (3.955) and a relative importance of (79.1%). This was followed by the effect "Waste of efforts and time" with a Mean (3.909) and a relative importance of (78.2%). The effect "Financial losses/ Accumulations" ranked third with a Mean (3.727) and a relative importance of (74.5%).

Table 4.12 Means, Standard Deviations and Relative importance of the Responses of the Sample on the Effects of disputes in public construction projects in Bahrain according to categories of organization

N	Effect of Dispute	Client			Contractor			Consultant		
		Means	RI*	Rank	Means	RI*	Rank	Means	RI*	Rank
1	Delay of public benefit	3.556	71.1%	2	3.224	64.5%	1	3.591	71.8%	4
2	Project performance (slow work progress)	3.694	73.9%	1	3.058	61.2%	4	3.955	79.1%	1
3	Reputation of one party	2.722	54.4%	6	3.054	61.0%	6	2.955	59.1%	6
4	Relationships between parties	3.028	60.6%	5	3.056	61.1%	5	3.091	61.8%	5
5	Financial losses/ Accumulations	3.500	70.0%	4	3.167	63.3%	3	3.727	74.5%	3
6	Waste of efforts and time	3.528	70.6%	3	3.222	64.4%	2	3.909	78.2%	2
	Total subscale	3.338	66.8%		3.130	62.6%		3.538	70.8%	

* Relative importance= (Mean/5*100)

4.1.5 DR methods in the public construction projects

-DR methods in public construction projects in Bahrain for all categories of organization:

The results in table (4.13) show that the Mean of "Disputes resolution in public building projects in Bahrain", was (2.879) and a relative importance of (57.6%). The results in table (4.13) also show that the first of "Disputes resolution in public building projects in Bahrain" was

"Mediation" with a Mean (3.355) and a relative importance of (67.1%). This was followed by the Item "Ad hoc arbitration" with a Mean (3.026) and a relative importance of (60.5%). The DR "Institutional arbitration" ranked third with a Mean (2.908) and a relative importance of (58.2%). The DR "Litigation" came in the fourth place with a Mean (2.816) and a relative importance of (56.3%). The DR "Adjudication" ranked fifth with a Mean (2.289) and a relative importance of (45.8%).

Table 4.13 Means, Standard Deviations and Relative importance of the Responses of the Sample on the Disputes resolution in public construction projects in Bahrain

n	DR method	Means	Standard Deviations	Relative importance	Rank
1	Mediation	3.355	1.055	67.1%	1
2	Ad hoc arbitration	3.026	0.993	60.5%	2
3	Institutional arbitration	2.908	1.009	58.2%	3
5	Litigation	2.816	1.092	56.3%	4
4	Adjudication	2.289	0.964	45.8%	5
	Total subscale	2.879	0.574	57.6%	

-DR methods in public construction projects in Bahrain according to categories of organization:

The results in table (4.14) show that the first of "Disputes resolution in public construction projects in Client organizations in Bahrain" was "Mediation" with a Mean (3.333) and a relative importance of (66.7%). This was followed by the Item "Ad hoc arbitration" with a Mean (2.972) and a relative importance of (59.4%). The DR "Institutional arbitration " ranked third with a Mean (2.833) and a relative importance of (56.7%). The results in table (4.14) also show that the first of "Disputes resolution in public construction projects in Contractor organizations in Bahrain" was "Ad hoc arbitration" with a Mean (3.389) and a relative

importance of (67.8%). This was followed by the Item "Mediation" with a Mean (3.333) and a relative importance of (66.7%). The DR "Institutional arbitration" ranked third with a Mean (3.222) and a relative importance of (64.4%).

The results in table (4.14) also show that the first of "Disputes resolution in public construction projects in Consultant organizations in Bahrain" was "Mediation" with a Mean (3.409) and a relative importance of (68.2%). This was followed by the Item "Litigation" with a Mean (2.955) and a relative importance of (59.1%). The DR "Ad hoc arbitration" ranked third with a Mean (2.818) and a relative importance of (56.4%).

Table 4.14 Means, Standard Deviations and Relative importance of the Responses of the Sample on the Disputes resolution in public building projects in Bahrain according to categories of organization

N	DR method	Client			Contractor			Consultant		
		Means	RI*	Rank	Means	RI*	Rank	Means	RI*	Rank
1	Mediation	3.333	66.7%	1	3.333	66.7%	2	3.409	68.2%	1
2	Ad hoc arbitration	2.972	59.4%	2	3.389	67.8%	1	2.818	56.4%	3
3	Institutional arbitration	2.833	56.7%	3	3.222	64.4%	3	2.773	55.5%	4
4	Adjudication	2.167	43.3%	5	2.278	45.6%	5	2.500	50.0%	5
5	Litigation	2.667	53.3%	4	2.944	58.9%	4	2.955	59.1%	2
	Total subscale	2.794	55.9%		3.033	60.7%		2.891	57.8%	

* Relative importance= (Mean/5*100)

The Committee of Arbitration:

The results in table (4.15) show that (56) respondents said that The Committee of Arbitration mostly includes "Engineers and Lawyers" which is the highest percentage of the sample (73.7%). The results also show that (13.2%) of the sample said that The Committee of Arbitration mostly include "Engineers", and same percentage (13.2%) said that The Committee of Arbitration mostly include "Lawyers".

Table 4.15 Frequencies and Percentage for the Committee of Arbitration -The arbitration method preferred.

the Committee of Arbitration	Frequency	Percentage
Engineers	10	13.2%
Lawyers	10	13.2%
Engineers and Lawyers	56	73.7%
Total	76	100%

The results in table (4.16) show that (31) respondents said that The arbitration method preferred is "Ad hoc arbitration" which is the highest percentage of the sample (40.8%). The results also show that (39.5%) of the sample said that the arbitration method preferred is "Institutional arbitration". And (19.7%) of the sample said that The Committee of Arbitration mostly include "any type ".

Table 4.16 Frequencies and Percentage for the arbitration method preferred

the arbitration method preferred	Frequency	Percentage
Ad hoc arbitration	31	40.8%
Institutional arbitration	30	39.5%
any type	15	19.7%
Total	76	100%

4.1.6 Hypotheses test and findings

Causes of disputes according to study variables ($H_{0.1} : H_{alt.1}$)

The main hypotheses:

$H_{0.1}$: There are no significant differences in the level of Causes of Disputes in the Construction Public Sector in Bahrain according to study variables (categories of organization, Type of projects, working experience, Number of implemented projects).

$H_{alt.1}$: There are significant differences in the level of Causes of Disputes in the Construction Public Sector in Bahrain according to study variables (categories of organization, Type of projects, working experience, Number of implemented projects).

Causes of disputes according to categories of organization variable

Means and standard deviations for the responses of sample in Causes of Disputes subscale were calculated according to the categories of organization variable, the results are shown in the following table:

Table 4. 17 Means and standard deviations for the responses of sample in Causes of Disputes subscale According to the categories of organization

categories of organization	means	standard deviations
Client	3.126	0.431
Contractor	2.889	0.437
Consultant	3.262	0.530

The results in table show that means for the responses of sample in Causes of Disputes subscale According to the categories of organization, to investigate significant differences between means we using one way ANOVA :

Table 4. 18 Significant differences in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to categories of organization

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.397	2	0.699	3.264	0.044
Within Groups	15.628	73	0.214		
Total	17.026	75			

The results in table show that there are significant differences (P-value=0.044) in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to categories of organization for the benefit of Consultants.

Causes of disputes according to Type of projects variable

Means and standard deviations for the responses of sample in Causes of Disputes subscale were calculated according to Type of projects variable, the results are shown in the following table:

Table 4. 19 Means and standard deviations for the responses of sample in Causes of Disputes subscale According to Type of projects

Type of projects	means	standard deviations
Building and Utilities (Building works)	3.029	0.461
Roads and Infrastructure (Civil works)	3.117	0.414
both the above	3.156	0.552

The results in table show that means for the responses of sample in Causes of Disputes subscale According to Type of projects, one way ANOVA is used to investigate significant differences between means :

Table 4. 20 significant differences in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to Type of projects

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.182	2	0.091	0.395	0.675
Within Groups	16.843	73	0.231		
Total	17.026	75			

The results in table show that there are no significant differences (P-value=0.675) in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to Type of projects.

Causes of disputes according to working experience variable

Means and standard deviations for the responses of sample in Causes of Disputes subscale were calculated according to working experience variable, the results are shown in the following table:

Table 4. 21 Means and standard deviations for the responses of sample in Causes of Disputes subscale According to working experience

Working Experience	Means	Standard Deviations
Less than 5 years	3.034	0.267
5 - 10 years	3.175	0.603
11 - 20 years	3.024	0.338
More than 20 years	3.135	0.490

The results in table show that means for the responses of sample in Causes of Disputes subscale According to working experience, , one way ANOVA is used to investigate significant differences between means:

Table 4. 22 Significant differences in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to working experience

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.308	3	0.103	0.443	0.723
Within Groups	16.717	72	0.232		
Total	17.026	75			

The results in table show that there are no significant differences (P-value=0.723) in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to working experience.

Causes of disputes according to Number of implemented projects variable

Means and standard deviations for the responses of sample in Causes of Disputes subscale were calculated according to the Number of implemented projects variable, the results are shown in the following table:

Table 4. 23 Means and standard deviations for the responses of sample in Causes of Disputes subscale According to Number of implemented projects

Number of implemented projects	means	standard deviations
Less than 10	3.165	0.533
10 – 20	3.028	0.474
21 - 30	2.984	0.383
More than 30	3.202	0.443

The results in table show that means for the responses of sample in Causes of Disputes subscale According to Number of implemented projects, , one way ANOVA is used to investigate significant differences between means:

Table 4. 24 Significant differences in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according Number of implemented projects

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.541	3	0.180	0.788	0.505
Within Groups	16.484	72	0.229		
Total	17.026	75			

The results in table show that there are no significant differences (P-value=0.505) in the level of "Causes of Disputes in Public Construction Projects in Bahrain" according to Number of implemented projects.

Effects of disputes according to study variables ($H_{0.2}$: $H_{alt.2}$)

The main hypotheses:

$H_{0.2}$: There are no significant differences in the level of effects of Disputes in the Construction Public Sector in Bahrain according to study variables (categories of organization, Type of projects, working experience, Number of implemented projects).

$H_{alt.2}$: There are significant differences in the level of effects of Disputes in the Construction Public Sector in Bahrain according to study variables (categories of organization, Type of projects, working experience, Number of implemented projects).

Effects of disputes according to categories of organization variable

Means and standard deviations for the responses of sample in Effects of disputes subscale were calculated according to the categories of organization variable, the results are shown in the following table:

Table 4. 25 Means and standard deviations for the responses of sample in Effects of disputes subscale According to the categories of organization

categories of organization	means	standard deviations
Client	3.338	0.807
Contractor	3.130	0.406
Consultant	3.538	0.646

The results in table show that means for the responses of sample in Effects of disputes subscale According to the categories of organization, , one way ANOVA is used to investigate significant differences between means:

Table 4. 26 Significant differences in the level of "Effects of disputes in public Construction projects in Bahrain" according to categories of organization

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.655	2	0.827	1.757	0.180
Within Groups	34.387	73	0.471		
Total	36.042	75			

The results in table show that there are no significant differences (P-value=0.180) in the level of "Effects of disputes in public Construction projects in Bahrain" according to categories of organization.

Effects of disputes according to Type of projects variable

Means and standard deviations for the responses of sample in Effects of disputes subscale were calculated according to Type of projects variable, the results are shown in the following table:

Table 4. 27 Means and standard deviations for the responses of sample in Effects of disputes subscale According to Type of projects

Type of projects	means	standard deviations
Building and Utilities (Building works)	3.298	0.649
Roads and Infrastructure (Civil works)	3.414	0.783
both the above	3.310	0.641

The results in table show that means for the responses of sample in Effects of disputes subscale According to Type of projects, one way ANOVA is used to investigate significant differences between means:

Table 4. 28 Significant differences in the level of "Effects of disputes in public Construction projects in Bahrain" according to Type of projects

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.214	2	0.107	0.218	0.805
Within Groups	35.829	73	0.491		
Total	36.042	75			

The results in table show that there are no significant differences (P-value=0.805) in the level of "Effects of disputes in public Construction projects in Bahrain" according to Type of projects.

Effects of disputes according to Working Experience variable

Means and standard deviations for the responses of sample in Effects of disputes subscale were calculated according to working experience variable, the results are shown in the following table:

Table 4. 29 Means and standard deviations for the responses of sample in Effects of disputes subscale According to working experience

working experience	means	standard deviations
Less than 5 years	3.595	0.439
5 - 10 years	3.326	0.813
11 - 20 years	3.225	0.691
More than 20 years	3.393	0.640

The results in table show that means for the responses of sample in Effects of disputes subscale According to working experience, one way ANOVA is used to investigate significant differences between means:

Table 4. 30 Significant differences in the level of "Effects of disputes in public Construction projects in Bahrain" according to working experience

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.793	3	0.264	0.540	0.657
Within Groups	35.250	72	0.490		
Total	36.042	75			

The results in table show that there are no significant differences (P-value=0.657) in the level of "Effects of disputes in public building projects in Bahrain" according to working experience.

Effects of disputes according to Number of implemented projects

Means and standard deviations for the responses of sample in Effects of disputes subscale were calculated according to the Number of implemented projects variable, the results are shown in the following table:

Table 4. 31 Means and standard deviations for the responses of sample in Effects of disputes subscale According to Number of implemented projects

Number of implemented projects	means	standard deviations
Less than 10	3.278	0.494
10 – 20	3.222	0.599
21 - 30	3.046	0.538
More than 30	3.804	0.956

The results in table show that means for the responses of sample in Effects of disputes subscale According to Number of implemented projects, one way ANOVA is used to investigate significant differences between means:

Table 4. 32 Significant differences in the level of "Effects of disputes in public Construction projects in Bahrain" according Number of implemented projects

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.006	3	1.669	3.871	0.013
Within Groups	31.037	72	0.431		
Total	36.042	75			

The results in table show that there are significant differences (P-value=0.013) in the level of "Effects of disputes in public Construction projects in Bahrain" according to Number of implemented projects for the benefit of More than 30 projects.

DR according to study variables ($H_{0.3}$: $H_{alt.3}$)

The main hypotheses:

$H_{0.3}$: There are no significant differences in the level of methods of resolution of Disputes in the Construction Public Sector in Bahrain according to study variables (categories of organization, Type of projects, working experience, Number of implemented projects).

$H_{alt.3}$: There are significant differences in the level of methods of resolution of Disputes in the Construction Public Sector in Bahrain according to study variables (categories of organization, Type of projects, working experience, Number of implemented projects).

DR according to Number of the categories of organization variable

Means and standard deviations for the responses of sample in Disputes resolution subscale were calculated according to the categories of organization variable, the results are shown in table 4.33:

Table 4. 33 Means and standard deviations for the responses of sample in Disputes resolution subscale According to the categories of organization

categories of organization	means	standard deviations
Client	2.794	0.477
Contractor	3.033	0.550
Consultant	2.891	0.722

The results in table show that means for the responses of sample in Disputes resolution subscale According to the categories of organization, one way ANOVA is used to investigate significant differences between means :

Table 4. 34 Significant differences in the level of "Disputes resolution in public Construction projects in Bahrain" according to categories of organization

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.689	2	0.345	1.047	0.356
Within Groups	24.037	73	0.329		
Total	24.726	75			

The results table 4.34 show that there are no significant differences (P-value=0.356) in the level of "Disputes resolution in public Construction projects in Bahrain" according to categories of organization.

DR according to Type of projects variable

Means and standard deviations for the responses of sample in Disputes resolution subscale were calculated according to Type of projects variable, the results are shown in the following table:

Table 4. 35 Means and standard deviations for the responses of sample in Disputes resolution subscale According to Type of projects

Type of projects	means	standard deviations
Building and Utilities (Building works)	2.684	0.691
Roads and Infrastructure (Civil works)	3.083	0.517
both the above	2.800	0.493

The results in table show that means for the responses of sample in Disputes resolution subscale According to Type of projects, one way ANOVA is used to investigate significant differences between means:

Table 4. 36 Significant differences in the level of "Disputes resolution in public construction projects in Bahrain" according to Type of projects

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.100	2	1.050	3.387	0.039
Within Groups	22.627	73	0.310		
Total	24.726	75			

The results in table show that there are significant differences (P-value=0.039) in the level of "Disputes resolution in public Construction projects in Bahrain" according to Type of projects for the benefit of Roads and Infrastructure (Civil works) projects.

DR according to Working Experience variable

Means and standard deviations for the responses of sample in Disputes resolution subscale were calculated according to working experience variable, the results are shown in the following table:

Table 4. 37 Means and standard deviations for the responses of sample in Disputes resolution subscale According to working experience

working experience	means	standard deviations
Less than 5 years	2.600	0.702
5 - 10 years	2.958	0.472
11 - 20 years	2.780	0.531
More than 20 years	2.960	0.653

The results in table show that means for the responses of sample in Disputes resolution subscale According to working experience, one way ANOVA is used to investigate significant differences between means:

Table 4. 38 Significant differences in the level of "Disputes resolution in public construction projects in Bahrain" according to working experience

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.056	3	0.352	1.071	0.367
Within Groups	23.670	72	0.329		
Total	24.726	75			

The results in table show that there are no significant differences (P-value=0.367) in the level of "Disputes resolution in public Construction projects in Bahrain" according to working experience.

DR according to Number of implemented projects variable

Means and standard deviations for the responses of sample in Disputes resolution subscale were calculated according to the Number of implemented projects variable, the results are shown in the following table:

Table 4. 39 Means and standard deviations for the responses of sample in Disputes resolution subscale According to Number of implemented projects

Number of implemented projects	means	standard deviations
Less than 10	2.941	0.610
10 – 20	2.876	0.708
21 - 30	2.691	0.413
More than 30	2.906	0.419

The results in table show that means for the responses of sample in Disputes resolution subscale According to Number of implemented projects, one way ANOVA is used to investigate significant differences between means:

Table 4. 40 Significant differences in the level of "Disputes resolution in public construction projects in Bahrain" according Number of implemented projects

Source of variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.505	3	0.168	0.500	0.684
Within Groups	24.222	72	0.336		
Total	24.726	75			

The results in table show that there are no significant differences (P-value=0.684) in the level of "Disputes resolution in public Construction projects in Bahrain" according to Number of implemented projects.

Hypothesis test results:

All null-hypothesis assumptions are true, differences in means are not significant at $\alpha = 0.05$ because all P-values > 0.05) except, the consultants category of organization who were more able to define the real causes of disputes. The ANOVA test also shows that the respondents with more than 30 projects experience were more able to define the effects of disputes on the industry. The DR used for the civil work type of project is significant in the field.

4.2 Discussion of Results:

4.2.1 Research Summery and main findings

The research takes the form of a typical academic dissertation report. It is divided into four chapters. They are incorporated to cover aspects of disputes in public construction projects.

Issues related to the problem of arising disputes in the field are examined. To begin with, an overview of theories, scholarly materials and case studies concerning disputes in the public construction industry. Then, presenting project phases and parties' involved, gradually into the concerned main case study which is MOW in the Kingdom of Bahrain. Discussing disputes types, causes and effects in construction projects as the main problem. Defining DR and discussing the available ADR in the field. Two public project's case studies were presented with the researcher comments. The local case study had two disputes. One between the client and the contractor and it was resolved by institutional Arbitration. The client also went into dispute with the project consultant

and it was resolved by ad hoc arbitration. Mediation was used as a resolution method in the international case study.

By restating the research objectives, a multi method approach was used in the methodology, which is a procedure of collecting, analyzing and combining both qualitative and quantitative data at some stage of the research process to understand the problem more completely. The relative importance of significant factors contributing to disputes in Bahrain is identified and evaluated as follows:

The general information obtained from the respondents reflects on the nature of public construction projects. Most respondents were quantity surveyors, project managers, and head of departments. Civil work (roads and infrastructure) was the most public type of projects.

The results also show that, most of the respondents have been involved in less than 10 projects. However, the budget allocated for most of the projects is more than 1 million Bahraini Dinars. This means that public projects are key projects in the kingdom. Although the number of projects is limited, The cost of each is very high.

Most of the respondents experienced the customized –modified- conditions of the contract and were involved in disputes at least one to five times. Which proves dispute occurrence in the ministry projects.

Causes of disputes in the public construction projects related to Project Process for all categories of organization include "Delay in authorities' approval", "Lack of Planning" and "Misinterpretation of the terms of contract".

Both the client and the consultant agree that the first cause of dispute related to process is the "Delay in authorities' approval", while the contractors first cause is "Misinterpretation of the terms of contract".

All categories of organization agree that "Variations" are the first cause of dispute related to Uncertainty of the Public Project, followed by "Scope change" and "Unexpected site conditions" for all categories.

The results also show that all categories of organization agree that "Lack of communication" is the first cause of dispute related to “Personal Engaged”, followed by "Ineffective management control" and "Improper coordination" for all categories.

Both the client and consultants agree with the overall survey result that disputes affect project performance, i.e. "slow work progress" while the first effect for the contractors is "Delay of public benefit" which came the second cause in overall effects, followed by "Waste of efforts and time".

The results also show an agreement between the client and consultants in terms of the most suitable DR. "Mediation" ranked highest among all DRs. The first DR recommended for the contractor is “Ad hoc arbitration”, which ranked second DR in overall, followed by "Institutional arbitration".

To study the hypothesis, Overall Means, Standard Deviations, and Relative Importance of Subscales “Causes, effects & DR of Disputes” were calculated According to the independent variables “categories of organization, Type of projects, working experience, Number of implemented projects” then Investigate Significant Differences between Overall Means using One Way ANalysis Of VAriance (ANOVA) which is used to determine whether there is a significant difference in means between more than two groups.

4.2.2 Research Conclusion :

The research draws attention to an inevitable problem that any construction project may fall into, how disputes negatively affect the country's economy and the public benefit and also negatively effect the parties involved in the dispute. Successful construction projects shall get accomplished within time and allocated budget, that is an indictor of an effiecent construction industry.

Considering proactive actions to mitigate and avoid disputes is essential at early stages of theproject. The size of the project, allocated budget and uniqueness of the projects in term of parties involved, type of work, project location, technology used and design also contribute to the emergence of conflicts.

Disputes causes in the public construction industry in Bahrain, are Delay in authorities approval related to Project Process,Variations related to Project Uncertainty and Lack of Communication related to people engaged.

The main effect of dispute is on the project performance . Disputes slow the work progress.While the most frequently used DR is Mediation.

Disputes can be avoided by proactive methods.However, once they occur non-advererial ADR has to utilized properly. They are fast, efficient and cost-effective. Good dispute management involves selecting and using the most appropriate resolution procedure available. As the government's objective is to ensure that relationships between the client and other construction parties are non-adversarial.

Although MOW uses mediation, it has not been a successful approach. To the fact that most of the MOW cases follow the two-tire structure: mediation followed by arbitration. The reasons behind not using mediation to reach a final settlement was not clarified. The survey question asked for the most frequently used DR, not the final DR that resolves the dispute. In my opinion, there is a misunderstanding of the use of mediation in the MOW. Fortunately, the BCDR shall be utilized in the recent projects' conditions of contract. BCDR is best suited for managing public construction disputes because it utilizes the non-adversarial methods properly. Although, the addition include institutional arbitration in the BCDR, Ad hoc arbitration is still an option once agreed earlier in the contract.

Finally, the objectives of the research were achieved. Recommendations are given below based on the above.

4.3 Study's recommendations:

This section presents the general recommendations for the proper management of public construction projects in order to avoid or at least mitigate disputes in public construction projects. The section also presents some suggestions for future studies.

4.3.1 Research Recommendations

The construction industry is an important part of the economy and thereby contributes a significant amount of income to the Bahrain government. Bahrain government should exploit money for the public benefit instead of wasting it in disputes. It is one of the objectives of the research to find solutions for construction disputes.

Recommendations:

Project-based organizations, like case study considered need to adopt new approaches to avoid/resolve disputes, as follows:

Before the MOW engages in any project, it is vital to consider the following proactive methods:

- Draw up a risk management plan to guide their strategic planning.
- Define the adequate communication channels; assign well-trained personnel with strong communication skills.
- Ensure timely payment schedules.
- Project operation should be independent to ensure little political interference.
- Keep abreast of new laws, information and technology.
- Activate PMO role by implementing PMS right from early stages of the project.
- Deal wisely with the claims and disagreements when they are still small.

With today's complex types of projects, high cost allocated and interrelated issues, it is nearly impossible to totally avoid disputes. Thus, the following reactive resolution method may be considered:

- Mediation is the applicant DR to public construction projects. Decision makers and personnel involved shall do their best to utilize such efficient method to their benefit. CED should be more aware of exploiting such method and more trained. Otherwise, BCDR shall be involved in future disputes to resolve disputes with mediation.
- Arbitration shall be the second DR for the MOW. Due to the projects nature, arbitration tends to become as complex as litigation because risk exposure for MOW increases with such method.

In such type of projects, all parties shall consider the following:

- Lessons learnt are important documents, which all parties must be involved in record through the project life cycle. Thus, Knowledge Management Directorate (KM) in MOW shall be activated. It shall mainly identify problems and the way it shall be resolved.
- Project progress reporting among parties.
- QA and QC on agreed interval.
- Project budgeting shall be better studied with flexible margins due to external influences.
- The contract shall be very clear and accurate and detailed from the very beginning in term of clauses, procedures and specification.
- To avoid delays in authorities approval, it is recommended that all approvals and certificates required are to be obtained prior the start date of the contract. It is very important to be in hand after feasibility study.

Delays in authorities approval includes the initial project requirements, such as survey certificate, civil defense and electricity approvals, And also those required during the construction. MOW must ensure obtain the approvals within the time. This is the project manager's responsibility. Tasks and roles must be clear. Following up with Central Planning Office (CPO), any permit needed to avoid delays.

- Project Management Office (PMO) must has a role among parties. It shall include a person who is aware of contractual issues, (contract terms, date, warning letters, specification and consequences). Thus, in case of any changes, the PMO must be aware of it.
- Create seminars or study groups to spread awareness and clarification among all staff during project implementation.

- Encourage communication and dialogue to solve any problem or recommend suggestions.
- Means of formal communication should be very clear from the beginning. It shall be very clear with nowadays applications.
- Assign a Checklist controller. Before awarding the contract or before start of the work, there must be a checklist with dates for such as Site clearance and Electricity and Water (EWA) requirements.
- Proper Document controller must be used (Nowadays, soft wares and IT work).
- Mediation shall be fully and properly utilized .Thus, the mediator is a must to be agreed on in prior.
- Misinterpretation of terms of contract -because of not clear tender or specification- shall be avoided by providing a detailed bill of quantity (BOQ) like suppliers and amounts. Also to avoid any misinterpretation of terms of contract, develop a procedure to clarify any doubt. This procedure must be before signing the agreement.
- Prior agreement must name the title of the authorized personnel for change orders. This shall be clearly stated under variation clauses in the contract. Approvals for variations must be obtained from both parties, specifically from the authorized person or who is in behalf. Thus, any variation shall not proceed without the approval of the authorized person.
- New DR Mechanism can be adopted for Ministries projects with similar nature which is Dispute Avoidance Adjudication Board (DAAB):

The DAAB shall be assigned by the project parties at the early stages of the project. The DAAB are independent, qualified, expert members. Who become familiar with the parties and key individuals

and deal with issues once they arise. They play two main non-adversarial methods, as follows:

1-Advisory Role

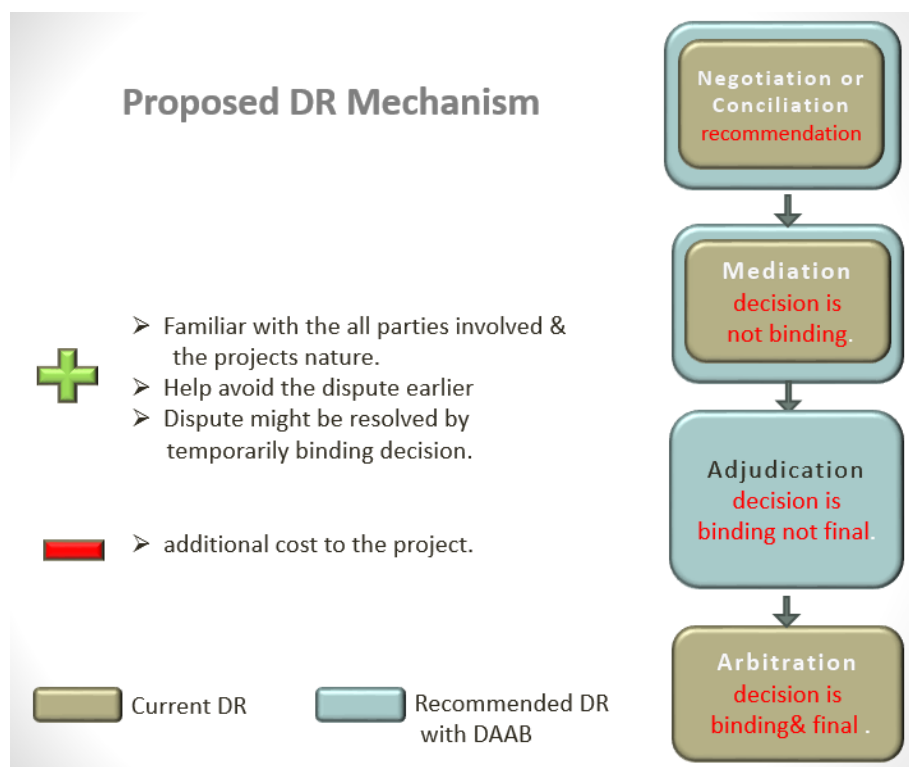
- To give recommendations whenever a conflict occur.
- To follow up the project progress, visit the site, read important communications.
- To assist the parties in case of any disagreement.

The parties will not be bound to act on any advice given in the process. Although, it is for the project benefit to do so.

2-Adjudicatory Role

Once dispute was not settled by mediation. The board use adjudication issues a decision which is temporarily binding.

Figure 4. 8 Proposed DR Mechanism for MOW (Illustrated by the researcher)



4.3.2 Future Recommendations

- Similar research can be carried out for other ministries within the public sector projects in Bahrain like Electricity and Water (EWA) and Ministry of Housing (MOH).
- Similar type of research can be done for any sector in Bahrain.

Moreover, since predominant causes and effects of disputes are identified, future studies can examine ways in which each cause and effect within the construction industry can be enhanced as a dispute avoidance measure.

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Appendices

Appendix A: Dispute clauses in conditions of contract of MOW



67.2 Mediation

If the parties are unable to reach agreement on any matter on which the Engineer has given a decision or failed to give a decision in accordance with Clause 67.1, then the matter shall immediately be referred by the parties to a neutral mediator (the **Mediator**) whose costs shall be paid in equal shares by the parties and the following clauses shall apply:

- a if the parties are unable to agree on the choice of a Mediator, or if the chosen Mediator is unable or unwilling to act, then either party may immediately apply to the organisation stated in the Contract Agreement to appoint a Mediator;
- b the parties shall, within fourteen (14) days of the appointment of a Mediator, or any other such period as the parties may subsequently agree, jointly meet with the Mediator to agree a programme for the exchange of any relevant information and the structure to be adopted for the negotiations;
- c all negotiations shall be conducted in confidence and are not to be referred to in any concurrent or subsequent proceedings, unless they conclude with a legally binding agreement. If the parties accept the Mediator's recommendations, or otherwise reach agreement on the resolution of their dispute, such agreement shall be recorded and, once signed by the designated representatives, shall be binding on the parties;

- d if no agreement is reached, either party may invite the Mediator to provide to both parties a non-binding opinion. Such opinion shall not be used in evidence in any concurrent or subsequent proceeding without the prior consent of both parties; and
- e the parties shall bear their own costs of preparing and submitting evidence to the Mediator. If the Mediator finds that the mediation has been initiated or conducted frivolously or vexatiously, then the Mediator shall have the power to order the party so initiating or conducting the mediation to pay the reasonable costs of the other party for preparing for and attending the mediations and if the costs cannot be agreed, they shall be assessed by the Mediator, whose decision shall be binding on the parties.

If the parties fail to reach agreement within twenty-eight (28) days of the Mediator being appointed, or such other period as the parties may agree, then both parties shall be entitled to submit the dispute to arbitration under the terms of Clause 67.3. With the agreement of the parties, the Mediator shall record those facts that the parties have agreed. All other matters in dispute shall be referred to an Arbitration Committee (as defined in Clause 67.3) who shall be allowed access to the recorded and agreed facts. The Mediator's role shall cease on the appointment of the Arbitration Committee and the Mediator shall not be required to appear as a witness in the arbitration, or to provide any additional evidence obtained during the mediation.

67.2 Mediation (if applicable)

If stated to be applicable in the Appendix to Tender Clause 67.2 as set out in the Part 2 Conditions shall apply and shall be incorporated in the Contract.

67.3 Arbitration

If the Engineer shall fail to give such decision for a period of three (3) months after being requested to do so or if either the Employer or the Contractor is dissatisfied with any such decision of the Engineer then and in any such case subject to Clause 67.2 (if stated in the Appendix to Tender to be applicable) either the Employer or the Contractor may within three (3) months after receiving notice of such decision or within three (3) months after the expiration of the said period for such decision or within three (3) months after the failure of any mediation under Clause 67.2 (as the case may be) require that the matter be referred to the arbitration of an arbitration committee (the **Arbitration Committee**) to be formed of three (3) members. The Employer and the Contractor shall each appoint one (1) member and if one party fails so to appoint within fifteen (15) days of being requested by the other party so to do, the H.E. The Minister of Justice of the Kingdom of Bahrain upon a request from either party shall appoint a member for the party who has so failed to appoint. The third member, who shall be the Chairman of the Arbitration Committee, shall be appointed by agreement between the other two (2) members and if such agreement is not reached within fifteen (15) days after their appointment, the said H.E. The Minister of Justice of the Kingdom of Bahrain shall appoint the third member upon the request of either party.

67.4 Arbitration rules

In any arbitration:

- a the Arbitration Committee shall have full power to open up, revise and review any decision, opinion, direction, certificate or valuation of the Engineer;
- b neither party shall be limited in the proceedings before the Arbitration Committee to the evidence or agreements put before the Engineer for the purpose of obtaining its said decision;
- c no decision given by the Engineer in accordance with the Contract shall disqualify it from being called as a witness and giving evidence before the Arbitration Committee on any matter relevant to the dispute or difference referred to the Arbitration Committee;
- d no such appointments of arbitration shall be made and no arbitration shall proceed until after the date of issue of the Taking Over Certificate with respect to the whole of the Works unless the reference to arbitration relates

solely to the withholding by the Engineer of the Taking Over Certificate with respect to the whole of the Works to which certificate the Contractor claims in accordance with the Conditions of Contract to be entitled;

- e the award of the Arbitration Committee shall be reached if not unanimously by a majority of the Arbitration Committee;
- f the award of the Arbitration Committee shall be final and binding on the parties;
- g the costs of the arbitration shall be within the discretion of the Arbitration Committee; and
- h such arbitration shall take place in Bahrain and shall be conducted in the English Language.

AppendixC: Survey Form

Dear Mr. / Mrs.:

I am graduate student at University of Bahrain and I am preparing a master thesis in the Engineering Management Program. The title is:

**"Disputes in Public Construction Projects:
A Case Study on Ministry of Works (MOW) in Bahrain"**

The purpose of this research questionnaire is to identify the main causes, effects and dispute resolution methods related to MOW in particular.

It is in four parts:

1. Part one seeks to collect information on your background;
2. Part two asks for your opinions or comments on causes of disputes that are classified as the following :
 - 2.1: causes related to the project process.
 - 2.2: causes related to uncertainty of the project.
 - 2.3: causes related to personal engaged.
3. Part three asks about the side effects of disputes.
4. Part four asks for your experience of dispute resolution method.

The questionnaire will be used for academic purposes only, thus confidentiality is guaranteed.

Please return the completed questionnaire as soon as possible. If you would like any further information about the research, please let me know:

Regards,

Amal Abualfath

Contact details: 36190192

Part (1): General Information.

(Please tick one answer)

1. Under which of the categories listed below your organization is classified:

- ☐ Client
- ☐ Contractor
- ☐ Consultant

2. Your current occupation:

- ☐ Project manager
- ☐ Site supervisor
- ☐ Designer
- ☐ Quantity surveyor
- ☐ Engineer
- ☐ Senior engineer
- ☐ Director
- ☐ Section chief
- ☐ Head of the department/group
- ☐ Others, *specify*

--

3. Type of projects you are involved in?

- ☐ Building and Utilities (Building works)
- ☐ Roads and Infrastructure (Civil works)
- ☐ Both mentioned above

4. Your relevant working experience:

- ☐ Less than 5 years
- ☐ 5 - 10 years
- ☐ 11 - 20 years
- ☐ More than 20 years

5. Number of implemented projects throughout the last five years?

- ☐ Less than 10
- ☐ 10 – 20
- ☐ 21 - 30
- ☐ More than 30

Continue part 1:

6. The biggest project you have been in term of budget?

- ☐ Less than 250 000 BD
- ☐ 250 000 – 499 000 BD
- ☐ 500 000 – 699 000 BD
- ☐ 700 000 – 1 million BD
- ☐ More than 1 million BD

7. General Conditions of Contract applied in a project?

- ☐ FIDIC
- ☐ NEC
- ☐ JCT
- ☐ Customized

8. How many times were you involved in a construction dispute?

- ☐ 1 – 5 times
- ☐ 6 – 10 times
- ☐ More than 10 times

Part (2):

Causes of Disputes in Public Construction Projects in Bahrain

2.1: Based on your experience, select the appropriate frequency of occurrence for each factor causing dispute?

Causes Related to the Project Process						
Factors of Disputes		Frequency Of Occurrence				
		ALWAYS	OFTEN	SOMETIMES	RARE	NEVER
1	Misinterpretation for terms of contract					
2	Unclear Language of contract					
3	Undefined project scope					
4	Lack of Planning					
5	Lack of Quality Control & Assurance					
6	Illogical stakeholder/s expectations					
7	Inadequate detailed plans					
8	Acceleration of the project					
9	Error in design					
10	Failure to account the cost properly					

Continue 2.1:

Causes Related to the Project Process						
Factors of Disputes		Frequency Of Occurrence				
		ALWAYS	OFTEN	SOMETIMES	RARE	NEVER
11	Improper feasibility study					
12	Improper scheduling					
13	Delay in authorities approval					
14	Delay the project by owner					
15	Delay the project by contractor					
16	Delay the project by consultant					

Continue part 2:

2.2: Based on your experience, select the appropriate frequency of occurrence for each factor causing dispute?

Causes Related to Uncertainty of the Project						
Factors of Disputes		Frequency Of Occurrence				
		ALWAYS	OFTEN	SOMETIMES	RARE	NEVER
1	Unclear project objectives					
2	Scope change					
3	Variations					
4	Imprecise pre-feasibility stage					
5	Inadequate investigation before bidding					
6	Discrepancy in specification					
7	Fluctuation in price of materials					
8	Unexpected site conditions					
9	Suspension of work					
10	Project stakeholders interference					
11	Unexpected risks associated with the project's complexity					

Continue part 2:

2.3: Based on your experience, select the appropriate frequency of occurrence for each factor causing dispute?

Causes Related to Personal Engaged						
Factors of Disputes		Frequency Of Occurrence				
		ALWAYS	OFTEN	SOMETIMES	RARE	NEVER
1	Improper coordination					
2	Skill shortage					
3	Cultural differences					
4	Differing goals					
5	Lack of communication					
6	Ineffective management control					
7	Improper employer representative					

Part (3):

Effects of Disputes in Public Construction Projects in Bahrain

Based on your experience, select the appropriate frequency of occurrence for each factor as an effect of a dispute?

Effects of Disputes		Frequency Of Occurrence				
		ALWAYS	OFTEN	SOMETIMES	RARE	NEVER
1	Delay of public benefit					
2	Project performance (slow work progress)					
3	Reputation of one party					
4	Relationships between parties					
5	Financial loses/ Accumulations					
6	Waste of efforts and time					

Part (4):

Disputes Methods of Resolution in Public Construction Projects in Bahrain

Based on your experience, select the appropriate frequency of occurrence for each disputes resolution method?

Disputes Methods of Resolution		Frequency Of Occurrence				
		ALWAYS	OFTEN	SOMETIMES	RARE	NEVER
1	Mediation					
2	Ad hoc arbitration					
3	Institutional arbitration					
4	Adjudication					
5	Litigation					

5-The Committee of Arbitration mostly include:

☐Engineers

☐Lawyers

☐Engineers and Lawyers

6- What is your favorable arbitration method ?

☐ Ad Hoc arbitration

☐ Institutional arbitration

Why ?

Thank You for completing this survey

ملخص البحث

النزاعات في المشاريع الانشائية العامة

دراسة حالة: وزارة الأشغال في مملكة البحرين

مشاريع الانشاء تتضمن طرفين أو أكثر لديهم مصلحة مشتركة ، غالباً ما يشوبها "النزاع". فإذا لم يتم حل النزاعات في الحال، فإنه ليس للطرف المتضرر خيار غير "المطالبة".

المطالبات العالقة تتصاعد إلى "نزاعات". وهكذا فإن النزاعات هي إحدى المشاكل التي لا يمكن تلافيها والتي قد تواجه أي مشروع انشائي خلال تنفيذ المشروع.

إن البحث يستقصي أهم الأسباب وتأثير النزاعات في مشاريع الانشاءات العامة في مملكة البحرين ، من أجل تجنبها أو على الأقل تخفيفها. كذلك تقدم الدراسة توصيات بطرق الحل المناسبة للنزاعات بناءً على طبيعة المشاريع العامة. لقد تم اختيار وزارة الأشغال في مملكة البحرين لتمثل القطاع العام في هذا المجال.

تبنى البحث نهجاً متعدد الطرق، وهو بحث نوعي وكمي في آن واحد. البحث النوعي يتضمن معلومات تم جمعها من مواد علمية ومقابلات شخصية ودراسات نماذج. نتيجة هذا النوع من البحث ساعد في تصميم الاستبيان للبحث الكمي. إن نموذج الاستبيان يتضمن العميل والممثل في وزارة الأشغال وكلاً من المقاولين والمستشارين والذين وقعوا في نزاعات في بعض المشاريع الحديثة.

لقد تم التحليل الاحصائي لهذه الدراسة باستخدام برنامج الحزمة الاحصائية للعلوم الاجتماعية ومن أبرز الطرق المستخدمة هي حساب الأهمية النسبية و تحليل التباين الأحادي للفرضيات. كشفت نتائج الاستبيان الرئيسية للفئات الثلاث والذين قاموا بالإجابة على الاستبيان - الزبون ، المقاولين والمستشارين - أن أهم الأسباب للنزاعات في مشاريع الانشاءات العامة في مملكة البحرين تتعلق بالية عمل المشروع هي (التأخير في موافقة السلطات) ، (ضعف التخطيط السليم) و (التفسير الخاطئ لبنود العقد). بينما الأسباب المتعلقة بغموض المشروع هي (الانحراف عن خطة العمل) ، (تغير نطاق العمل) و (الحالات غير المتوقعة في موقع العمل) ، أما أهم الأسباب المتعلقة بالأشخاص العاملين في الانشاءات العامة هي (ضعف التواصل بين أطراف المشروع) ، (الرقابة الإدارية غير الفعالة بين أطراف المشروع) و (التنسيق الغير مناسب لطبيعة الشروع).

كما كشف البحث أهم تأثيرات النزاعات في المجال، وهي (بطئ تقدم العمل) ، (ضياع الجهود والوقت) و (تأخر المنفعة العامة). (الوساطة) أتت في المقام الأول كأهم وأكثر الطرق استخداماً في حل النزاعات في هذا المجال، يتبعها تالياً (التحكيم باستخدام الحكم الخاص) ثم (التحكيم المؤسساتي).

أخيراً، فإن البحث يوصي بإجراءات تصحيحية استباقية لكي يتم أخذها بعين الاعتبار من قبل جميع أطراف المشروع لتجنب المزالق التي قد تؤدي إلى نزاعات مستقبلية ، ويذكر البحث كذلك حلول عملية لأهم أسباب النزاعات المذكورة في البحث ويناقش طريقة الحل المناسبة للنزاعات المرتبطة بطبيعة المشاريع العامة ومن أبرزها التوصية بتشكيل "مجلس لتجنب و فض المنازعات" من بداية المشروع ، يتشكل من خبراء مؤهلين و مستقلين، يتابعون المشروع من أولى مراحله و يقومون بزيارات دورية تفقدية لموقع العمل وذلك لحل أي مشكلة قبل تفاقمها لنزاع و لهم كذلك دور قضائي بحال لم يتم حل النزاع بالوساطة وذلك لتجنب التسوية عن طريق التحكيم_ قدر الامكان_ والذي يصبح معقداً كالتقاضي و مكلفاً جداً كونه لا يتناسب مع طبيعة المشاريع العامة .

جامعة البحرين

قسم الهندسة الميكانيكية

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