The Causes of Disputes That Would Lead to Binding Dispute Resolution Methods. A Perspective of the Quebec Construction Industry.

by

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Les causes des litiges pouvant mener à des méthodes contraignantes de règlement. Une perspective de l'industrie de la construction du Québec

Ahmad Jamal Harb ARAR

RÉSUMÉ

Les causes des litiges étant nombreuses et présentes dans presque tous les projets, il s'avère nécessaire de mettre en place une stratégie pour les éliminer. Or, les litiges et les méthodes de règlement des différends n'ont pas tous le même impact sur le projet et ses acteurs. Les méthodes contraignantes de règlement des litiges telles que l'arbitrage et le recours aux tribunaux seraient, selon la littérature, des méthodes de règlement engendrant des coûts plus importants, des délais plus longs et affectant la durabilité de la relation commerciale entre les parties au litige, si on les compare aux méthodes plus douces, ou méthodes non contraignantes, telles que la médiation, le comité de résolution de différends et la négociation. Cette étude se concentre sur les causes menant généralement à des litiges qui ne peuvent être résolus par les méthodes non contraignantes et qui nécessitent alors le recours à l'arbitrage et aux tribunaux. L'identification de celles-ci permettront d'aider les parties aux projets de construction à mieux faire face à ces différents risques et à prioriser les techniques de prévention pour faire face à ces menaces. Pour atteindre les objectifs de cette étude, trois questions de recherche ont été étudiées : Les différends sont-ils inévitables dans les projets de construction ? Les méthodes contraignantes sont-elles plus préjudiciables à la durabilité des relations commerciales et à l'avancement des projets que les méthodes non contraignantes ? Et enfin, quelles sont les causes des différends qui conduisent à l'utilisation des méthodes contraignantes ? Cette étude a utilisé la méthode de recherche mixte - conception séquentielle exploratoire. Dans un premier temps, des données qualitatives ont été recueillies par le biais d'entretiens avec des experts en litige de construction et du domaine de la construction. Ces entretiens avaient pour but d'explorer la possibilité de relier les causes de certains litiges à l'utilisation des méthodes contraignantes de règlement des différends. Puis, dans un deuxième temps, des données quantitatives ont été recueillies par le biais d'une enquête afin de généraliser les conclusions au sein de l'industrie de la construction au Québec. Les résultats ont montré qu'il n'y a pas de preuve statistique que les litiges sont inévitables dans les projets de construction, bien que les participants, lors des entretiens, ainsi que les résultats de l'enquête appuient cette affirmation. En ce qui concerne l'impact sur la relation d'affaires, les résultats ont montré qu'il existe des preuves statistiquement significatives qui soutiennent la croyance que les chances de maintenir les relations d'affaires sont élevées dans le cas des méthodes de règlement non contraignantes et sont faibles dans le cas des méthodes de règlement contraignantes. En ce qui concerne l'impact sur l'avancement des travaux du projet, les résultats ont montré que le recours aux tribunaux et l'arbitrage sont considérés comme les méthodes ayant l'impact le plus négatif, tandis que les méthodes de règlement non contraignantes sont les méthodes ayant l'impact le moins négatif. En ce qui concerne les causes de litiges les plus associées à l'utilisation de méthodes de règlement contraignantes, les changements imprévus, le manque de communication, les ambiguïtés dans les documents contractuels, les erreurs de conception et les retards dans l'avancement des travaux sont les causes identifiées comme étant celles les plus liées aux méthodes contraignantes de règlement des différends.

Mots-clés: méthodes de règlement des litiges, méthodes contraignantes de règlement des litiges, causes des litiges de construction

The Causes of Disputes That Would Lead to Binding Dispute Resolution Methods. A Perspective of the Quebec Construction Industry.

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ABSTRACT

There are numerous causes of dispute that exist in almost every aspect of the project, and setting up a strategy to eliminate disputes from taking place in the project means literally and simply doing everything right. However, not all disputes would have the same impact on the project and the project parties, and not all dispute resolution methods (DRMs) have the same level of consequences. There is a widespread argument claim that the binding dispute resolution methods, such as arbitration, and litigation (judicial process) are the most painful dispute resolution methods in terms of the cost, time-consuming effort and the sustainability of the business relationship between the disputing parties, especially when comparing it with the softer methods such as mediation, dispute review board and negotiation (non-binding DRMs). This study focuses on the causes that lead to the more hostile types of disputes among the general dispute cases, which usually produce disputes that cannot be resolved through non-binding methods and require involvement in the binding stages, such as arbitration and litigation (judicial processes), which would help the construction project parties better address such types of risks and prioritize their prevention techniques to face those threats. To meet the objectives of this study, three research questions were investigated: are disputes inevitable in construction projects?; are binding DRMs more harmful to the sustainability of business relationships and project progress than non-binding DRMs?; and what are the causes of disputes that lead to the binding DRMs stage? This study was carried out using the mixed method — exploratory sequential design, where firstly, qualitative data obtained through interviews have been collected from experts in the construction field to explore the possibility of connecting certain causes of disputes with reaching the binding stages. Then, in the second phase, quantitative data obtained through surveys have been collected in order to generalize the findings within the Quebec construction industry. The results showed that there is no statistical evidence supporting the claim that disputes are inevitable within construction projects, despite the fact that the participants in the interviews phase and the descriptive statistics of the survey results support this claim. In regard of the impact on the business relationship, the results showed that there is statistically significant evidence supporting the belief that the chances of maintaining the business relationships are high in the case of non-binding DRMs, and are low in the case of binding DRMs. With regard to the impact on the project's work progress, the results showed that arbitration and litigation (judicial processes) are considered to be the methods with the most negative impact, while the non-binding DRMs were considered the methods with the least negative impact. With regard to the causes of dispute that are most associated with reaching binding DRMs, among 10 groups that contained 38 causes of disputes, unforeseen changes, lack of communication, ambiguities in contract documents, design errors, and delays in work progress were ones chosen as the methods connecting most with binding DRMs.

Keywords: Dispute resolution methods, binding dispute resolution methods, causes of construction disputes

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DRMs	Dispute Resolution Methods
ADR	Alternative Dispute Resolution
DRB	Dispute Review Board

INTRODUCTION

Construction projects are floating above a sea of uncertainties, many of which are attached to the nature of the projects in the first place, where each project is a prototype, and has a specific, targeted delivery time and a targeted budget to stay within, not to mention the number of entities and people who have to interact and cooperate in the project. These features of the projects make the likelihood of experiencing a dispute throughout the project quite high, therefore, the effective use of skills and techniques to handle and resolve disputes is considered as one of the most successful management indicators (Acharya *et al.*, 2006).

The sources of disputes are so diverse and are located in every aspect of the project: from owner-related issues, through the contractor, design, contract, human behaviour, and the project-related issues, to external related issues (Cakmak & Irlayici Cakmak, 2014). On the other hand, resolving the dispute once it takes place between the project parties is not always an easy task, and in many cases, it's as hard as "split-the-baby" (Torone, 1998), however, not all dispute resolution methods possess the same level of hostility and require the same amount of time and money. Those differences become clear when comparing non-binding DRMs, such as negotiation, dispute review board and mediation, with binding DRMs, such as arbitration and litigation (judicial processes). In the case of non-binding DRMs, the effort is conducted to resolve the dispute in a consensual way, while in the case of binding DRMs, an obligatory decision will be made to settle the dispute and, as can be expected, through the journey of the dispute from non-binding to binding DRMs, the degree of hostility and the costs associated increase (Cheung, 1999).

This study aims to shed light on the causes of disputes that are most associated with reaching binding DRMs, which are, among all the causes of disputes, the ones that are responsible for producing the most hostile, costly and time-consuming sort of disputes, as well as for generating the instability that would be brought to the business relationship between the disputing parties.

Identifying the causes of disputes that can lead to binding DRMs would help the construction projects parties respond to the threats of being in a situation outside of the scope of work, by better planning for the risks and weaknesses associated with those causes. In addition, an assessment sheet entitled "The potential risk of reaching the binding dispute resolution methods" is developed based on the results of the survey in the second phase. This assessment sheet aims to provide the project parties with a quick overall assessment of the probability of workers experiencing binding DRMs in their project.

This study is conducted in two phases: the first is qualitative through the use of interviews and the second is quantitative through the use of surveys. The need for exploration (qualitative) and the need for generalization (quantitative) both paved the way that leads to selecting the design of this research, which is a mixed method-exploratory sequential design, where both qualitative and quantitative data have been collected in a sequential manner. In addition, feedback sessions have been conducted with the interview participants to validate the assessment sheet "The potential risk of reaching the binding dispute resolution methods".

This study consists of five (5) chapters. In the first one, the important aspects related to the topic of the study have been covered, starting with the definition of dispute, the differences between a dispute and a conflict, and the causes of disputes. Then, a brief review of the main dispute resolution methods has been illustrated, including both binding and non-binding DRMs. In addition, the regulations and procedures governing the process of the arbitration and litigation in Quebec and Canada have been explained. Finally, in this chapter, the starting point of this research has been laid out.

In the second chapter, the methodology applied throughout the study has been explained. This chapter has two main sections following the introduction; the first one providing a quick overview of different philosophical paradigms, resonating approaches and research methods, while in the

second section, a complete justification for the way the research design has been chosen and the way the research will be conducted are outlined.

The third chapter contains data analysis and discussion, where the results of both phases one and two have been shown, as well as the discussion of the results in each phase. At the end of this chapter, the way the assessment sheet has been developed is illustrated.

In the fourth chapter, in addition to listing the main limitations and delimitations of this study, the conclusions reached in phases one and two are illustrated. Finally, a few recommendations for future research have been offered.

In the last parts of this thesis, there are 14 appendixes showing the interview protocol, the survey instrument and the output of the statistical test carried out by SPSS statistics.

CHAPTER 1

LITERATURE REVIEW

1.1 Disputes in Construction

1.1.1 Definition of Construction Dispute

The word "dispute", as per Cambridge's dictionary, means an argument or disagreement between two parties, in particular when they are official parties, such as two countries, worker and employer or parties to a business contract. In the same context, the term "construction disputes" is expressed as "the existence of incompatibilities of need and value" (Cheung & Yiu, 2006), while, a study conducted by (Vorster, 1993) defined the disputes as an issue arising from a disagreement between the project parties in relation to the project's processes and activities.

It's worth noting that some studies, such as (Love *et al.*, 2008) which defines a dispute as "any contract question or controversy that must be settled beyond the job site management" are more precise about what might be a confusion of understanding the differences between dispute and conflict, in the context of the project's issues and disagreements, which will be detailed in the following section.

1.1.2 Difference between Dispute & Conflict

It's important to be aware of the differences between the terminologies used in the context of disagreements within a project, such as "dispute" and "conflict", and figure out how the previous studies dealt with it, as this research focuses on disputes rather than conflicts. In particular, the disputes that produce cases could be escalated to the arbitration or litigation stages (judicial processes). As a result, it's quite important to understand when we should consider a disagreement a dispute.

The conflict is considered to exist once a discordance of interest comes about while the dispute is associated with "justiciable issues" (Fenn *et al.*, 1997). Furthermore, the main purpose for handling conflicts is to avoid it evolving into a dispute, but on the other hand, when we deal with a dispute that means the axe has already come down and now the dispute needs resolution (Fenn *et al.*, 1997). In other words, the dispute has escalated from a mismanaged conflict.

It could be argued that the conflict, by default, exists between the contracting parties in which they all try to maximize the benefits on their end, which could, in some cases, affect the benefits of the other contracting parties, and therefore, successful management will keep an eye on the sources of the potential conflicts and prevent them from becoming a dispute. According to (Acharya *et al.*, 2006), it is proposed that conflicts arise from mishandled risks; then, if they are not being managed well, they becomes a claim, and the claim can then escalate to a dispute if it is not cleared up, as shown in Figure 1.1.

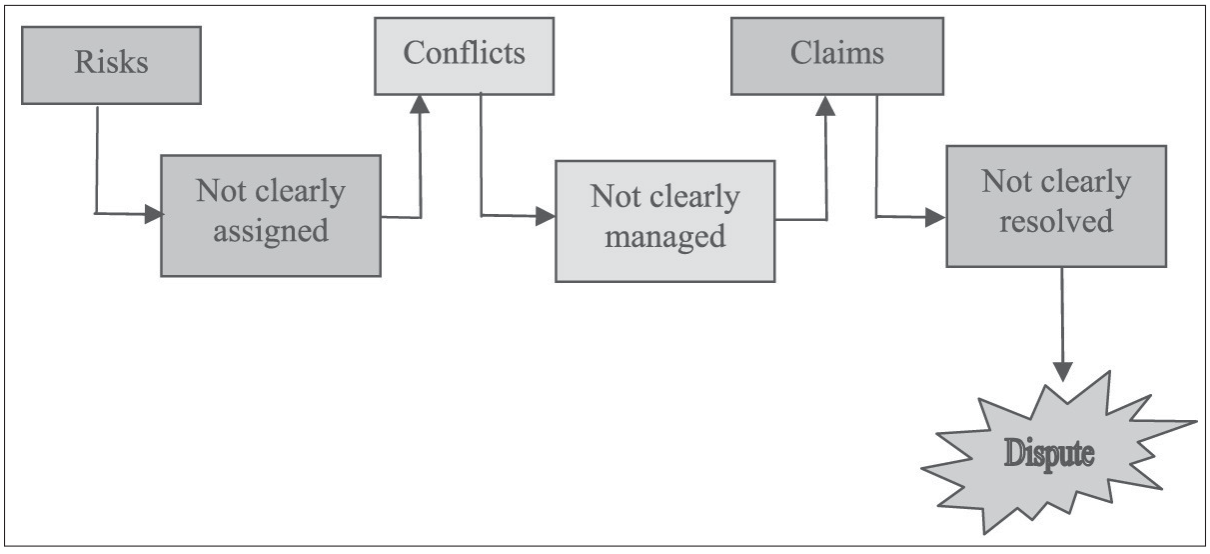


Figure 1.1 Risk, conflict, claim and dispute continuum model (Acharya *et al.*, 2006)

1.1.3 Causes of Disputes

Many studies investigated the causes of disputes in construction projects. Different categories were proposed in an attempt to recognize the factors that influence and cause disputes.

A study by (Cakmak & Irlayici Cakmak, 2014) proposes a comprehensive classification for the causes of disputes, which contains seven categories and twenty-eight causes of disputes shown in Table 1.1. The conclusion driven out of this study stated that the leading cause of construction disputes are the contractor-related factors, in which a high number of disputes arises.

A different approach was suggested by (Cheung & Pang, 2013), a classification that consists of three-factor groups: task factor, contract incompleteness and people factor, are suggested to be the common source of disputes in construction projects, which lead to two main types of construction disputes: contractual and speculative, as a result, the incomplete contract has been highlighted as the most familiar cause of construction disputes.

Moreover, (Carmichael, 2002) illustrates that the sources of the dispute could be “personalities, different opinions, values, desires, needs and habits, performance, insufficient attention to contract documentation, and unexpected eventualities”.

A study conducted by (Cheung & Yiu, 2006) titled “Are Construction Disputes Inevitable?” classified the dispute sources in three categories: contract provisions, triggering events and conflicts, and in a notable conclusion, the study concluded that the disputes are inevitable in construction projects, especially within complex projects.

A literature review handled by (Jaffar *et al.*, 2011) in regard to the causes of disputes in the construction industry has categorized them into three groups as well:

- Behavioural problems, which are mostly related to people, the human ingredient of the project, with all that involves their characters, desires, interaction, ambition. “It was noted earlier that construction is not a science, it is an art. Construction is really people, and the successful contract administrator, or disputant to a contract interpretation or unfortunate

Table 1.1 Common causes of disputes by categories, adapted from (Cakmak & Irlayici Cakmak, 2014)

No.	Category of Disputes	Causes of Disputes
1	Owner related	variations initiated by the owner
		change of scope
		late giving of possession
		acceleration
		unrealistic expectations
		payment delays
2	Contractor related	delays in work progress
		time extensions
		financial failure of the contractor
		technical inadequacy of the contractor
		tendering
		quality of works
3	Design	design errors
		inadequate / incomplete specifications
		quality of design
		availability of information
4	Contract related	ambiguities in contract documents
		different interpretations of the contract provisions
		risk allocation
		other contractual problems
5	Human behavior related	adversarial / controversial culture
		lack of communication
		lack of team spirit
6	Project related	site conditions
		unforeseen changes
7	External factors	weather
		legal and economic factors
		fragmented structure of the sector

occurrence on a project, is well served to know a little about people involved" (Vorster, 1993) as cited in (Jaffar *et al.*, 2011).

- Contractual problems, which include “definition, interpretation and clarification of the contract”.
- Technical problems, such as design deficiency, uncertainty, wrong pricing and the quality of the contractor’s work.

As can be noticed, many studies with different approaches were conducted around the causes of disputes in the construction projects, in this section, we showed a sample for these studies to clarify that although there are differences in the classification applied, and the way the causes were named, but, the recognized sources of the disputes are the same, as well as the basic concept of the cause of dispute remained the same among all the different studies.

Many causes of disputes could be observed, argued and investigated, and factors could be added and others could be delisted. Some causes proposed to have more influence than others, as well as arguing about the presence of some causes in regard to the project’s type, the project delivery system and the ownership sector, but among all these variables, the certain and unquestionable fact is the negative effect of the disputes on the project’s objectives, and the negative effect on the cost, time and the quality of the work, not to mention the harmful impact of the disputes on the continuity of the business relationship between the contracting parties.

1.2 Dispute Resolution Methods

1.2.1 Introduction

The traditional methods of dispute resolution were located between only two steps, which are defined as the line of defence against reaching the litigation stage, which is by far considered the most costly and time-consuming way to resolve a dispute. These two steps as shown in Figure 1.2 are the negotiation leads by design professionals, which is considered a non-binding DRM, and the arbitration which is considered a binding DRM. However, the enormous variety of the projects’ types and the uniqueness of their nature encouraged the researchers to keep discovering more suitable techniques and methods to facilitate the way the disputes could be handled in

construction projects. As a result, many methods have been developed over time and therefore, a plethora of studies scrutinizing the different dispute resolution methods have been conducted as well (Pena-Mora *et al.*, 2003).

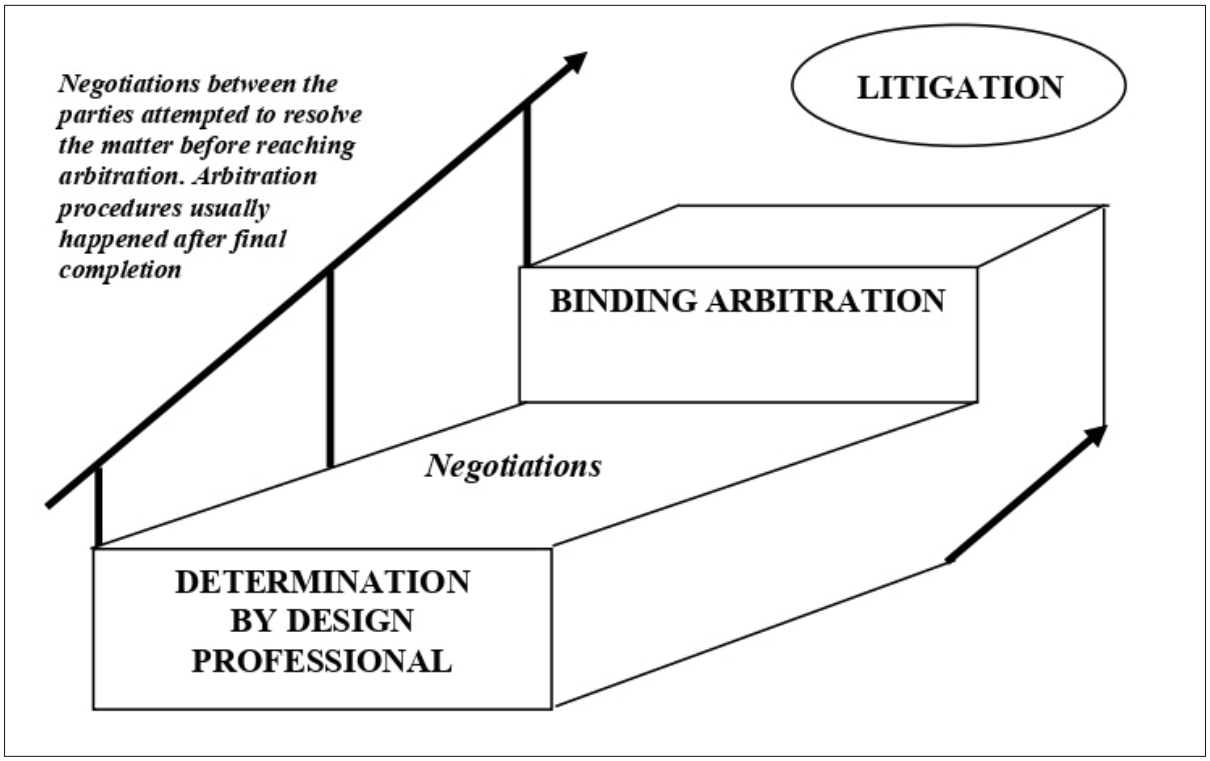


Figure 1.2 Traditional two-step dispute resolution "Ladder" in construction projects, adapted from (Pena-Mora *et al.*, 2003)

Dispute resolution methods, or DRMs, are the mechanisms, procedures and techniques used to tackle disputes which occur in construction projects. Considering the interest and the benefits of each party, dispute resolution methods help reach an agreement accepted by the disputing parties. A study entitled "winning ADR battles" by (Torone, 1998), indicates that the processes of dispute resolution methods are "ADR proceedings often become 'splitting-the-baby' exercises in which all parties are asked to settle the case through compromise".

To better understand the perception of the terminology used in dispute resolution studies, we should highlight the difference between DRMs and ADR, which will most likely be faced in any research in regard to the resolution of disputes. In general, DRMs or dispute resolution methods

refer to the approaches employed to resolve a dispute, starting with negotiation and ending with litigation (judicial process), on the other hand, ADRs or alternative dispute resolutions refer to all approaches employed to resolve the dispute out of court, which means excluding litigation (judicial process), when the ADR terminology is used.

A study by (Cheung, 1999) illustrated the ascending sequence of the different types of dispute resolution used in terms of "escalating hostility and cost" as shown in Figure1.3, which starts by the approach with the lowest cost and hostility degree, which are logically prevention techniques and negotiation, as they are the first common practices to start dealing with the dispute once it takes place between the project parties, by taking the steps in the proposed sequence. The non-binding and binding approaches come respectively, ending with what the study suggests as the most harmful approach on the sustainability of the business relationship between the contracting parties, as well as the costliest and longest approach, which is litigation (judicial process).

In the following two sections, we will look over the two main categories of the dispute resolution methods, the non-binding and the binding resolution methods, and outline the main techniques that fall under each of them.

1.2.2 Non-binding Dispute Resolution Methods

1.2.2.1 Mediation

As per (Moore, 2014), mediation is a non-binding dispute resolution process, in which the disputants choose to get help from a third party to resolve their dispute. The third party, who is called the mediator, is not authorized to make a binding decision, as the convergence of views among the disputants is the only way to settle the dispute. Eventually, the participants have to decide whether to bring their dispute down or escalate it to further steps. In general, the targeted settlement to resolve a dispute through the mediation would be by reaching a "Win-Win" solution (Qu & Cheung, 2014).

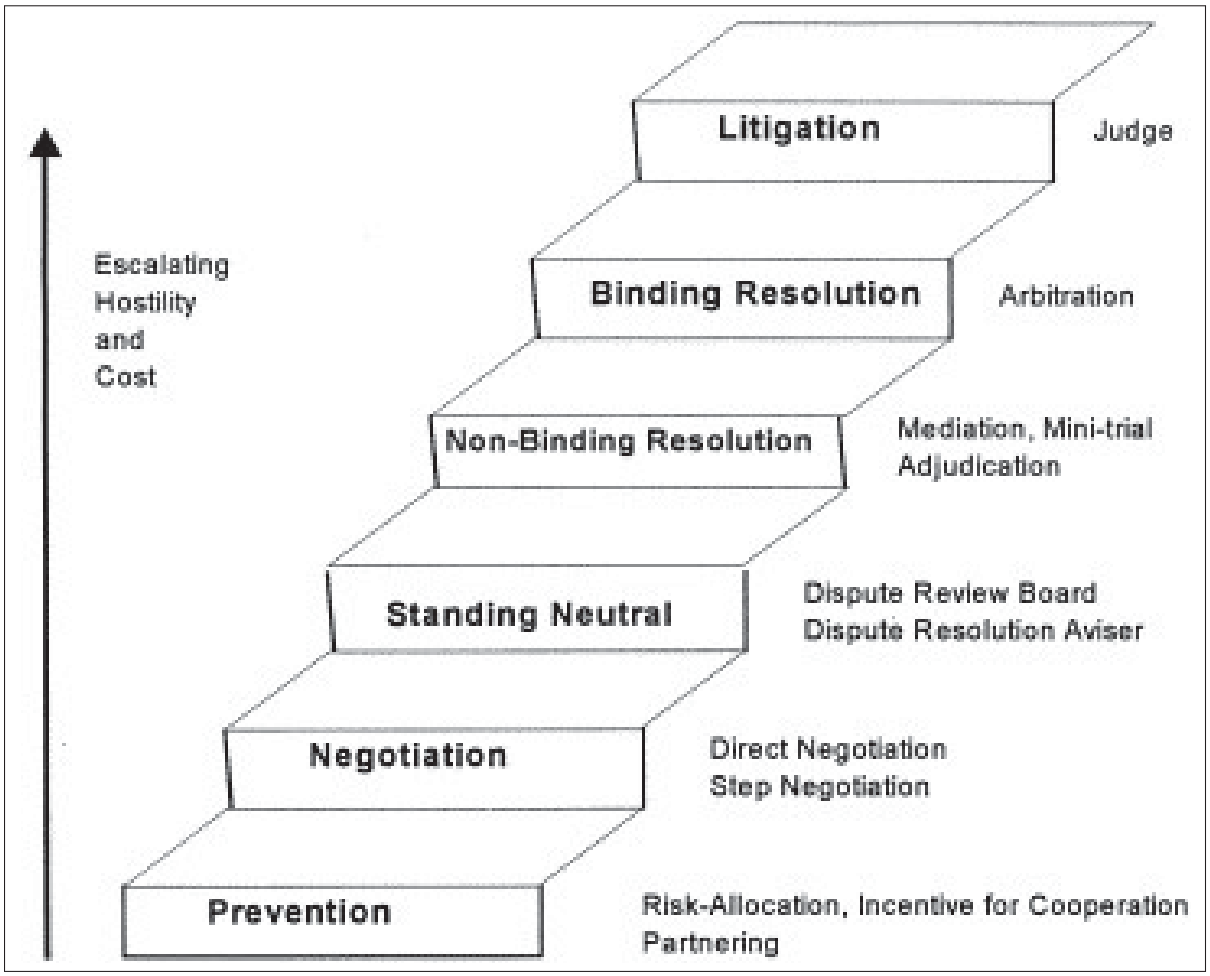


Figure 1.3 Construction dispute resolution steps, adapted from (Cheung, 1999)

The mediator leads the negotiation between the disputants and attempts to reach the origin of the dispute. The mediator aims to let each party feel that their side of the story is heard and helps them in "softening the troubled relationship" (Alaloul *et al.*, 2019). Furthermore, a study by (Gad, 2012) described the contribution of mediation as it can "facilitate communications and maximize the parties' chances for a value-creating resolution".

Nevertheless, there is no other way to close a dispute through mediation unless the disputants agree to do so and come to a settlement (Alaloul *et al.*, 2019); this full control and the voluntary basis in accepting the decision aren't the exclusive factors encourages the disputants to consider

mediation as the preferred dispute resolving method, where the cost-saving in comparison to other methods plays a key role in this matter (Gould & King, 2010). Actually, it can be argued that disputants who choose mediation and who agree to resolve the dispute by mediation, are those who have a good trust relation and those who are most willing to maintain their business relationship (Moore, 2014). Finally, if the process successfully brings the disputants on the same page, then the agreement "is often in the form of a written agreement by both parties summarizing the main points of the agreement" (McAleer, 2012).

It should be noted that some studies considered both mediation and conciliation the same dispute resolution method, due to similarity in the process followed, as well as the role of the mediator and conciliator, but with minor differences, as detailed in (Gad, 2012), except that the conciliator could propose a non-binding settlement in an attempt to fix the dispute, while the mediator role is to help the disputants reach an agreement to resolve the dispute without submitting such proposal.

1.2.2.2 Dispute Review Board

The dispute review board or DRB, is a non-binding alternative dispute resolution method, in which a board of experienced individuals comprised of three experts will keep close to the activities and processes of the project with the intention to create a sense with the different aspects of the project. This acquired sense would be the main success factor of this method; if a dispute escalates to this stage, the disputants will have an expert panel that is familiar with the project and ready to hear the case and help the project parties (Menassa & Mora, 2010).

Once a dispute arises, the dispute resolution board will hold a hearing session with for both parties having equal chances to tell their side of the dispute. The process results in recommendations by the board to resolve the dispute, the choice of either party accept the board recommendations or escalate the dispute to another stage certainly remaining to the disputants themselves (Agdas & Ellis, 2013).

Furthermore,(Agdas & Ellis, 2013) conclude that the DRB method proved to be not only an effective dispute resolution method but also a dispute prevention tool, the prevention nature of this method coming from the way the expert board is designed to work, where the regular visits and the continuously open communication channels with the project parties help the board in maintaining a cooperative environment and a trusted relation, thereby helping the project parties get the project done and achieve the desired objective (Thompson *et al.*, 2000). In the same sense, (Harmon, 2003a) concludes that using a DRB method could decrease the likelihood of facing an escalated and expensive dispute by helping the projects parties settle the dispute in from the onset.

1.2.2.3 Mini-trial

The mini-trial process is a non-binding dispute resolution method, considered to be one of the last attempts by the disputants to get their dispute resolved away from the binding DRMs. It takes place when other methods were not successful in settling the dispute, and in the purpose of predicting the outcome of the litigation or the real trial but in a quicker, less expensive and more flexible way (Alaloul *et al.*, 2019).

On the other hand, "The trial-like nature of the preparation and hearing may continue to polarize the positions of the parties rather than promote an atmosphere of cooperation from the outset" (Cedires.com, 2019), therefore, the mini-trial is considered a method that involves hostile behaviour in comparison with the other dispute resolution methods in the non-binding DRMs category (Alaloul *et al.*, 2019).

At the end of the mini-trial process, the resolution is a solution proposed by the judge, however, it's still optional for disputants either to accept the judge's decision or to escalate the dispute a step further (Moore, 1995).

1.2.3 Binding Dispute Resolution Methods

1.2.3.1 Adjudication/Expert Determination

The Adjudication/Expert determination is a "temporarily binding" dispute resolution method, whereby, the decision made by the adjudicator will remain valid until the end of the project. However, the disputants can appeal the decision after completion of the project through arbitration or litigation (judicial process), thus, the adjudication/expert determination method is designed to provide a temporary and time-efficient resolution to the project's parties who are unwilling to interrupt their work progress (Dancaster, 2008).

As a method intended to be time-efficient, it is accompanied by a restricted time frame; the decision should be made within two months starting when any of the disputing parties demand to start the process as what has been applied in the UK's projects. The adjudicator or the expert should be selected by a consensual decision between the parties, yet, they should arrange to agree on and find an available adjudicator within the notice dispute period, which takes us to the next challenge. In contrast with the DRB method, the adjudicator has no idea about the project yet and just gets requested once the dispute occurred, therefore, it's quite challenging in many cases to make the decision within the prefixed time frame (Pena-Mora *et al.*, 2003).

1.2.3.2 Arbitration

Arbitration is a binding dispute resolution method intended to fulfill the need for an obligatory decision as does the judicial process, but in a faster, cheaper, confidential way and that is made by experts who have a recognizable knowledge and experience in the construction industry (Wildman & Stipanowich, 2013), however, a study by (Ossman *et al.*, 2010) has found that the background field of the arbitrator (owner, CM, contractor, etc.) wouldn't influence his decision.

The arbitration will be grounded contractually by a preceding agreement between the contract parties, the contract clause may contain the location where the arbitration will be held along with the regulation to be applied (Gad, 2012).The panel is often constituted the same way the panel is

constituted in other dispute resolution methods, in which each party chooses one member while they agree on the third member, which usually results in a panel of three members, although, in some small dispute cases, one arbitrator could be enough (Pena-Mora *et al.*, 2003). The parties should choose an organization to administrate the process and arrange for the hearing sessions, and it also can help the disputants by selecting the arbitrators for the panel or naming the third member of the panel (Harmon, 2003b).

Arbitration surpasses litigation (judicial process) in terms of efficiency (Tanielian, 2013), however, it is enforced by the court, and that's what makes the decision made by the arbitration panel after the hearing sessions binding and final (Alaloul *et al.*, 2019).

On the other hand, some studies highlighted the defects developed through the years in the arbitration process, neither the time-saving nor the cost-saving is guaranteed, due to the high demand and the delegation of the responsibility from the courts, which has forced the arbitration process to become more rigid and less attractive as a preferred dispute resolution method instead of litigation (judicial process) (Pena-Mora *et al.*, 2003).

1.2.3.3 Litigation (Judicial Process)

Litigation has historically been the long-established way to resolve a dispute. The other methods to resolve disputes, named the alternative disputes resolution (ADR) methods, are actually the alternative to court proceedings. Litigation (judicial process) is the last attempt when dealing with a dispute, by taking the adversarial positions to the court, the disputants acknowledge that they are desperate to resolve their issue through a softer dispute resolution method, taking into consideration that their business relationship and the potential opportunity for future cooperation are at stake. This is in addition to its high cost, the time needed and the non-confidential nature of the court, which makes litigation the last preferred way for disputants in the construction industry. However, it is inevitable if no other methods are successful in resolving the dispute (Alaloul *et al.*, 2019).

A binding decision in a win-lose form, along with a deterioration in the parties' relationship, are the main outcomes of the litigation process. Through litigation, the disputants do not have control in the process in comparison to the alternative dispute resolution methods, in addition to the inability to determine the accurate time required for the entire process, especially in the large-complex projects where an extensive number of documents, technical issues, and witnesses, are there, the same issue applies to the cost estimated, thus, by taking those two factors (time and cost) into consideration, even the case winner could be the loser as well, particularly if the case amount represents a significant percentage of the contractor's cash flow (Pena-Mora *et al.*, 2003) and (Harmon, 2003b).

1.3 Arbitration Regulations and Procedures in Quebec

1.3.1 Quebec Arbitration Law

Canada has been participating in "New York Arbitration Convention" since May 12, 1986, as one of 156 countries committed to the convention, which was established in 1958 as a replacement for Geneva Protocol on arbitration Clauses of 1923 (Website: NewYork Convention). It is worth noting that federal regulations adopt the New York Convention, and all of the provinces except Quebec regulated the arbitration under two different regulations, domestic arbitration and international arbitration, while the Quebec legislation contained its implication in the regulations concerning the matter, which is the Civil Code of Quebec and in the Code of Civil Procedure (Website: Consensual Arbitration in Quebec by Frédéric Bachand).

Federally, the arbitration is regulated by the Commercial arbitration Act (CAA), which applied since August 10, 1986, as well as the structure of commercial arbitration and its procedures, provided by the Commercial arbitration Code, which is paved by the Commercial arbitration Act, (CAA) " the Code applies to all commercial arbitrations where at least one of the parties is a federal department or Crown corporation or in relation to admiralty or maritime law issues where the place of arbitration is Canada" (Website: Department of Justice, 2017).

The regulations in Quebec require the disputants to prove that they tried to resolve their dispute through alternative dispute resolution methods such as the arbitration before raising the issue to the court. The disputing parties will be required to prove their case before the judge. This legislation became active on January 1, 2016, with the purpose "to assist in the shift from a trial-based to an agreement-based culture" (Ministère de la justice).

1.3.2 Arbitration Process

The arbitration process illustrated on the website of (Ministère de la justice) as guidance for disputants in Quebec, contained the following steps:

- Notice:

  When the parties agreed to consider arbitration as a method to resolve their disputes and which is usually done either in the time of drafting the contract or after the dispute occurs. The right to take the dispute to arbitration becomes the right of both parties, any of them can start the process by sending a notice to the other party (Ministère de la justice) and (Website: Consensual Arbitration in Quebec by Frédéric Bachand).
- Choice of the arbitrator:

  After receiving the notice to begin the arbitration process, the parties will choose the arbitrator(s) based on the terms of their agreement. The disputants have the right to choose the number of arbitrators they want, usually between one and three arbitrators, they could agree together on the nominated arbitrators, or refer the matter to a third party such as the arbitrators' institutes (Ministère de la justice) and (Website: Consensual Arbitration in Quebec by Frédéric Bachand).
- Before the hearing:

  By now, the notice to begin the arbitration process has been sent by one of the parties and the arbitrator(s) is (are) selected; the next step is to have a preparatory meeting with the arbitrator, which is intended to discuss and clarify the regulations of the hearing sessions as "the procedure and rules for the hearing, the presentation of evidence, the calling of witnesses

(if necessary), the date, and the duration and place of the hearing" (Ministère de la justice) and (Website: Consensual Arbitration in Quebec by Frédéric Bachand).

- During the hearing:

  Similar to the court, in the arbitration hearing, the parties present their pieces of evidence and argue their points, as well as call witnesses to present their testimony. The hearing session could be conducted over one day or more based on the complexity of the case, the time needed as perceived by the arbitrator. By the end of the hearing, the arbitrator will review the case in order to release the decision, in other words, the "arbitration award" (Ministère de la justice) and (Website: Consensual Arbitration in Quebec by Frédéric Bachand).

- After the hearing:

  As a binding dispute resolution method, the arbitration award is final and enforced by the court and cannot be appealed most of the time. The arbitrator must release the decision within three months maximum after the hearing session was conducted and after the case was being examined (Ministère de la justice) and (Website: Consensual Arbitration in Quebec by Frédéric Bachand).

1.3.3 Arbitration Organizations in Quebec

To name but a few, the following are examples of the arbitration institutes acting in Quebec:

- Institut de Médiation et d'Arbitrage du Québec (IMAQ):

  IMAQ is a non-profit organization founded in 1977, provides over 100 arbitrators and 300 mediators, their mission is to enhance and expand the "participatory justice" which is achievable through the alternative dispute resolution such as the arbitration. IMAQ become a subsidiary of the Institute of Arbitration and Mediation of Canada (IMAC) in addition to other mediation and arbitration institutes from six different provinces since 2008, and it offers three types of membership: Accredited Member; to those who are willing to be certified as an arbitrator or mediator. Institutional mediator; to those who are practising the mediation for one year at least. Partner or Student Member; to anyone who is consistent with IMAQ objectives but doesn't meet the requirement of the other two types of membership. In

opposite to CCAC (Canadian Commercial arbitration Center), the Institute of mediation and arbitration of Quebec IMAQ doesn't provide services of the arbitration and mediation, but it is certifying the mediators and arbitrators who are offering services through their entities (Website: Institut de médiation et d'arbitrage du Québec).

- Canadian Commercial Arbitration Center (CCAC):

  A private non-profit organization established in 1986, a member of the International Federation of Commercial arbitration Institutions, and a founding member of the Commercial arbitration and Mediation Center for the Americas (Website: International Trade Center).

  CCAC provides management service for the arbitration program including the entire process starting from receiving the notice of arbitration from one of the parties, the selection of the arbitrators until the arbitration award rendered (Website: Canadian Commercial Arbitration Center).

1.4 Litigation Regulations and Procedures in Quebec

1.4.1 Canadian Court System

The authority of establishing legislation goes to the federal or the province level, depending on the subject matter, the issues related to "regulation of trade and commerce, banking, patents, copyrights, criminal law, and taxation" fall within the competence of the federal level, while the issues related to "property and civil rights, and the administration of justice" classified under the provinces level (Herring, 2017).

Provincial courts, federal courts and superior court are the three types of Canadian courts. The provincial courts are based on the provincial legislation have authority on issues such as "civil, criminal, family and provincial law matters", while the federal courts like the tax court of Canada and federal court of Canada have the jurisdiction on issues such as taxation, trade, and copyright, etc., and finally, the Superior Court of Canada handles appeal cases that are coming from the provinces' court of appeal , where each province has their own appeal court (Herring, 2017).

1.4.2 Quebec Court System

As shown in Figure 1.4, the Quebec court system consists of two levels:

- Courts of First Instance:

  This category in Quebec includes the municipal court, court of Quebec (which has three divisions: firstly, civil division for claims less than $85,000 CAD, secondly, criminal and penal division, and thirdly, the youth division), the superior court of Quebec (including claims of more than $85,000 CAD), the federal court and the human rights tribunal (The Quebec Judicial System, 2017).
- Appeal Courts:

  This category includes the court of appeal of Quebec (to appeal the decisions of the courts of the first instance), the federal court of appeal (to appeal the decisions of the federal court), and the Supreme Court of Canada (which is the highest level of litigation in Canada) (The Quebec Judicial System, 2017).

1.5 Point of Departure

1.5.1 Unavoidable Challenge

It is an established fact that the occurrence of the dispute in the construction projects is an inescapable challenge the project's parties are probably going to face, especially within complex projects (Cheung & Yiu, 2006). This reality encouraged the construction industry players to adopt the skills and techniques related to alternative dispute resolution methods, and consider the effective use of them as a successful key tool that should be owned by the project manager and the project management team.

1.5.2 The Sooner the Better

Among many dispute resolution methods, arbitration and litigation are considered binding methods to resolve a dispute between the disputants. Reaching this stage mean that the

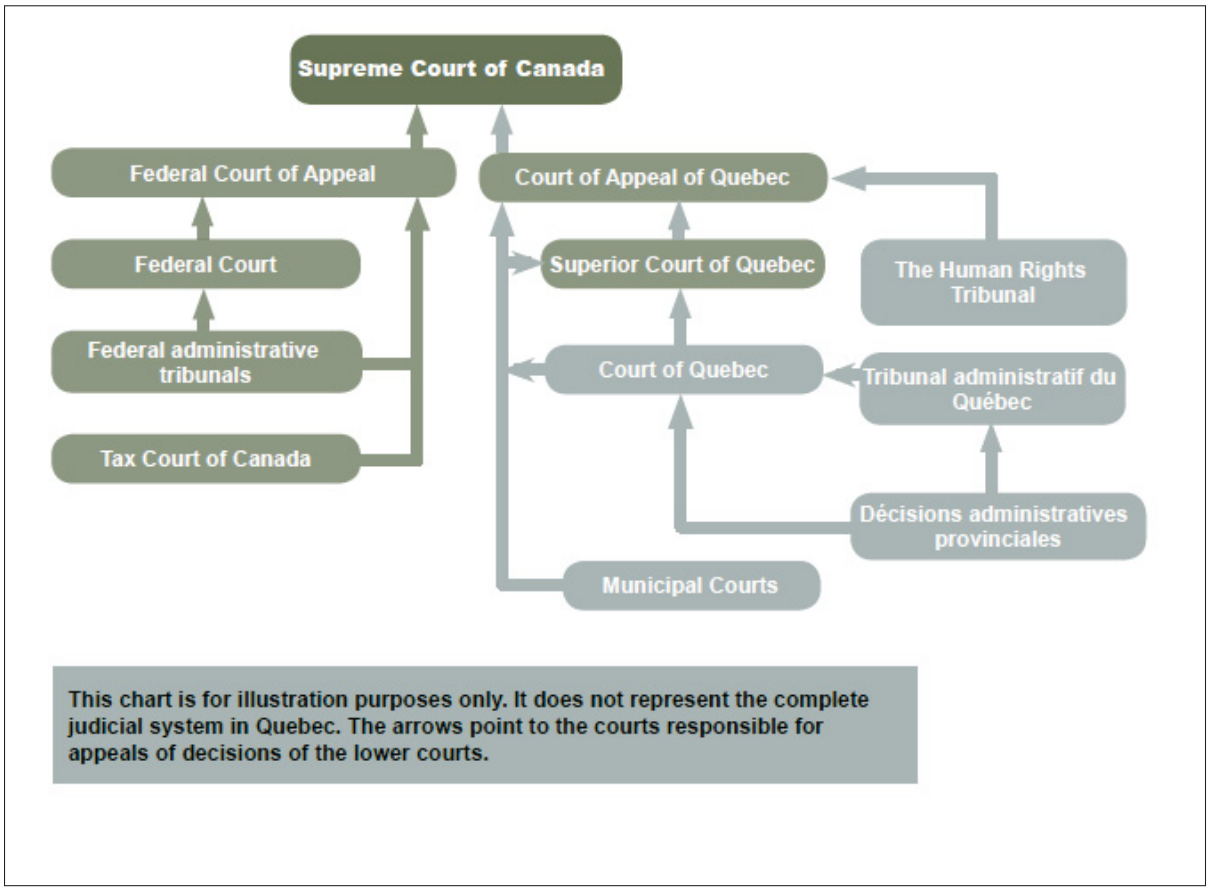


Figure 1.4 The judicial system, adapted from (The Quebec Judicial System, 2017)

attempts of using the softer methods (non-binding) didn't successfully accomplish a mutual agreement between the disputants, where usually the process of dispute resolution starts with such techniques, often by negotiation as an effective instant action taking to deal with disputes (Cheung & Yiu, 2006), or a kind of preventive technique such as dispute review board DRB, or any other non-binding dispute resolution methods, in which the likelihood to maintain the business relationship between parties would remain high, hand in hand with saving an undesired increase in the costs related to the process of resolving the dispute (Cheung, 1999). Therefore, it is quite clear that the longer it takes to resolve the dispute the higher the cost and the negative side effects would be, and vice-versa, the sooner the dispute is resolved, the less the troubles need to be tackled.

1.5.3 Indispensable Step

When disputants face the fact that nothing except a binding decision could resolve their dispute, at that moment the process of arbitration or litigation (judicial processes) becomes with all the expected hostility, cost, and time needed, an indispensable step (Alaloul *et al.*, 2019). However, the extended process of these methods could turn the winner into a loser as well. The construction industry players understand the importance of the operational and financial agility, which makes them unwilling to be stuck in the middle of an extended long process, especially when an important fund is stuck with the dispute case as well (Pena-Mora *et al.*, 2003).

1.5.4 Is It Predictable?

A study entitled "ARE CONTRACT DISPUTES PREDICTABLE?", conducted by (Diekmann & Girard, 1995), determined the possibility to predict the occurrence of the disputes in construction projects by identifying the weakness areas in the project, specially the weaknesses that have been recognized in the construction industry as a disputes causes. Accordingly, this study builds on these results and aims to predict a deeper perspective of a different aspect in the dealing with construction disputes, which is about predicting and highlighting the disputes causes that could result in disputes not being resolved until they reach the painful resolution methods such as arbitration and litigation (judicial processes).

1.5.5 Research Questions

This literature review went through many studies that have investigated the different aspects of construction dispute resolution, many findings, analysis, and conclusions of those studies have directed the way on how this study would contribute to the body of knowledge. The findings of this literature review can be summarized as follows: Firstly, there are signs in the literature review that the industry believes that the construction disputes are inescapable especially in complex projects, however, we will revisit this claim in this study as will be explained below. Secondly, disputes wouldn't always be resolved by non-binding methods, thus, the parties would

face more hostile, costly and time-consuming methods such as arbitration and litigation (judicial processes). Thirdly, the occurrence of construction disputes is predictable, which means that we can expect an occurrence of disputes based on some of the projects' characteristics or on the existence of some of the causes of disputes. This study aims investigate the causes of disputes that can lead not only to disputes in general, but in particular to the disputes that cannot be resolved until they reach the binding DRMs stage, arbitration or litigation (judicial processes). The generalization limits of this study are meant to be within the construction industry of Quebec, where there is a notable scarcity in studies that concern Quebec in particular within the general context of the construction dispute resolution. Therefore, the research questions can be formed with the following three questions:

- Are disputes inevitable in the construction industry?
- Are the binding DRMs more harmful to the sustainability of business relationships and project progress than the non-binding DRMs?
- What are the causes of disputes that lead to the stage of the binding DRMs?

The first question aims to provide the logical base to this study by revisiting the claim that the disputes in the construction projects are an inevitable matter. By doing so, this study would highlight the importance of investigating the causes of disputes as it's considered a challenge the project parties more likely are going to face. While the second question aims to provide a ground for this study by revisiting the claim that the binding DRMs have a more destructive impact on the chances of maintaining the business relationship between the disputing parties and a more negative effect on the work progress than the non-binding DRMs. By doing so, this research question may justify why this research trying to discover those dispute causes that are responsible for taking the project parties to that harmful and painful stage of solving the disputes. The third question, which represents the core of the study, aims to highlight the causes of disputes that are most associated with reaching the binding DRMs, and it could produce disputes that cannot be resolved before reaching that harmful stage.

CHAPTER 2

METHODOLOGY

2.1 Introduction

This chapter contains two main sections. In the first section, a review of the most common paradigms, in addition to shedding light on the concept of the two different reasoning approaches deductive and inductive, and review for the quantitative, qualitative, and mixed-design methods. In the next section, the reasoning approach followed to adapt the paradigm and the research method of this study will be illustrated. Finally, this section ends with clarification on the statistical analysis employed to interpret the results and how the validity and reliability issues were addressed, the following Figure 2.1 as adapted from (Thornhill *et al.*, 2009) illustrate the anatomy of the research as will be covered briefly in this chapter.

2.2 Research Design Methods Overview

2.2.1 Philosophical Paradigms Overview

The paradigm or the theoretical framework is "a loose collection of logically related assumptions, concepts, or propositions that orient thinking and research" (Bogdan & Biklen, 1998) as cited in (Mackenzie & Knipe, 2006),there is a paramount importance in identifying the philosophical paradigm that will be followed by the researcher as early as the study started, in particular, the followed philosophy will guide the researcher's decisions through the study and make his/her choices logical and associated with each other. Furthermore, the paradigm followed will outline the way the researcher would deal with the research problem, as well as link to the background and the "scholarly community" of the researcher (Huff, 2008) as cited in (Creswell, 2017).

A study by (Scotland, 2012) explained the four philosophical assumptions which are ontology, epistemology, axiology, and methodology, and the way of thinking about them which would frame the paradigm that the researcher is going to follow as shown in Figure 2.2 as adapted

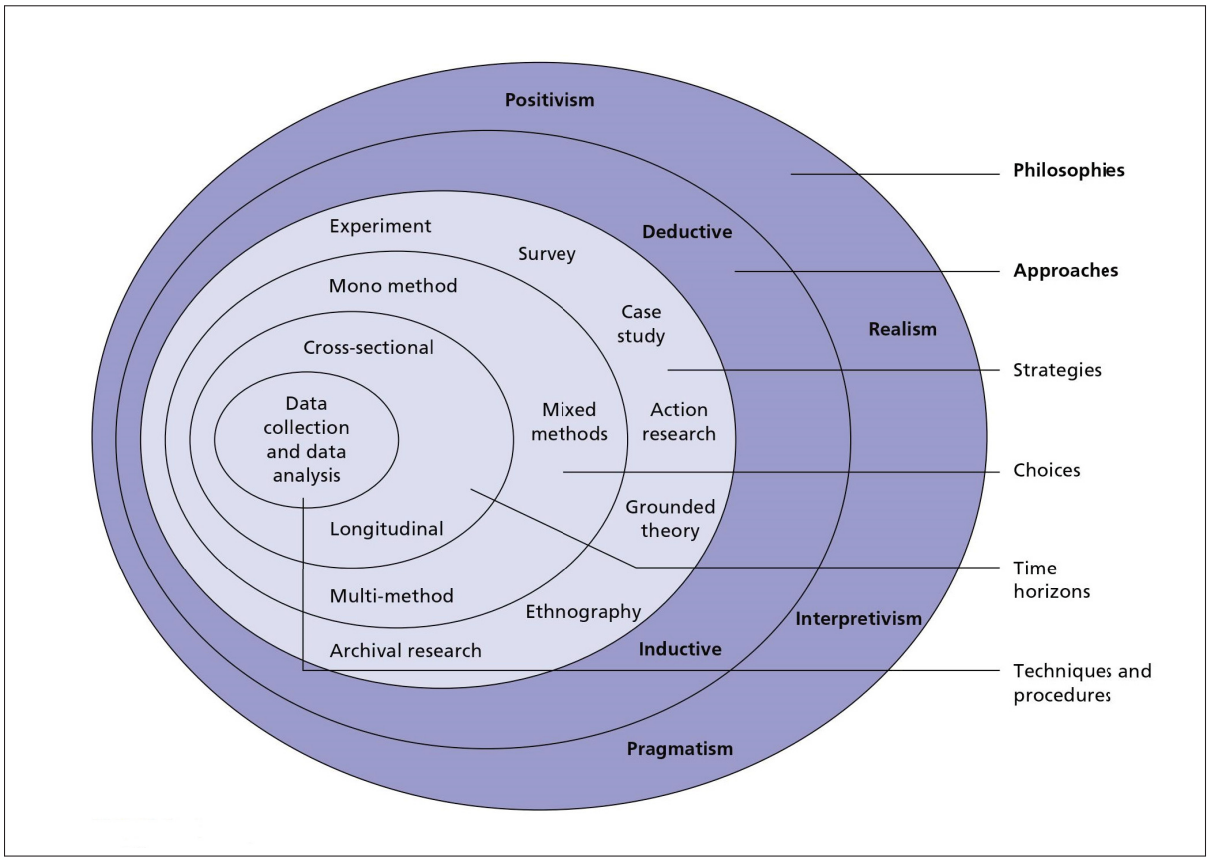


Figure 2.1 The research onion, adapted from (Thornhill *et al.*, 2009)

from (Aldawod & Day, 2017). Thus, in the following subsections, the main common paradigms: positivism, interpretivism, realism, and pragmatism will be clarified from the point of view of the different philosophical assumptions.

2.2.1.1 Positivism

Occasionally, it's pointed out as a "scientific method" (Mackenzie & Knipe, 2006), which is probably attached with the quantitative method, and aims to recognize the factors reasoning the results, as well as focusing on "explaining relationships" (Scotland, 2012). It should be noted that this paradigm developed later to the post-positivism paradigm, which has common thoughts with the positivism about the beliefs on the single reality and the goal of explaining

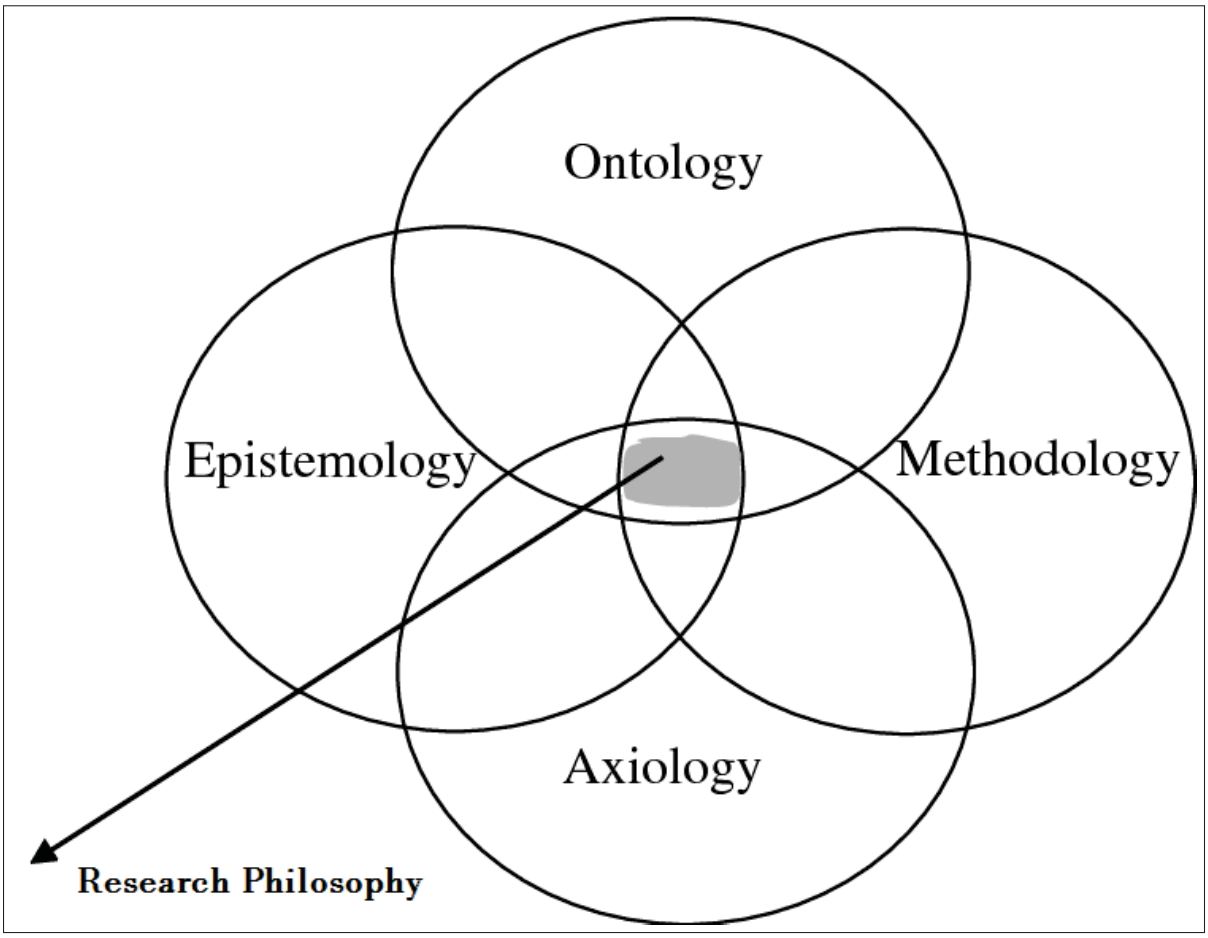


Figure 2.2 The relationship between ontology, epistemology, methodology and axiology, adapted from (Aldawod & Day, 2017)

relationships. However, post-positivism believes that the reality may not be fully explored, so they prefer to believe in the various aspects coming from the participants (Creswell, 2017).

2.2.1.2 Interpretivism

Interpretivism, or the constructivist paradigm, which is probably linked to the qualitative method or the mixed method, where both quantitative and qualitative data collection methods are employed (Mackenzie & Knipe, 2006).In this paradigm, there is a concentration on the perspectives of the participants and their experiences, as well as their acts and behaviour in the actual life context, in addition, one of the main distinguishing aspects of the interpretivism

paradigm from the positivism paradigm is the belief that the "personal background" of the researcher will influence or interfere with their interpretation of the data (Creswell, 2017).

2.2.1.3 Realism

Just like the positivism paradigm, the realism paradigm is associated with the scientific approach and the objectivity, however, they believe that reality is present independently of our subjectivity, both forms of realism: direct and critical believe that "to experiencing the world. First, there is the thing itself and the sensations it conveys", however, the critical realism only insists that there is a second step for this process, which is "the mental processing that goes on sometime after that sensation meets our senses", in addition, this paradigm endorses that the research will be affected by the researcher's background and his/her opinions (Thornhill *et al.*, 2009).

2.2.1.4 Pragmatism

Usually, in the pragmatism paradigm, the researcher does not have ties that bind them with a specific philosophy. The importance here is for the research and the question wanted to be answered, thus, the researcher, through this paradigm, intends to find the most appropriate manner to serve the research, in other words, it focuses more on the research question rather than focusing on the methods (Creswell, 2017). Consequently, it's argued that the pragmatism paradigm is the best choice for the mixed research, where the researcher will interfere less with the philosophical assumptions and instead, will be well directed to figure out what kind of work should be done to investigate the research question and obtain the answers (Brierley, 2017).

2.2.2 Approaches Overview

2.2.2.1 Deductive Approach

The deductive approach is usually described as a "waterfall", where it starts with a theory at the top of the waterfall, then the hypothesis, then passes through data collection, then finally,

examines the theory. Furthermore, the sequence of the deductive approach described as it "begins with the general and ends with the specific", and because this approach associated with the quantitative method, hence, it's well-grounded by regulation and fundamental guidelines (Soiferman, 2010).

2.2.2.2 Inductive Approach

Quite the opposite, the inductive approach is linked to the qualitative method of data collection and analysis. This approach is described as the organizing steps to get the qualitative data analyzed (Thomas, 2006); it is usually described as "mountaineering", where it starts from the bottom with constructed themes from the raw data observed from the participants as their opinion about specific phenomena, then build a hypothesis, then finally at the top, builds a theory, and contrary to the deductive approach, it outlines the "moving from the specific to the general" (Soiferman, 2010).

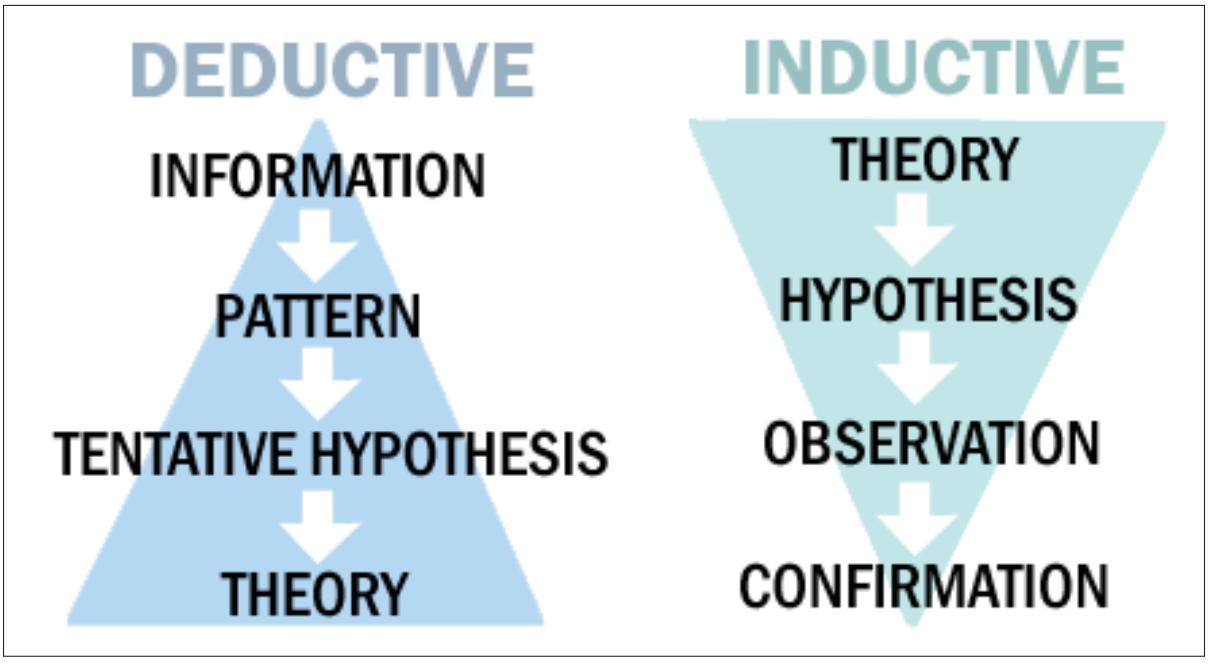


Figure 2.3 Deductive vs Inductive, adapted from (Tucker, 2014)

2.2.3 Research Methods

Two studies conducted by (Soiferman, 2010) and (Castellan, 2010) pointed out the characteristics that differentiate quantitative and qualitative methods; those characteristics will be the basis for the following two subsections, in which the differences between the quantitative and qualitative designs will be illustrated in the terms of the following main aspects: the purpose of the research, research question and hypothesis, data collection, data analysis, and role of the researcher.

2.2.3.1 Quantitative Design Approach

- The purpose of the research:

  As a method guided by the deductive reasoning approach, it begins with a theory to be tested and relationships to be discovered among the variables, in other words, the quantitative research aims to investigate the relationships between variables by applying statistical analysis on the data collected, which are usually numerical data that could be interpreted through statistical analysis (Soiferman, 2010).
- Research question and hypothesis:

  In the quantitative research method, the researcher gets engaged in a comprehensive literature review, in which the outcome of the previous studies will be the base for his/her study, hence the knowledge gained through the literature review will provide the researcher with the necessary knowledge to create the hypothesis, which represents the researcher's prediction for the outcome of his/her study (Castellan, 2010).
- Data collection:

  The data collected through the quantitative method are formed of numbers in order to be used in statistical analysis, many tools could be employed to gather those data, such as surveys, checklist, rating scale, and rubrics (Soiferman, 2010).
- Data analysis:

  In the quantitative method, the data analyzed by applying a statistical analysis which facilitates how the researcher could interpret the data, both descriptive and inferential statics could serve the study goals, the descriptive statistic applied on the data to identify the "central

tendencies" such like mean, mode, and median, while inferential statistics could serve to identify the possible relationship between the variables (Soiferman, 2010) and (Castellan, 2010).

- Role of the researcher:

  Objectivity: this one word could summarize the position of the researcher and frame how he/she would act in the quantitative method. Intentionally, the researcher keeps his/her personal beliefs, experience, and personal background away from the interpretation of the data (Soiferman, 2010) and (Castellan, 2010).

2.2.3.2 Qualitative Design Approach

- The purpose of the research:

  The qualitative method relying on the textual data, and the data that couldn't be numerical such as emotion, experience, and the culture, it's employing the inductive approach by "moving from the specific to the general", the aim of this method is to explore the substance of these data by extracting the themes among the data and categorize it in a way could help the researcher interpret those data to draw conclusions and may build a theory around them (Soiferman, 2010).

- Research question and hypothesis:

  Instead of conducting a comprehensive literature review to set up a framework guided by the finding of the previous studies, which is what the quantitative method is all about, the qualitative method researchers either don't consider the previous studies at all and prefer to explore and involve in the "natural setting" to have their own notes and views for the phenomena under study, or just conducting a literature review in order to be updated about what has been done by other researchers and not to be accused of neglecting or not respecting the effort made on the subject matter (Castellan, 2010).

- Data collection:

  Instead of numbers in the quantitative method, the qualitative method relies on textual data such as words, documents, and images, and that data could be gathered through interviews,

reviewing documents and material, or spending time in the actual field to take comments and record the findings (Soiferman, 2010).

- Data analysis:

  The process of analyzing data through qualitative method is depending on the researcher's abilities to read, review and observe the data, and categorize it into themes, in which those themes would help the researcher interprets the data and draw conclusions Furthermore, the data analysis within the qualitative method doesn't have to respect the sequence followed in the quantitative method, where the data collection should be completed first before conduct the analysis, in the qualitative method both data collection and analysis could be done in parallel and the researcher could make several movements between the data collection and data analysis until getting it done, actually, this flexibility comes from the nature of "emergent design" which is one of the distinguishing features of the qualitative method (Soiferman, 2010) and (Castellan, 2010).

- Role of the researcher:

  The researcher is defined as an instrument in the qualitative method where his/her personal beliefs, experience and personal background play a significant role in the way the data would be interpreted, which makes the qualitative method a subjective method in its nature (Soiferman, 2010) and (Castellan, 2010).

2.2.3.3 Mixed Design Approach

The mixed method or as occasionally called "the third paradigm", in which the researcher deals with the study from both quantitative and qualitative perspectives, is an acknowledgment that no single type of data or single philosophical view could achieve adequately the research objectives, thus, a combination of quantitative and qualitative methods, philosophies, purposes, and designs would form a better way to conduct the research and could offer better understanding for the subject being investigated in a way that one type of data couldn't provide (Creswell & Clark, 2017), (Johnson & Onwuegbuzie, 2004),and (Johnson *et al.*, 2007).

Usually, the mixed-method research is linked to the pragmatism paradigm, in which the focus of the researcher will be on the research question not on the methods, and where the researcher intends to find the best way to serve the research away from the philosophical debate, in addition, the mixed-method researcher could adapt different paradigms. However, they should clearly mention how the philosophical assumptions formed the paradigm that they believe is the best fit to answer the research question (Creswell & Clark, 2017).

As mentioned in (Creswell & Clark, 2017), there are different designs of the mixed method based on the weight of the quantitative and qualitative parts in each study, as well as, on the priority given to either of both methods, a basic definition of each design will be illustrated briefly in the following:

- Convergent design:

  When the research question could be more deeply understood in case both quantitative and qualitative data are collected for the same question, in the convergent design, the phase of the data collection accrued at the same time for both quantitative and qualitative ways and with an equal priority.

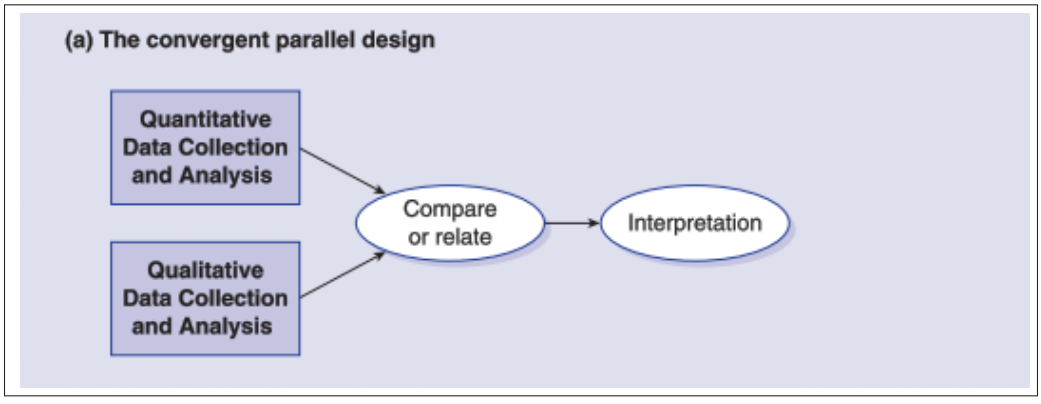


Figure 2.4 Convergent design, as adapted from (Creswell & Clark, 2017)

- Explanatory design:

  The significance of the explanatory design turns out when qualitative data are needed in order to create a better understanding of the quantitative data, in this case, the order of data

collection will start with the quantitative data then will be followed by the qualitative, this design gives the priority to the quantitative method.

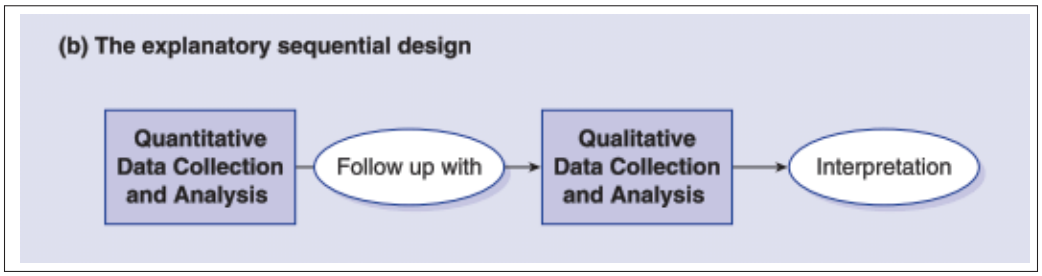


Figure 2.5 Explanatory design, as adapted from (Creswell & Clark, 2017)

- Exploratory dsign:

  The exploratory design is the best fit when the researcher is looking to generalize the finding of the qualitative method that conducted in the first phase. This generalization would be achieved through a quantitative approach with a larger sample in the second phase. In addition, the exploratory design helps the researcher initiate a topic not clearly understood or when there is a lack in the literature could help in identifying the variables, the data collection starts with the qualitative data then followed by the quantitative data collection which would take the advantage of the results and tools that developed through the qualitative phase, the priority in this design is for the qualitative method.

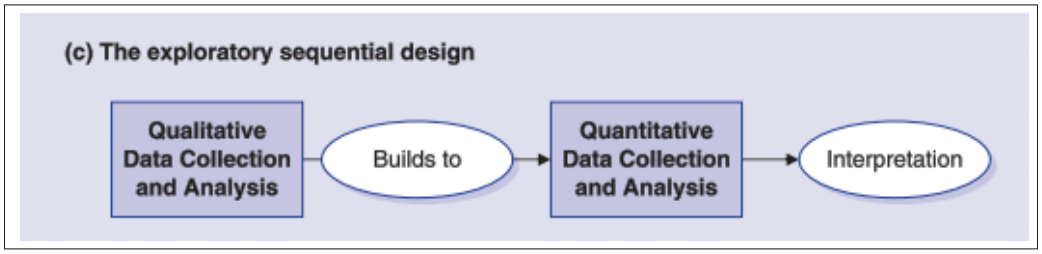


Figure 2.6 Exploratory design, as adapted from (Creswell & Clark, 2017)

- Embedded design:

  The embedded design represents the attempt of the researcher who begins the research mainly with one of the two ways, quantitative or qualitative but also decides to conduct a second

endorsement phase of data collection (either a quantitative after qualitative, or a qualitative after quantitative). The second phase aims to better address the research question and achieve the study objectives, the data collection for both quantitative and qualitative data could be in the same time or sequentially, and the priority in this design goes to the main method followed.

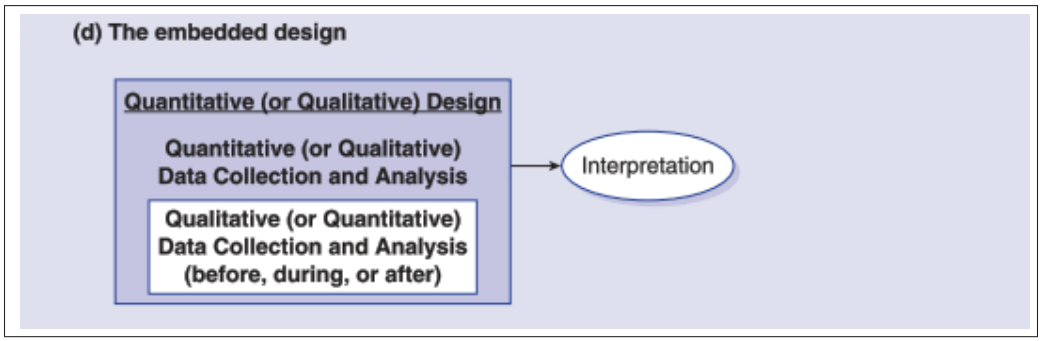


Figure 2.7 Embedded design, as adapted from (Creswell & Clark, 2017)

- Transformative design:

  This design is governed by the transformative framework and its related roles of data collection and analysis for both quantitative and qualitative data, in which the priority could be equal or tilted to either one of the data collection methods, as well as the data collection order could be in the same time or sequentially.

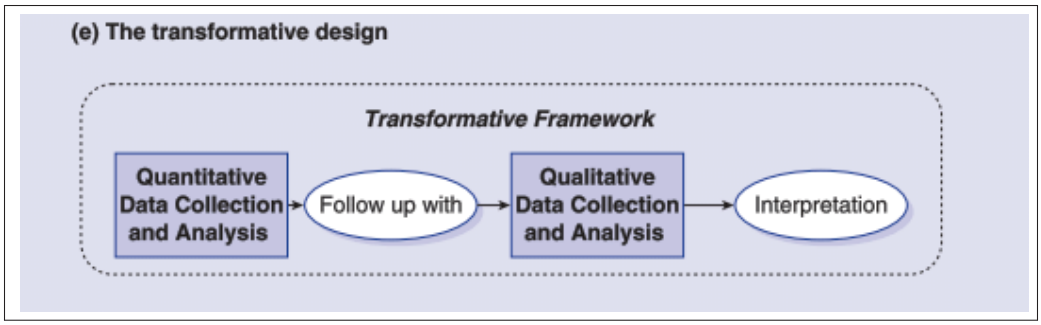


Figure 2.8 Transformative design, as adapted from (Creswell & Clark, 2017)

- Multiphase design:

  When achieving the study objective, it requires multiple phases of data collection over a

period of time. That data, quantitative and qualitative, could be collected sequentially or at the same time, and both methods have an equal priority.

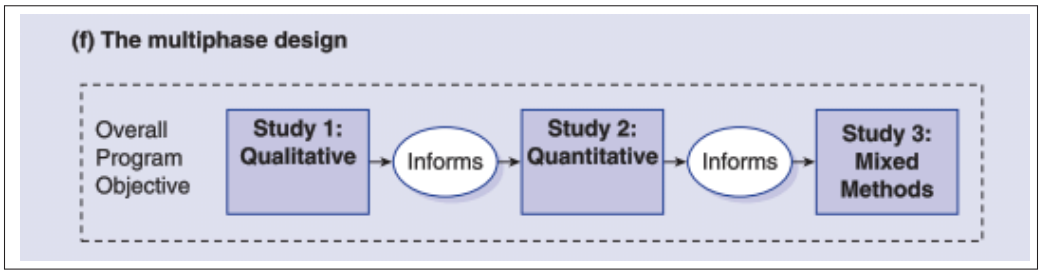


Figure 2.9 Multiphase design, as adapted from (Creswell & Clark, 2017)

2.3 Justify the chosen design of the research

Among the general causes of disputes, this study aims to highlight the causes of disputes that can lead to disputes that can't be resolved until reaching the binding DRMs stage, arbitration and litigation (judicial processes). To achieve this objective the researcher conducted a literature review in order to be aware about what has been done in the same context and build on it along the way. The methodology chosen to conduct this study was undiscovered until the literature review was completed, in which the literature review along with the nature of the research's question did form in one way or another the methodology selected to conduct this study, as illustrated in the following subsection.

2.3.1 Why there is a need for qualitative data?

It was noticed during the literature review the abundant of the studies that addressed the different aspects of the construction disputes, such as the causes of disputes, dispute resolution methods, and preventing the disputes, however, the studies that investigated the causes of disputes didn't try to make a link between the causes of disputes and the level of disputing would be reached by the project parties, in other words, the previous studies treat the whole causes as the same, from the point of the disputing level that would be reached, without any further classification,

while this study tries link between certain projects' characteristics and causes of disputes to the situation where more complex disputes are produced, in which it would be very difficult to settle the dispute through the non-binding dispute resolution methods, and it requires entering in the binding resolution methods like arbitration and litigation (judicial processes).

This study attempts to contribute to the gap illustrated above, by highlighting the causes of dispute that are leading to the binding DRMs stage. However, the lack of studies that investigated this connection has formed the need to explore the topic closely with experts from the industry, this desired exploration will produce a qualitative data through interviews with those experts, those interviews will be dedicated to investigating the participants' views about the possibility to link between certain causes of disputes and reaching the arbitration and litigation stages.

2.3.2 Why there is a need for quantitative data?

The findings of the qualitative phase would help in having deep insight about the relationship investigated, but there is a big debate if those findings could be generalized within the Quebec construction industry or not, therefore, the need of generalization driven the study to hold the second phase of data collection and analysis which would be quantitative data that have been collected through a survey using a larger participants sample, for the purpose of the generalization within the Quebec construction industry.

The findings of the qualitative phase provide the base knowledge about the variables, which have been used to develop the instrument (survey) of the quantitative phase and accommodate new causes of disputes that were not mentioned in the literature review.

2.3.3 The chosen design of the research

As described in the previous two subsections, the need for exploration (qualitative) and the need for generalization (quantitative) formed the way that leads to select the design of this research, which is the **Mixed Method-Exploratory Sequential Design**,where both qualitative and quantitative data have been collected in a sequential manner, qualitative data in the first

phase then quantitative data in the second phase, Figure 2.10 illustrates the reasoning approach behind the selection of the research design.

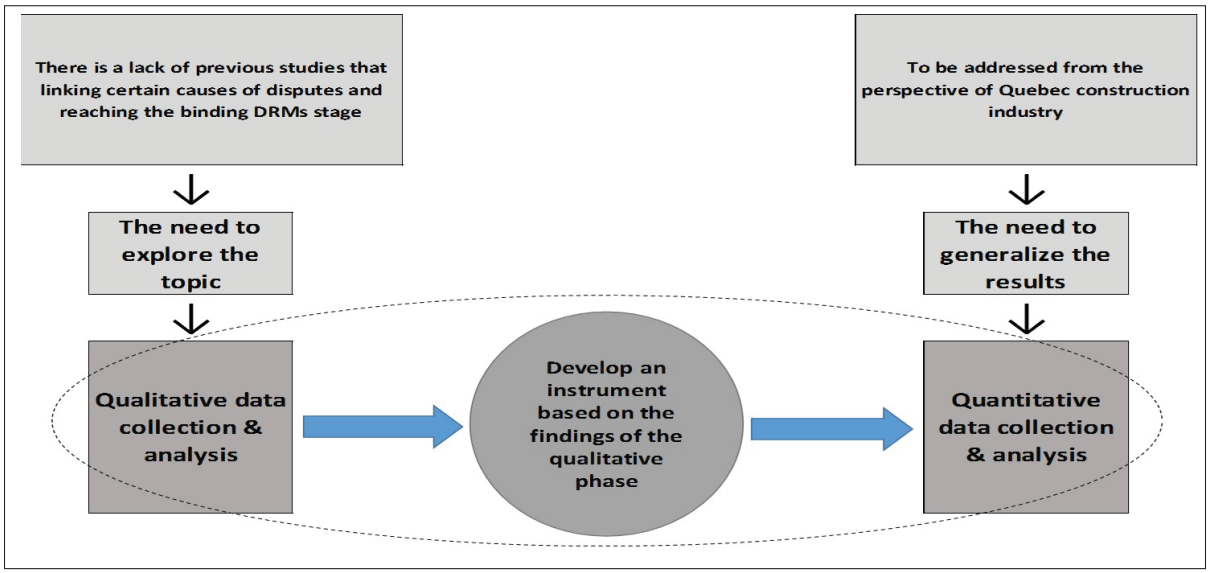


Figure 2.10 The research design flowchart-Mixed Method-Exploratory Sequential Design

2.3.4 The paradigm followed

To achieve the research objectives, the researcher gave the priority to the research question and to the work would be required to answer it in the best way possible, instead of focusing on the methods and the philosophical assumptions, therefore, the researcher adapt the pragmatism paradigm and employed the mixed-method design to better address the topic, however, since the study is involving in both qualitative and quantitative phases, the researcher respect the guidelines of the philosophies underpinning the qualitative phase (interpretivism or constructivist) and the quantitative phase (post positivism).

2.3.5 Data collection

Since both qualitative and quantitative method are employed in the mixed research design, both qualitative and quantitative data will be collected and analyzed in this study, Figure 2.11 describing the strategies followed to handle the data collection and the data processing in this study, as a part of the research processes.

The semi-structured interview was chosen to gather the qualitative data in the first phase of the exploratory sequential design, where the researcher has the chance to get untied thoughts from experts about the possibility to link between some of the project characteristics and the disputes that can't be resolved before reaching the binding resolution methods as arbitration and litigation (judicial processes).

On the other hand, the survey was chosen to conduct the quantitative data collection in the second phase, the survey would allow collecting from much bigger sample to help the study reach the desired level of generalization.

2.3.6 Sampling Approach

Applying the mixed-method design means conducting two completed studies in your main study, therefore the roles and guidelines of both methods will be applied (Creswell & Clark, 2017).

In the qualitative phase, which is the first phase will be conducted, the researcher decided to use at the beginning the purposeful sampling, where the study requires participants with considerable experience in dealing with construction disputes from several points of view, one side of the view is the disputing parties such as the contractor and the owner, and the other side is the experts of the arbitration and litigation process such as mediators, arbitrators, and lawyers who are specializing in the construction law.

In addition, the researcher considers that the use of snowball sampling would be helpful to reach qualified participants and could be a supportive strategy for the researcher to cover any gap

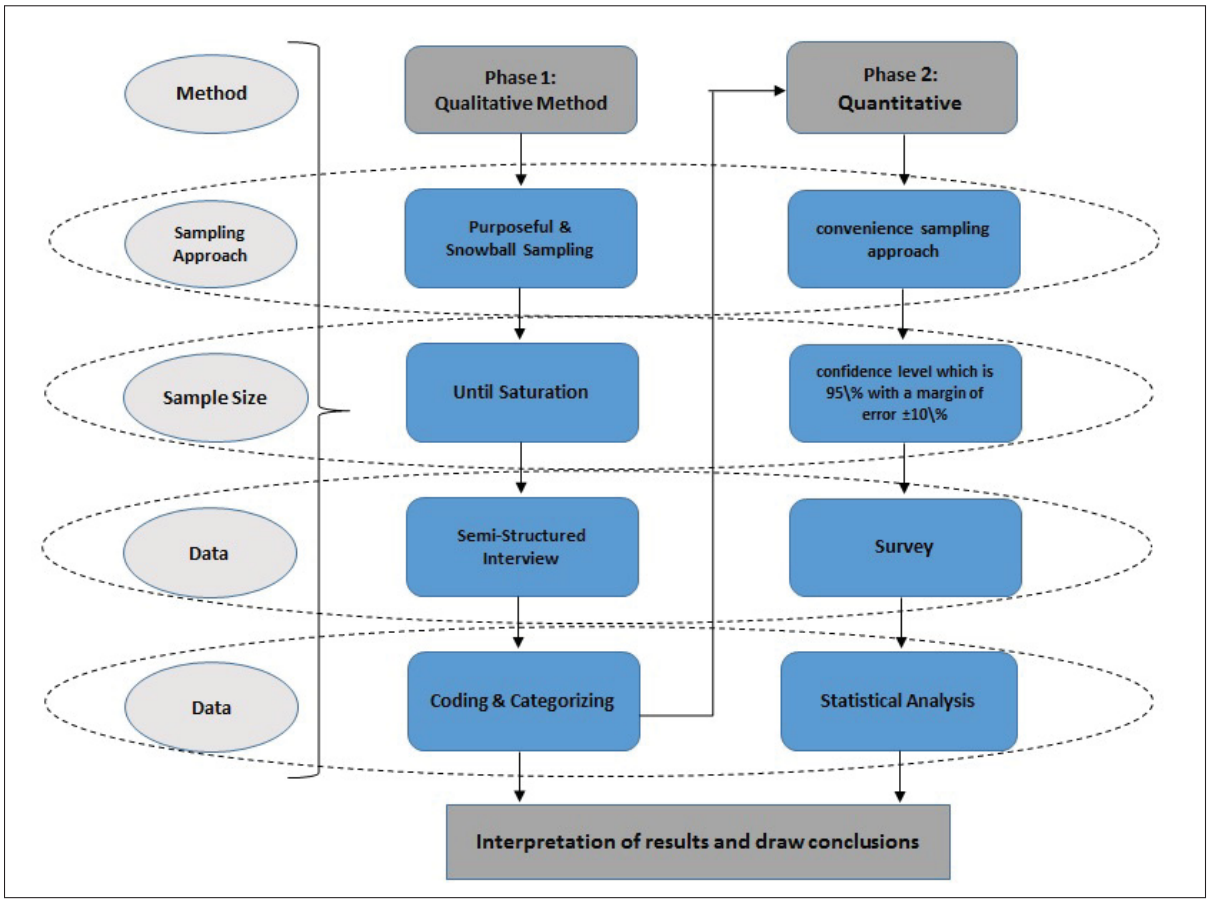


Figure 2.11 The Research processes flowchart

could be in the participants' sample due to the researcher's social network and the available ways to access the targeted participants.

In the quantitative phase and because the need to make generalization is the main purpose for holding the follow-up quantitative phase, the researcher decided not to share the same participants with the first phase, this approach called non-nested design as per (Small, 2011), the sampling approach employed is the convenience sampling approach, which targeting the individuals who are involved in the project management activities, and procurement division from the contractor or the owner side, as well as arbitrators, mediators, and lawyers who are dealing with disputes in the construction industry, in addition to the condition that the participants should have considerable experience in Quebec construction industry, in order to serve the generalization

limitation within the construction industry of Quebec, and therefore, the individuals who meet these conditions and willing to participate will be recruited.

2.3.7 Sample Size

The sample size of the qualitative phase has been decided to be unlimited until saturation accrued and the interviews stop adding new issues, the researcher believes that applying this approach without making a previous judgment on the sample size would better ensure that the sample is not closed until all the variables uncovered and the participants stop adding new causes of disputes that are associated with reaching the binding DRMs stages.

There is variety in the resources that provide many formulas to calculate the sample size for the quantitative phase, however, the difficulty in determining the overall population size in an accurate way, which includes as illustrated before (engineers and the individuals who are involving in the projects management activities and procurement division from both the contractor and the owner side, as well as, arbitrators, mediators, and lawyers specializing in the construction law), thus no formula could provide the accurate sample size and therefore, a different approach was employed to determine the survey setting based on the final number of respondents have been reached:

- Firstly, since the total population is unknown, the calculation of the stander deviation wouldn't be possible, therefore, as the following equation stated, the most conservative result of the stander deviation would be 0.5, thus, the assumption of $\sigma = 0.5$ was made and then used in the calculation of the margin of error.

$$\sigma = \sqrt{\frac{p(p-1))}{n}} \tag{2.1}$$

- Secondly, the confidence level set to be at $\alpha = 95\%$ which indicates that 95% of the time the confidence intervals will contain the population parameter.
- Thirdly, the sample size has been reached in this study is 107 respondents, only 94 of them are valid for analysis, a total of 13 responses were excluded for three different reasons, four

responses with no experience in Quebec, two responses seems to be duplicated, and seven responses refused to participate based on the statement was provided to them at the beginning of the survey. Accordingly, the final sample size is n = 94 will be used in the calculation of the margin of error in the next step.

- Fourthly, the margin of error has been calculated using the following Cochran's Sample Size Formula:

$$n = Z_{a/2}^2 \times \frac{\sigma(1-\sigma)}{E^2} \tag{2.2}$$

Where E is the margin of error we need to calculate, n is the sample size equal to 94, σ is the stander deviation assumed to be 0.5, and Z is the critical value of half of the confidence level which is 95%.

As a result of the above equation the margin error is equal to .101, which can be stated as this survey with 94 sample size and 95% level of confidence will estimate the true parameter 95% of times with a margin of error ±10%.

2.3.8 Data Analysis

As every aspect of the mix-method research, the data analysis went through both qualitative and quantitative analysis as a complete two separate studies (Creswell & Clark, 2017).

In phase one, a qualitative data has been collected through semi-structured interviews, then, a sequence of coding and categorizing the data have been implemented, in which the collected data got processed in many rounds of the reading, rereading, highlighting and headlining, coding, match the similar codes, grouping the codes into categories, and finally grouping the similar categories into themes that are directly related to answering of the research question.

On the other hand, the data analysis that is related to the quantitative phase has applied the statistical analysis to process the data, that includes both descriptive and inferential analysis, the following is the statistical methods applied for each question:

2.3.8.1 The First Research Question

Are disputes inevitable in the construction industry? this is the first research question and it is represented in the following question in the survey: "To what extent do you agree or disagree with the following statement: The construction disputes are inevitable no matter the prevention strategy followed."

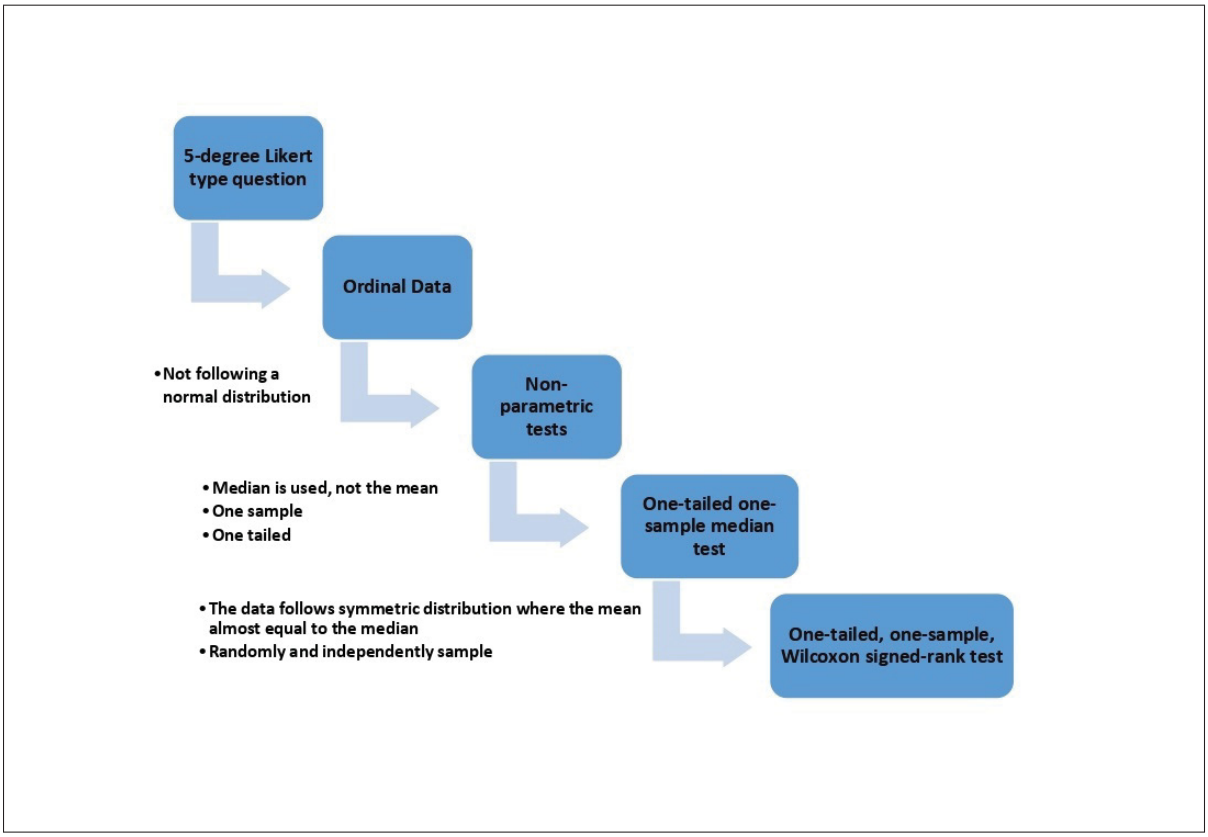


Figure 2.12 Reasoning approach - Wilcoxon singed rank test

A 5 point Likert scale-type question such as this question will produce ordinal data, which is not following a normal distribution, and therefore, non-parametric tests will be applied, further, since the median is the best choice to represent ordinal data, not the mean, and because the data of this question represent one sample, and because we are looking for values less than the median "dispute are not inevitable" that's mean we need to perform a one-tailed test, or in other

words, a directed test, therefore, we are looking for a one-tailed one-sample median test, which leaves us with two options; one-tailed one-sample Wilcoxon signed-rank test and one-tailed one-sample signed test.

Also, the two main assumptions of the Wilcoxon signed-rank test are met; the data follows symmetric distribution where the mean almost equal to the median, and the sample has been chosen randomly and independently, hence eventually, the one-tailed one-sample Wilcoxon signed-rank test is the chosen test for this question as illustrated in Figure 2.12, it should be noted that SPSS doesn't have the option to perform one tailed Wilcoxon test, therefore, the *p-vale* resulted from the two tailed test will be divided on 2 to get the *p-vale* for one tailed test.

To test whether there is a belief within the population that the disputes are inevitable in the construction projects, which mean a median greater than 3 on the 5 point Likert scale, in this case, the null hypothesis will represent the opposite side of the equation when the median is equal or less than 3 on the 5 point Likert scale.

$$H_0 : Median \leq 3$$

$$H_a : Median > 3$$

By rejecting H_0 we assume that the data sample shows sufficient evidence that the disputes are inevitable, while if we fail to reject H_0 that means the data sample shows insufficient evidence that the disputes are inevitable.

2.3.8.2 The Second Research Qestion

Are the binding DRMs more harmful to the sustainability of business relationships and project's work progress than the non-binding DRMs? This is the second research question and it is represented in the next three questions in the survey, the first two questions about the chances of maintaining the business relationship between the disputing parties, in the case the dispute is

resolved through the non-binding methods and in the case the dispute is resolved through the binding methods, while the last question assessed the difference in the effect of the different DRMs on the project's work progress.

1. Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through non-binding dispute resolution methods such as negotiation, mediation, and dispute review board?

   A form of 5 point Likert scale-type questions was used in this question also, and the same reasoning approach of the previous question has applied, and therefore, the one-tailed, one sample, Wilcoxon signed-rank test has been chosen to test the hypothesis that the chances to keep the business relationship are high when the dispute is solved through the non-binding DRMs and that means a median greater than three, which represent the alternative hypothesis, while the null hypothesis, in this case, would be the median is less than or equal three.

$$H_0 : \textit{Median of (chances of maintaining the business relationships through the non-binding DRMs)} \leq 3$$

$$H_a : \textit{Median of (chances of maintaining the business relationships through the non-binding DRMs)} > 3$$

   By rejecting H_0we assume that the data sample statistically shows sufficient evidence that the chances of maintaining the business relationship when the dispute is resolved through the non-binding DRMs are high, while if we fail to reject H_0 then, the data sample shows insufficient evidence that the chances of maintaining the business relationship when the dispute is resolved through the non-binding DRMs are high.

2. Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through binding dispute resolution

methods such as arbitration and litigation (Court Proceeding)?

The same procedure and test of the previous question were used in this question to test the hypothesis that the chances to keep the business relationship are low when the dispute is solved through the binding DRMs and that's mean median is less than three, which represent the alternative hypothesis, while the null hypothesis, in this case, would be the median is greater than or equal three.

$$H_0 : \textit{Median of (chances of maintaining the business relationships through the binding DRMs)} \geq 3$$
$$H_a : \textit{Median of (chances of maintaining the business relationships through the binding DRMs)} < 3$$

By rejecting H_0 we assume that the data sample statistically shows sufficient evidence that the chances of maintaining the business relationship when the dispute is resolved through the binding DRMs are low, while if we fail to reject H_0 then, the data sample shows insufficient evidence that the chances of maintaining the business relationship when the dispute is resolved through the binding DRMs are low.

3. If any of the following dispute resolution methods occurred during the project, how would you rank them from the one that has the most negative effect on the project progress to the one that has the least negative effect?

Through this question, the participants were asked to rank five DRMs, arbitration, mediation, dispute review board, litigation (judicial processes), and negotiation, from 1 to 5, in which the method ranked as number one is the method with the most negative effect and the method ranked as number five is the method with the least negative effect on the project's work progress.

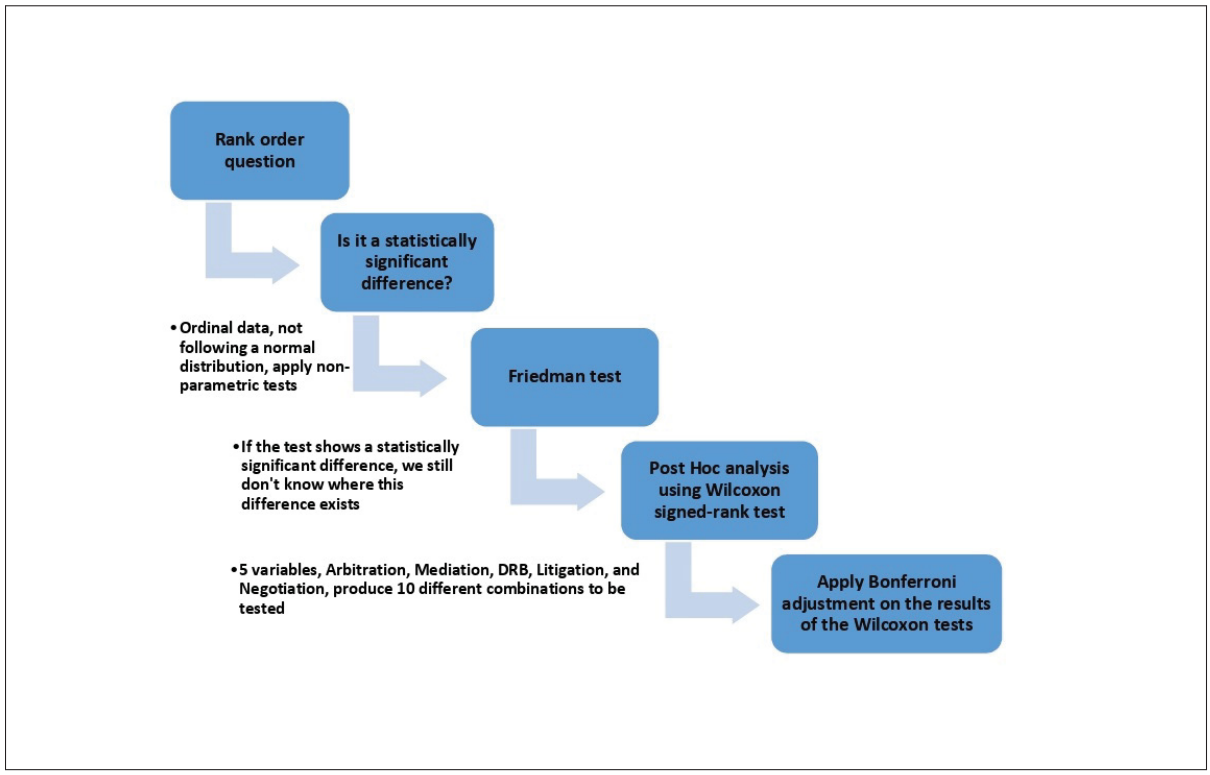


Figure 2.13 Reasoning approach - Friedman test - Post Hoc analysis - Wilcoxon singed rank test

As shown in Figure 2.13, and as the procedure mentioned in (statistics.laerd.com),the results of this question coming as ordinal data that are not following the normal distribution, the median would be a good descriptive parameter to show how the sample distinguishes these DRMs in the terms of the negative impact on the project progress, furthermore, a statistical test is required to figure out if there is a statistically significant difference between the variables, and since the data is ordinal data, a non-parametric test would be the choice.

The Friedman test as a non-parametric test will be applied to check if there is a statistically significant difference between the variables, this test involving four main assumptions that they were all met in this case, “the dependent variable should be measured at the ordinal or continuous level”, “Samples do NOT need to be normally distributed”, “One group that is measured on three or more different occasions”, and “Group is a random sample from the

population".

$$H_0 : \textit{There is no statistically significant difference}$$

$$H_a : \text{T}\textit{here is a statistically significant difference}$$

If the Friedman test shows a statistically significant difference, then we need to test where these differences exist, hence, the post hoc analysis using Wilcoxon signed-rank test will be employed, therefore, the five variables will produce 10 different groups to be tested, arbitration and mediation, arbitration and dispute review board, arbitration and litigation, arbitration and litigation, arbitration and negotiation, mediation and dispute review board, mediation and litigation, mediation and negotiation, dispute review board and litigation, dispute review board and negotiation, and litigation and negotiation.

A separate hypothesis will be created for each of the 10 combinations, as an example for these hypotheses, the following is the hypothesis for combination of arbitration and mediation:

$$H_0 : \textit{There is no statistically significant difference between Arbitration and Mediation}$$

$$H_a : \text{There is a statistically significant difference between Arbitration and Mediation}$$

A Bonferroni adjustment will be applied to Wilcoxon signed-rank test results in order to mitigate the likelihood of having type 1 error by rejecting the null hypothesis while it's true (McDonald, 2014), to do so, divide the significance level on the number of tests:

$$Adj.Sig = \alpha(.05)/No.Of.Tests(10) = .005 \tag{2.3}$$

2.3.8.3 The Third Research Question

What are the causes of disputes that are leading to reach the stage of the binding DRMs? this is the third research question and it is represented in the following question in the survey: "Based

on your experience in Quebec, choose the causes you think are most associated with reaching the stage of binding dispute resolution methods Arbitration and Litigation (Court Proceeding)".

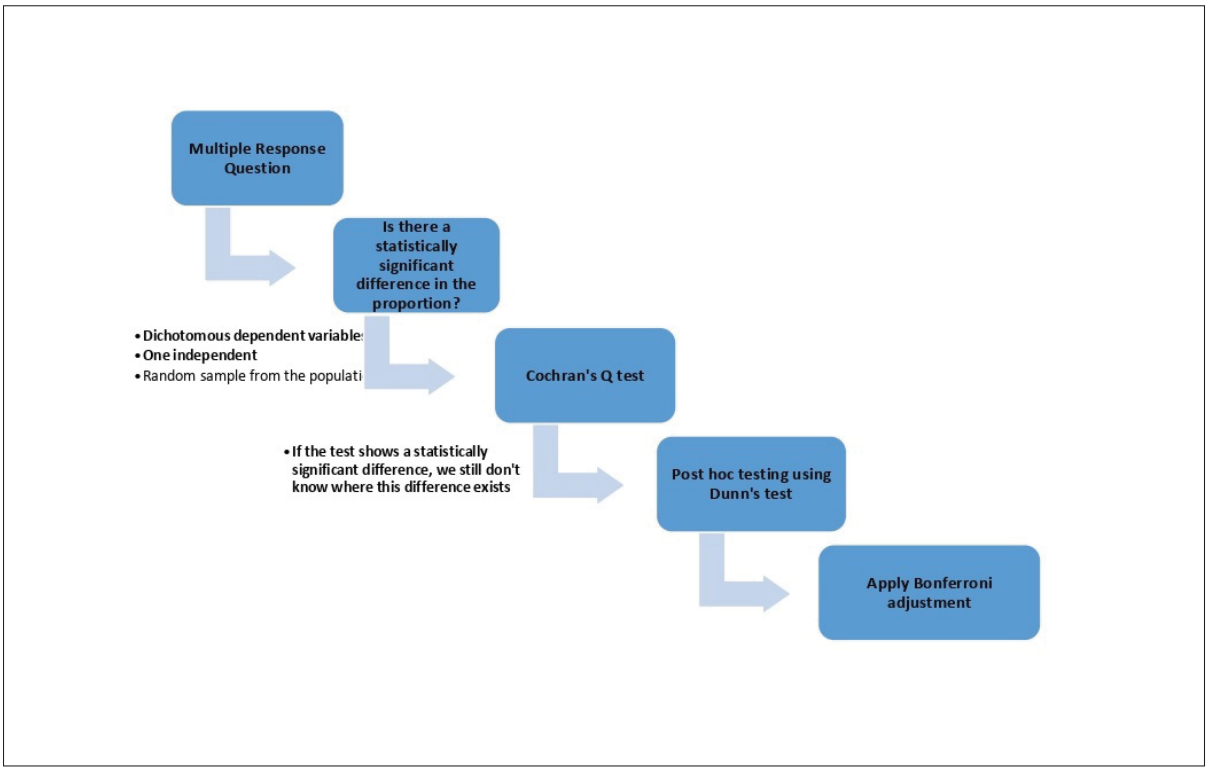


Figure 2.14 Reasoning approach - Cochran's Q test - Post Hoc - Dunn's test

Through this question, the participants were asked to choose all the causes of disputes that they think it's associated with reaching the binding DRMs stage, a total of 38 causes of disputes distributed over 10 groups, seven groups adapted from the literature review and three groups extracted from the participants' interviews in the first phase.

As shown in Figure 2.14, and as the procedure mentioned in (statistics.laerd.com), to better deal with this type of question, each cause of dispute treated as a separate dichotomous variable and coded with 0 for not selected and 1 for selected, then through the multiple response analysis and the frequencies, the proportions of the causes of disputes in each group would be presented, furthermore, a statistical test is required to figure out if there is a statistically significant difference

between the proportions of the variables, and since the data is nominal and dichotomous in their nature, Cochran's Q test as a non-parametric test would be the choice.

Cochran's Q test as a non-parametric test will be applied to check if there is a statistically significant difference between proportions of the causes of disputes in each group, this test involving four main assumptions, and they were all met in this case, "dichotomous variables", "one independent variable", "random sample from the population", and "sufficiently large sample size".

$$H_0 : \textit{There is no statistically significant difference between the proportions}$$
$$(P_a = P_b = \ldots = P_n)$$

$$H_a : \textit{There is a statistically significant difference between the proportions}$$

If Cochran's Q test shows a statistically significant difference, then we need to test where these differences exist, hence, the post hoc analysis using Dunn's test will be employed, therefore, all pairwise comparisons for the causes of each group are calculated and a separate hypothesis will be created for each of the pairs, as an example for these hypotheses, the following is the hypothesis for one of the combinations of the first group of causes of disputes, change of scope and payment delays:

$$H_0 : \textit{There is no statistically significant difference between}$$
$$\textit{Change of scope and Payment delays}$$

$$H_a : \textit{There is a statistically significant difference between}$$
$$\textit{Change of scope and Payment delays}$$

By using SPSS to perform the post hoc test using Dunn's test, the Bonferroni adjustment will be applied automatically in order to mitigate the likelihood of having type 1 error by rejecting the null hypothesis while it's true, as a result of dealing with multi-comparisons.

2.3.9 Validity and Reliability

In the first place, conducting a mixed method in the construction research is highly recommended to enhance the validity and reliability of the obtained data and the conclusions that will be driven from results, a study by (Abowitz & Toole, 2010) stated that the "Combining quantitative and qualitative approaches in research design and data collection, however, should be considered whenever possible" in the construction researches. In this study the validity and the reliability issues have been addressed in two different ways:

2.3.9.1 Pilot Study

A pilot survey conducted with three colleagues from the construction department at ÉTS, the purpose of the pilot survey was to early detect any problems in the survey form, to double-check the clarity of the instructions, to make sure that the survey successfully obtaining the data that is supposed to be obtained, and whether there any other issues were presented incorrectly.

In order to achieve the objectives of the pilot study, the process was designed as following order:

1. Completing the survey by the first pilot participant, then, a feedback session with the participant, then, modifying the survey based on the feedback received from the first pilot participant.
2. Completing the survey by the second pilot participant, then, a feedback session with the participant, then, checking which issues got resolved successfully from the issues raised in the first pilot, and checking whether there are new issues to be addressed, then, modifying the survey based on that new issue.
3. Completing the survey by the third pilot participant, then, a feedback session with the participant, then, checking which issues got resolved successfully for the issues raised in the second pilot, and then, checking if there are new issues to be addressed, then finally, modifying the survey based on that new issue.

Throughout this process, many issues have been reported by the participants of the pilot study, which could be summarized as the following:

First pilot participant: ID: PP01

- The survey link was not working and showing that the participant is not authorized.
- The survey by mistake asking the participant to provide their email address which is a discrepancy to the anonymous nature of the survey.
- In the fourth section of the survey, the participant used to click beside one cause of dispute from each group, and he did the same for all the other nine groups, however, the instructions of the question explaining to the participants that they can choose all causes that apply. Then, during the feedback session, the participant was asked about the reason for doing that, the answer was that he didn't notice the instructions. To overcome this issue, a bold and underlined text format started to be used to highlight the illustration paragraph.

Second pilot participant: ID: PP02

- The second pilot participant didn't face the issue with the survey's link as the previous participant has. Therefore, this issue considered resolved.
- The survey didn't ask the participant for their email address as did for the first pilot participant. Therefore, this issue is considered resolved.
- In the fourth section of the survey, the second pilot participant did the same mistake as the first pilot participant, which mean the participant was choosing only one factor from each group and think this is the way the question should be answered, therefore, the measures were taken after the first pilot participant feedback didn't work. Thus, to counter this issue the illustration text was repeated in the description box under each group to be more visible for the participant.
- In section 3, question 9, it was noticed that the participant gave the same ranks for four methods out of the total five, then during the feedback session, it was realized that the participant didn't understand the question correctly. Therefore, two measures have been taken to overcome this issue, the first measure is by adding a description box illustrate the ranking order as follows: The most negative effect method will be number 1 and the least negative effect method will be number 5 "La méthode la plus négative sera la numéro 1 et La méthode la moins négative sera la numéro 5". The second measure was by adding a

restriction on the survey which prevents the participant from choosing the same rank for more than one method.

Third pilot participant: ID: PP03

- As the third pilot participant is a French native speaker, few writing mistakes were reported as well as some suggestions to improve the understandability of the questions.
- The participant reported that the illustration text which was repeated in the questions of the last section does not display, and non-understandable symbols are showing up instead. The problem has been resolved and get tested again.

2.3.9.2 Feedback Sessions

The methodology followed in this research contained two phases, the first phase (interviews) was to explore the subject, while the second phase (survey) was to generalize the findings, then, based on the findings of the survey the assessment sheet has been developed, at the end, feedback sessions to validate the assessment sheet has been conducted with the experts who have participated in the first phase (interviews), the purpose of this session was to ask the experts who initiate the subject with the researcher in the first phase, about their feedback and whether they think the tool gives reliable results. Out of nine participants in the first phase, only 5 have participated in the feedback session, with around 55.6% acceptance rate, each of these participants has filled the assessment sheet based on their actual or based on an imaginary scenario, the results of the participants' trials and their comments are listed in Table 2.1.

Table 2.1 Feedback sessions of the assessment sheet

Participant ID	Participant's Profession	Feedback received	Trial result	Comments
Participant # 01	Academic professor & Arbitrator-Mediator	Yes	41% Moderate level of risk of being involved in binding DRMs	Perhaps a little low, considering all the unfortunate situations that I inserted my answers based on it
Participant # 02	Lawyer (Construction law)	No	-	-
Participant # 03	Lawyer (Construction law)	Yes	17% Low level of risk of being involved in binding DRMs	No comments received
Participant # 04	Project manager	No	-	-
Participant # 05	President of general contracting company	No	-	-
Participant # 06	Health and Safety Director	Yes	Not recived	it looks good! great work-No detailed comments recived
Participant # 07	Director of technical services	Yes	42.1% Moderate level of risk of being involved in binding DRMs	The results are realistic
Participant # 08	Lawyer (Construction law)	No	-	-
Participant # 09	Head of maintenance and services	Yes	Not recived	Impressive what your questioning was leading too

CHAPTER 3

DATA ANALYSIS

3.1 Phase 1: Qualitative Data Analysis

3.1.1 Introduction

In the first phase, a qualitative data have been collected, in order to enhance a better understand about the causes that are associated with reaching the binding disputes resolution methods, by deeply comprehending the thoughts of experts in the construction industry.

In addition, the qualitative phase is meant to initiate the subject and provide in deep exploration that would help the researcher in tackle the second phase, as well as, the qualitative phase doesn't target to achieve any generalization where this goal left to the quantitative phase.

The semi-structured interview was the chosen way to collect the data, the recruitment process targeted to recruit an expert in the construction industry of Quebec such as the project managers and the project management team members and experts who have experience and direct relations with dispute and dispute resolution in the construction industry such as mediators, arbitrators, and lawyer who are specialist in the construction law.

The data collected from the participants went through a process of coding and categorizing until it got shaped in the form of three main themes that are representing the answer to the research question, and providing the base to the quantitative phase.

3.1.2 The Interview Participants' Demographics

A total of 125 invitations to participate in the interviews were sent, the interview has been conducted with 9 participants, with an acceptance rate around 8.8%, the recruitment process tends to recruit experts with a long-standing experience in Quebec, the participants' professions and their expertise are shown in Table 3.1.

Table 3.1 Participants' Professions and Expertise

Participant ID	Participant's Profession	Total experience	Experience in Quebec
Participant # 01	Academic professor & Arbitrator	30	30
Participant # 02	Lawyer (Construction law)	5	5
Participant # 03	Lawyer (Construction law)	50	50
Participant # 04	Project manager	10	7
Participant # 05	President of general contracting company	17	10
Participant # 06	Health and Safety Director	25	13
Participant # 07	Director of technical services	20	20
Participant # 08	Lawyer (Construction law)	30	30
Participant # 09	Head of maintenance and services	13	13

The recruitment process meant to hire experts who have strong ties to the construction industry of Quebec. 67% of the participants have their entire career life in Quebec, in general, no one was interviewed without being at least 50% of their total years of experience in Quebec.

Furthermore, the recruitment process aimed to cover three main categories of the participants' profession, the first category represents the persons who are directly or indirectly involve in the construction execution, such as project manager, president of general contracting company, and head of maintenance and services, this category reflects 55% of the participants. The second category, which reflected 33% of the participants, represents the legal aid providers as the lawyers who are specialist in the construction law, the last category represents the dispute resolution specialist, like mediators and arbitrators. This category reflected almost 12% of the participants.

In another dimension, the participants as well represent a variety of business organization types as shown in Figure 3.1, the lion share goes to the law firms with 34% of the participants, while the participants working for contracting companies represent 22%.

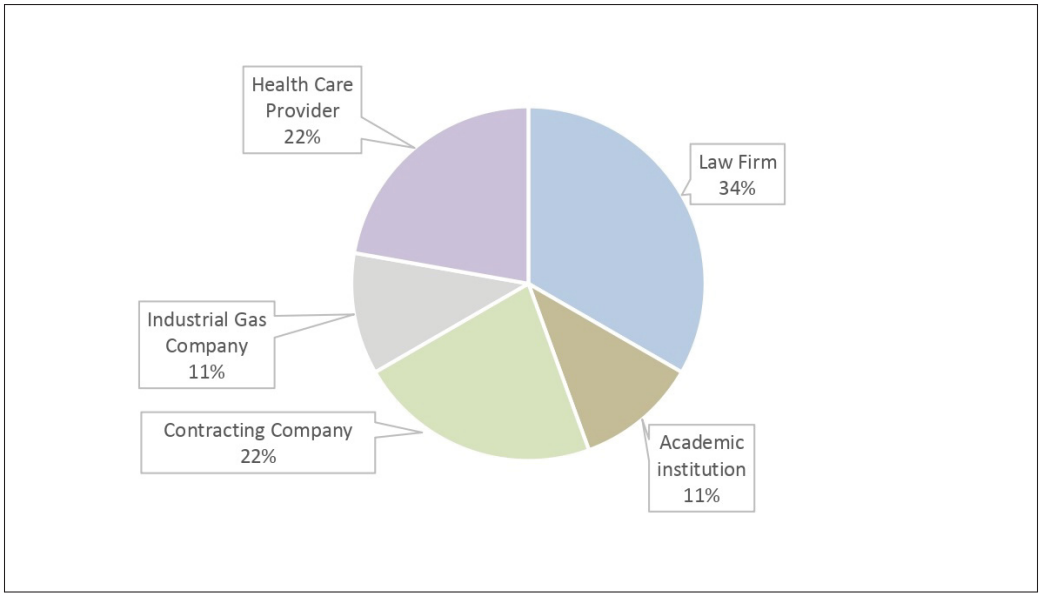


Figure 3.1 Types of organizations of interviews participants

The business sector is the last distinguish factor between the participants, as shown in Figure 3.2 both public and private sectors are represented, the sense behind this selection is to investigate any possible differences in dealing with disputes between the public and the private sectors.

3.1.3 The Semi-Structured Interviews

As earlier mentioned, the interview was designed to examine the possibility of linking between the general causes of disputes that have been cited from the literature review and the reaching of the binding DRMs stages (arbitration and judicial processes), as well as leaving a room to adopt new causes of disputes from the participants' personal experiences, in which they believe it's connected to the reaching of the binding DRMs but not mentioned in the literature review.

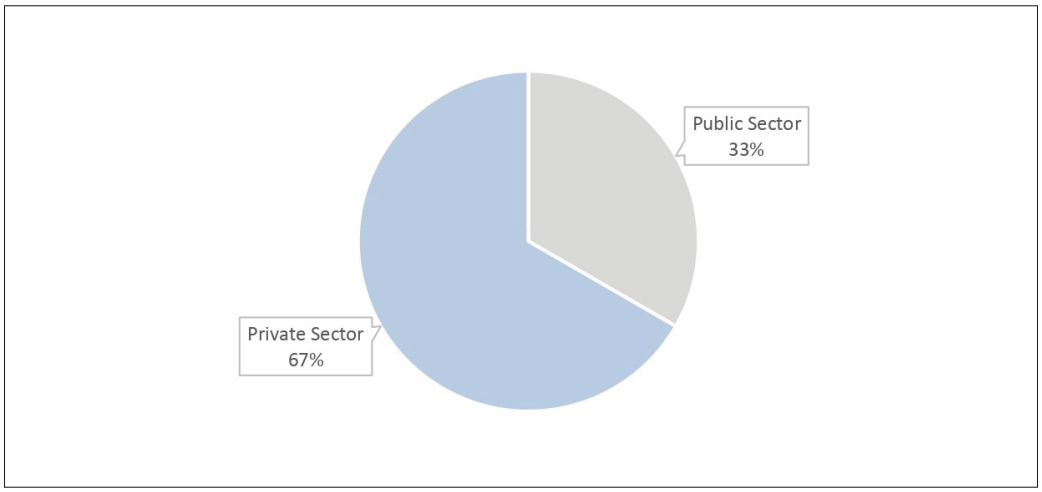


Figure 3.2 The business sectors of the participants in the interviews

In addition, the interview's design aimed to test two claims that provide the base of the argument of this study, the first one is the disputes inevitability and the second one is about the harmful effect of the binding dispute resolution methods on the sustainability of business relationships.

As shown in Appendix I, the interview contains three main sections. The first one is the introductory part, where the participants were asked about their profession, the number of years of experience in the construction field, and how many of those years were in Quebec construction projects.

The second section is about the impact of reaching the binding disputes resolution methods, the participants were asked the following four questions:

- "According to some studies, the construction disputes are inevitable (no matter the prevention strategy followed, the construction disputes are most likely to show up in the project), to what extent do you agree or disagree and why?"

  Through this question, the participant starts the subject relevant part of the interview by express their agreement or disagreement with the argument stating that the disputes are inevitable in the construction project, and justify their choices by explaining why they agree or disagree that the disputes are inevitable.

- "Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through non-binding methods like negotiation, mediation and dispute review board?"

  This question stated to assess the participants' opinion about the effect for resolving the dispute through the non-binding DRMs on the chances of maintaining the business relationships, this question, together with the next question provided us a tool to assess the differences in the participants' thoughts between the effect of resolving the dispute during the non-binding DRMs or during the binding DRMs.

- "Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through binding methods like arbitration and litigation (judicial processes)?"

  Just like the previous question, this question stated to assess the participants' opinion about the effect for resolving the dispute, but here, through the binding DRMs on the chances of maintaining the business relationships.

- "How you could rank the following disputes resolution methods from the one has most negative effect on the project progress to the one has the least negative effect: arbitration, mediation, dispute review board, litigation (judicial processes) and negotiation?"

  Supposing that these dispute resolution methods occurred during the project, this question asking the participants to give their thoughts on the effect these methods could have on the project's work progress , the participants were asked to rank them from 1 to 5 where the method takes the rank number 1 represents the most negative effect, and the method takes the rank number 5 represents the least negative effect.

In the third section of the interview, the participants were asked three questions, this section pointed to investigate the causes associated with reaching the binding DRMs arbitration and litigation (judicial processes) stages:

- "At the planning stage when developing the risk prevention plan, do you prefer concentrating more on preventing disputes from reaching arbitration and litigation (judicial processes) stages or preventing disputes from happening at all?"

  This question was placed to get an insight on how the participants would deal with the disputes prevention plan, which would give the researcher an idea on how beneficial would be to target to highlight the causes of disputes that lead to a more hostile type of dispute and have a high probability to reach the binding DRMs stages.

- "What are the factors you think played the main role in pushing the disputes to reach the binding methods stage, arbitration and litigation (judicial processes), in other words, what distinguishes the disputes reach the arbitration and litigation (judicial processes) stages from the disputes resolved earlier through the non-binding methods like negotiation, dispute review board, and mediation?"

  The last two questions serve as the core of this interview, in this question, the participants were asked to give their thoughts on how to distinguish the dispute would be escalating to the binding DRMs stages from the dispute is resolved earlier through the non-binding DRMs, this question meant to not provide the participants any thinking boundaries about how they would identify or recognize the distinction, in an opposite to the next question, in which, the participants were provided with a list of causes of disputes to pick from what they believe it's connected with reaching the binding DRMs stages.

- "Based on your experience, click beside the causes you think are most associated with reaching the stage of binding methods, arbitration and litigation (judicial processes). If you think that there are other factors not mentioned in the table, you could add it into the empty box below the table."

  While the previous question gives the participants the freedom to identify the distinction, this question provides them a list of causes of disputes cited from the literature review, a total of 28 causes fallen under seven groups of causes: owner-related, contractor-related, design-related, contract-related, human behaviour-related, project-related, and external factors. Nevertheless,

the participants were given an option to add any causes they think it's not mentioned in the groups listed.

3.1.4 Coding

The coding process took place through several steps in which the gathered data got processed in many rounds of the reading, rereading, highlighting and headlining, coding, match the similar codes, grouping the codes into categories, and finally grouping the similar categories into themes that are directly related to answering of the research question. As will be illustrated in detail in the following pages, the coding process resulted in three main themes, 15 categories, and 42 codes, as shown in Figure 3.3.

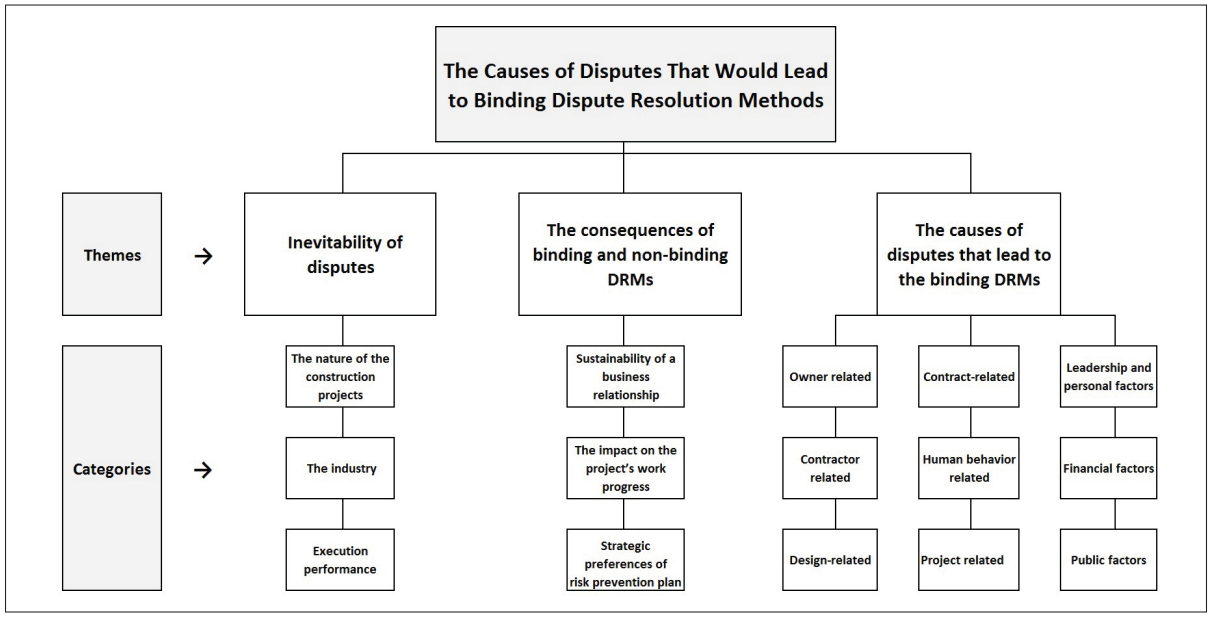


Figure 3.3 Coding process flowchart

The first step was to transcribe the audio records from the interviews. The transcribing also works as the initial reading and comprehending for the data, and as an early discovering tool for any downsides would need to be adjusted, therefore, this step was done in parallel with keeping conducting interviews with new participants, in order to reflect the feedback gathered from the participants into the new interviews.

The second step started after completing all the interviews and the transcribing, in this step a several reading rounds were conducted, in each of them, all that is relevant to the subject or contribute to the answer of the research question were highlighted. In the third step, all the highlighted pieces were rereading in their context, and a particular code was given to each one of them, then conducting a second reading round to match between the similar codes and deleting the unnecessary ones, as a result, 42 different codes were identified, each of them reflects a single idea that is contributing to the answering of the research question. In the next step, all the codes have grouped into categories, each category represents one aspect that is related to the answering of the research question, and at the same time, it's comprising at least more than one code, the codes that got categorized in the same category, they are the codes who are together would provide a more comprehensive understanding of the aspect covered by that category, as a result, 15 categories were generated. In the last step, the generated categories got sorted under three main themes, these themes are mirroring the hypotheses this study was grounded on, which is at first, the inevitability of the disputes, in which this study reassesses the hypothesis claims that the disputes are inevitable in the construction project, despite the prevention strategies would be taken, some sort of the dispute will always find their way between the project parties. In the second theme, the hypothesis will be tested is the claim that resolving the dispute through the binding DRMs, as arbitration and judicial processes, is more damaging on the sustainability of the business relationships between the project parties than if it resolved through the non-binding DRMs. The third theme represents the heart of the study, where the causes of disputes are investigated to discover the ability to connect between some sort of causes of disputes and the reaching of the binding DRMs stages in the process of settling the dispute.

3.1.5 Theme 1: Inevitability of Disputes

As illustrated in the coding section, the collected data went through several steps in the coding process until it gets formed in the shape of themes, in this section the process of forming the first theme, inevitability of the disputes, which stands for the first research question, "Are disputes inevitable in the construction industry?" will be detailed in the following pages.

This theme consists of three categories, and eight codes as shown in the Figure 3.4, which are representing the thoughts expressed by the participants about the inevitability of the disputes and the reasons they used as justification for their belief.

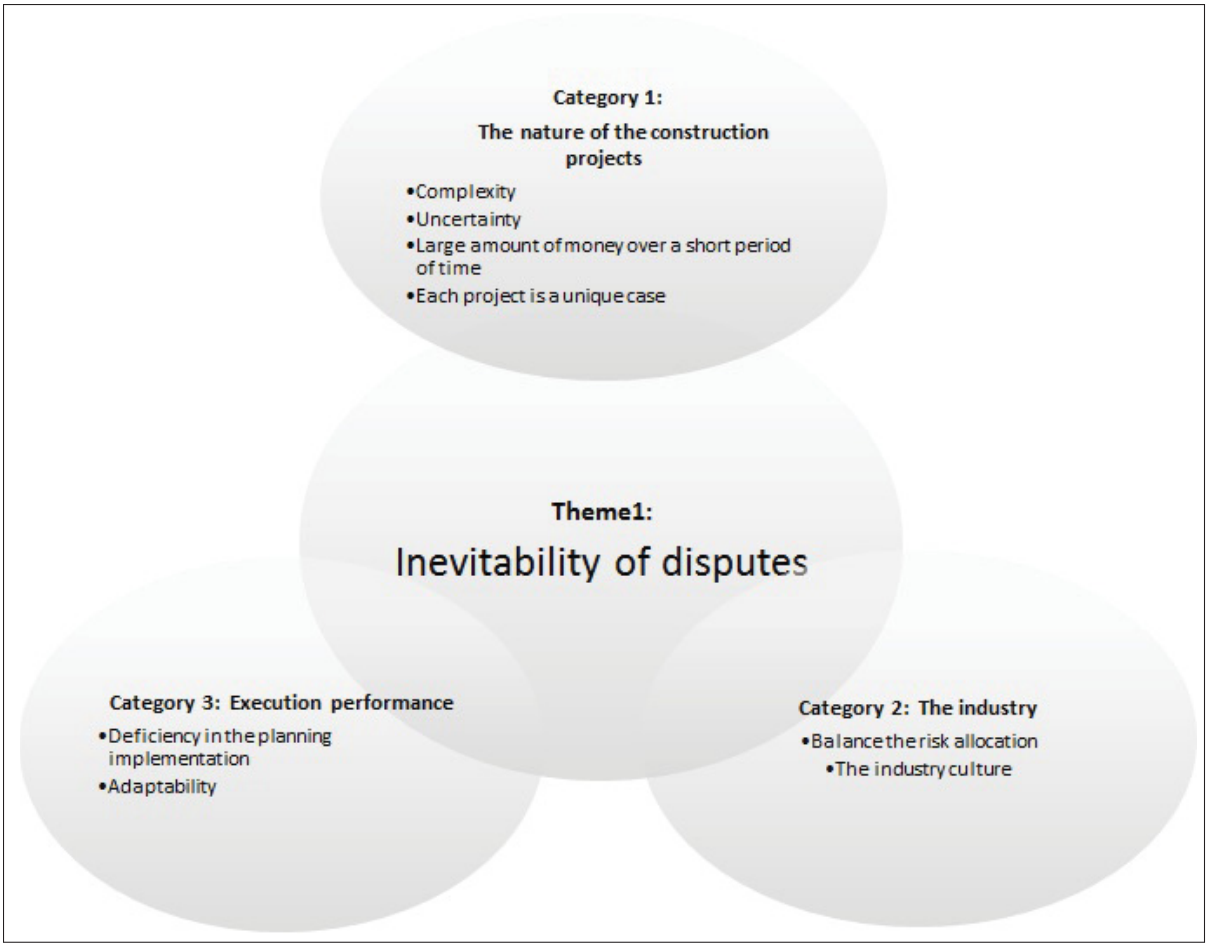


Figure 3.4 Theme 1: Inevitability of disputes

It can be noticed that many participants expressed that they agree with the argument that the disputes are inevitable, taking into the consideration that the dispute could vary from small disagreement can be settled by negotiation, to a more complex and hostile sort of dispute that required an intervention from a third party like a mediator, or even needed an escalation to the arbitration process or to the court.

This theme and its categories and codes are the results of the first question of part two of the interview “According to some studies, the construction disputes are inevitable (no matter the prevention strategy followed, the construction disputes are most likely to show up in the project), to what extent do you agree or disagree and why?”, in the following sections, each category and the codes that are consisting of will be presented.

3.1.5.1 Category 1: The Nature of the Construction Projects

Through their endorsement to the inevitability nature of the construction projects disputes, the participants support their positions with a large variety of grounds, these grounds are describing and justifying why the construction disputes are inescapable and why no planning strategy could grant keeping the project parties clean of disputes.

The first group of the supporting reasons is all around the nature of the construction projects, and what makes it an ideal incubator of the disputes, as shown in Table 3.2, this category contains four codes: complexity, uncertainty, a large amount of money over a short period of time, and each project on his own.

The first code falls under the nature of the construction projects category, and contributes to the endorsement of the inevitability of the disputes, is the complexity of the construction projects, the construction projects involve an enormous number of activities, the majority of them are related to each other, and some are lapped over each other “Construction projects are extremely complicated, In 02”, which make extremely hard to track all the difficulties and the areas of the potential dispute, in addition, many teams who are involved in the construction activity are from many different disciplines and different companies sometimes, and they are crossing over and need to cooperate “It’s so complicated and so diverse, In 03”, the second code falls under the same category is the uncertainty, which is the dominant feature of the construction projects, where many variables are affecting the success of the project and therefore the achievement of the business goals of the project parties, “A lot of unknown in the construction projects, In 02”, these unknown represents the risks associated with many aspects of the construction projects, as

Table 3.2 Category 1: The nature of the construction projects

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
1	The nature of the construction projects	1	Complexity	it's so complicated and so diverse	In.02: at 10.58 min
				construction projects are extremely complicated	In.03: at 3:35 min
		2	Uncertainty	a lot of unknown in the construction projects	In.02: at 12.15 min
		3	Large amount of money over a short period of time	large amounts of money which are involved in a business relationship over a short period of time	In.03: at 3:43 min
		4	Each project on his own	Each construction project is like a prototype	In.08: at 3:25 min

the productivity, material delivery, the weather conditions, to name but a few, and this makes the claim of considering the uncertainty as one of the main attributes of the construction projects' nature is a respected claim.

Another attribute of the construction project described in the third code, "large amounts of money which are involved in a business relationship over a short period of time, In 03", this self-explanatory code stands for the argument says that in most cases the business activity is seeking a profit in one way or another, which makes a place like the construction project with a large amount of money is circulating in a limited time frame, is an ideal place to occur disputes.

The last code "Each project is a unique case" integrating with the other three codes to form this category is the unique nature of the construction projects, "Each construction project is like a prototype, In 08", each project is a new case with unique details to be involved in, and unique personalities to deal with, this individual nature makes the lessons learned from the other

projects are not fitting properly to the project in question, thus it becomes very challenging to keep things on the right track.

3.1.5.2 Category 2: The Industry

The industry is the second category under the inevitability of the construction disputes theme, this category and the two codes contained are supporting the argument that the disputes inevitability from the industry behavior point of view, in which the participants used some of the industry practices as reasoning to consider the disputes as inescapable.

As shown in Table 3.3, this category contained two codes, balance risk allocation and the industry culture.

Table 3.3 Category 2: The industry

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
2	The industry	5	Balance risk allocation	the goal of the owner is to transfer all the risk in the side of the general contractor, and at the same time, the market wants to transfer all the risk on general contractor	In.04: at 2:58 min
		6	The industry culture	knowing the industry and what they expect and how they dissect the documents, they try to find reasons to dispute, and they have new knowledge how to extract more and more money out of the client	In.09: at 2:41 min

The first code “Balance the risk allocation” is referring to the situation of loading more risk on one of the project parties more than the other, this unbalancing could be reflected in some sort of contracts or in a general atmosphere as described in the participant In 04, the answer is “The goal of the owner is to transfer all the risk on the side of the general contractor, and at the same time, the market wants to transfer all the risk on the general contractor, In 04”,this unbalanced

risk would flame the feeling of injustice and provides an excuse to many aggressive behaviours in an attempt to defend what would be believed as the rights.

In addition, the industry culture code speaks for what would be widely considered as the stigma of the construction market, as what the participant In 09, it is expressed, “Knowing the industry and what they expect and how they dissect the documents, they try to find reasons to dispute, and they have new knowledge how to extract more and more money out of the client”, this stigma, however, it doesn’t rest on scientific facts, raises the presumption of bad faith between the project parties, and increases the hostile measures would be taken once they feel any threaten.

3.1.5.3 Category 3: Execution Performance

In this category, as extracted from the participants’ interviews, there are two codes, as shown in Table 3.4 represent two aspects of the execution performance that are directly affecting the efforts of preventing the disputes, therefore, enhancing the belief about the disputes inevitability.

Table 3.4 Category 3: Execution performance

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
3	Execution performance	7	Deficiency in the implementation of the planning	when you do the risk prevention plan, when you do the things well before beginning of the work, you can do some pretty good prevention	In.01: at 2:58 min
		8	Adaptability	we have to know that in the project, things evolution during the project, so you have to adapt to it	In.06: at 5:10 min

The efforts invested in the planning stage, it has been and still consider as a very powerful tool to prevent the disputes or reduce them at least, however, the “Deficiency in the planning implementation” will contradict with such efforts, and would lead to failure in preventing the disputes from showing up.

The construction project is known as a dynamic place where many changes could take place during the project, and as figured by the participant In 06, the ability to adapt to those changes would be an effective skill to prevent disputes, and vice-versa, where the inability to adapt will increase the chances to experiencing disputes during the project, “We have to know that in the project, things evolution during the project, so you have to adapt to it.”

3.1.6 Theme 2: The Consequences of Binding and Non-Binding DRMs

In the first theme, the inevitability of the disputes, the ground of this study was established by recognizing that many of the participants believe that there is no escape from facing some sort of disputes in the construction projects, however, even the ones who didn’t believe in the inevitability of the disputes they also provide a ground to this study but in a different direction, by rejecting the inevitability of the disputes and believing that the disputes are preventable, they could justify why a study like this one doing effort to understand more the causes of disputes and therefore preventing them from happening. In the other hand, the second theme, the consequences of the binding and non-binding DRMs, represent the second side of the study triangle, in which the argument claims that the binding dispute resolution methods are more harmful on the sustainability of the business relationship between the parties of the disputes than the non-binding DRMs, will be tested, therefore, the inevitability of the disputes along with considering of the harmful effect of reaching binding DRMs, will both provide the ground for this study, which aims to identify the causes of the disputes that are most associated with reaching the binding DRMs which is the most painful stage to be reached in the process of resolving the disputes.

As shown in the Figure3.5, this theme contains three categories and 11 codes, which resulted from the following four questions of the interview:

- Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through non-binding methods like negotiation, mediation and dispute review board?
- Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through binding methods like arbitration and litigation (judicial processes)?
- How can you rank the following dispute resolution methods from the one that has most negative effect on the project progress to the one that has the least negative effect: arbitration, mediation, dispute review board, litigation (judicial process) and negotiation?
- At the planning stage when developing the risk prevention plan, do you prefer concentrating more on preventing disputes from reaching arbitration and litigation stages or preventing disputes from happening at all?

As will be shown in detail in the following sections, the participants have shown a tendency to believe that the chances of maintaining the business relationships become very small when a dispute reaches the binding DRMs, while there are better chances if the dispute gets settled through the non-binding DRMs, in addition, it's worth to mention that some of the participants have shown differences between the arbitration and the judicial process in the side of the chances of maintaining the business relationship, but still, these differences are just about which one is more harmful and that's not contradicting with their belief that the binding DRMs are more painful than the non-binding, and the chances to keep the business relationship after that will be a tough job.

Furthermore, the participants have shown a sort of unanimous consent about considering judicial process as the method has the biggest negative impact on the project's work progress if it occurs during the project and considering the negotiation as the method with the least negative impact. The last dimension will be covered in this theme, is how the participants would deal with the risk prevention plan and whether they prefer to set up a plan to target to prevent the disputes

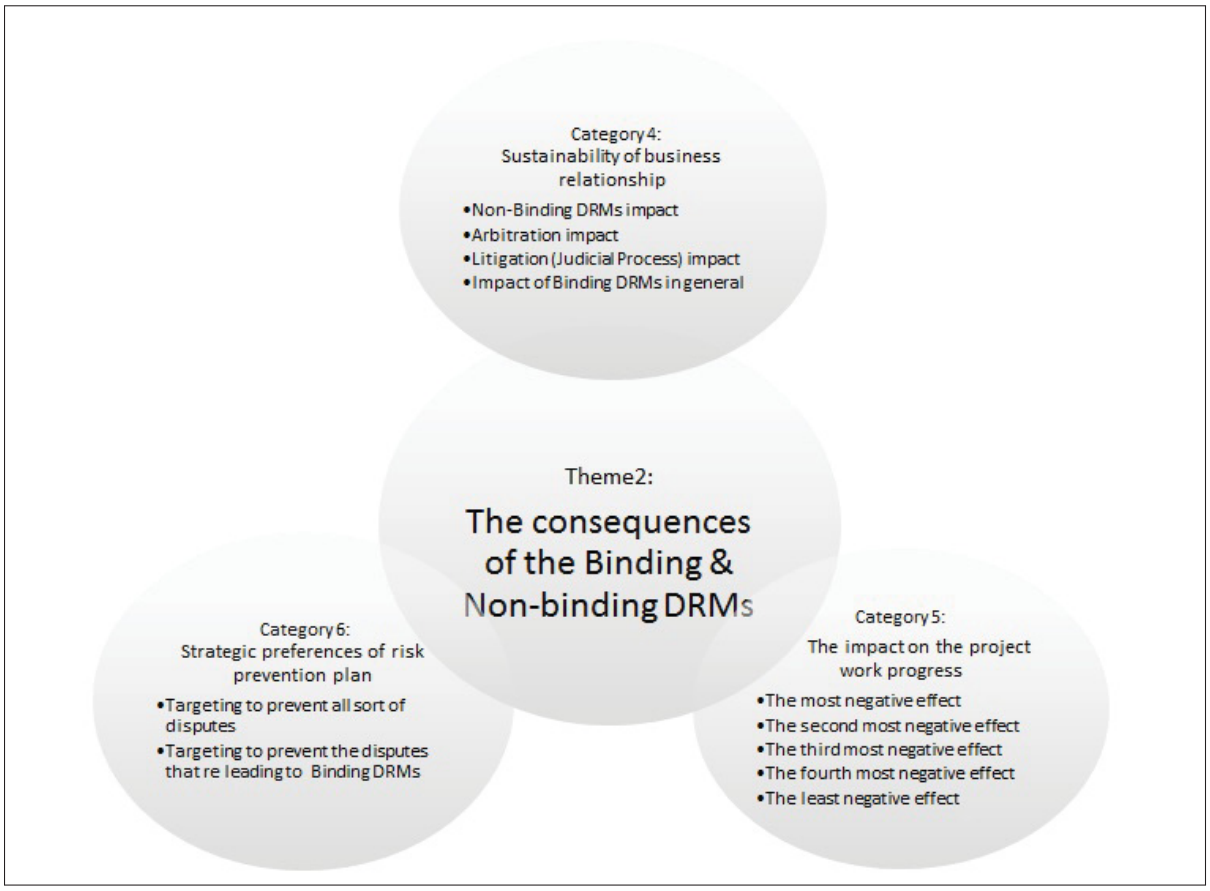


Figure 3.5 Theme 2: The consequences of the binding & non-binding DRM

from reaching the binding DRMs or to target to prevent all sorts of disputes from showing up in the first place, the majority of the participants exposed a fancy to plan for the biggest target possible, which is preventing the disputes from happening at all.

The following sections will present in detail each category and its codes in the way how they contribute to building up this theme:

3.1.6.1 Category 4: Sustainability of Business Relationship

This category represents the thoughts of the participants about the chances of maintaining the business relationship between the disputing parties and keep the opportunity to make a future business, if the dispute is resolved either through the binding or the non-binding DRMs.

As listed in Table 3.5 and Table 3.6 , there are four codes included in this category, these codes can together show the entire picture of the participants' belief and how they clearly think that the chances of maintaining the business relationships keep becoming less as we pass from the non-binding to the binding DRMs.

Table 3.5 Category 4: Sustainability of business relationship part 1

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
4	Sustainability of business relationship	9	Non-Binding DRM effect	The chances are better, because negotiation and mediation are the first steps	In.01: at 4:27 min
				There are greater chances to maintain the business relationship	In.02 at 13:19 min
				The chances are not really high	In.04 at 4:44min
				Very very little, as since you involve someone to mediate a dispute it's almost impossible to maintain the business relationship	In.05 at 3:10min
				It's 50 %, there are half of it we don't want any future business with them and there are half of it that is regular contractor and that we are used to resolving the dispute this way	In.06 at 5:45min
				We generally keep the relationship	In.07 at 9:38min
				Most likely to maintain the business relationship	In.08 at 4:34 min
				Higher because of the more we talked the more we engaged	In.09 at 7:09 min
		10	Arbitration effect	The business relationship maybe can be maintain, because since 2016 with the new procedure of the civil code, most contract have those clause	In.01: at 5:49 min
				when you go to arbitration you really know that you have a problem, you couldn't have an agreement, you done a lot of effort	In.07: at 10:37 min

Table 3.6 Category 4: Sustainability of business relationship part 2

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
4	Sustainability of business relationship	11	Litigation (Judicial Process) effect	It is harder, the hostility building up because it takes years, arbitration is shorter and because in the arbitration you don't need lawyer, they could be but you don't need them, and in litigation there are lawyers	In.01: at 6:41 min
				There are greater chances if we don't go through litigation	In.02: at 13:27 min
				almost no chance that will be business together after that, especially after going court	In.06: at 6:24 min
				when you go to court you know you have no more relation after that, you don't want any relationship after that	In.07: at10:228 min
		12	Effect of Binding DRMs in general	There is very little chance of maintaining the relationship	In.03: at 5:42 min
				In the private sector near non, but in the public sector and because the binding process which allows people to still do business with someone who they have dispute with him	In.08: at 4:56 min
				The chance is really low, when you bring lawyer in the issue, in the dispute, it's not helping a lot, because in my experience, you bring people that they have limited experience with the construction, and they are missing a lot of technical information and the knowledge of the industry	In.04: at 6:37 min
				the chances are slim, but in the public tender the government will establish grounds on which you could exclude people for certain reasons, unless they are blacklisted, otherwise they can bid	In.09: at 8:03 min

The first code, non-binding DRMs impact, showing a general agreement among the participants that the non-binding DRMs are the preferable way to clear up the disputes in terms of the possibility to have a future business and keeping the relationship with the other party in a good faith, as clearly expressed by some of the participants, "There are greater chances of maintaining the business relationship. In 02" and "We generally keep the relationship, In 07", in the other hand, some other participants used to justify their belief by mentioning that the non-binding

DRMs are the first step would be taken to deal with a dispute, therefore, it sounds logical to keep the relationship in good standing if it was resolved through this early step, “The chances are better, because negotiation and mediation are the first steps,” while others direct the credits to the intensity level of discussion and face to face negotiation are involved in the non-binding DRMs, as it grants more engagement and more possibility to clear the dispute, “Higher because the more we talked, the more we were engaged.”

The next code, arbitration impact, represents the minor differences as being reported by the participants between the arbitration and the judicial process in terms of maintaining the business relationships, these differences come based on two justifications, the first one is about the familiarity of the arbitration as its begin to be mentioned in most of the contracts since the new Code of Civil Procedure in 2016 and therefore it doesn’t come as a surprise anymore “The business relationship maybe can be maintained, because since 2016 with the new procedure of the civil code, most contracts have those clauses,” the second one is standing to the point that the disputing parties by reaching the arbitration they have paid a lot effort to settle the dispute without success and then by being in the arbitration they realize that they are in a serious problem it needs more attention to get it resolved “When you go to arbitration you really know that you have a problem, you couldn’t have an agreement, you put in a lot of effort.”

Just like with the previous code, this one is focused on how the judicial process is different than the arbitration in terms of keeping a good standing relationship between the disputing parties, as can be noticed, most of participants’ emphasis on the great difficulties to keep doing business with someone who is suing them “Almost no chance that will be business together after that, especially after going court” and “When you go to court you know you have no more relation after that, you don’t want any relationship after that,” while some other participants try to explain the factors that make it much harder than arbitration, although they tend to believe that both arbitration and judicial process are tough methods and maintaining the business relationship will be hard in both cases, the first factor is the time, as it takes longer in the judicial process and the opposition accumulated during the time, and the other factor is the existing of the lawyer in the process, which is referring to the presence of new parties in the issue who are not involved

before, and that can kill the last friendly relation that still exists. However, even in the arbitration, there is a possibility to have a lawyer but it's not mandatory "It is harder, the hostility building up because it takes years, arbitration is shorter and because in the arbitration you don't need a lawyer, they could be but you don't need them, and in litigation there are lawyers."

The last code shows the thoughts of the participants who evaluate the binding DRMs as one, without mentioning any difference between the arbitration and the judicial process in terms of maintaining the business relationships, some of these evaluations are clearly stated that the chances are very little "There is very little chance of maintaining the relationship," while other using the interfering of new parties to the issue as reasoning for this low chance, where they believe that the lawyers would not help in keeping the relationship in good standing because they are out of the industry and therefore they lack its details and secrets "The chance is really low, when you bring a lawyer into the issue, it's not helping a lot, because, you bring people that they have limited experience with the construction, and they are missing a lot of technical information and the knowledge of the industry."

On the other hand, some of the participants found it worthy to mention the differences between the public and the private sector about the matter, where in the private sector, the chances to have future business with someone who litigates you are very minimal, while in the public sector, the open tender is the way used to reward a job, and no rules would prevent someone from entering the tender just because he is suing you, "In the private sector near none, but in the public sector the binding process allows people to still do business with someone whom they have disputed with him" he could be excluded based on such established criteria, but not because he is just suing you, thus it may end up doing business with someone who still has an open case with you in the court "The chances are slim, but in the public tender the government will establish grounds on which you could exclude people for certain reasons, unless they are blacklisted, otherwise they can bid."

3.1.6.2 Category 5: The Impact on the Project Work Progress

This category formed by the participants' responds about the negative impact the different dispute resolution methods could have on the project progress, supposing these methods occur during the project, this assessment of the negative impact on the project's work progress along with assessment shown in the previous category about the impact on the business relationship, will both provide a complete picture on the most harmful dispute resolution methods.

The participants were asked to rank the following five dispute resolution methods; mediation, dispute review board, judicial process, negotiation, and arbitration based on the negative impact on the project's work progress, the participants have shown a sort of unanimous consent on the judicial process as the method holds the most negative impact on the project's work progress and considering the negotiation as the method with the least negative impact, while there are some differences in the ranking of the other three methods but in general, the arbitration considered by the majority as the method with the second most negative impact, then, the mediation and the dispute review board in the third and fourth place respectively as shown in Table 3.7.

3.1.6.3 Category 6: Strategic Preferences of Risk Prevention Plan

In this category, the strategic preferences the participants would consider during the planning stage to prevent disputes have been covered, as shown in Table 3.8, this category has two codes that represent two different ways of planning for dispute prevention, targeting to prevent all sorts of disputes from being in the project and targeting to prevent the disputes that are leading to the binding DRMs.

The aim behind the question which formed this category was to figure out whether the participants would take the advantage of knowing the causes of disputes that are leading to the binding DRMs to set up plans to prevent those sorts of disputes, or they would stick to the higher target and set up plans to prevent all sorts of disputes not only the ones associated with reaching the binding DRMs.

Table 3.7 Category 5: The impact on the project work progress

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
5	The impact on the project work progress	13	The most negative effect	Litigation	In.01: at 07:39 min In.02: at 14:30 min In.03 at 09:05 min In.04: at 09:20 min In.05: at 04:15 min In.06: at 08:58 min In.07 at 15:36 min In.08: at 06:25 min In.09: at 13:56 min
		14	The second most negative effect	Arbitration	
		15	The third most negative effect	Mediation	
		16	The fourth most negative effect	Dispute review board	
		17	The least negative effect	Negotiation	

As has been noticed, most of the participants are preferring to follow the jackpot, and planning to prevent all sorts of disputes from taking place in the project, “We have to make the plan in order to have no disputes, preventing them from happening at all. In 07”, however, they tend to believe that the disputes are inevitable, thus the aim behind this plan will be impossible to achieve “I think we should always aim for the highest possible objective, in 02”.

On the other hand, some participants chose to be more selective in their plans and chose to focus more on preventing the causes of disputes that can lead to the binding DRMs “Preventing the disputes from reaching arbitration and litigation stage, in 08”.

Table 3.8 Category 6: Strategic preferences of risk prevention plan

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
6	Strategic preferences of risk prevention plan	18	Targeting to prevent disputes from happening at all	we can prevent them from happening at all, but from surprises.	In.01: at 9:36 min
				I think we should always aim for the highest possible objective.	In.02: at 18:29 min
				trying to consider to prevent all the disputes, we are trying to consider all the issue that can happened	In.04: at 10:38 min
				When you planning you like to prevent them from happening at all, but you have to have a resolution path	In.05: at 5:30 min
				take all the measures to avoid any case of disputes	In.06: at 10:06 min
				we have to make the plan in order to have no disputes, preventing them from happening at all	In.07: at 17:00 min
		19	Targeting to eliminate the disputes could lead to Binding DRM	we try to plan for both, we try to eliminate disputes and we try to eliminate arbitration and litigation	In.03: at 19:39 min
				preventing the disputes from reaching arbitration and litigation stages	In.08: at 7:22 min

3.1.7 Theme 3: The Disputes' Causes that Lead to the Binding DRMs

This part represents the core of the study, where the questions used in the interview to form this theme had focused on the possibility to highlight some sorts of the causes of disputes that are most associated with reaching the binding DRMs, arbitration and litigation (judicial processes), therefore, the participants were asked two questions, the first one is an open form question, in which they were asked to name the causes of disputes they think it would produce a hostile type of disputes that would be escalated to the binding DRMs, while in the second question, the participants were provided with a list containing seven groups of causes, as have been cited from the literature review, and a total of 28 general causes of disputes under these groups to select from it the ones they think it would generate a dispute can reach the binding DRMs.

- What are the factors you think played the main role in pushing the disputes to reach the binding methods stage (arbitration and litigation), in other words, what distinguishes the

disputes reach the arbitration and litigation stages from the disputes resolved earlier through the non-binding methods like negotiation, dispute review board, and mediation?

- As adapted from (Cakmak and Irlayici Cakmak, 2014), the following table showing the most common causes of disputes, there are six groups of causes: owner-related, contractor-related, design-related, contract-related, human behavior-related, project-related, and external factors. Based on your experience click beside the causes you think they are most associated with reaching the stage of binding methods (arbitration and litigation (judicial processes)). If you think that there are other factors not mentioned in the table, you could add it in the empty box below the table.

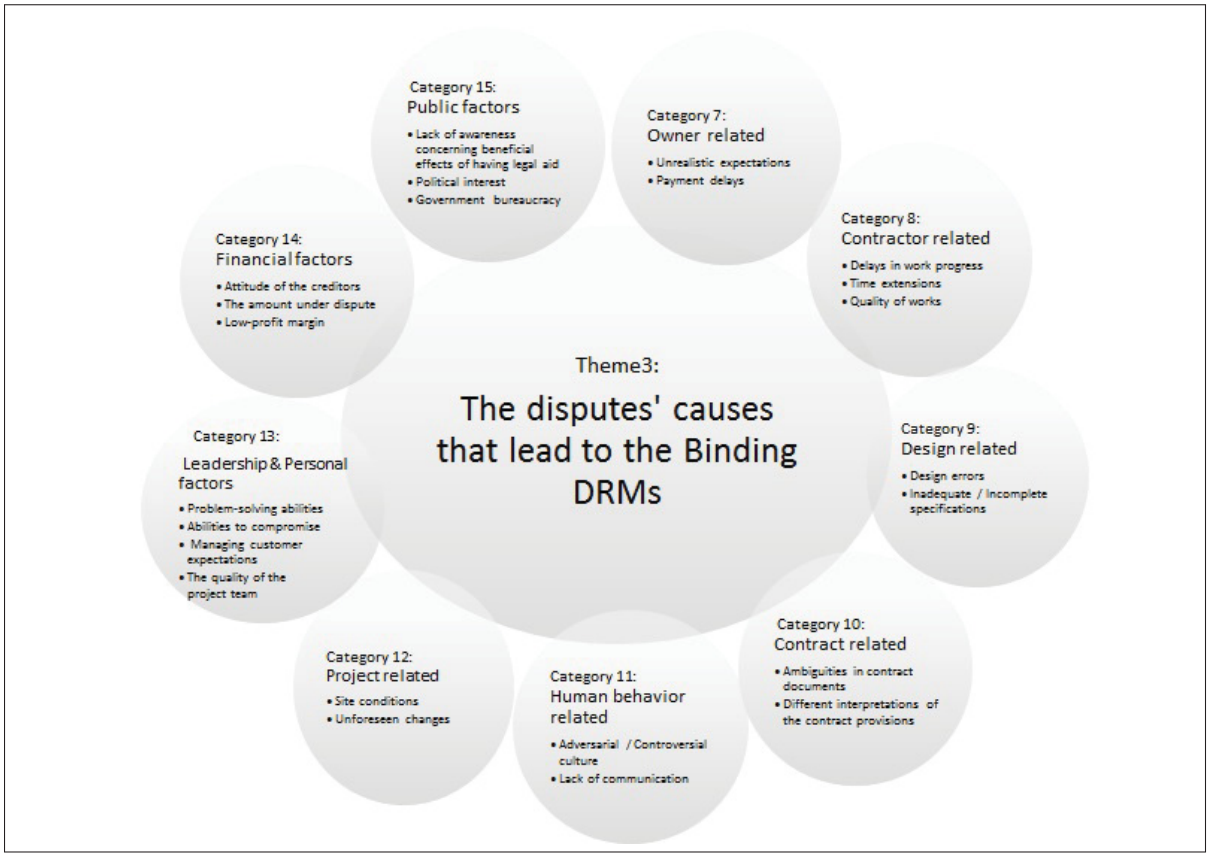


Figure 3.6 Theme 3: The causes of disputes which lead to the binding DRM

As shown in Figure 3.6, a total of 6 categories (groups) out of original 7 groups contained causes of disputes have been connected with producing disputes could reach the binding DRMs, only

13 codes (causes of disputes) have been connected out of the original 28 causes through those categories, the main criterion to select those factors was the importance and the value given by the participants for those factors, as well as, all those 13 causes have passed the threshold of 50% of the participants' votes, in addition, 10 new causes were extracted from the participants and categorized into three additional categories, those causes were not mentioned in the list provided from the literature review.

3.1.7.1 Categories 7-12: Owner Related, Contractor Related, Design Related, Contract Related, Human Behavior Related, and Project Related

These factors were chosen by the participants as the most causes of disputes that are associated with reaching the binding DRMs stages, in addition to the importance shown by the participants for these causes of disputes, they all crossed the threshold of 50% of the participants' choices. Among 28 causes of disputes adapted from the literature review, only 13 causes were linked to the binding DRMs, as shown in Table 3.9.

It's worth to mention, all the causes groups that have been extracted from the literature review, have got some dispute's causes connected to the reaching of the DRMs, except the external factor group, in which the three factors have fallen under this category, the weather, legal and economic factors, and fragmented structure of the sector, don't consider as one of the dispute's causes types that could lead to arbitration or the judicial process.

Furthermore, as noticed, the human behavior related category of causes has the most participants' attention as the most source of difficult disputes that can't be resolved easily in the non-binding DRMs, especially the code number 30, lack of communication which the majority of the participant agreed to, in addition, and in the same level of the importance comes the project related category, in which the site condition factor considered as one of the main sources of disputes that could reach the binding DRMs, as well as the contractor related category where the delays in work progress have been identified as one of the common causes that lead the parties of the disputes to the binding DRMs.

Table 3.9 Categories 7-12: Owner related, Contractor related, Design related, Contract related, Human behavior related, and Project related

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
7	Owner related	20	Unrealistic expectations	These factors were chosen by the participants from a list of disputes' causes that have been provided to them in the interview.	In.01: at 14:39 min In.02: at 21:11 min In.03 at 14:39 min In.04: at 17:16 min In.05: at 7:30 min In.06: at 12:49 min In.07 at 23:21 min In.08: at 10:11 min In.09: at 26:29 min
		21	Payment delays		
8	Contractor related	22	Delays in work progress		
		23	Time extensions		
		24	Quality of works		
9	Design related	25	Design errors		
		26	Inadequate / Incomplete specifications		
10	Contract related	27	Ambiguities in contract documents		
		28	Different interpretations of the contract provisions		
11	Human behavior related	29	Adversarial / Controversial culture		
		30	Lack of communication		
12	Project related	31	Site conditions		
		32	Unforeseen changes		

3.1.7.2 Category 13: Leadership and Personal Factors

This is the first category of causes of disputes associated with reaching the DRMs that is extracted from the participants and weren't mentioned in the list of causes of disputes that has been cited from the literature review, this category refers to the factors related to leadership and personal abilities, in which the participants highlighted the significance of those abilities to either direct the dispute to be resolved in the early stages or escalated further to the binding DRMs, this category contains four codes as shown in Table 3.10.

Table 3.10 Category 13: Leadership & Personal factors

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
13	Leadership & Personal factors	33	Problem-solving abilities	they can't reach some point among themselves, because negotiation and mediation, it's the disputes parties who solved their problem by themselves	In.01: at 10:51 min
		34	decision making & compromising abilities	They (the dispute parties) have to have a decision	In.01: at 11:13 min
				the key to one solving the dispute by listen to the other, you win some you lose some	In.09: at 21:56 min
		35	Managing customer expectations	I would say that contractor managing their customers' expectations are really the biggest way to avoid disputes	In.05: at 11:58 min
		36	The quality of the project team	The quality of the team, the engineers, the architect, the quality of the stakeholder	In.07: at 27:14 min

At the top of this list comes the problem-solving abilities as a key skill if it exists among the disputing parties would help in a significant way to settle the dispute, and visa versa, if the disputing parties suffering lack of this ability it most likely to see the dispute keeps escalating from one stage to another "They can't reach some point among themselves, because negotiation and mediation, it's the disputes parties who solved their problem by themselves, in 01".

The next code states the ability to compromise, whether this ability is related to the authority or to the intent, mostly both should exist, to have the authority to compromise without the intent would not work, as well as the good intentions alone will not be enough "The key to one resolving the dispute by listening to the other, you win some, you lose some, in 09".

Continuing with the leadership and personal abilities, the ability to manage the customer expectations is a cornerstone in the process of keeping the customer satisfied where the failure in lining with the customer expectation would be a source of hard sort of dispute, this managing for the expectations include the expectations about, to name but a few, the future product, the

time required to complete the work, or even about the level of caring “I would say that contractor managing their customers’ expectations are really the biggest way to avoid disputes, in 05”.

The last code in this category refers to the quality of the project team, where the investment in a qualified team will be paid back, they are the team who is in many cases, either contribute to the success of the project or its failure and therefore, avoid many disputes from happening besides, of course, preventing the dispute could happen from reaching the binding DRMs “The quality of the team, the engineers, the architect, the quality of the stakeholder, in 07”.

3.1.7.3 Category 14: Financial Factors

As shown in Table 3.11, there are three financial related factors have been raised through the interview, and also weren’t included in the list cited from the literature review, the participants expressed their fear that the financial issue would cause an out of control factors that can surge the disputes to the stage of the binding DRMs.

Table 3.11 Category 14: Financial factors

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
14	Financial factors	37	Attitude of the creditors	it’s the attitude of the creditors	In.02: at 24:03 min
		38	The amount under dispute	the amount under negotiation is effect, so you can have a big project but the amount of negotiation is really low, so probably will do negotiation in house or dispute review board and find good way to solve the issue	In.04: at 14:50 min
		39	Low-profit margin	so he is so tight that anything he can’t absorb, and that’s make him very resistance to changes than on the other hand, how much you are with tight price goanna make difference	In.07: at 21:37 min

The attitude of the creditors identified as a factor could make the disputant in a rigid standing against the efforts of clearing up the dispute if the solution can't satisfy the obligations of the creditors, especially when those creditors represent a continuous pressure to the stability of the disputant "It's the attitude of the creditors, in 02" who could make the situation uncompromising."

The second factor, the amount under dispute, sounds logic as of the participants' thoughts, in which the amount of money being in dispute would be one of the main factors to decide on which route the dispute will take "The amount under negotiation is affected, so you can have a big project but the amount of negotiation is really low, so probably will do negotiation in house or dispute review board and find good way to resolve the issue, in 04".

The last factor under the financial factors category is the low-profit margin, as finding yourself stuck with a very tight margin will make you very sensitive to any issues could touch this margin, also, even if you show an understanding and being ready to compromise, this low margin would not give you enough room needed to reflect a flexibility, "so he is so tight that he can't absorb anything, and that makes him very resistant to changes than on the other hand, how much you are with tight price goanna make difference, in 07".

3.1.7.4 Category 15: Public Factors

The public factors group shows the last category of the factors that are playing an important role in pushing the dispute into the binding DRMs and have not been listed within the factors cited from the literature review, as shown in Table 3.12 the awareness about the legal aid effect, the political interest, and the government process bureaucracy are the factors added by the participants as could play a role in taking the disputes to the binding DRMs.

Lack of awareness concerning beneficial effects of having legal aid considered by some of the participants as factors would make the disputing parties missed an opportunity to resolve the dispute earlier, principally if the legal aid was not used in the early stages and before the issue is escalated "Publishing of legal aid effect, in 02".

Table 3.12 Category 15: Public factors

No.	Categories	Code No.	Codes	Supporting quotes	Location at the records
15	Public factors	40	Lack of awareness concerning beneficial effects of having legal aid	publishing of legal aid effect	In.02: at 24:16 min
		41	Politics interest	politics interest add an impact on the method we choose, because basically the public owner need to be careful about the way the people look at the issue	In.04: at 15:56 min
		42	Government processes bureaucracy	Sometime the government procedures too heavy that would kill the project, so if you don't have quick government process you definitely create all the other problems like delay in payments delay in constructions and so on	In.07: at 127:50 min

Some projects represent the public interest and are very connected to the life of the people, and that makes it more able to bring more the political attention, in which the way the project would deal with its issues it is a bit different, on other words, will make its issues under a microscope, and therefore, that would have an impact on resolving such disputes that would represent a public embarrassment, which could mean taking further steps to make the dispute under the sun of the binding DRMs "Political interest add an impact on the method we choose, because basically the public owner need to be careful about the way the people look at the issue, in 04".

As it was referred by the participants, the government bureaucracy would not be considered as a direct factor in making the disputes reach the binding DRMs, but it could lead to other issues like delay in work progress which can be a very pushing factor to reach the binding DRMs "Sometime the government procedures too heavy that would kill the project, so if you don't have quick government process you definitely create all the other problems like delay in payments delay in constructions and so on, in 07".

3.1.8 Discussion

3.1.8.1 First Theme Discussion : Inevitability of Disputes (Interviews)

The aim behind the first two themes, the inevitability of disputes, and the second theme, the consequences of the binding and the non-binding DRMs, is to provide the grounds to the research question, by revisiting two arguments represent those grounds, the first argument state that the disputes in the construction projects are inescapable no matter what prevention strategy you are following, some sort of disputes will find its way between the project parties, while the second argument state that the binding DRMs are more harmful on the sustainability of the business relationships and the project progress than the non-binding DRMs.

It has been noticed that most of the participants agreed on considering the disputes in the construction projects are inevitable, and probably the projects ' parties will have to deal with some sorts of dispute in their projects, many justifications have used to support this belief, those justifications summarized in three categories as shown in Figure 3.4, the first category represents the nature of the construction projects, where things like the degree of complexity known about the construction projects, the individual nature of the projects, the amount of money circulating in a short time frame, and finally, the degree of uncertainty enveloping many aspects of the construction process played the main role in making the presence of a dispute in the construction project is a matter of time.

In addition, the industry behavior has also taken its part of the blame, in which it can be noticed that the majority of the inevitability reasons used by the participants are about the stigma has been placed on the construction industry as a place full of tricks, and therefore, the bad faith easily finds its way between the project parties, and finally, reasons like the ability of the project parties to adapt to the changes keep happening in the projects and the deficiency in the planning implementation, which both falls under the execution performance category, are also considered as reasons to make the disputes are inevitable.

On the other hand, although the disputes are considered inevitable by most of the participants, the significant and the degree of impact could the dispute have will be different from dispute to another, thus, the type and size of the dispute are what really matters, where many disputes could be cleared up easily through the negotiation or even through other non-binding dispute resolution methods that are stated in their contracts, but on the other side, some sorts of disputes will be more difficult to settle and would require involvement in the binding DRMs as the arbitration and the judicial process, which take us from the idea behind the first theme, the inevitability of the disputes, to the idea of the second theme which differentiating between the degree of the negative impact of the binding and non-binding DRMs.

3.1.8.2 Second Theme Discussion : The Consequences of Binding and Non-Binding DRMs (Interviews)

In the second theme, and in continuing with the first theme in an attempt to construct the ground for the research question, the participants were asked about how they think both binding and non-binding DRMs will affect the sustainability of the business relationship between the disputing parties, and as noticed easily, there is consensus on considering the chances of maintaining the business relationship are much higher if the dispute is resolved through the non-binding DRMs than if the dispute got escalated further to the binding DRMs.

However, there are some differences have been reported between the arbitration and the judicial process in the side of the chances of maintaining the business relationship, where the judicial process considered as more damaging to any future business relationship possibility, in a way more than the impact could be for the arbitration, owing to the longer process time the court need than the arbitration, and for the mandatory use of a lawyer in the court proceeding unlike the arbitration where hiring a lawyer is optional, and at the end, for the arbitration and since the new Code of Civil Procedure 2016 in Quebec, most contracts start to have the arbitration term in their contract, and therefore the use of arbitration would no longer be a surprise for them, however, these differences are just about which one is more harmful, arbitration or the judicial process, and that's not contradicting with the participants' belief that the binding DRMs, in

general, are more painful than the non-binding, and the chances of maintaining the business relationship will be difficult.

In addition, on the side of the impact on the project's work progress , and by assuming that the dispute and the resolution method happened during the project, the participants have shown a sort of unanimous consent about considering the judicial process as the method with the biggest negative impact on the project's work progress and considering the negotiation as the method with the least negative impact, while there are some differences in ranking the other three methods, but generally, they considered the arbitration as the method with a second-most negative impact on the project progress, then the mediation, then the dispute review board as the fourth most negative impact method.

In the last part under this theme, the participants mostly chose to run after the biggest target, which is preventing all sorts of disputes from happening, rather than focusing on preventing the disputes that can lead to the binding DRMs, despite this result which contradicts to the hypothesis made by this study, that the project parties would take the advantage of knowing the factors that are causing disputes that can't be resolved before reaching the binding DRMs, this advantage would be used to make better targeting in the planning stage by concentrating more on the causes lead to the most harmful dispute resolution method, despite these results, this study still means to enhance our understanding for the causes of disputes that can lead to the binding DRMs, it may mean the participants prefer to target the bigger goal and prevent all sorts of disputes, which is human nature, but still, the more we understand the causes, the better we can deal with it, which is at the end would help them achieve their big target as well.

3.1.8.3 Third Theme Discussion : The Disputes' Causes that Lead to the Binding DRMs (Interviews)

In the last theme, which represents the core of this study, the participants were asked to examine their experience and chose the causes of disputes that are most likely to produce disputes that wouldn't be resolved before reaching the binding DRMs stage, among seven causes' groups have been cited from the literature review, which contain 28 dispute cause, only 13 causes belong to

six groups have been linked to the DRMs, as well as, a new three groups of causes contain 10 causes of disputes have been extracted from the participants' answers and they aren't mentioned in the list cited from the literature review. As previously mentioned, the main criterion to select those factors was the importance and the value given by the participants for those factors, as well as, they all passed the threshold of 50% of the participants' votes. However, some other factors from the list have been selected by some participants as factors could lead to the DRMs, but they neither not commanding enough participants' attention nor mentioned by the participants in the open-form question, thus, they aren't considered among the causes that are most associated with reaching the DRMs at the part of the study.

On the side of the causes chosen from the literature review list, the human behaviour-related, project-related, and contractor-related categories have the most participants' attention as the most source of difficult disputes that wouldn't be resolved easily in the non-binding DRMs, among these categories, the causes like, lack of communication, site condition factor, and the delays in work progress have been identified as one of the most common causes that can lead the parties of the disputes to the binding DRMs.

While on the side of the causes that weren't mentioned in the literature review, three groups of causes have been raised, the personal and leadership factors, financial factors, and public factors, in which altogether contain ten additional causes that contribute pulling the dispute to the binding DRMs places, factors like problem-solving abilities, abilities to compromise, managing customer expectations, and the quality of the project team, have been reported under the personal and leadership category.

In addition, factors like the attitude of the creditors, the amount under dispute and the low-profit margin have been reported as causes belong to the financial factors, and at the end, public factors category contains three causes, lack of awareness concerning beneficial effects of having legal aid, political interest and government bureaucracy.

3.2 Phase 2: Quantitative Data Analysis

3.2.1 Introduction

The first phase aimed to explore the subject of the study and provide the researcher with a deeper insight about the subject and to initially test the hypothesis of the study with a small group of experts in the filed, on the other hand, the quantitative phase aimed to generalize the findings within the Quebec construction industry, therefore, a quantitative data have been collected, from a larger sample of professionals who are engaged in the construction industry of Quebec, which include the teams of construction contractors, teams of design/consulting engineering firms, owners and owners' representative, and the teams in charge of the construction activities in the public bodies, to name but a few.

The survey was the chosen way to conduct this phase, the questionnaire was built on a Google form, the link to the survey was communicated to the potential participants, the process of compiling the questionnaires took place between April 12 and June 5, 2020, a total of 107 responses have been collected, 94 of them were valid for analysis purposes, the survey settings were set to be at 95% confidence level with a margin of error equal to ±10% based on the sample size has been reached.

The data collected went through rounds of statistical analysis, both descriptive and inferential statistics, where is it needed, in attempt to answer the three questions of the research: are disputes inevitable in the construction industry?; are the binding DRMs more harmful to the sustainability of business relationships and project progress than the non-binding DRMs?; and what are the causes of disputes that are leading to reach the stage of the binding DRMs?

The first two questions aim to provide the logical base to the study and to the third question, these two questions have tested the claim that the existence of the disputes in the construction projects an inevitable matter, and the claim that the binding DRMs have a more destructive impact on the chances of maintaining the business relationship between the disputing parties and more negative effect on the work progress than the binding DRMs.

The third research question which represents the core of the study, aimed to highlight the causes of disputes that are most associated with reaching the binding DRMs, by asking the participants to choose from the general causes of a dispute the ones they think, based on their experience, it could produce disputes can't be resolved before reaching the DRMs stages.

3.2.2 The Survey Participants' Demographics

A total of 107 responses were collected, 94 of them were valid for the analytic purposes, three responses were excluded due to absence of experience in the Quebec construction industry, another two responses were excluded because it seems to be duplicated response, and a total of seven responses for participants have refused to complete the survey based on the statement was provided to them at the beginning of the survey.

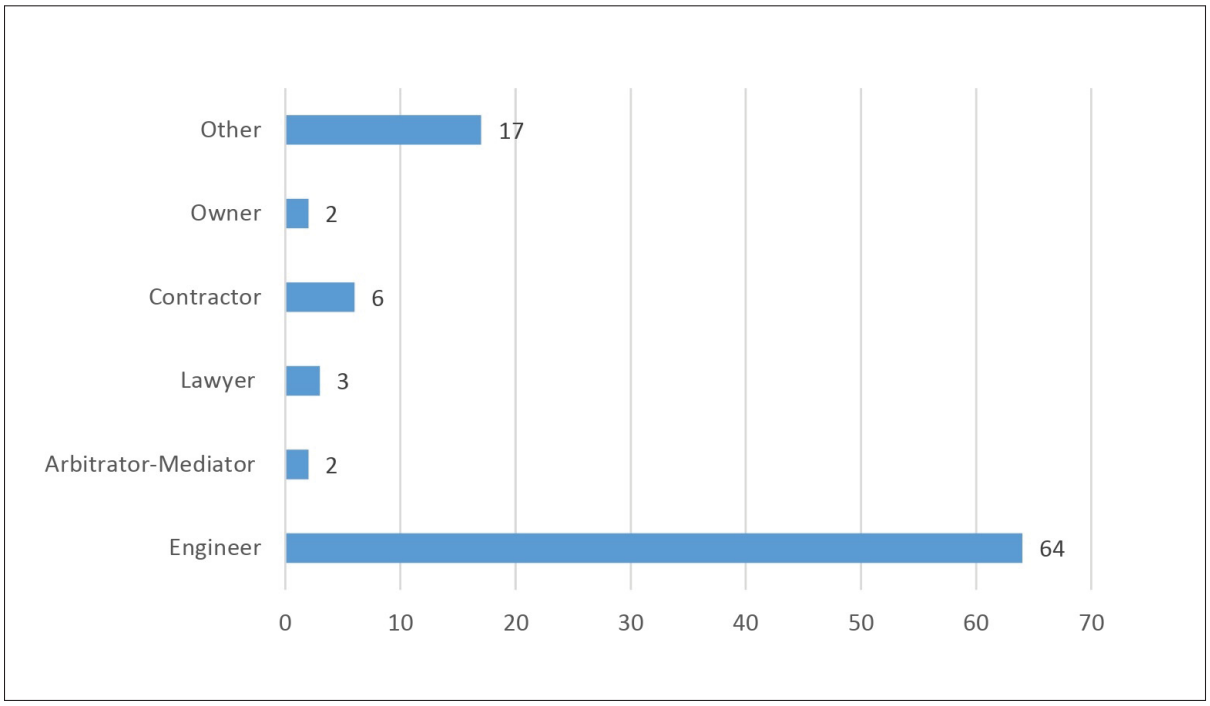


Figure 3.7 Professions of survey participants

As shown in Figure 3.7 the professions of the participants could be categorized in six clusters, the greatest share of the participants calls themselves an engineer, this category represents

68.1% of the total participants and includes many positions related to the construction, such as project managers, construction managers, and project engineers, whether they are working for contracting or design/consulting companies.

The next cluster speaks for the arbitrators and mediators, which represents 2.1% of participants, then, the next cluster with 3.2% are the lawyers who specialize in construction law, the next category is accounted to the contractors with 6.4% of the participants, the next cluster stands for the owners and the owners' representatives with 2.1% of the participants, and lastly, the cluster named "other" with 18.1% of the participants represents all other professions that are related to construction but that are not included in one of the previous clusters, such as financial director, OHS manager, business development manager, supervisor, and technician, to name but a few.

Figure 3.8 shows the different types of organizations that the participants of the survey belong to, most of the participants are working in contracting and design/consulting entities, which represent a percentage of 61% and 21% of the participants respectively, the rest of the participants distributed among three clusters, who are working for law firms represent 3% and who are working for public entities represent 9%, while the last 6% of the participants represent those who are working for a different type of organization than the ones listed in the previous clusters.

In a different dimension, Figure 3.9 shows how the participants are distributed based on their business sectors. It's very clear that the participants who are working in the private sector took the lion's share with 91%, while the ones who are working for the public sector represent 9% of the total participants.

In the last dimension, Figure 3.10 addresses the experience of the participants, which illustrates that 37% of the participants have acquired more than 20 years of experience in the construction industry, and 24% with experience ranging between 11 and 20 years, and 16% with 5 to 10 years of experience, and the participants who have less than five years of experience represent 23% of the participants.

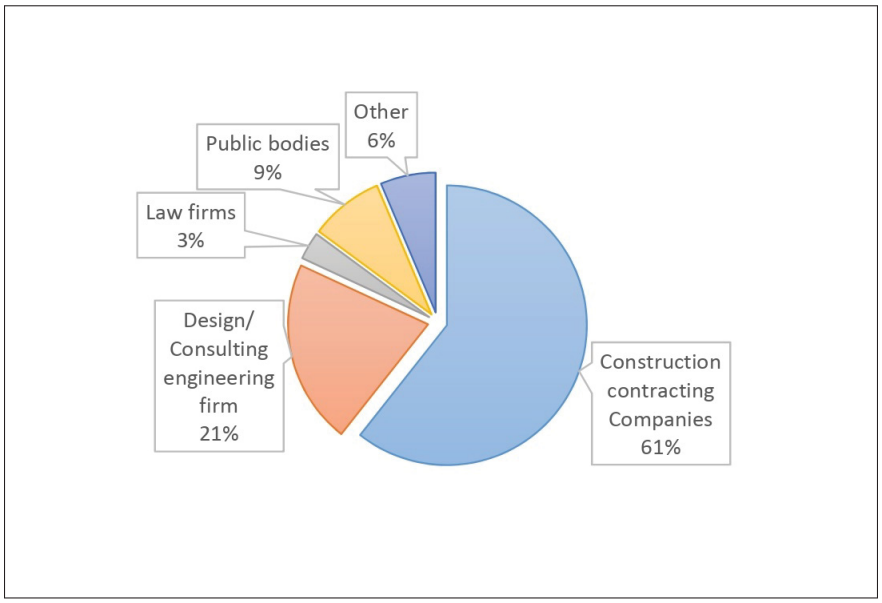


Figure 3.8 Types of organizations of survey participants

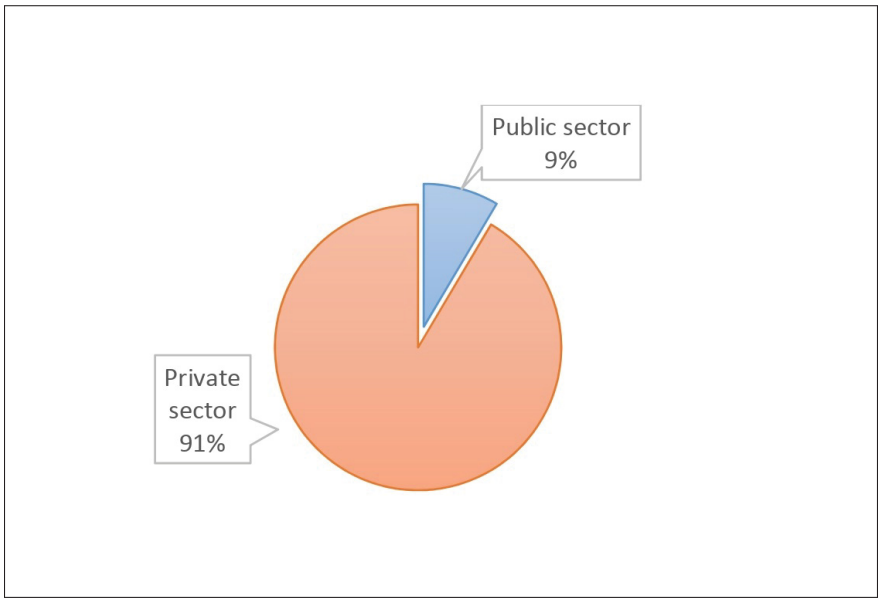


Figure 3.9 The business sector of the participants in the survey

In addition, Figure 3.11 shows the years of experience in the Quebec construction industry in particular, taking into consideration that all the responses that have been received without the existence of the experience in the Quebec construction industry were excluded, in an attempt to keep the generalization within the boundaries that been decided for this study.

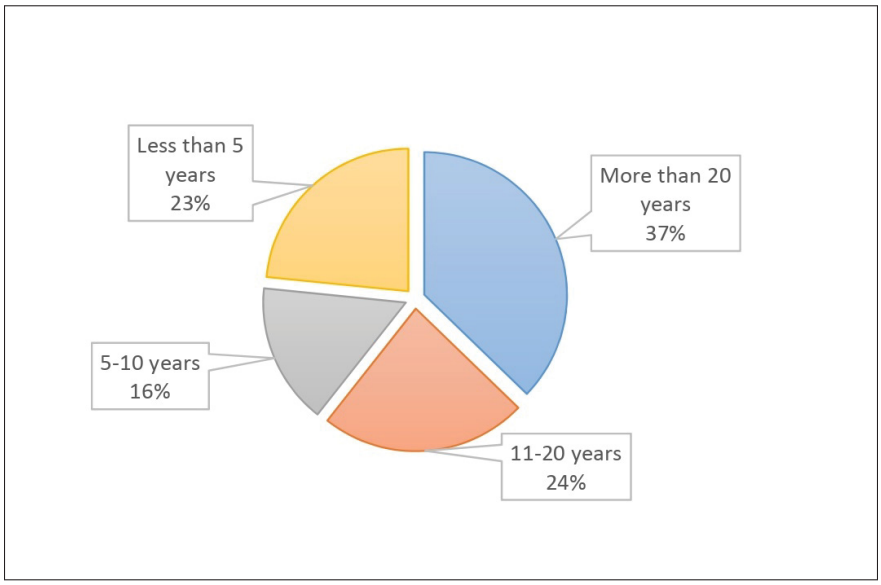


Figure 3.10 General experience of the survey participants

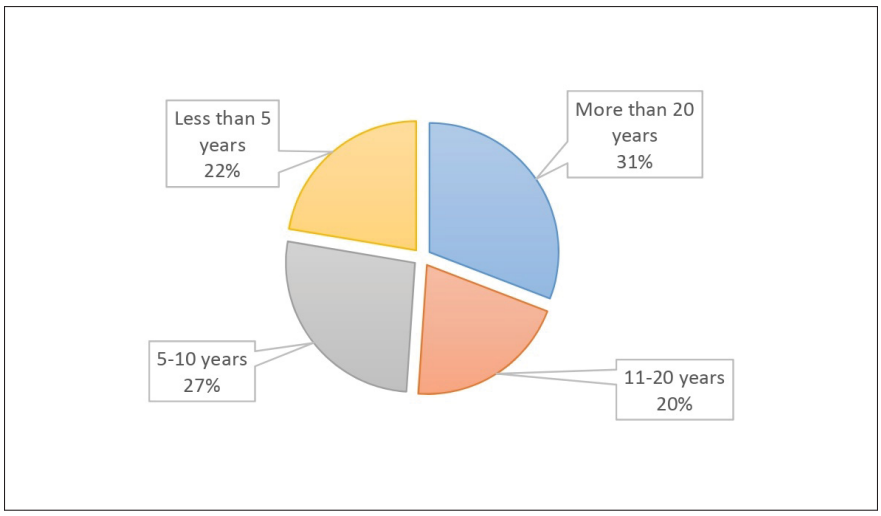


Figure 3.11 Quebec experience of the survey participants

3.2.3 Survey Structure

The survey was created on Google forms in both English and French, and the link to reach it was communicated to the potential participants, mainly through emails and social media, as shown in Appendix II. A brief summary about the study and its purposes in addition to the terms of the confidentiality and ethical consideration have been delivered to the participants in the first page of the survey.

The survey was designed around the research questions, where each group of the survey's questions was formed to provide answers for one of the three research questions. The survey consists of three main sections as the following:

The first section contained the introductory questions, information like the profession of the participant, the type of organization they are working for, the total years of experience they have, and their experience in Quebec construction industry, have been collected, to better understand and classify the participants into clusters.

The second section contained four questions that speak for the first two research questions: "are disputes inevitable in the construction industry?" and "are the binding DRMs more harmful to the sustainability of business relationships and project progress than the non-binding DRMs?"

- "To what extent do you agree or disagree with the following statement: The construction disputes are inevitable no matter the prevention strategy followed."
  This question used a 5-point Likert scale to measure the thoughts of the participants whether they agree or disagree with the claim that the disputes are inevitable in the construction projects, the 5-degree scale ranges from 1 (strongly disagree) to 5 (strongly agree).

- "Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through non-binding dispute resolution methods such as negotiation, mediation, and dispute review board?"
  In this question, the participants' thoughts about the effect of resolving the dispute through the non-binding DRMs on the chances of maintaining the business relationships have been measured, like the previous question, the participants were given a Likert scale from 1 to 5 where 1 represents a very low chance to maintain the business relationship and 5 represents a very high chance.

- "Based on your experience, what are the chances of maintaining the business relationship between the disputing parties if the dispute is resolved through binding dispute resolution methods such as arbitration and litigation (court proceeding)?"

This question also stated to assess the participants' opinion about the effect for resolving the dispute, but here, through the binding DRMs on the chances of maintaining the business relationships, the participants were given a 5 point Likert scale from 1 to 5 where 1 represents a very low chance to maintain the business relationship and 5 represents a very high chance.

- "If any of the following dispute resolution methods occurred during the project, how would you rank them from the one has the most negative effect on the project progress to the one that has the least negative effect?"

  This question served to assess the effect on the project's work progress if the dispute and the dispute resolution occurred during the project, the participants were asked to rank the following dispute resolution methods: mediation, arbitration, dispute review board, negotiation, and litigation (judicial process), from 1 to 5 where the method that gets the rank number 1 represents the method with the most negative effect on the work progress and the method that gets the rank number 5 represents the least negative effect.

The questions in the third section meant to address the answer for the third research question, "What are the causes of disputes that are leading to reach the stage of the binding DRMs?"

In this section, 10 groups of causes of disputes have been provided to the participants in the survey, the first 7 groups have been cited from the literature review, and they are as follows: owner related, contractor-related, design-related, contract-related, human behaviour-related, project-related, and external factors, those seven groups contain 28 causes of disputes, while the last three groups of causes which contain 10 causes of disputes have been extracted from the participants of the interviews in the first phase, and they are leadership and personal related, financial-related factors, and public-related factors.

These 10 groups and their 38 causes of disputes have been formed in the form of "tick all that apply" questions, in which the participants have the freedom to choose all the disputes they think it's associated with reaching the binding DRMs stages.

3.2.4 The Inevitability of Disputes (Survey)

The participants were asked to express their thoughts whether they agree or disagree with the belief that the disputes are inevitable in the construction projects, to answer this question, a 5-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree” were provided, the answers of total 94 valid responses are distributed as shown in Figure3.12.

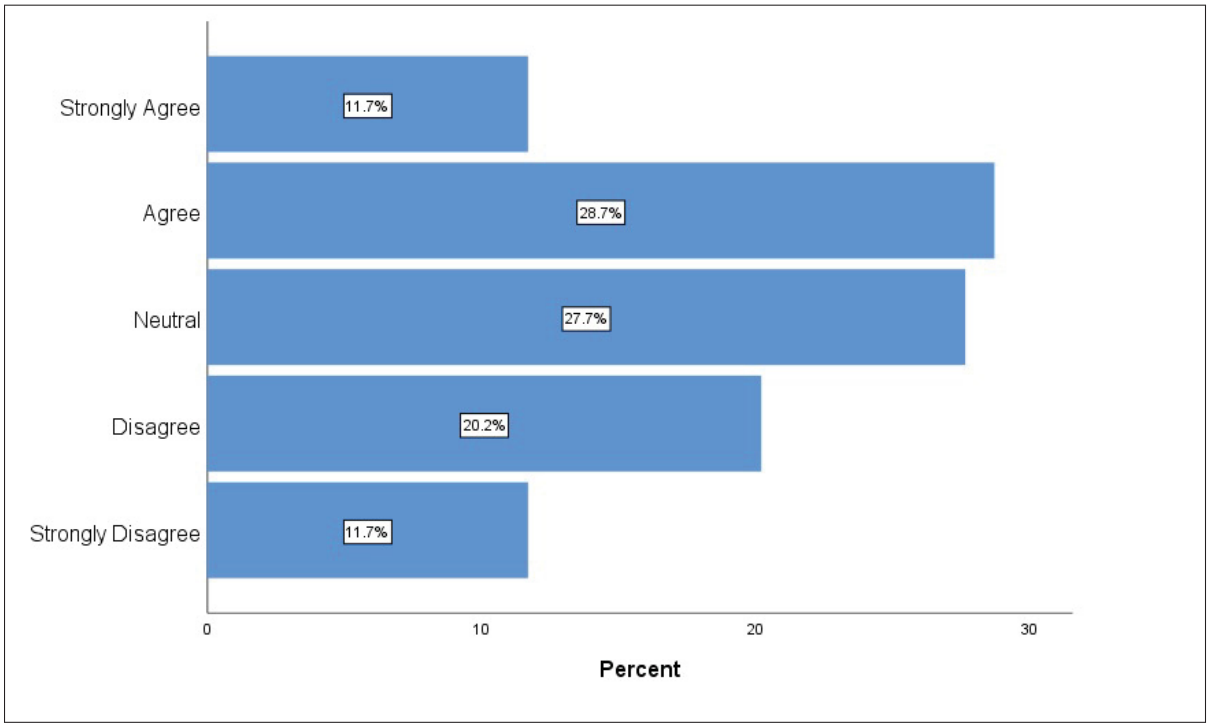


Figure 3.12 The inevitability of disputes: Responses distribution

As it can be noticed, the highest percentage of the respondents who represent a 28.7% of the total sample stated that they agree with the claim about the inevitability of the dispute, while with only 1% fall short, the percentage of respondents who were neutral with the statement is 27.7%, this percentage represents those who didn’t take one side of the argument by agreeing or disagreeing, on the other hand, 20.2% of the participant said that they disagree with the belief about the inevitability of the disputes, while the percentages of those who either strongly agree and strongly disagree came equal with the percentage of 11.7% for both.

In another dimension around the central tendency of the data, the most frequent answer which represented in the value of the mode equal 4, which is mean the answer by agreeing to the statement was the most repeated answers, however, the value of the median is 3 which represents the 50th percentile where 50% of the responses are above the answer 3 and the other 50% are less than 3.

To test whether there is statistically significant evidence supporting the claim within the population that the disputes are inevitable in the construction projects, which mean median greater than 3 on the 5 point Likert scale, in this case, the null hypothesis will represent the opposite side of the equation when the median is equal or less than 3 on the 5 point Likert scale, as shown in the following hypothesis:

$$H_0 : Median \leq 3$$

$$H_a : Median > 3$$

In referring to the reasoning approach illustrated in the methodology chapter Sec. 2.3.8.1, the one-tailed, one sample, Wilcoxon signed-rank test was used to test the aforementioned hypothesis, as a result, the Wilcoxon test showed that there is insufficient evidence that the population believes that the disputes are inevitable in the construction projects (*P-value* =.274 $> \alpha = .05$, fail to reject the null hypothesis),the full test report by SPSS is included in Appendix III.

3.2.5 The Consequences of Binding and Non-Binding DRMs (Survey)

In this section, the differences in the impact of the binding and non-binding DRMs on two dimensions, sustainability of the business relationship and the project's work progress , were assessed, these two dimensions represent the second research question which aims to, as the aim of the first question, provide the ground to the third and the main research question.

To assess the difference in the impact on the business relationship, two 5-point Likert scale questions were used, one for the binding and one for the non-binding DRMs, while to assess the impact on the project's work progress , a ranking type question was used, in which the respondents were asked to rank five dispute resolution methods, arbitration and litigation, which represent the binding DRMs, and mediation, negotiation and dispute review board, which represent the non-binding DRMs, from the one that has the most negative effect to the one that has the least negative effect on the project's work progress .

3.2.5.1 The Impact on the Sustainability of the Business Relationship

At first, the participants were asked about the chances of maintaining the business relationship between the disputing parties, if the dispute is resolved through the non-binding DRMs, a 5-point Likert scale ranging from 1 "very low chances" to 5 "very high chances" were provided, the answers of total 94 valid responses are distributed as shown in Figure3.13.

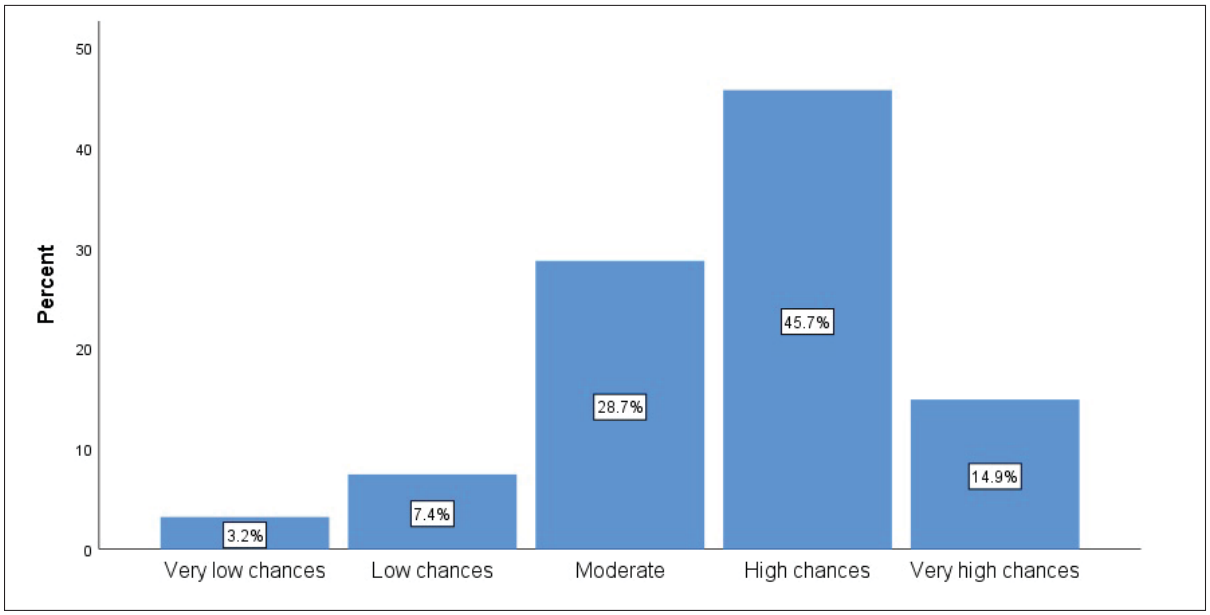


Figure 3.13 The chances to maintain the business relationship if the dispute solved through the non-binding DRMs

As the graph demonstrates, a total percentage of 60.6% of the respondents had revealed that the chances of maintaining the business relationship when the dispute is resolved through the non-binding DRMs are either high or very high, 45.7% high chances and 14.9% very high chances, while 28.7% of the respondents think that the chances are moderate, and the percentages of those who consider that the chances are low and very low were 7.4% and 3.2% respectively.

This trend reflected precisely in the central tendency measures, where both the mode and the median values are equal to 4 which are representing the high chances of maintaining the business relationship if the dispute cleared up early during the non-binding DRMs.

Furthermore, to test if the data shows statistically significant evidence supporting the claim that the chances of maintaining the business relationship are considered a high chance, which means, median greater than 3 on the 5 point Likert scale, as shown in the following hypothesis:

$$H_0 : \textit{Median of (chances of maintaining the business relationships through the non-binding DRMs)} \leq 3$$

$$H_a : \textit{Median of (chances of maintaining the business relationships through the non-binding DRMs)} > 3$$

In referring to the reasoning approach illustrated in Sec. 2.3.8.2, the one-tailed, one sample, Wilcoxon signed-rank test was used to test the aforementioned hypothesis, the result showed that there is statistically significant evidence through the data that the chances of maintaining the business relationship when the dispute is resolved through the non-binding DRMs are high (*P-value* =1.15E-7 $< \alpha = .05$, reject the null hypothesis), the full test report by SPSS is included in Appendix IV.

Secondly, the participants were asked about the chances of maintaining the business relationship between the disputing parties, if the dispute is resolved through the binding DRMs this time, a 5-point Likert scale ranging from 1 “very low chances” to 5 “very high chances” were provided

as well, the answers of total 94 valid responses are distributed as shown in Figure 3.14. As opposed to the data of the previous question, a total percentage of 69.2% of the respondents has stated that the chances of maintaining the business relationship when the dispute is resolved through the binding DRMs are either low or very low, 42.6% low chances and 26.6% very low chances, while 19.1% of the respondents think that the chances are moderate, and the percentage of those whom they believe that the chances are high and very high were 9.6% and 2.1% respectively.

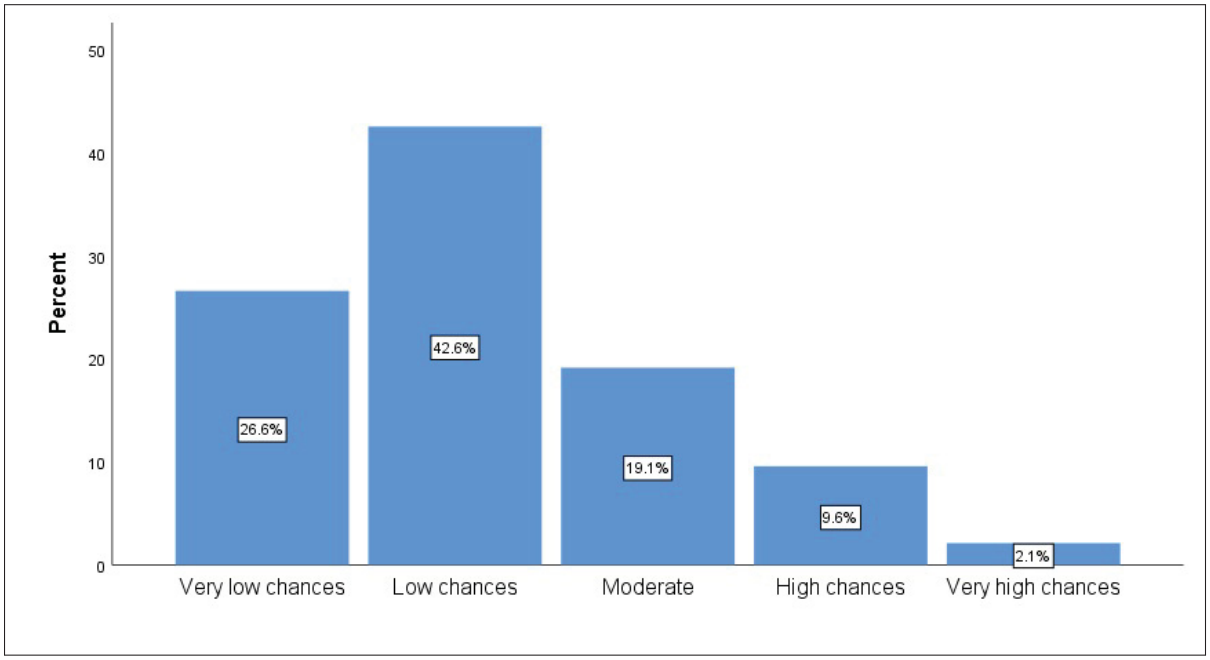


Figure 3.14 The chances to maintain the business relationship if the dispute solved through the binding DRMs

The central tendency measures indicated the same trend, where both the mode and the median values are equal to 2, which are expressing the low chances of maintaining the business relationship if the dispute is resolved through the binding DRMs.

In addition to what the descriptive statistics have provided, the inferential statistics were used as well to test if the data shows statistically significant evidence supporting the claim that the chances of maintaining the business relationship are considered a low chance, which means, a median less than 3 on the 5-point Likert scale, as shown in the following hypothesis:

$$H_0 : \textit{Median of (chances of maintaining the business relationships through the binding DRMs)} \geq 3$$

$$H_a : \textit{Median of (chances of maintaining the business relationships through the binding DRMs)} < 3$$

As the previous question, the one-tailed, one sample, Wilcoxon signed-rank test was adopted to test the above hypothesis, the result pointed that there is statistically significant evidence through the data that the chances of maintaining the business relationship when the dispute is resolved through the binding DRMs are low (*P-value* =1E-9 $< \alpha = .05$, reject the null hypothesis), the full test report by SPSS is included in Appendix IV.

3.2.5.2 The Impact on the Project Work Progress

The participants were asked to rank the following five dispute resolution methods; arbitration and litigation, which represent the binding DRMs, mediation, negotiation and dispute review board, which represent the non-binding DRMs, from the method that has the most negative effect to the method that has the least negative effect on the project's work progress, to determine that, a ranking question type was used, in which the ranked number one states for the "method with the most negative effect" and the ranked number 5 states for the "method with the least negative effect", the ranking order has been generated based on the values of the median and the mode, as shown in Figure 3.15.

This rank has been formed based on the median and mode measures because the frequencies wouldn't work in this type of question and since the data produced are ordinal, so the median would be a better representative of the central tendency of the data, in a way the mean wouldn't. However, in this case, both median and mean ranks were a match, where the binding DRMs, litigation (judicial process) and arbitration, came in the first two ranks as the methods with the most negative impact on the project's work progress with median and mode values equal to 1 for the litigation, and for the arbitration values of 2.5 and 2 for the median and the mode respectively,

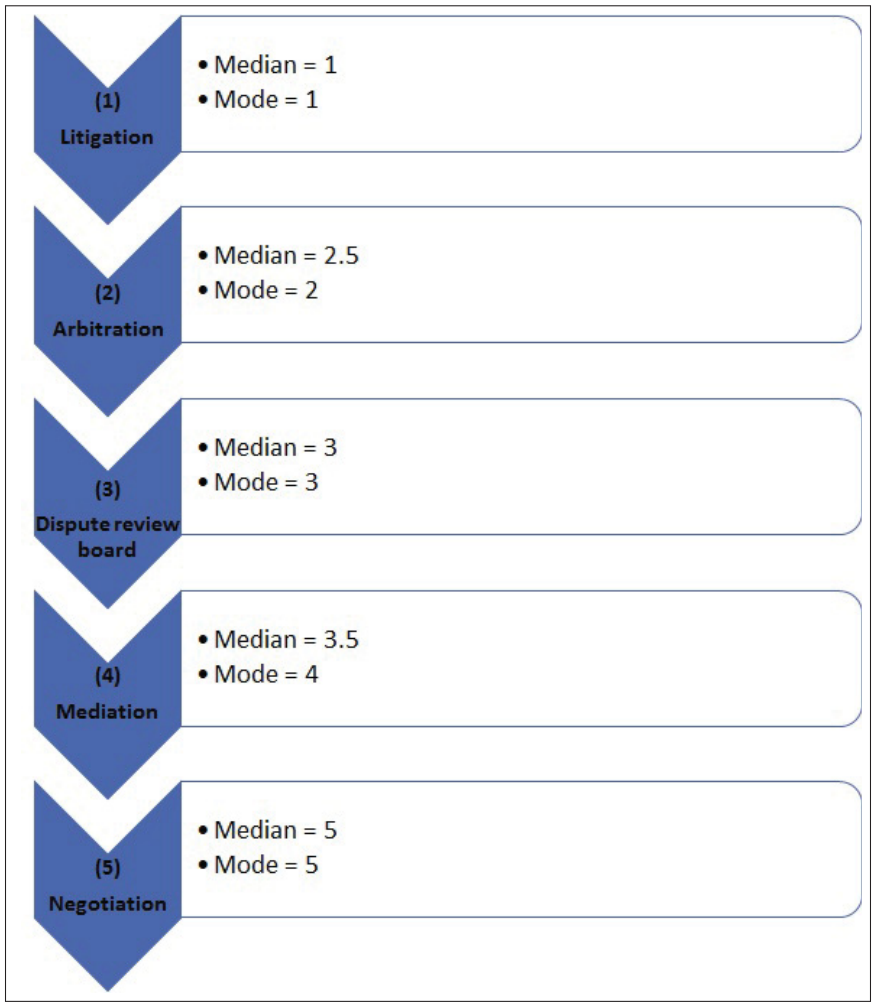


Figure 3.15 Ranking order based on the negative impact on the project work progress

on the other hand, the non-binding DRMs came in the ranks from 3 to 5, in clear segregation from the binding DRMs.

Furthermore, to test if there is a statistically significant difference between the disputes resolution methods, and as the reasoning approach represented in Sec. 2.3.8.2, the Friedman test was employed to test the following hypothesis:

H_0 : *There is no statistically significant difference*

H_a : T*here is a statistically significant difference*

The results of the Friedman test showed that there is a statistically significant difference (*P-value* =1. 88E-28 < α = .05, reject the null hypothesis), however, the Friedman test indicates only if there is a difference, but can't specify where the differences exist, hence, a follow-up stage has made, and the post hoc analysis using Wilcoxon signed-rank test will be employed, the five variables produced 10 different pairs for testing, each pair has a separate hypothesis, as an example, the following is the hypothesis for the combination of arbitration and mediation:

H_0 : *There is no statistically significant difference between Arbitration & Mediation*

H_a : There is a statistically significant difference between Arbitration & Mediation

The results of the Post Hoc analysis illustrated in Figure 3.16, taking into consideration that the *p-values* produced were compared to the adjusted α which has been adjusted based on Bonferroni adjustment by dividing the value of α = .05 on the total number of pairs which is 10, and that produced $adj.\alpha$ = .005.

As can be noticed, the test pointed that all pairs showed a statistically significant difference (*P-value* < $adj.\alpha$ = .005, reject the null hypothesis) except two pairs, the dispute review board with mediation and dispute review board with the arbitration (*P-value* > $adj.\alpha$ = .005, fail to reject the null hypothesis) however, even these two pairs would be considered as statistically significant difference before applying the Bonferroni adjustment, the full test report by SPSS is included in Appendix V.

3.2.6 The Disputes' Causes that Lead to the Binding DRMs (Survey)

This section is dedicated to answer the third research question, which is the main research question, in which the participants were asked to choose all the causes of disputes that they think it's associated with reaching the binding DRMs stage, a total of 38 causes of disputes

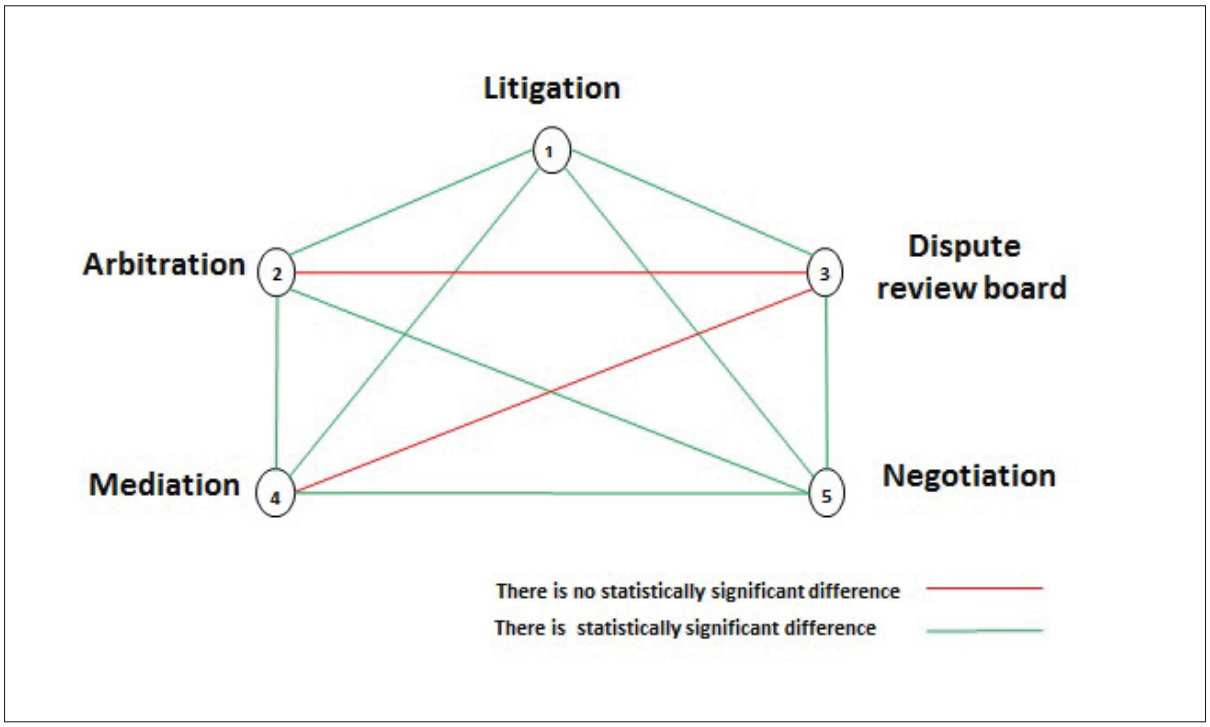


Figure 3.16 The impact on the project work progress - pairwise comparison

distributed over 10 groups have been provided to the participants, 7 groups adapted from the literature review and 3 groups extracted from the participants' interviews in the first phase.

To better deal with this type of question, each dispute cause treated as a separate dichotomous variable and coded with 0 for not selected and 1 for selected, then, analyzed through descriptive and inferential statistics based on each group of causes separately, in order to produce reasonable numbers of pairwise comparisons that could be analyzed and interpreted.

But firstly, the following is the main highlights if we treat all the 10 groups as one big cluster, through the multiple response analysis and the frequencies, it could be noticed through that the 94 participants have produced 1,727 responses (click times), which means in average each participant has chosen 18.4 causes of disputes as his/her choice of the disputes associated with reaching the binding DRMs, the unforeseen changes has been identified as the most common causes of disputes connected to the binding DRMs with percentage of 76.6% of the participants

and 4.2% of the total 1,727 responses, then, in very close percentage, the lack of communication came in the second rank as the most causes linked to the binding DRMs with 75.5% of the participants and 4.1% of the total 1,727 responses, while the ambiguities in contract documents came in the third place with 74.5% of the participants and 4.05% of the total 1,727 responses, then at the end of the top 5 causes associated with reaching the binding DRMs, the design errors and the delays in work progress, came in the fourth and fifth places respectively, the design errors has been received 71.3% of the participants and 3.9% of the total 1,727 responses, while the delay in work progress has received 68.1% of the participants and 3.7% of the total 1,727 responses.

In the following subsections, the proportions of the causes of disputes in each group have been presented, then, in referring to the reasoning approach illustrated in Sec. 2.3.8.3, Cochran's Q test statistical test has been applied for each group to test whether there is a statistically significant difference between the proportions of the variables, as the following hypothesis:

$$H_0 : \textit{There is no statistically significant difference between the proportions}$$
$$(P_a = P_b = \ldots = P_n)$$

$$H_a : \textit{There is a statistically significant difference between the proportions}$$

Further, the post hoc analysis using Dunn's test has been employed to test where the differences exist among the variable proportions, therefore, all pairwise comparisons for the causes of each group are calculated and a separate hypothesis was created for each of the pairs, as an example for these hypotheses, the following is the hypothesis for one of the combinations of the first group, change of scope and payment delays, taking into consideration, as explained in Sec. 2.3.8.3 that Bonferroni adjustment has been applied to deal with the multi-comparisons:

$$H_0 : \textit{There is no statistically significant difference between}$$
$$\textit{Change of scope \& Payment delays}$$

H_a : *There is a statistically significant difference between Change of scope & Payment delays*

In the following subsections, the frequencies of each group will be presented, along with the result of Cochran's Q test and the post hoc analysis using Dunn's test.

3.2.6.1 Owner Related Causes

This group contained the owner related dispute causes, and as can be noticed in Table 3.13, this group has received a total of 246 responses (click times) from a total 94 valid respondents, and since this question is a multiple response question so the participants can choose all the choices they think its apply, therefore, the tables are showing two different percentages, the responses percentage, which represent the percentage of votes each cause of disputes has received out of the total 246 votes, and the percentage of the cases which represent the percentage of respondents who chose that cause of dispute out of the 94 respondents, however, they are not contradicting one another, it's just a different way of communicating the results, therefore, and because the percentage of responses are added up to 100% it will be obvious to use to compare between the proportion of each dispute's causes.

As shown in Table 3.13, the "unrealistic expectations" has received the highest percentage of the responses with 24% as the most associated causes of disputes with reaching the binding DRMs from the owner related group of causes, not far from that, the "payment delays" came in the second rank with 23.2% of the total responses, while "variations initiated by the owner" and "change of scope" have received 19.5% and 18.3% of the total responses respectively, last in the line, the "late giving possession" and "acceleration" have been the least dispute's causes associated with the reaching of the binding DRMs from the owner related group with percentages of 8.9% and 6.1% respectively.

Moreover, the results of Cochran's Q test showed that there is a statistically significant difference between the proportions of the causes (*P-value* =1. 8E-16 $< \alpha = .05$, reject the null hypothesis), next, post hoc analysis using Dunn's test was carried out, the six causes of disputes in the owner

Table 3.13 First group: Owner related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Variations initiated by the owner	48	19.5%	51.6%
Change of scope	45	18.3%	48.4%
Late giving of possession	22	8.9%	23.7%
Acceleration	15	6.1%	16.1%
Unrealistic expectations	59	24.0%	63.4%
Payment delays	57	23.2%	61.3%
Total	246	100.0%	264.5%

group have created 15 pairwise combinations for comparison, the results are illustrated in Figure 3.17.

Out of total 15 pairwise, 8 showed statistically significant difference (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis), while the other 7 pairwise are not statistically significant difference (*Adj.P-value* $> \alpha = .05$, fail to reject the null hypothesis), and as can be noticed, the causes with the highest 4 proportions, “unrealistic expectations”, “payment delays”, “variations initiated by the owner”, and “change of scope”, are not statistically significant difference from each other, while all of them are statistically significant difference from the two causes with the least proportions, “late giving possession” and “acceleration”, the full test report by SPSS is included in Appendix VI.

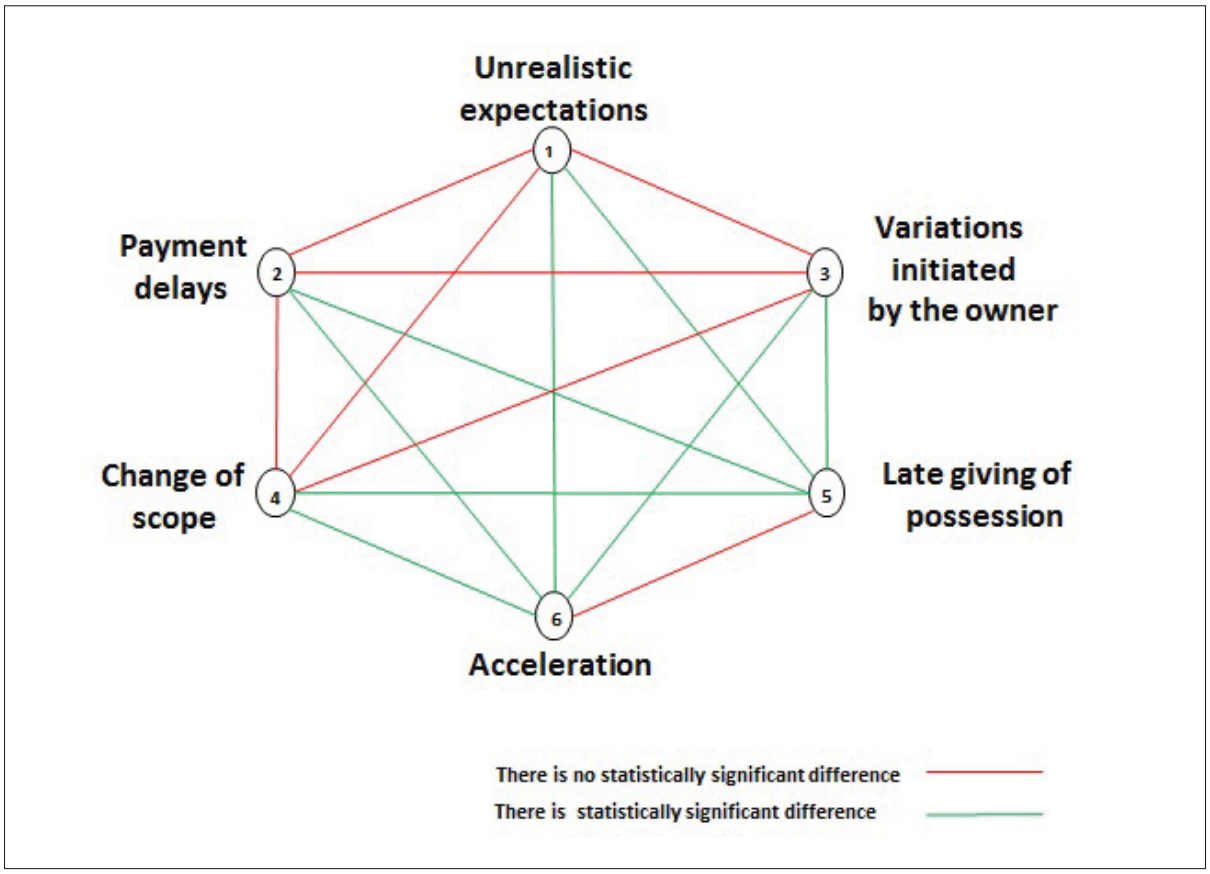


Figure 3.17 First group: Owner related - pairwise comparison

3.2.6.2 Contractor Related Causes

This group of causes included the contractor related dispute causes, and as can be noticed in Table 3.14, this group has received a total of 252 responses (click times) from a total 94 valid respondents, the “delays in work progress” has the highest percentage of the responses with 25.4% as the most associated causes of disputes with reaching the binding DRMs from the contractor related group of causes, then, the “quality of works” came in the second rank with 21.4% of the total responses, then with a close proportion, the “technical inadequacy of the contractor”, “time extensions”, and “financial failure of the contractor” have received 17.1%, 15.9%, and 13.5% of the responses respectively, at last, the “tendering” has a share of 6.7% of the responses as the least dispute’s causes associated with the reaching of the binding DRMs from the contractor causes group.

Table 3.14 Second group: Contractor related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Delays in work progressa	64	25.4%	68.1%
Time extensions	40	15.9%	42.6%
Financial failure of the contractor	34	13.5%	36.2%
Technical inadequacy of the contractor	43	17.1%	45.7%
Tendering	17	6.7%	18.1%
Quality of works	54	21.4%	57.4%
Total	252	100.0%	268.1%

In the next step, Cochran's Q test was applied and the result showed that there is a statistically significant difference between the proportions of the causes of the contractor group (*P-value* =1E-11 $< \alpha = .05$, reject the null hypothesis), then, post hoc analysis using Dunn's test was conducted, the six causes of disputes in the contractor group have created 15 pairwise combinations for comparison.

As shown in Figure 3.18, out of total 15 pairwise, 8 showed statistically significant difference (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis), while the other 7 pairwise are not statistically significant difference (*Adj.P-value* $> \alpha = .05$, fail to reject the null hypothesis), and as can be noticed, the "delays in work progress", which is the cause with the highest proportion in this group is statistically significantly different than all the other causes in this group except with the "quality of work", which is the cause with the second highest proportion, however, there is

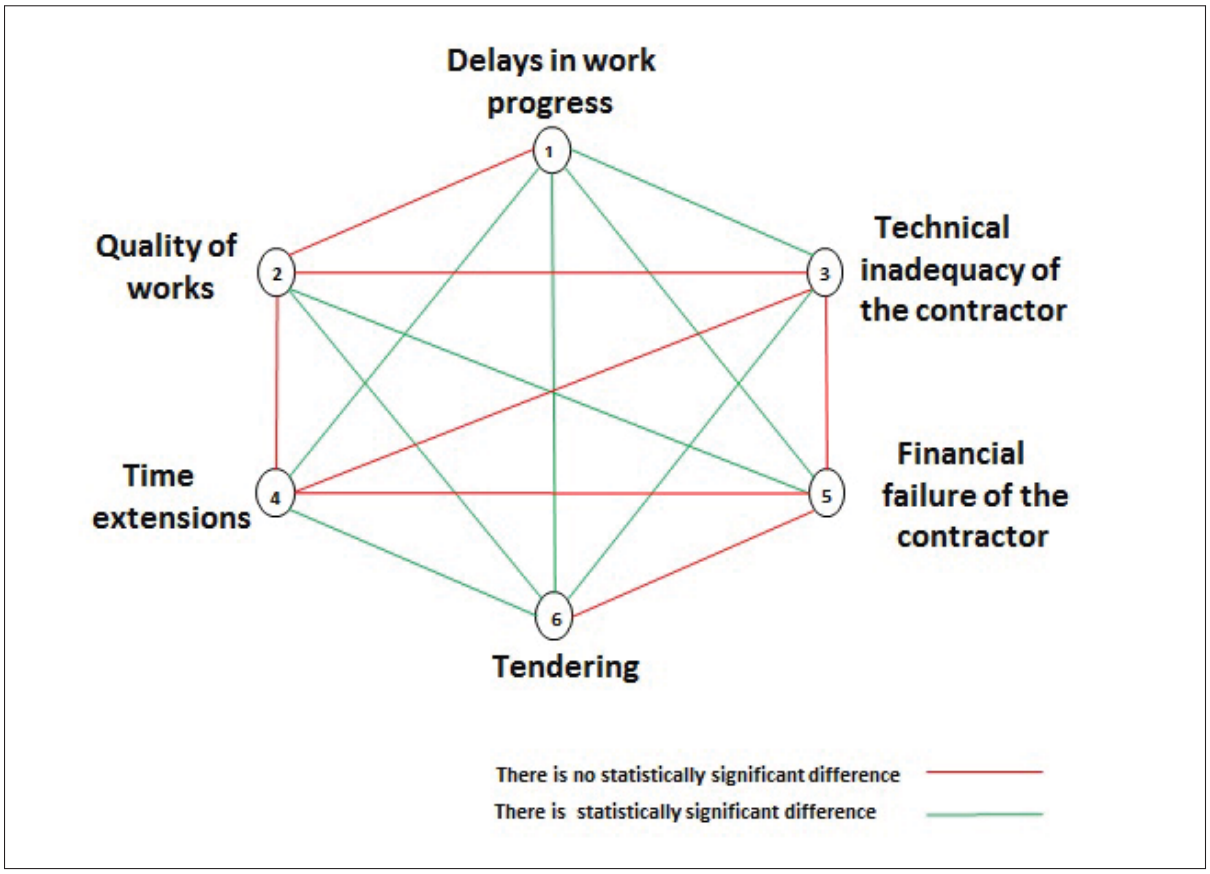


Figure 3.18 Second group: Contractor related - pairwise comparison

no statistically significant difference between the "quality of work" and causes in the third and fourth ranks, "technical inadequacy of the contractor" and "time extensions", the full test report by SPSS is included in Appendix VII.

3.2.6.3 Design Related Causes

This group represents the design-related causes of disputes, and it received a total of 211 responses (click times) for all the four causes under this group as shown in Table 3.15, the "design errors" has received the highest percentage of the responses with 31.8% as the most associated causes of disputes with reaching the binding DRMs from the design-related group of causes, then, the "inadequate-incomplete specifications" came in the second place with 29.4% of the total responses, while "quality of the design" and "availability of the information"

have received 20.9% and 18% of the total responses respectively, as the least dispute's causes associated with the reaching of the binding DRMs from the design-related group.

Table 3.15 Third group: Design related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Design errors	67	31.7%	71.3%
Inadequate - Incomplete specifications	62	29.4%	66.0%
Quality of design	44	20.9%	46.8%
Availability of information	38	18.0%	40.4%
Total	211	100.0%	224.5%

As the same procedure of the previous groups, Cochran's Q test was employed and the result showed that there is a statistically significant difference between the proportions of the causes of the design group (*P-value* =9E-6 $< \alpha = .05$, reject the null hypothesis), then, post hoc analysis using Dunn's test was conducted for the six pairwise combinations which were produced from the four causes of disputes in the design group.

As can be noted in Figure 3.19, out of total 6 pairwise, 4 showed statistically significant difference (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis), while the only two pairwise are not statistically significant difference (*Adj.P-value* $> \alpha = .05$, fail to reject the null hypothesis), but a closer look, the two causes with the highest proportions "design errors" and "inadequate-incomplete specifications" are not statistically significant different from each other, but both of them are statistically significantly different from the other two causes with the lower proportions, "quality of the design" and "availability of the information", the full test report by SPSS is included in Appendix VIII.

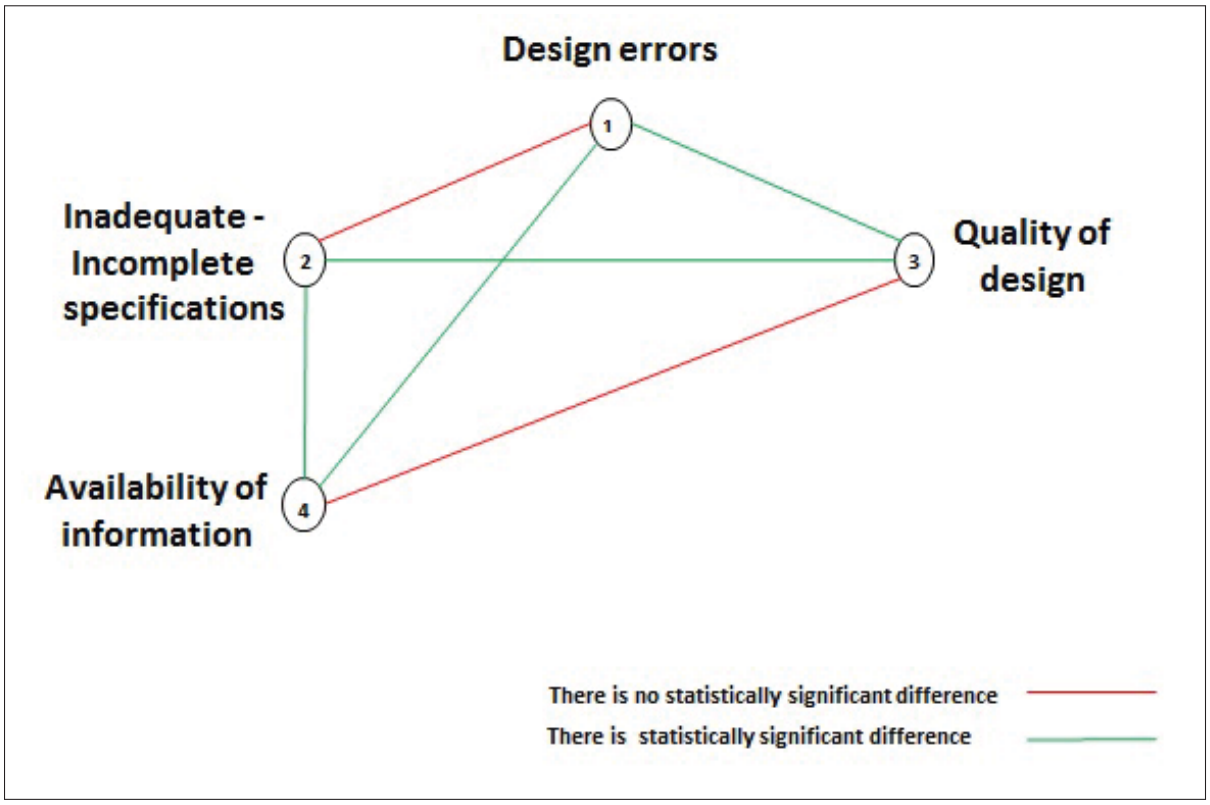


Figure 3.19 Third group: Design related - pairwise comparison

3.2.6.4 Contract Related Causes

With many similarities to the previous group, this group represents the design-related dispute causes, and it received a total of 186 responses (click times) for all the four causes under this group as shown in Table 3.16, the "ambiguities in contract documents" has received the highest percentage of the responses with 37.6% as the most associated causes of disputes with reaching the binding DRMs from the contract-related group of causes, then, the "different interpretations of the contract provisions" came in the second place with 31.2% of the total responses, while "risk allocation" and "other contractual problems" have received 16.1% and 15.1% of the total responses respectively, as the least dispute's causes associated with the reaching of the binding DRMs from the contract-related group.

Table 3.16 4th group: Contract related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Ambiguities in contract documents	70	37.6%	74.5%
Different interpretations of the contract provisions	58	31.2%	61.7%
Risk allocation	30	16.1%	31.9%
Other contractual problems	28	15.1%	29.8%
Total	186	100.0%	197.9%

Further, Cochran's Q test was performed and the result showed that there is a statistically significant difference between the proportions of the causes of the design group (*P-value* =1E-11 $< \alpha = .05$, reject the null hypothesis), then, Post Hoc analysis using Dunn's test was carried out for the six pairwise combinations which were produced from the four causes of disputes in the contract group.

The result of the post hoc analysis using Dunn's test showed that out of total 6 pairwise, 4 were statistically significantly different (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis) as shown in Figure 3.20, and as the same as the previous group, the two causes with the highest proportions "ambiguities in contract documents" and "different interpretations of the contract provisions" are not statistically significantly different from each other, but both of them is a statistically significant different with the other two causes with the lower proportions, "risk allocation" and "other contractual problems", the full test report by SPSS is included in Appendix IX.

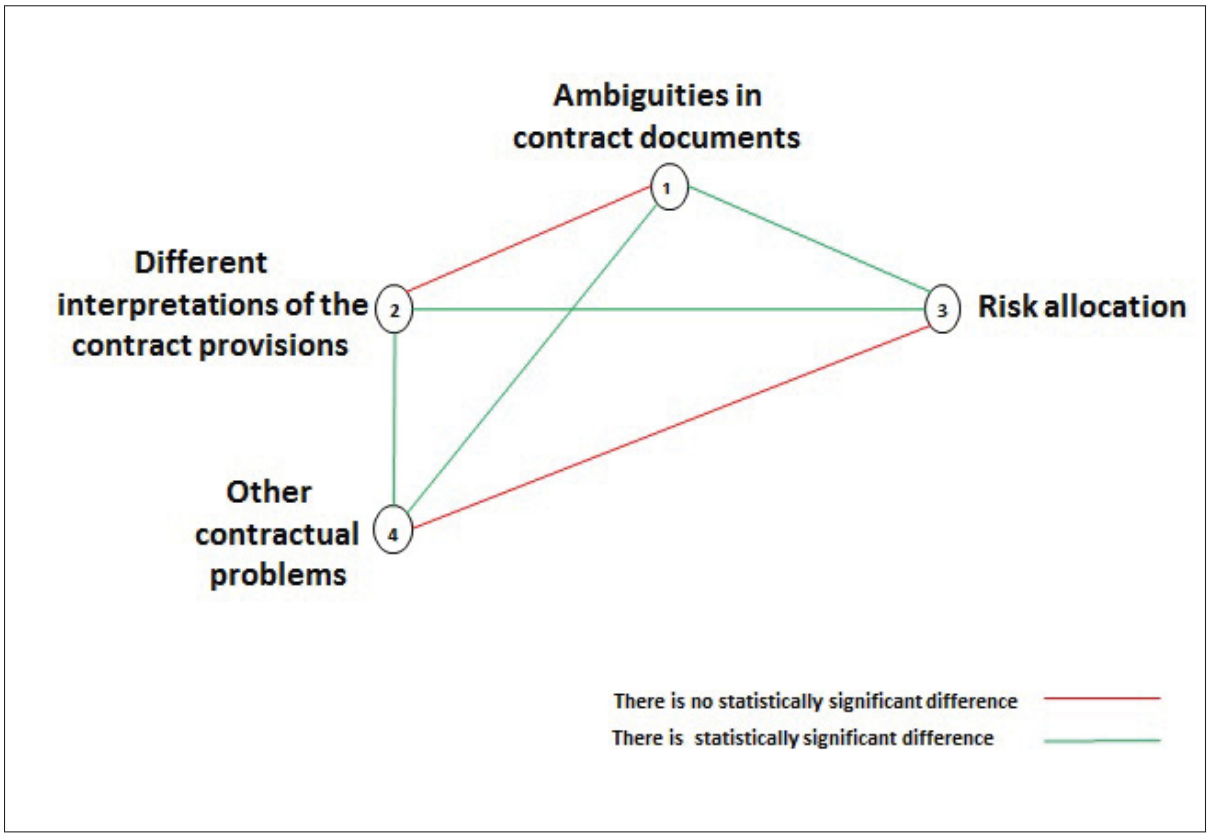


Figure 3.20 4th group: Contract related - pairwise comparison

3.2.6.5 Human Behavior Related Causes

This group dedicated to the human behavior related dispute causes, a total of 140 responses (click times) have been received, as shown in Table 3.17, the “lack of communication” has received the highest percentage of the responses with 50.7% as the most associated causes of disputes with reaching the binding DRMs from the human behavior related group of causes, then, the “adversarial-controversial culture” has the second-highest percentage with 25% of the total responses, and “lack of team spirit” has received 24.3% of the total responses, as the least dispute’s causes associated with the reaching of the binding DRMs from the human behavior related group.

In further step, the Cochran’s Q test was conducted and the result showed that there is a statistically significant difference between the proportions of the causes of the human behavior

Table 3.17 5th group: Human behavior related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Adversarial - Controversial culture	35	25.0%	38.9%
Lack of communication	71	50.7%	78.9%
Lack of team spirit	34	24.3%	37.8%
Total	140	100.0%	155.6%

group (*P-value* =2.4E-8 $< \alpha = .05$, reject the null hypothesis), then, post hoc analysis using Dunn's test was carried out for the three pairwise combinations of this group.

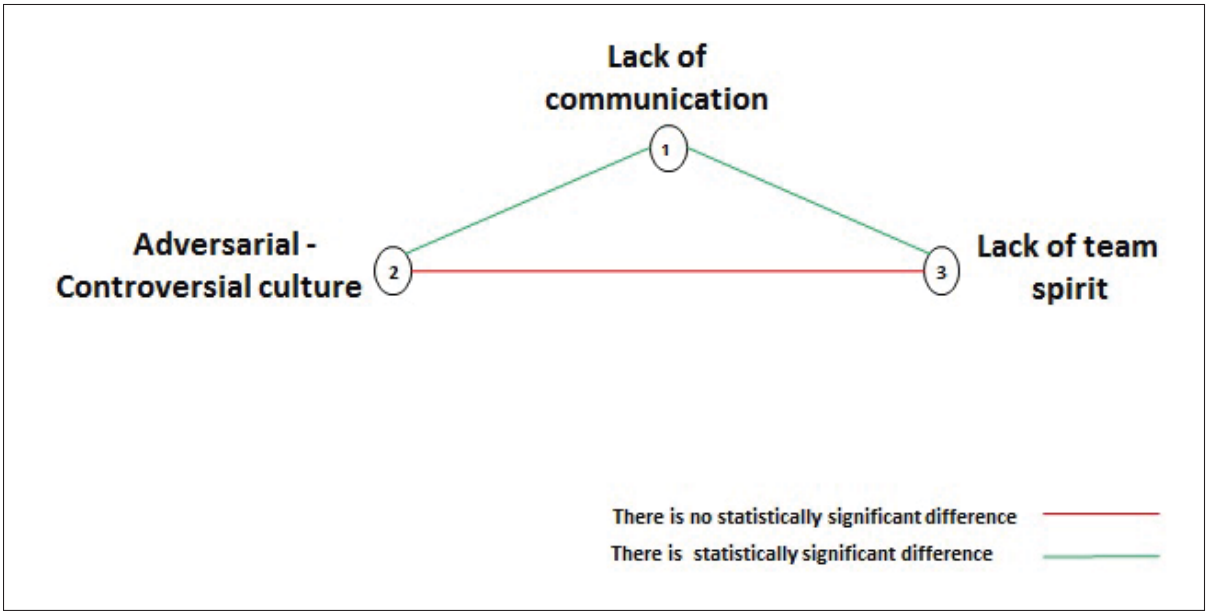


Figure 3.21 5th group: Human behavior related - pairwise comparison

The results of the Post Hoc analysis using Dunn's test, as shown in Figure 3.21 pointed that there is statistically significant difference (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis) when compared the "lack of communication" to both the "adversarial-controversial culture" and "lack of team spirit", while there is not statistically significant difference between the pairwise of "adversarial-controversial culture" and "lack of team spirit" (*Adj.P-value* $> \alpha = .05$, fail to reject the null hypothesis), the full test report by SPSS is included in Appendix X.

3.2.6.6 Project Related Causes

The project related group contained only two causes of disputes, "site conditions" and "unforeseen changes", and has received a total of 122 responses, as shown in Table 3.18,the "unforeseen changes" has received 59% of the responses, while "site conditions" has received only 41% of the total responses.

Table 3.18 6th group: Project related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Site conditions	50	41.0%	55.6%
Unforeseen changes	72	59.0%	80.0%
Total	122	100.0%	135.6%

Since this group has only two causes of disputes, therefore, unlike the previous groups, the post hoc analysis was not performed and only Cochran's Q test was conducted to determine if there is a statistically significant difference between the two causes of this group, the result showed that there is a statistically significant difference between the proportions of "unforeseen changes"

and “site conditions” (*P-value* =.004 < α = .05, reject the null hypothesis), the full test report by SPSS is included in Appendix XI.

3.2.6.7 External Fctors Related Causes

This group contained to the external related dispute causes, a total of 125 responses have been received, as shown in Table 3.19, the “legal and economic factors” has received 42.4% of the total responses as the most associated causes of dispute with reaching the binding DRMs from the external factors behaviour related group of causes, in the second place, the “weather” has the second-highest percentage with 36% of the total responses, while “fragmented structure of the sector” has received only 21.6% of the total responses.

Table 3.19 7th group: External factors related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Weather	45	36.0%	51.7%
Legal and economic factors	53	42.4%	60.9%
Fragmented structure of the sector	27	21.6%	31.0%
Total	125	100.0%	143.7%

In addition, Cochran’s Q test was performed and the result showed that there is a statistically significant difference between the proportions of the causes of the external factor group (*P-value* =.001 < α = .05, reject the null hypothesis).

Then, Post Hoc analysis using Dunn’s test was carried out for the three pairwise combinations of this group, and as shown in Figure 3.22, the results of the Post Hoc analysis using Dunn’s

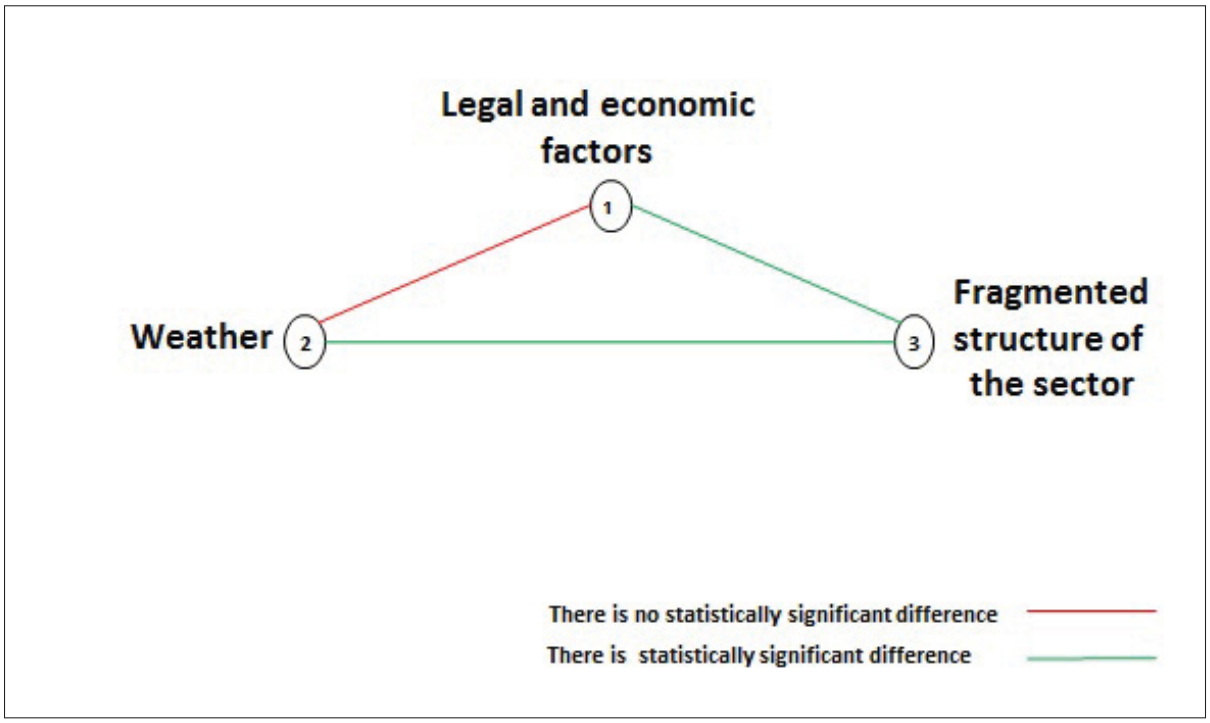


Figure 3.22 7th group: External factors related - pairwise comparison

test pointed that there is statistically significant difference (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis) when compared the "fragmented structure of the sector" to both the "legal and economic factors" and "weather", while there is no statistically significant difference between the pairwise of"legal and economic factors" and "weather" (*Adj.P-value* $> \alpha = .05$, fail to reject the null hypothesis), the full test report by SPSS is included in Appendix XII.

3.2.6.8 Leadership and Personal Related Causes

This group represents the leadership and personal related dispute causes, and it has received a total of 184 responses (click times) for all the four causes under this group as shown in Table 3.20,the "decision-making and compromising ability" has received the highest percentage of the responses with 28.8%, then with a slight difference, the "problem-solving ability" has received 25.5% of the total responses, while "the ability to manage the customer's expectations" and "the quality of the project team" have received the same percentage of 22.8% of the total responses.

Table 3.20 8th group: Leadership & personal related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Solving problems ability	47	25.5%	51.6%
Decision-making & compromising ability	53	28.8%	58.2%
The ability to manage the customer's expectations	42	22.8%	46.2%
The quality of the project team	42	22.8%	46.2%
Total	184	100.0%	202.2%

In addition, Cochran's Q test was performed, but the result showed that there is no statistically significant difference between the proportions of the causes of the leadership and personal group (*P-value* =.279 $>$ α = .05, fail reject the null hypothesis), and therefore, no further analysis would be conducted, the full test report by SPSS is included in Appendix XIII.

3.2.6.9 Financial Related Causes

This group contained to the financial-related dispute causes, a total of 131 responses have been received, as shown in Table 3.21, the "the amount under dispute" and the "low-profit margin" have received 39.7% and 38.2% of the total responses respectively, as the most associated dispute cause's with reaching the binding DRMs from the financial factors related group of causes, while "attitude of the creditors" has received only 22.1% of the total responses. In the next step, Cochran's Q test was performed and the result showed that there is a statistically significant

Table 3.21 9th group: Financial factors related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Attitude of the creditors	29	22.1%	33.0%
The amount under dispute	52	39.7%	59.1%
Low-profit margin	50	38.2%	56.8%
Total	131	100.0%	148.9%

difference between the proportions of the causes of the financial factors group (*P-value* =.002 < α = .05, reject the null hypothesis).

Then, Post Hoc analysis using Dunn's test was employed for the three pairwise combinations of this group, and as shown in Figure 3.23, the results of the Post Hoc analysis using Dunn's test pointed that there is statistically significant difference (*Adj.P-value* < α = .05, reject the null hypothesis) when compared the "attitude of the creditors" to both thethe "the amount under dispute" and the "low-profit margin", while there is no statistically significant difference between the pairwise of"the amount under dispute" and "low-profit margin" (*Adj.P-value* > α = .05, fail to reject the null hypothesis), the full test report by SPSS is included in Appendix XIV.

3.2.6.10 Public Related Causes

This group contained the public-related dispute causes, where a total of 130 responses (click times) have been received, as shown in Table 3.22, the "government processes bureaucracy" has received the highest percentage of the responses with 48.5% as the most associated dispute cause's with reaching the binding DRMs from the public-related group of causes, then, the "politics interest" has the second-highest percentage with 30.8% of the total responses, and "lack

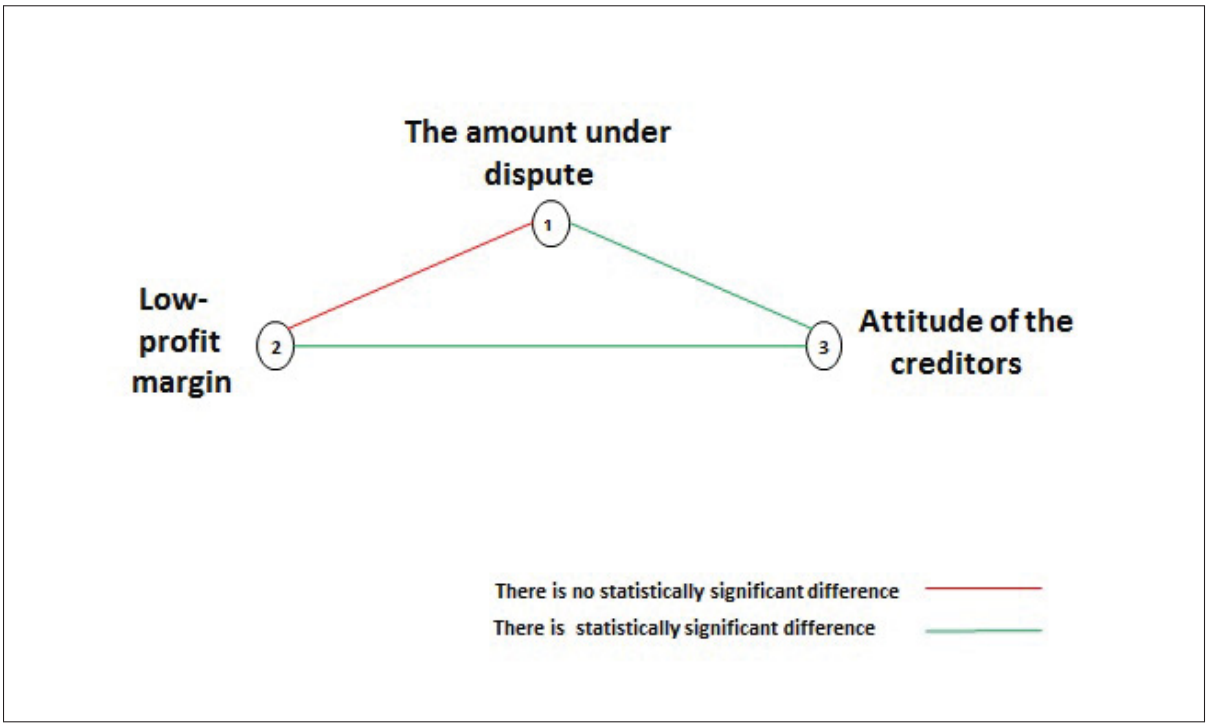


Figure 3.23 9th group: Financial factors related - pairwise comparison

of awareness concerning beneficial effects of having legal aid" has received only 20.8% of the total responses.

In a further step, Cochran's Q test was conducted and the result showed that there is a statistically significant difference between the proportions of the causes of the public group (*P-value* =3E-6 $< \alpha = .05$, reject the null hypothesis), then, Post Hoc analysis using Dunn's test was carried out for the three pairwise combinations of this group, as shown in Fig.3.24.

The results of the Post Hoc analysis using Dunn's test, pointed that there is statistically significant difference (*Adj.P-value* $< \alpha = .05$, reject the null hypothesis) when compared the "government processes bureaucracy" to both the "politics interest" and "lack of awareness concerning beneficial effects of having legal aid", while there is not statistically significant difference between the pairwise of "politics interest" and "lack of awareness concerning beneficial effects

Table 3.22 10th group: Public factors related - Proportions of the causes

Disputes Causes	Responses		Percent of Cases
	No. of Times Selected	Percent	
Lack of awareness concerning beneficial effects of having legal aid	27	20.8%	31.4%
Politics interest	40	30.8%	46.5%
Government processes bureaucracy	63	48.5%	73.3%
Total	130	100.0%	151.2%

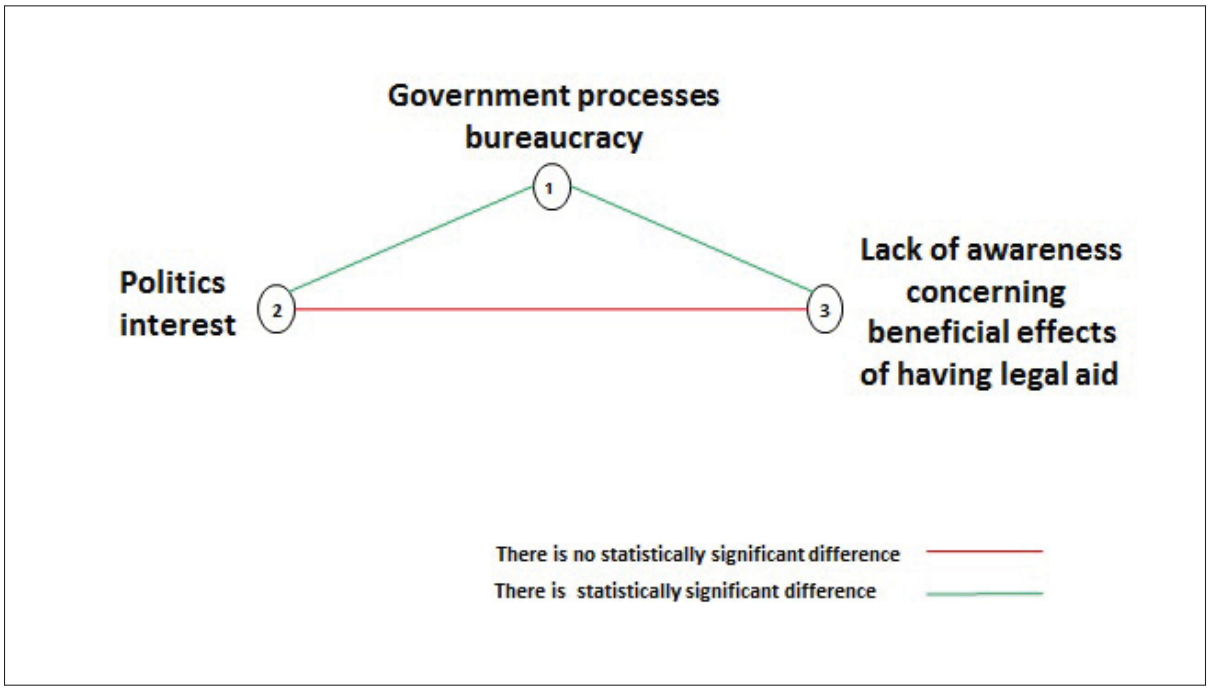


Figure 3.24 10th group: Public factors related - pairwise comparison

of having legal aid" (*Adj.P-value* > α = .05, fail to reject the null hypothesis), the full test report by SPSS is included in Appendix XV.

3.2.7 Discussion

3.2.7.1 First Theme Discussion: The Inevitability of Disputes (Survey)

The participants were asked whether they believe that the disputes are inevitable or not in the construction process, both descriptive and inferential statistics were employed to answer this question, as shown in Figure 3.12, the percentages were inconclusive, where the difference between the percentage of whom agreed with the percentage of whom were neutral was only 1%, however, the largest percentage of the participants who represent 40.4% of the total valid responses have stated that they agreed or strongly agreed with the claim, while the percentage of whom disagree or strongly disagree with the inevitability of the dispute were 31.9%, and 27.7% who neither agree nor disagree with the claim.

These confusing percentages are reflected on the measures for central tendency as well, where the mode is equal to 4 which mean that the most frequented answer was the "agree" on the inevitability nature of the dispute, while the median is equal to 3 which is the neutral answer and that means 50% of the participants' answers are below 3 and 50% of them are above 3.

On the other hand, a one-tailed, one sample, Wilcoxon signed-rank test was performed to test if there is a statistical significance evidence to support the claim of the inevitability of the disputes, this claim was pointed out from the literature review and the phase one of this study (interviews), eventually, the results showed that there is insufficient evidence within the data that the population believes that the disputes are inevitable in the construction projects (*P-value* > α).

This question was designed to provide the grounds to the main research question "what are the causes of disputes that can lead to the binding DRMs stages," and despite the fact that the data didn't show sufficient evidence to support that there is a belief on the inevitability of the dispute among the population, which contradict to the initial belief that extracted from the literature review and phase one, but still could be considered a solid ground to the main research question, where the belief among the population that the disputes are not inevitable would support the

effort of this study by taking advantage of such studies in the continuous attempts by the industry to prevent the disputes.

Since we don't believe it's inevitable, therefore, we could prevent them for taking a place in the projects, or the most important, prevent those they responsible for producing the most painful sort of dispute, those they probably produce the sort of dispute that can't be resolved before reaching the binding DRMs.

3.2.7.2 Second Theme Discussion: The Consequences of Binding and Non-Binding DRMs (Survey)

To assess the consequences on the business relationship, and on the project's work progress , the participants were asked two sets of questions, the first set was dedicated to assessing the difference in impact on the sustainability of the business relationships between the binding and non-binding DRMs by using two 5 point Likert scale questions, while the second set was dedicated to assessing the impact on the project's work progress by using a ranking type question, these two sides represent the second research question, "Are the binding DRMs more harmful to the sustainability of business relationships and project progress than the non-binding DRMs?"

On the side of the impact on the business relationship, both descriptive and inferential statistics were employed to answer this part, and as can be noticed in Figure 3.13 and Figure 3.14, there is a distinct trend among the participants considering the chances of maintaining the business relationships if the dispute is resolved through the non-binding DRMs as high chances and the chances when the dispute is resolved through the binding DRMs as low, which would describe the harmful impact that the binding DRMs, arbitration and litigation (judicial process), have on the chances of maintaining the business relationship between the disputing parties.

In addition, a one-tailed, one sample, Wilcoxon signed-rank test was performed on both data, the non-binding and the binding, to test whether there is statistical significance evidence would support that the chances of maintaining the business relationships are high in the case of the non-binding DRMs and are low in the case of the binding DRMs. As a result, the tests revealed

that there is statistically significant evidence that the participants believe that the chances of maintaining business relationships are high in the case of the non-binding DRMs and are low in the case of the binding DRMs (*P-value* $< \alpha$) for both tests.

On the side of the impact on the project's work progress, both descriptive and inferential statistics were employed, as well, and as can be noticed in Figure 3.15, there is clear segregation between the bindings and the non-binding DRMs in terms of their effect on the project's work progress, where the litigation and arbitration fall in the ranks 1 and 2 respectively as the methods with the most negative impact, while the non-binding DRMs, dispute review board, mediation, and negotiation fall in the ranks from 3 to 5, respectively. And that came consistent with our understanding of the dispute in the first place, where the dispute is a problem, a disagreement, an obstacle, and it would be more beneficial for the project parties to clear it up as early as possible, and resolving the dispute through the non-binding DRMs means that it got resolved earlier than if it's resolved through the binding DRMs, and therefore the obstacle situation would be moved away in an early stage, and the negative impact will be stopped, while in the case of the binding DRMs the disagreement situation will stick to the project much longer.

However, to verify whether the differences between the dispute resolution methods are statistically significant or not, two rounds of testing have been conducted, in the first, a Friedman test showed that there is a statistically significant difference (*P-value* $< \alpha$, reject the null hypothesis), then in the second, a post hoc analysis using Wilcoxon signed-rank test showed the differences between the 10 pairs produced from the five dispute resolution methods, the result of the post hoc analysis confirmed that all pairs are containing statistically significant differences except two pairs, the dispute review board with arbitration and mediation, which would not affect the ability to infer that there is statistically significant evidence that the binding DRMs are considered more harmful on the project's work progress than the non-binding DRMs.

This research question (including the two parts, the sustainability of the business relationship and the impact on the project's work progress), as for the first research question, was designed to provide the grounds to the main research question, "what are the causes of disputes that can lead

to the binding DRMs stages," by assessing the claim that the binding DRMs are more harmful on the sustainability of the business relationship and on the project's work progress , and as illustrated above, the data showed statistically significant evidence that there is a belief among the population that the binding DRMs are more damaging to the business relationships than the non-binding DRMs, as well as, the evidence that the binding DRMs have a more negative impact on the project's work progress than the non-binding DRMs, where the litigation (judicial process) and the arbitration were ranked as the methods with most negative impact.

Throughout this theme the results show evidence that the binding DRMs are the most painful methods in terms of their impact on the business relationship and on the project works than the non-binding DRMs, hence, this would be considered as a justification for the reasons that make this study aims to highlight the causes of disputes that are associated with reaching the Binding dispute resolution stage.

3.2.7.3 Third Theme Discussion: The Disputes' Causes that Lead to the Binding DRMs (Survey)

As it has been grounded in the previous two research questions, the need to identify the causes of disputes that are producing some sorts of disputes that can't be resolved before reaching the binding DRMs was logically justified, hence, a type of multiple response questions with a total of 38 causes of disputes distributed over 10 groups have been provided to the participants, 7 groups have been adapted from the literature review and 3 groups were extracted from the participants' interviews in the first phase, in order to choose all the causes of disputes that are, as the belief of the participants, most associated with reaching the binding DRMs, arbitration, and litigation (judicial process).

In general, among all the groups, the unforeseen changes, lack of communication, ambiguities in contract documents, design errors, and the delays in work progress, have been identified as the top five causes of disputes that are responsible for producing disputes with high chances of reaching the stage of the binding DRMs.

In addition, each group has been treated separately as well, in order to deal with a reasonable amount of pairwise comparisons that can be analyzed and interpreted, hence, Cochran's Q test has been performed for each group to test if there is a statistically significant difference between the proportions of the causes, then, it has been followed by post hoc analysis using Dunn's test to check where the differences exist between the causes.

This way has opened the door to see which cause is the most associated with reaching the binding DRMs from each group, which would be considered as the weak point or the source of potential risk that the construction projects parties need to handle it in careful, and as shown in the previous subsections, the results pointed that the "unrealistic expectation" is the most cause has been linked to the binding DRMs from the owner related group, while the "delays in work progress" received the highest percentage of the participants' choices from the contractor related group, and in the design-related group, the "design errors" was the selected cause, and in the contract-related group, the "ambiguities in contract documents" was the cause who brought the most of the attention, the "lack of communication" has been the selected cause from the human behavior related group, further, the "unforeseen changes" has been marked as the cause which received the highest percentage in the project-related group and among all the other groups, then, the "legal and economic factors" was the choice of the participants from the external factors related group, while the "decision-making and compromising ability" was the selected cause from the leadership and personal group, eventually, in the last two groups of causes, the "amount under dispute" was chosen from the financial-related group, while the "government bureaucracy" was the choice from the public-related group.

The results of Cochran's Q test showed that all the 10 groups have statistically significant differences between the proportions of the causes ($P\text{-}value < \alpha$) except the Leadership & personal related group, however, based to the post hoc analysis not all the pairwise were statistically significantly different, but it can be noticed that the cause which ranked as number 1 in each group is statistically significantly different from the cause which ranked in the last place, and the pairwise comparisons which showed insufficient evidence for the statistically significant difference was located in between, which would make a doubt about the rank of the causes in

each group but not about the fact that there is statistically significant difference between the causes proportions of each group.

Therefore, and because some pairwise comparisons didn't show a statistically significant difference, instead of picking the most associated cause with reaching the binding DRMs from each group, the weight of each cause proportion has been considered in developing an assessment sheet as will be illustrated in the next section, in this assessment sheet the potential level of risk of reaching the binding DRMs will be calculated based on the weighted proportion of each cause.

3.2.8 Assessment Sheet - The Potential Risk of Reaching the Binding Dispute Resolution Methods

This assessment sheet meant to assess the level of the potential risks of reaching the binding DRMs, it's developed based on the weighted proportion of each of the 38 causes of disputes that were listed in the survey, and it is intended to provide a quick guess on the probability of reaching the binding DRMs and to highlight the potential risk so the assessment taker would manage it carefully in his/her project.

The results of both descriptive and inferential statics were employed to proper design this sheet, in descriptive statics, through the multiple responses analysis by SPSS, all the 38 causes were treated as one big cluster, and the proportion of each cause was extracted and assigned to one question related to that cause in the assessment sheet, the sheet contained 38 questions on the likelihood of certain events in the project, the assessment taker should answer each of them on a scale of 1 to 5, where 1 is extremely unlikely and 5 is extremely likely, then based on the answers, the weighted proportions of the causes will be calculated in two ways, the first one, for each group separately to monitor the probability of reaching the binding DRMs for each group. If the probability of any group exceeds 50% of the total group's weight, the sheet will display a warning sentence highlighting the potential risk area in the output section, the second way the weighted proportions were calculated is by adding all the probabilities of the total 38 causes together, then based on the total probability, the sheet will display in the output section

the overall probability of reaching the binding DRMs and the classification of the level of risk into one of three classifications, high risk for any percentage above 50%, moderate risk for percentages between 30% to 49%, and low risk for any percentages less than 30%.

Summing up the assessment sheet design, the input section contains 38 questions associated with 38 causes of disputes, and in the output section, the output will be displayed in two parts, the first part is the total risk level of reaching the binding DRMs and classify it between high, moderate, and low risks, the second part is in the shape of warning sentences, it will be displayed for the assessment taker on high-risk areas of the project based on his/her answers, when the probability any group exceeds 50% of the total group's weight a warning sentence in regard of that area will be displayed, even if the total risk is a low or moderate risk.

On the side of inferential statics, Cochran's Q test has been carried out on the group of the 38 causes of disputes together, the results showed that there is a statistically significant difference between the proportions of the causes (*P-value*=2.4E-64 $< \alpha = .05$).

As it may be noticed, Figure 3.25 shown the assessment sheet in a theoretical case just to show how the sheet is working, this theoretical case was decided to have a high level of risk and all the groups have exceeded the threshold of 50%, in order to display all the warning sentences, for the seek of example.

Assessment sheet - The potential risk of reaching the binding dispute resolution methods

On a scale from 1 to 5, where 1 extremely unlikely to happen and 5 extremely likely to happen, choose what best describes your project:

Owner	The project owner may have unrealistic expectations about the project?	4
	The project may experience delays in payments?	3
	The project may experience variations initiated by the owner?	5
	The project may experience a change of scope?	2
	The project may experience delays in giving of possession?	1
	The project may get requested to accelerate the progress by the owner?	3
Contractor	The contractor may experience delays in work progress?	4
	The contractor may experience problems with the quality of the works produced?	2
	The contractor may not technically adequate to the job?	4
	The contractor may ask for time extensions?	2
	The contractor may experience a financial failure?	5
	The contractor may experience problems related back to the tendering phase?	2
Design	The project may experience design errors?	2
	The project may suffer from inadequate - incomplete specifications?	3
	The project may face concerns about the quality of the design?	5
	The project may experience unavailability in the required information?	4
Contract	The contract may have some sort of ambiguity?	3
	The contract provisions may have different interpretations?	4
	The contract may contains an unbalanced risk allocation?	3
Contract	The project may experience other contractual problems?	3
Human behavior	The project may experience a lack of communication?	4
	The project may experiencean adversarial - controversial culture among the project parties?	4
	The project may experience a lack of team spirit?	3
Project	The project may fail to manage the unforeseen changes if it occurred?	2
	The project may experience difficult site conditions?	5
	The project may be sensitive to the changes in the current legal and economic environment?	4
External	The project may fail to manage unexpected weather conditions?	5
	The project may experience fragmentation issues between his parties, client, contractor, designer, and manufacturers?	4
Leadership	The project team may suffer a lack of decision-making & compromising ability?	3
	The project team may suffer a lack of solving problems ability?	3
	The project team may experience problems in managing the customer's expectations?	4
	The project team may not qualify enough to do the job?	3
	The project may face claims with relatively big amounts?	5
Financial	The project's prices may considered a low-profit prices?	3
	The project may face inflexible response from creditors about any unexpected financial situation?	3
	The project may run through an above-average number of government approvals and permits?	4
Public	The project may experience an above-average politics interest?	3
	The project parties may have a lack of awareness concerning the beneficial effects of having legal aid?	2

Output

Probability of reaching the binding dispute resolution methods (Arbitration & Litigation)

60.6%

Your project includes a high level of risk of being involved in binding dispute resolution methods (Arbitration & Litigation)

Things to keep in mind:

You may pay more attention to the owner related issues in your project, concerns about, the expectations of the owner, payment delays, variation orders, and requests to accelerate the work progress, need to be managed carefully.

You may pay more attention to the contractor related issues in your project, concerns about, the delays in work progress, quality of the work, technical and financial adequacy of the contractor, and the requests for time extensions, need to be managed carefully.

You may pay more attention to the design issues in your project, concerns about, the design errors, inadequate or incomplete design, overall quality of the design, and the availability of the information, need to be managed carefully.

You may pay more attention to the contract issues in your project, concerns about, ambiguities in contract documents, different interpretations for the contract clauses, and the way the risk is allocated, need to be managed carefully.

You may pay more attention to the human behavior issues in your project, concerns about, efficient communication, adversarial culture among the project parties, and the existence of the team spirit among the group, need to be managed carefully.

You may pay more attention to the issues related to the way the project is ready to deal with the unforeseen changes and difficulty in regard to the site condition.

You may pay more attention to the external factors in your project, concerns about, how the project will deal with the legal and economic environment, unexpected weather conditions, and the effects of the fragmented structure of the construction sector, need to be managed carefully.

You may pay more attention to the leadership and personal issues with the project team, concerns about, the ability of the project team to make decisions and make compromising, problems solving skills, and the quality of the project team, need to be managed carefully.

You may pay more attention to the financial issues in your project, concerns about, facing big claims, dealing with low-profit prices, and the willingness of creditors to cooperate in unexpected situations, need to be managed carefully.

You may pay more attention to the public issues in your project, concerns about, government bureaucracy, political interest, and lack of awareness among the project parties about the benefits of having legal aid, need to be managed carefully.

Figure 3.25 Assessment sheet - The potential risk of reaching the binding dispute resolution methods

CONCLUSION AND RECOMMENDATIONS

4.1 The First Phase Conclusions (Interviews)

The first phase of this study, the interviews phase where the qualitative data have been collected, aimed to explore and initiate the subject, by providing the researcher a deep insight about the topics that are going to be quantified in the second phase, this exploration comes in a clear way in all the three main themes which are representing the three research questions, for example, in the first theme, the inevitability of the disputes, rather than gathering quantitative responses as what the second phase did, generous explanations have been provided for the reasons behind why there is a belief in the inevitability of the dispute, which produced three categories and eight different codes, that in turn served as a solid theoretical ground for the findings of the second phase.

In the first theme, the participants expressed their inputs on the argument that the disputes are inevitable in the construction projects, and it has been noticed that most of the participants have agreed with the claim, and have provided many reasons that explaining the basis of this belief, some of these reasons are related to the nature of the construction projects, such as the degree of complexity known about the construction projects, the individual nature of the projects, the amount of money circulating in a short time frame, and the degree of uncertainty enveloping many aspects of the construction process, while other reasons are related to the industry culture, such as the industry practices on allocating the risk between the project parties, and the stigma that got stuck on the industry as a place you have to drive in with caution to avoid being tricked, and finally, reasons related to the execution performance, such as the adaptability and the deficiency in the implementation of plans.

In the second theme, the participants were asked about the impact of the binding and non-binding DRMs on the sustainability of the business relationship between the disputing parties and on the

project's work progress , and as it has been noticed there is a consensus among the participants that considered the chances of maintaining the business relationship are higher when the dispute is resolved through the non-binding DRMs.

In addition, on the side of the impact on the project's work progress , the participants' thoughts consensus again about considering the judicial process the method with the biggest negative impact on the project's work progress , and considering the negotiation the method with the least negative impact, while there are some differences in ranking the other three methods, but generally, they considered the arbitration as the method with a second-most negative impact on the project progress, then the mediation, then the dispute review board, hence, it can be concluded that the binding DRMs have a more negative impact on the project progress than the non-binding DRMs.

In the third theme, the participants were asked to choose the causes of disputes that are most likely to produce disputes that wouldn't be resolved before reaching the binding DRMs stage, seven causes' groups have been cited from the literature review and provided to the participants, as well as, leaving the space for them to add any other causes that they thought it's associated with reaching the binding DRMs and aren't mentioned in the literature review, out of 28 dispute cause have been provided to the participants, only 13 causes have brought the attention of the most participants and passed the threshold of 50% of the participants' votes, in addition, new three groups of causes contain 10 causes of disputes have been extracted from the participants' answers that they weren't mentioned in the list cited from the literature review.

On the side of the causes that were chosen from the literature review list, the human behaviour related, project-related, and contractor related categories had the most participants' attention as the most source of difficult disputes, causes such as lack of communication, site condition, and the delays in work progress have been identified as one of the most common causes that can lead the parties of the disputes to reach the binding DRMs.

On the side of the causes that weren't mentioned in the literature review, three groups of causes have been formed, first, the personal and leadership factors group with causes such as decision-making and compromising abilities, problem-solving abilities, managing customer expectations, and the quality of the project team, second, financial factors group with causes such as the attitude of the creditors, the amount under dispute, and the low-profit margin, third, public factors group with causes such as lack of awareness concerning beneficial effects of having legal aid, political interest, and the government bureaucracy.

4.2 The Second Phase Conclusions (Survey)

The main purpose behind the second phase is generalization, where a considerable larger sample of quantitative data has been collected through a survey; again, the survey was formed around the three themes which represent the three questions in the research as the interviews were.

In the first theme, the participants were asked whether they believe that the disputes are inevitable or not in the construction process. The percentages were inconclusive, with a slight trend towards believing in the inevitability of the disputes, where the percentage of whom agreed or strongly agreed was 40.4%, while the percentage of whom disagree or strongly disagree with the inevitability of the dispute were 31.9%, and 27.7% who neither agree nor disagree with the claim, in addition, one-tailed, one sample, Wilcoxon signed-rank test was performed and the results showed that there is insufficient evidence within the data that supports the belief that the disputes are inevitable in construction projects.

In the second theme, the impact on the business relationship and the project's work progress were investigated. On the side of the impact on the business relationship, the results showed that most of the participants believe that there are high chances of maintaining the business relationship if the dispute is resolved through non-binding methods, where 60.6% considered the chances as high or very high, while only 10.6% believe the chances are low or very low. On the other hand,

it has been the opposite for the binding DRMs, where 69.2% of the participants believe that the chances of maintaining the business relationship when the dispute is resolved through the binding DRMs are low or very low chance versus 11.7% who believe that the chances are high or very high.

In addition, the result of the one-tailed, one sample, Wilcoxon signed-rank test showed that there is statistically significant evidence that supports the belief that the chances of maintaining the business relationships are high in the case of the non-binding DRMs and are low in the case of the binding DRMs.

On the side of the impact on the project's work progress , it can be noticed that there is clear segregation between the binding and the non-binding DRMs in terms of their effect on the project's work progress , where the litigation and arbitration fall in the ranks 1 and 2 respectively, as the methods with the most negative impact, while the non-binding DRMs, dispute review board, mediation, and negotiation fall in the ranks 3 to 5 respectively. Further, the Friedman test showed that there is a statistically significant difference between the rank of those dispute resolution methods, and then, the post hoc analysis using the Wilcoxon signed-rank test confirmed that all pairs are containing statistically significant differences except two pairs, the dispute review board with arbitration and mediation.

In the third theme, among 10 groups that contained 38 causes of disputes, the following five causes of disputes were the most associated with reaching the binding DRMs from the participants' point of view: unforeseen changes, lack of communication, ambiguities in contract documents, design errors, and delays in work progress. However, each group has been treated separately as well, and the results pointed out, as shown in Fig 4.1, the causes that are most associated with reaching the binding DRMs from each group. In addition, the results of Cochran's Q test showed that all the 10 groups have statistically significant differences between the proportions of

Group of causes	Disputes Causes
Owner related	Unrealistic expectations
Contractor related	Delays in work progress
Design related	Design errors
Contract related	Ambiguities in contract documents
Human behavior related	Lack of communication
Project related	Unforeseen changes
External factors related	Legal and economic factors
Leadership & Personal related	Decision-making & compromising ability
Financial related	The amount under dispute
Public related	Government processes bureaucracy

Figure 4.1 Disputes' causes that are most associated with reaching the binding DRMs from each group

their causes of disputes except the Leadership & personal related group, however, based on the post hoc analysis not all the pairwise were statistically significantly different.

4.3 Limitations

The limitations known as shortcomings or the "threats to validity" that influence the results of the study and were out of the researcher's control. Throughout the study, the researcher dealt with many issues that could be considered as potential weaknesses. The following points represent the limitations of this study:

- Due to the limited ability of the researcher to speak French, the interviews were conducted in English, and by doing so, the researcher may affect the abilities of the participants to express themselves fully because most of them were native French speakers, as well as, it

may be argued that some of whom refused to participate in the interview did that because they were not able or not willing to make an interview in English. However, an abstract and invitation in French were communicated to the participant in the invitation email; on the other hand, the entire aspects of the survey form (the invitation, privacy statement, and the questions) were presented in both French and English to counter this issue in the second phase.

- The size of the participants' samples was unequal between phase one and two, only nine interviews were conducted in phase one, while 94 valid survey responses were collected in phase two.

- When considering the participants' demographics, it can be noticed that the proportions of the participants' profession in the survey were unbalanced: out of 94 valid responses, 64 are engineers and the last 30 represent all the other professions (lawyers, arbitrators mediators, owners, contractors and others), the same thing occurred in the sector of the participants, where 91% represent the private sector and only 9% represent the public sector.

- It has been raised by one of the interview participants that the terminology "litigation" is too broad and even arbitration would be considered as one sort of litigation, as it may cause confusion for the participants. Hence, since then, an explanation has been provided to the participants that the dispute resolution method named "litigation" is the court proceeding or the judicial process.

- No validation of coding (inter-rater reliability testing) has been conducted, the researcher has done the coding process and interpretation of them to answer the research questions himself without validation for the coding.

4.4 Delimitations

The delimitations known as the study boundaries that have been set by the researcher to define the scope limits of the study, the following points represent the limitations of this study:

- The generalization limits of this study meant to be within the Quebec construction industry, therefore, all the participants in both phases were required to have considerable experience in Quebec.

- This study treated all the participants as one sample, and no differences between the participants' responses have been investigated based on their professions, business sector, or their years of experience.

4.5 Recommendations for future research

The following represents a few recommendations for future researches based on what has been covered in this study:

- The same study could be conducted in different provinces while comparing the results with those in Quebec.
- The same study could be conducted by replacing the qualitative data in the first phase, which has been collected through interviews, by analyzing actual cases that have gone through court procedures, and figure out the causes of disputes for those cases instead of getting them from the interview participants, as it was done in this study.
- Study the differences between causes of disputes that can lead to reaching the binding DRMs based on different variables, such as the contract delivery type, the size of the project, type of the project whether its buildings, roads, or infrastructure projects, and the influence of procurement process.

APPENDIX I

SEMI-STRUCTURED INTERVIEW

Part One: Introductory questions

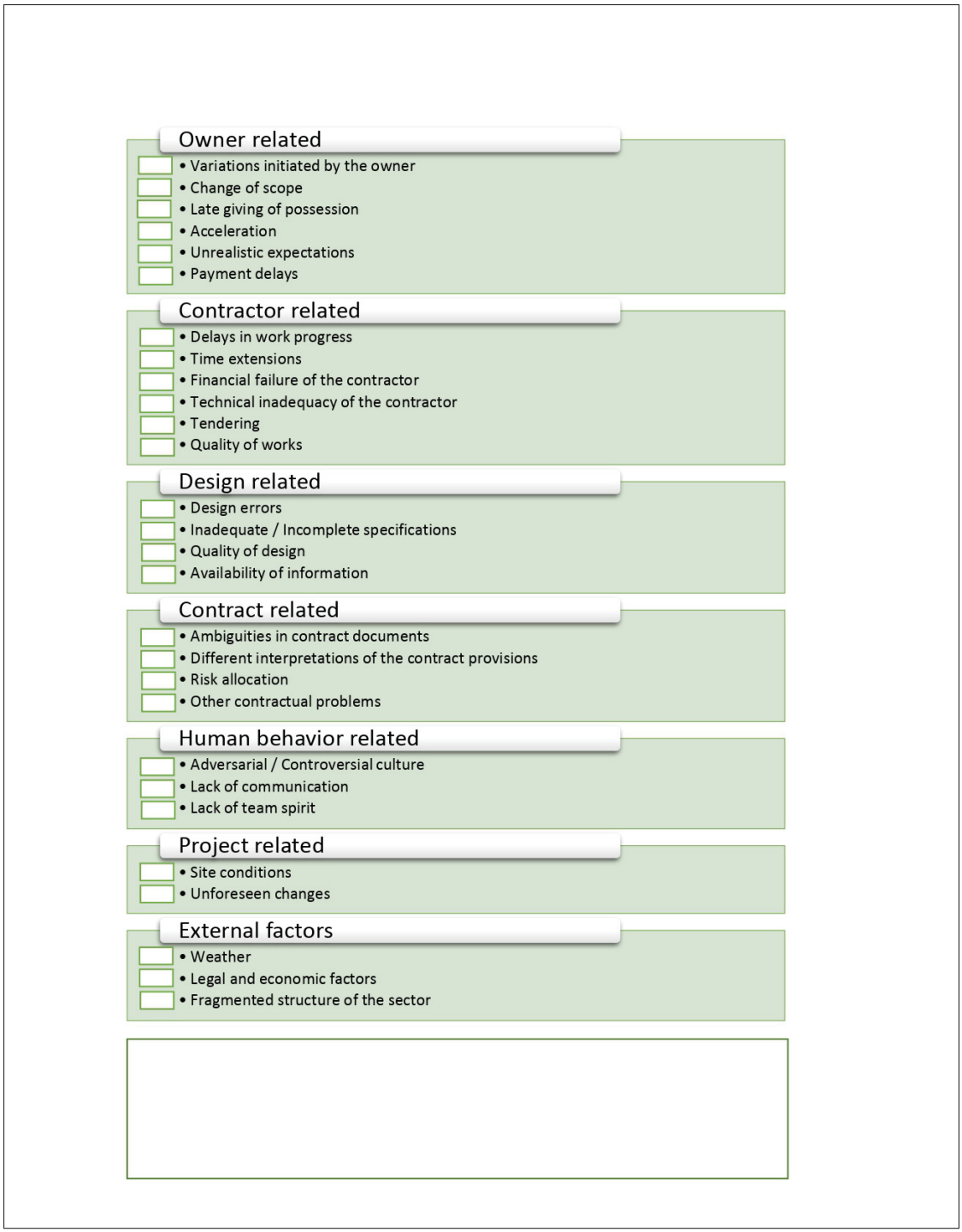
- What is your name?
- What is your profession?
- How many experience years you have in construction disputes filed?
- How many of these years were in Quebec projects?

Part Two: The impact of reaching the binding disputes resolution methods (Arbitration & Litigation)

- According to some studies, the construction disputes are inevitable (no matter the prevention strategy followed, the construction disputes are most likely to show up in the project), to what extent you agree or disagree & why?
- Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through Non-binding methods like negotiation, mediation and dispute review board?
- Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through binding methods like arbitration and litigation?
- How you could rank the following disputes resolution methods from the one has most negative effect on the project progress to the one has the least negative effect: Arbitration, Mediation, dispute review board, litigation and negotiation?

Part Three: The causes associated with reaching the Arbitration & Litigation stages to solve the disputes

- At the planning stage when developing the risk prevention plan, do you prefer concentrating more on preventing disputes from reaching arbitration and litigation stages or preventing disputes from happening at all?
- What are the factors you think played the main role in pushing the disputes to reach the binding methods stage (Arbitration and litigation), in other words, what distinguishes the disputes reach the Arbitration and litigation stages from the disputes solved earlier through the non-binding methods like negotiation, dispute review board, and mediation?
- As adapted from (Cakmak and Irlayici Cakmak, 2014), the following table showing the most common causes of disputes, there are six group of causes: Owner related, Contractor related, Design related, Contract related, Human behavior related, Project related, and External factors.
  Based on your experience click beside the causes you think they are most associated with reaching the stage of binding methods (Arbitration and Litigation).
  If you think that there are other factors not mentioned in the table, you could add it in the empty box below the table.


Owner related
• Variations initiated by the owner
• Change of scope
• Late giving of possession
• Acceleration
• Unrealistic expectations
• Payment delays
Contractor related
• Delays in work progress
• Time extensions
• Financial failure of the contractor
• Technical inadequacy of the contractor
• Tendering
• Quality of works
Design related
• Design errors
• Inadequate / Incomplete specifications
• Quality of design
• Availability of information
Contract related
• Ambiguities in contract documents
• Different interpretations of the contract provisions
• Risk allocation
• Other contractual problems
Human behavior related
• Adversarial / Controversial culture
• Lack of communication
• Lack of team spirit
Project related
• Site conditions
• Unforeseen changes
External factors
• Weather
• Legal and economic factors
• Fragmented structure of the sector

APPENDIX II

SURVEY

The consequences of dispute resolution methods / Quebec Construction Industry

.....

Les conséquences des procédures de règlement des différends / Secteur de la construction au Québec

PROJET DE RECHERCHE / RESEARCH PROJECT

Chercheure responsable / Lead Researcher : Christiane Papineau, Professeure au département de génie de la construction, École de technologie supérieure (ÉTS)
Étudiant / Student : Ahmad Arar, étudiant à la maîtrise, département de génie de la construction, ÉTS

Ce projet de recherche vise à identifier les caractéristiques du projet et les causes pouvant conduire à des litiges qui ne peuvent être résolus avant d'atteindre les étapes d'arbitrage et de litige (méthodes contraignantes de règlement des litiges). En d'autres termes, le projet vise à mettre en évidence les faiblesses des projets qui pourraient conduire à ces étapes de règlement des différends.

This research project aims to identify the project's characteristics and the causes that could lead to disputes that cannot be solved until reaching the arbitration and litigation stages (binding dispute resolution methods). In other words, the project aims to highlight the weaknesses of the projects that could lead to those stages of dispute resolution.

PARTICIPATION / PARTICIPATION

Vous êtes invité(e) à participer à ce projet de recherche. Après avoir lu le présent document et accepté de prendre part au projet, votre participation consistera à remplir un questionnaire anonyme composé de 18 questions portant sur les processus de règlement des différends dans les projets de construction. La durée de complétion du questionnaire est estimée à 7-10 minutes.
Votre participation est volontaire, ce qui signifie que vous êtes libre de refuser de participer. Vous pouvez mettre fin à votre participation pendant que vous remplissez le questionnaire, simplement en arrêtant de répondre aux questions. Aucune justification ne vous sera demandée. Une fois votre participation terminée (questionnaire complété et soumis), il ne sera plus possible de vous retirer du projet, car les réponses aux questions sont anonymes. Nous ne serons donc pas en mesure de déterminer quelles sont vos réponses.

You are invited to participate in this research project. After you read this document and agree to participate in the project, you will be asked to complete an anonymous questionnaire consisting of 18 questions in order to better understand the consequences of the dispute resolution processes which followed the occurrence of the dispute in construction projects. Completing the questionnaire will take approximately 7-10 minutes.

Your participation is voluntary, meaning you may decline if you wish. You can cease participating at any time by leaving any remaining questions blank. You will not have to provide any reason to justify your decision. Once you have finished completing the questionnaire and submitted it, you will no longer be able to withdraw from the project. Since the questionnaires are anonymous, we will not be able to determine which answers are yours.

CONFIDENTIALITÉ / CONFIDENTIALITY

Les données recueillies dans le cadre de ce projet seront anonymes et confidentielles, dans les limites prévues par la loi. Elles seront conservées par la chercheure principale de ce projet de recherche à l'ÉTS pendant deux ans. Elles ne seront utilisées que pour l'avancement des connaissances dans le domaine.
Elles pourront être publiées dans des rapports, des articles, faire l'objet de discussions scientifiques, ou être utilisées à des fins d'enseignement. Dans aucun de ces cas, il ne sera possible de vous identifier.

The data collected for this project will be anonymous and confidential to the extent permitted by law. The lead researcher will keep the information at ÉTS for at least 2 years. The data will only be used to advance knowledge in the research field.
The data may be published in reports, articles, be used for scientific discussions or for teaching purposes. However, it will not be possible to identify you in any of these cases.

ONSIDÉRATIONS ÉTHIQUES / ETHICAL CONSIDERATIONS

Le comité d'éthique de la recherche de l'ÉTS a autorisé la conduite du présent projet de recherche. Pour toute question en lien avec vos droits en tant que participant à la recherche, vous pouvez communiquer avec la coordonnatrice du comité d'éthique de la recherche de l'École de technologie supérieure au (514) 396-8800 poste 7807.

The ÉTS Research Ethics Committee has authorized this research project. If you have questions about your rights as a participant in the research project, please contact the coordinator of the Research Ethics Committee at (514) 396-8800 extension 7807.

PERSONNE-RESSOURCE / CONTACT PERSON

Si vous avez des questions ou besoin d'informations complémentaires au sujet du projet ou de votre participation, vous pouvez communiquer avec Ahmad Arar à:
ahmad-jamal-harb.arar.1@etsmtl.net.

If you have any question about the project or your role in it, please contact Ahmad Arar at:
ahmad-jamal-harb.arar.1@etsmtl.net.

*Required

1. ASSENTIMENT / ASSENT (J'ai lu et compris la description du projet / I have read and understood the project description) *

   Mark only one oval.

   - ◯ J'ACCEPTE de participer en remplissant le questionnaire / I AGREE to participate by completing the questionnaire
   - ◯ Je REFUSE de participer (vous serez alors redirigé vers la page de sortie du questionnaire) / I DO NOT WISH to participate (you will be redirected to the questionnaire exit page)

Skip to question 6

Section 1: Introductory questions / Rubrique 1 : Questions introductives

2. Which of the following best describes your profession? / Laquelle des propositions suivantes décrit le mieux votre métier ? *

   Mark only one oval.

   - ◯ Lawyer / Avocat
   - ◯ Engineer / Ingénieur
   - ◯ Arbitrator-Mediator / Arbitre-Médiateur
   - ◯ Other: _____

3. Which of the following best describes the principal industry of your organization? / Laquelle des propositions suivantes décrit le mieux le secteur d'activité principal de votre organisation ? *

   Mark only one oval.

   - ◯ Construction Company-Contractor / Entreprise de construction-Entrepreneur
   - ◯ Designer/ Architecte
   - ◯ Consulting engineer / Ingénieur-consultant
   - ◯ Public bodies / Organismes publics
   - ◯ Law Firm / Cabinet d'avocats
   - ◯ Other: _____

4. How long have you been working in the construction field? / Depuis combien de temps travaillez-vous dans le domaine de la construction ? *

Mark only one oval.

- ◯ Less than 5 years / Moins de 5 ans
- ◯ 5-10 years / 5 à 10 ans
- ◯ 11-20 years / 11 à 20 ans
- ◯ More than 20 years / Plus de 20 ans

5. How many years out of your total experience were in Quebec? / Sur l'ensemble de votre expérience, combien d'années ont été effectuées au Québec ? *

_____

Section2: The consequences of dispute resolution methods / Rubrique 2 : Les conséquences des procédures de règlement des différends

6. To what extent you agree or disagree with the following statement: The construction disputes are inevitable no matter the prevention strategy followed. / Dans quelle mesure êtes-vous en accord ou en désaccord avec la déclaration suivante : Les litiges dans construction sont inévitables, quel que soit la stratégie de prévention adoptée. *

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree / Pas du tout d'accord	◯	◯	◯	◯	◯	Strongly Agree / Tout à fait d'accord

7. Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through Non-binding dispute resolution methods such as negotiation, mediation, and dispute review board? / D'après votre expérience, quelles sont les chances de maintenir la relation commerciale entre les parties au litige si celui-ci est résolu par des méthodes de règlement des litiges non contraignantes telles que la négociation, la médiation et le Comité de résolution des différends ? *

Mark only one oval.

	1	2	3	4	5	
Very Low / Très faible	◯	◯	◯	◯	◯	Very High / Très élevé

8. Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through binding dispute resolution methods such as arbitration and litigation (Court Proceeding)? / D'après votre expérience, quelles sont les chances de maintenir la relation commerciale entre les parties au litige si celui-ci est résolu par des méthodes contraignantes de règlement des litiges telles que l'arbitrage et les procédures judiciaires ? *

Mark only one oval.

	1	2	3	4	5	
Very Low / Très faible	◯	◯	◯	◯	◯	Very High / Très élevé

9. If any of the following dispute resolution methods occurred during the project, how would you rank them from the one has the most negative effect on the project progress to the one that has the least negative effect. / Si l'une des méthodes de règlement des litiges suivantes est intervenue au cours du projet, comment classeriez vous les méthodes suivantes de règlement des litiges au cours d'un projet, de celle qui a l'effet le plus négatif sur le déroulement du projet à celle qui a l'effet le moins négatif. *

The most negative effect method will be number 1 and the least negative effect method will be number 5 / La méthode la plus négative sera la numéro 1 et la méthode la moins négative sera la numéro 5

Mark only one oval per row.

	1	2	3	4	5
Arbitration / Arbitrage	◯	◯	◯	◯	◯
Mediation / Médiation	◯	◯	◯	◯	◯
Dispute review board / Comité de résolution des différends	◯	◯	◯	◯	◯
Litigation (Court Proceeding) / Tribunal (Procédures judiciaires)	◯	◯	◯	◯	◯
Negotiation / Négociation	◯	◯	◯	◯	◯

Section3: The causes of disputes that are associated with reaching the binding dispute resolution stage. / Rubrique 3: Les causes des litiges associées à la résolution obligatoire des litiges.

Based on your experience in Quebec, choose the causes you think are most associated with reaching the stage of binding dispute resolution methods (Arbitration and Litigation (Court Proceeding)). En vous basant sur votre expérience au Québec, choisissez les causes qui vous semblent les plus associées à l'atteinte du stade des méthodes contraignantes de règlement des différends (Arbitrage et Tribunal (procédures judiciaires)).

10. First Group of Causes: Owner Related. / 1ière catégorie de causes : Liées au propriétaire.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Variations initiated by the owner / Changements initiés par le propriétaire
- [ ] Change of scope / Modification de la portée du projet
- [ ] Late giving of possession / Prise de possession tardive
- [ ] Acceleration / Accélération
- [ ] Unrealistic expectations / Attentes irréalistes
- [ ] Payment delays / Retards de paiement

11. Second Group of Causes: Contractor Related. / 2ième catégorie de causes : liées à l'entrepreneur.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Delays in work progressa / Retard dans l'avancement des travaux
- [ ] Time extensions / Prolongation de délai
- [ ] Financial failure of the contractor / Incapacité financière de l'entrepreneur
- [ ] Technical inadequacy of the contractor / Incapacité technique
- [ ] Tendering / Appel d'offres
- [ ] Quality of works / Qualité des travaux

12. Third Group of Causes: Design Related. / 3ième catégorie de causes : liées à la conception.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Design errors / Erreurs de conception
- [ ] Inadequate - Incomplete specifications / Spécifications insuffisantes - incomplètes
- [ ] Quality of design / Qualité de la conception
- [ ] Availability of information / Disponibilité des informations

13. 4th Group of Causes: Contract Related. / 4ième catégorie de causes : liées au contrat.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Ambiguities in contract documents / Ambiguïtés dans les documents contractuels
- [ ] Different interpretations of the contract provisions / Différentes interprétations des dispositions du contrat
- [ ] Risk allocation / Répartition des risques
- [ ] Other contractual problems / Autres problèmes contractuels

14. 5th Group of Causes: Human behavior Related. / 5ième catégorie de causes : liées aux Comportements humains.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Adversarial - Controversial culture / Culture antagoniste - controversée
- [ ] Lack of communication / Manque de communication
- [ ] Lack of team spirit / Manque d'esprit d'équipe

15. 6th Group of Causes: Project Related. / 6ième catégorie de causes : liées aux projet.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Site conditions / Conditions du site
- [ ] Unforeseen changes / Changements imprévus

16. 7th Group of Causes: External factors Related. / 7ième catégorie de causes : liées aux facteurs externes.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Weather / Météo
- [ ] Legal and economic factors / Facteurs juridiques et économiques
- [ ] Fragmented structure of the sector / Structure segmentée du secteur

17. 8th Group of Causes: Leadership & Personal Related. / 8ième catégorie de causes : liées au leadership & questions personnelles.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Solving problems ability / Capacité à résoudre les problèmes
- [ ] Decision-making & compromising ability / Capacité de décision & de compromis
- [ ] The ability to manage the customer's expectations / Capacité à gérer les attentes du client
- [ ] The quality of the project team / Qualité de l'équipe de projet

18. 9th Group of Causes: Financial factors Related. / 9ième catégorie de causes : liées aux facteurs financiers.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Attitude of the creditors / Attitude des créanciers
- [ ] The amount under dispute / Le montant en cause
- [ ] Low-profit margin / Faible marge bénéficiaire

19. 10th Group of Causes: Public factors Related. / 10ième catégorie de causes : liées aux facteurs publics.

Important Note: For each group of causes, you can chose one factor, no factor, or as many as you think./ Note importante: Pour chaque groupe de causes, vous pouvez choisir un facteur, aucun facteur ou autant de facteurs que vous le pensez.

Tick all that apply.

- [ ] Lack of awareness concerning beneficial effects of having legal aid/ Absence de sensibilisation par rapport aux bénéfices de recourir à des services juridiques
- [ ] Politics interest / Intérêts politiques
- [ ] Government processes bureaucracy / Délai de traitement des dossiers par le gouvernement

APPENDIX III

THE INEVITABILITY OF THE DISPUTES - ONE SAMPLE WILCOXON SINGED RANK TEST

```
*Nonparametric Tests: One Sample.
NPTESTS
  /ONESAMPLE TEST (Inevitable) WILCOXON(TESTVALUE=3)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05 CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	
1	The median of (To what extent you agree or disagree with the following statement: The construction disputes are inevitable no matter the prevention strategy followed.) equals Neutral.	One-Sample Wilcoxon Signed Rank Test	.548	Retain the null hypothesis

One-Sample Wilcoxon Signed Rank Test

To what extent you agree or disagree with the following statement: The construction disputes are inevitable no matter the prevention strategy followed.

One-Sample Wilcoxon Signed Rank Test Summary

Total N	94
Test Statistic	1267.000
Standard Error	156.637
Standardized Test Statistic	.600
Asymptotic Sig.(2-sided test)	.548

APPENDIX IV

THE CHANCES TO MAINTAIN THE BUSINESS RELATIONSHIP - ONE SAMPLE WILCOXON SINGED RANK TEST

```
*Nonparametric Tests: One Sample.
NPTESTS
  /ONESAMPLE TEST (Nonbinding) WILCOXON(TESTVALUE=3)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05 CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	
1	The median of Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through Non-binding dispute resolution methods such as negotiation, mediation, and dispute review board? equals Moderate.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis

One-Sample Wilcoxon Signed Rank Test

Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through Non-binding dispute resolution methods such as negotiation, mediation, and dispute review board?

One-Sample Wilcoxon Signed Rank Test Summary

Total N	94
Test Statistic	1922.500
Standard Error	151.401
Standardized Test Statistic	5.175
Asymptotic Sig.(2-sided test)	.000

```
*Nonparametric Tests: One Sample.
NPTESTS
  /ONESAMPLE TEST (Binding) WILCOXON(TESTVALUE=3)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05 CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	
1	The median of Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through binding dispute resolution methods such as arbitration and litigation (Court Proceeding)? equals Moderate.	One-Sample Wilcoxon Signed Rank Test	.000	Reject the null hypothesis

One-Sample Wilcoxon Signed Rank Test

Based on your experience, what are the chances to maintain the business relationship between the dispute parties if the dispute solved through binding dispute resolution methods such as arbitration and litigation (Court Proceeding)?

One-Sample Wilcoxon Signed Rank Test Summary

Total N	94
Test Statistic	351.000
Standard Error	185.599
Standardized Test Statistic	-5.991
Asymptotic Sig.(2-sided test)	.000

APPENDIX V

THE IMPACT ON THE PROJECT WORK PROGRESS - FRIEDMAN TEST AND POST HOC ANALYSIS USING WILCOXON SINGED RANK TEST

```
NPAR TESTS
  /FRIEDMAN=Rank_ArbitrationRank_MediationRank_DRB Rank_LitigationRank_Nego
tiation
  /STATISTICS QUARTILES
  /MISSING LISTWISE.
```

NPar Tests

Descriptive Statistics

	N	Percentiles 25th	50th (Median)	75th
Arbitration	94	2.00	2.50	3.00
Mediation	94	3.00	3.50	4.00
Dispute review board	94	2.00	3.00	4.00
Litigation (Court Proceeding)	94	1.00	1.00	1.00
Negotiation	94	3.00	5.00	5.00

Friedman Test

Ranks

	Mean Rank
Arbitration	2.70
Mediation	3.46
Dispute review board	3.14
Litigation (Court Proceeding)	1.57
Negotiation	4.13

Test Statistics[a]

N	94
Chi-Square	136.145
df	4
Asymp. Sig.	.000

a. Friedman Test

```
NPAR TESTS
  /WILCOXON=Rank_ArbitrationRank_ArbitrationRank_ArbitrationRank_Arbitratio
n Rank_Mediation
    Rank_MediationRank_MediationRank_DRB Rank_DRB Rank_LitigationWITH Rank_
Mediation Rank_DRB
    Rank_LitigationRank_NegotiationRank_DRB Rank_LitigationRank_Negotiation
 Rank_Litigation
    Rank_NegotiationRank_Negotiation (PAIRED)
  /STATISTICS QUARTILES
  /MISSING ANALYSIS.
```

NPar Tests

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Mediation - Arbitration	Negative Ranks	26[a]	39.96	1039.00
	Positive Ranks	68[b]	50.38	3426.00
	Ties	0[c]		
	Total	94		
Dispute review board - Arbitration	Negative Ranks	36[d]	45.65	1643.50
	Positive Ranks	58[e]	48.65	2821.50
	Ties	0[f]		
	Total	94		
Litigation (Court Proceeding) - Arbitration	Negative Ranks	78[g]	47.69	3720.00
	Positive Ranks	16[h]	46.56	745.00
	Ties	0[i]		
	Total	94		
Negotiation - Arbitration	Negative Ranks	20[j]	38.65	773.00
	Positive Ranks	74[k]	49.89	3692.00
	Ties	0[l]		
	Total	94		
Dispute review board - Mediation	Negative Ranks	55[m]	50.44	2774.00
	Positive Ranks	39[n]	43.36	1691.00
	Ties	0[o]		
	Total	94		

Ranks

		N	Mean Rank	Sum of Ranks
Litigation (Court Proceeding) - Mediation	Negative Ranks	80[p]	49.37	3949.50
	Positive Ranks	14[q]	36.82	515.50
	Ties	0[r]		
	Total	94		
Negotiation - Mediation	Negative Ranks	28[s]	46.43	1300.00
	Positive Ranks	66[t]	47.95	3165.00
	Ties	0[u]		
	Total	94		
Litigation (Court Proceeding) - Dispute review board	Negative Ranks	81[v]	47.22	3824.50
	Positive Ranks	13[w]	49.27	640.50
	Ties	0[x]		
	Total	94		
Negotiation - Dispute review board	Negative Ranks	23[y]	42.52	978.00
	Positive Ranks	71[z]	49.11	3487.00
	Ties	0[aa]		
	Total	94		
Negotiation - Litigation (Court Proceeding)	Negative Ranks	11[ab]	41.09	452.00
	Positive Ranks	83[ac]	48.35	4013.00
	Ties	0[ad]		
	Total	94		

a. Mediation < Arbitration
b. Mediation > Arbitration
c. Mediation = Arbitration
d. Dispute review board < Arbitration
e. Dispute review board > Arbitration
f. Dispute review board = Arbitration
g. Litigation (Court Proceeding) < Arbitration
h. Litigation (Court Proceeding) > Arbitration
i. Litigation (Court Proceeding) = Arbitration
j. Negotiation < Arbitration
k. Negotiation > Arbitration
l. Negotiation = Arbitration
m. Dispute review board < Mediation
n. Dispute review board > Mediation
o. Dispute review board = Mediation
p. Litigation (Court Proceeding) < Mediation
q. Litigation (Court Proceeding) > Mediation
r. Litigation (Court Proceeding) = Mediation
s. Negotiation < Mediation
t. Negotiation > Mediation
u. Negotiation = Mediation
v. Litigation (Court Proceeding) < Dispute review board
w. Litigation (Court Proceeding) > Dispute review board
x. Litigation (Court Proceeding) = Dispute review board
y. Negotiation < Dispute review board
z. Negotiation > Dispute review board
aa. Negotiation = Dispute review board
ab. Negotiation < Litigation (Court Proceeding)
ac. Negotiation > Litigation (Court Proceeding)
ad. Negotiation = Litigation (Court Proceeding)

Test Statistics[a]

	Mediation - Arbitration	Dispute review board - Arbitration	Litigation (Court Proceeding) - Arbitration	Negotiation - Arbitration	Dispute review board - Mediation
Z	-4.653[b]	-2.268[b]	-5.744[c]	-5.574[b]	-2.115[c]
Asymp. Sig. (2-tailed)	.000	.023	.000	.000	.034

Test Statistics[a]

	Litigation (Court Proceeding) - Mediation	Negotiation - Mediation	Litigation (Court Proceeding) - Dispute review board	Negotiation - Dispute review board	Negotiation - Litigation (Court Proceeding)
Z	-6.563[c]	-3.590[b]	-6.064[c]	-4.810[b]	-6.934[b]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

APPENDIX VI

FIRST GROUP: OWNER RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Variations initiated by the owner	46	48
Change of scope	49	45
Late giving of possession	72	22
Acceleration	79	15
Unrealistic expectations	35	59
Payment delays	37	57

Test Statistics

N	94
Cochran's Q	80.095[a]
df	5
Asymp. Sig.	.000

a. 1 is treated as a success.

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Variations initiated by the owner, Change of scope, Late giving of possession, Acceleration, Unrealistic expectations and Payment delays are the same for the specified categories.	Related-Samples Cochran's Q Test	.000

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Variations initiated by the owner, Change of scope, Late giving of possession, Acceleration, Unrealistic expectations, Payment delays

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	80.095
Degree Of Freedom	5
Asymptotic Sig.(2-sided test)	.000

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Acceleration-Late giving of possession	.074	.069	1.080	.280	1.000
Acceleration-Change of scope	.319	.069	4.629	.000	.000
Acceleration-Variations initiated by the owner	.351	.069	5.092	.000	.000
Acceleration-Payment delays	-.447	.069	-6.481	.000	.000
Acceleration-Unrealistic expectations	-.468	.069	-6.789	.000	.000
Late giving of possession-Change of scope	.245	.069	3.549	.000	.006
Late giving of possession-Variations initiated by the owner	.277	.069	4.012	.000	.001
Late giving of possession-Payment delays	-.372	.069	-5.401	.000	.000
Late giving of possession-Unrealistic expectations	-.394	.069	-5.709	.000	.000
Change of scope-Variations initiated by the owner	.032	.069	.463	.643	1.000
Change of scope-Payment delays	-.128	.069	-1.852	.064	.961
Change of scope-Unrealistic expectations	-.149	.069	-2.160	.031	.461
Variations initiated by the owner-Payment delays	-.096	.069	-1.389	.165	1.000
Variations initiated by the owner-Unrealistic expectations	-.117	.069	-1.697	.090	1.000
Payment delays-Unrealistic expectations	.021	.069	.309	.758	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX VII

SECOND GROUP: CONTRACTOR RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Delays in work progressa	30	64
Time extensions	54	40
Financial failure of the contractor	60	34
Technical inadequacy of the contractor	51	43
Tendering	77	17
Quality of works	40	54

Test Statistics

N	94
Cochran's Q	60.274[a]
df	5
Asymp. Sig.	.000

a. 1 is treated as a success.

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Delays in work progressa, Time extensions, Financial failure of the contractor, Technical inadequacy of the contractor, Tendering and Quality of works are the same for the specified categories.	Related-Samples Cochran's Q Test	.000

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Delays in work progressa, Time extensions, Financial failure of the cont ractor, Technical inadequacy of the contractor, Tendering, Quality of wo rks

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	60.274
Degree Of Freedom	5
Asymptotic Sig.(2-sided test)	.000

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Tendering-Financial failure of the contractor	.181	.070	2.567	.010	.154
Tendering-Time extensions	.245	.070	3.473	.001	.008
Tendering-Technical inadequacy of the contractor	.277	.070	3.926	.000	.001
Tendering-Quality of works	-.394	.070	-5.586	.000	.000
Tendering-Delays in work progressa	.500	.070	7.096	.000	.000
Financial failure of the contractor-Time extensions	.064	.070	.906	.365	1.000
Financial failure of the contractor-Technical inadequacy of the contractor	-.096	.070	-1.359	.174	1.000
Financial failure of the contractor-Quality of works	-.213	.070	-3.020	.003	.038
Financial failure of the contractor-Delays in work progressa	.319	.070	4.530	.000	.000
Time extensions-Technical inadequacy of the contractor	-.032	.070	-.453	.651	1.000
Time extensions-Quality of works	-.149	.070	-2.114	.035	.518
Time extensions-Delays in work progressa	.255	.070	3.624	.000	.004
Technical inadequacy of the contractor-Quality of works	-.117	.070	-1.661	.097	1.000
Technical inadequacy of the contractor-Delays in work progressa	.223	.070	3.171	.002	.023
Quality of works-Delays in work progressa	.106	.070	1.510	.131	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX VIII

THIRD GROUP: DESIGN RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Design errors	27	67
Inadequate - Incomplete specifications	32	62
Quality of design	50	44
Availability of information	56	38

Test Statistics

N	94
Cochran's Q	26.191[a]
df	3
Asymp. Sig.	.000

a. 1 is treated as a success.

```
 *Nonparametric Tests: Related Samples.
NPTESTS
  /RELATED TEST(Third_group_1 Third_group_2 Third_group_3 Third_group_4) COCHR
AN(SUCCESS=LIST(1) COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Design errors, Inadequate - Incomplete specifications, Quality of design and Availability of information are the same for the specified categories.	Related-Samples Cochran's Q Test	.000

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Design errors, Inadequate - Incomplete specifications, Quality of design , Availability of information

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	26.191
Degree Of Freedom	3
Asymptotic Sig.(2-sided test)	.000

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Availability of information-Quality of design	.064	.071	.899	.368	1.000
Availability of information-Inadequate - Incomplete specifications	.255	.071	3.598	.000	.002
Availability of information-Design errors	.309	.071	4.347	.000	.000
Quality of design-Inadequate - Incomplete specifications	.191	.071	2.698	.007	.042
Quality of design-Design errors	.245	.071	3.448	.001	.003
Inadequate - Incomplete specifications-Design errors	.053	.071	.750	.454	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX IX

4TH GROUP: CONTRACT RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Ambiguities in contract documents	24	70
Different interpretations of the contract provisions	36	58
Risk allocation	64	30
Other contractual problems	66	28

Test Statistics

N	94
Cochran's Q	54.125[a]
df	3
Asymp. Sig.	.000

a. 1 is treated as a success.

```
 *NonparametricTests: Related Samples.
NPTESTS
  /RELATED TEST(Fourth_group_1 Fourth_group_2 Fourth_group_3 Fourth_group_4) C
OCHRAN(SUCCESS=LIST(1) COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Ambiguities in contract documents, Different interpretations of the contract provisions, Risk allocation and Other contractual problems are the same for the specified categories.	Related-Samples Cochran's Q Test	.000

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Ambiguities in contract documents, Different interpretations of the cont ract provisions, Risk allocation, Other contractual problems

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	54.125
Degree Of Freedom	3
Asymptotic Sig.(2-sided test)	.000

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Other contractual problems-Risk allocation	.021	.074	.289	.773	1.000
Other contractual problems-Different interpretations of the contract provisions	.319	.074	4.330	.000	.000
Other contractual problems-Ambiguities in contract documents	.447	.074	6.062	.000	.000
Risk allocation-Different interpretations of the contract provisions	.298	.074	4.041	.000	.000
Risk allocation-Ambiguities in contract documents	.426	.074	5.774	.000	.000
Different interpretations of the contract provisions-Ambiguities in contract documents	.128	.074	1.732	.083	.500

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX X

5TH GROUP: HUMAN BEHAVIOR RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Adversarial - Controversial culture	58	35
Lack of communication	22	71
Lack of team spirit	59	34

Test Statistics

N	93
Cochran's Q	35.079[a]
df	2
Asymp. Sig.	.000

a. 0 is treated as a success.

```
 *Nonparametric Tests: Related Samples.
NPTESTS
  /RELATED TEST(Fifth_group_1 Fifth_group_2 Fifth_group_3) COCHRAN(SUCCESS=LIS
T(1) COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Adversarial - Controversial culture, Lack of communication and Lack of team spirit are the same for the specified categories.	Related-Samples Cochran's Q Test	.000

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Adversarial - Controversial culture, Lack of communication, Lack of tea m spirit

Related-Samples Cochran's Q Test Summary

Total N	93
Test Statistic	35.079
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	.000

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Lack of team spirit-Adversarial - Controversial culture	.011	.077	.140	.888	1.000
Lack of team spirit-Lack of communication	.398	.077	5.198	.000	.000
Adversarial - Controversial culture-Lack of communication	-.387	.077	-5.058	.000	.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX XI

6TH GROUP: PROJECT RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Site conditions	44	50
Unforeseen changes	22	72

Test Statistics

N	94
Cochran's Q	8.345[a]
df	1
Asymp. Sig.	.004

a. 0 is treated as a success.

APPENDIX XII

7TH GROUP: EXTERNAL FACTORS RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Weather	49	45
Legal and economic factors	41	53
Fragmented structure of the sector	67	27

Test Statistics

N	94
Cochran's Q	13.300[a]
df	2
Asymp. Sig.	.001

a. 1 is treated as a success.

```
 *Nonparametric Tests: Related Samples.
NPTESTS
  /RELATED TEST(Seventh_group_1 Seventh_group_2 Seventh_group_3) COCHRAN(SUCCE
SS=LIST(1) COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Weather, Legal and economic factors and Fragmented structure of the sector are the same for the specified categories.	Related-Samples Cochran's Q Test	.001

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Weather, Legal and economic factors, Fragmented structure of the sect or

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	13.300
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	.001

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Fragmented structure of the sector-Weather	.191	.078	2.465	.014	.041
Fragmented structure of the sector-Legal and economic factors	.277	.078	3.560	.000	.001
Weather-Legal and economic factors	-.085	.078	-1.095	.273	.820

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX XIII

8TH GROUP: LEADERSHIP & PERSONAL RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Solving problems ability	47	47
Decision-making & compromising ability	41	53
The ability to manage the customer's expectations	52	42
The quality of the project team	52	42

Test Statistics

N	94
Cochran's Q	3.844[a]
df	3
Asymp. Sig.	.279

a. 1 is treated as a success.

APPENDIX XIV

9TH GROUP: FINANCIAL FACTORS RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Attitude of the creditors	65	29
The amount under dispute	42	52
Low-profit margin	44	50

Test Statistics

N	94
Cochran's Q	12.025[a]
df	2
Asymp. Sig.	.002

a. 1 is treated as a success.

```
 *Nonparametric Tests: Related Samples.
NPTESTS
  /RELATED TEST(Ninth_group_1 Ninth_group_2 Ninth_group_3) COCHRAN(SUCCESS=LIS
T(1) COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Attitude of the creditors, The amount under dispute and Low-profit margin are the same for the specified categories.	Related-Samples Cochran's Q Test	.002

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Attitude of the creditors, The amount under dispute, Low-profit margin

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	12.025
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	.002

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Attitude of the creditors-Low-profit margin	-.223	.078	-2.858	.004	.013
Attitude of the creditors-The amount under dispute	-.245	.078	-3.130	.002	.005
Low-profit margin-The amount under dispute	.021	.078	.272	.785	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

APPENDIX XV

10TH GROUP: PUBLIC FACTORS RELATED - COCHRAN'S Q TEST AND POST HOC ANALYSIS USING DUNN'S TEST

NPar Tests

Cochran Test

Frequencies

	Value	
	0	1
Lack of awareness concerning beneficial effects of having legal aid	67	27
Politics interest	54	40
Government processes bureaucracy	31	63

Test Statistics

N	94
Cochran's Q	25.564[a]
df	2
Asymp. Sig.	.000

a. 0 is treated as a success.

```
 *Nonparametric Tests: Related Samples.
NPTESTS
  /RELATED TEST(Tenth_group_1 Tenth_group_2 Tenth_group_3) COCHRAN(SUCCESS=LIS
T(1) COMPARE=PAIRWISE)
  /MISSING SCOPE=ANALYSIS USERMISSING=EXCLUDE
  /CRITERIA ALPHA=0.05  CILEVEL=95.
```

Nonparametric Tests

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.
1	The distributions of Lack of awareness concerning beneficial effects of having legal aid, Politics interest and Government processes bureaucracy are the same for the specified categories.	Related-Samples Cochran's Q Test	.000

Hypothesis Test Summary

	Decision
1	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.

Related-Samples Cochran's Q Test

Lack of awareness concerning beneficial effects of having legal aid, Politics interest, Government processes bureaucracy

Related-Samples Cochran's Q Test Summary

Total N	94
Test Statistic	25.564
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	.000

Pairwise Comparisons

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Lack of awareness concerning beneficial effects of having legal aid-Politics interest	-.138	.077	-1.803	.071	.214
Lack of awareness concerning beneficial effects of having legal aid-Government processes bureaucracy	-.383	.077	-4.992	.000	.000
Politics interest-Government processes bureaucracy	-.245	.077	-3.190	.001	.004

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

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