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RESEARCH ARTICLE

Selecting the best dispute resolution method with choosing by advantages approach

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Abstract

The construction industry is fragmented and complex. The involvement of multiple stakeholders can lead to disputes that result in serious time and cost burdens. Developing effective strategies to best address the conflicts is significant for the successful completion of projects. Even though there are studies selecting Dispute Resolution Methods (DRMs), the literature lacks a step-by-step methodology for the proper selection of DRMs for contractual and relational conflicts. To address the gap, this study utilizes the Choosing-by-Advantages (CBA) method to select among the DRMs based on a set of identified construction risks. According to the CBA method, alternatives, factors, criteria, attributes, and advantages are determined. The study proposes several factors, including "claims management", "design management", "construction management", "contract", and "coordination and relationship". The alternatives are considered as negotiation, mediation, arbitration, and litigation. Thirteen interviews were conducted with industry experts. The findings implied that "negotiation" was the best option regarding the highest Importance of Advantages with the lowest cost. This study contributes to the literature by systematically implementing CBA in dispute resolution to guide industry practitioners in managing conflicts. This study presents a novel application of the CBA method in the context of DRM selection, extending its application beyond the traditional selection problems, such as designer and subcontractor selection. Moreover, the study helps practitioners, mediators, and policymakers assess existing DRMs and select the most suitable option using the CBA framework.

1. Introduction

Construction projects involve multiple stakeholders, complex contracting requirements, and a multitude of risks that can lead to conflicts and disputes [1]. In the construction industry, conflicts are inevitable as stakeholders may have different perspectives and conflicting goals [2]. Cakmak & Cakmak [3], stated that if conflicts are not moderated with a systematic approach, they tend to escalate into disputes, which then become

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an obstructive factor delaying the successful execution of a construction project. Therefore, it is critical to identify the root causes of disputes that support the successful completion of construction projects, aligning with the intended schedule and budget, with higher quality [3]. Typically, a dispute arises when one stakeholder rejects a request or claim, and the other one disagrees with their decision. Another cause for a potential dispute is the negligence of a request for a long time, where it is finally considered a rejection by the related stakeholders [4]. In addition, a significant portion of disputes stems from design changes; therefore, submittals and change orders require careful consideration to avoid disputes in design coordination [5]. Quality defects result in poor-quality work and construction defects that result in construction disputes and litigations [6]. Moreover, variations in scope, poor planning, adverse weather conditions, poor productivity and control, lack of resources, delays in payments, change orders, and poor communication are listed among the other causes of construction disputes [7]. Overall, the causes of disputes in construction projects are mostly related to contractual, cultural, and legal matters [8, 9]. As several factors identified in the literature cause conflicts and disputes, it is essential to select and use the best Dispute Resolution Method (DRM) before issues escalate and turn into inevitable consequences. Developing and selecting the most effective DRM to be used in resolving legal and contractual disputes that significantly influence the project's trajectory is extremely important.

DRMs are processes that are used to resolve conflicts or disagreements among parties [10]. There are different DRMs that stakeholders implement depending on the types of conflict. Various studies have provided a framework and strategies for the selection of the best DRM for the timely resolution of conflicts. For example, Gad et al. [11] developed an analytical framework for the choice of DRM in international construction projects for a set of risk factors. Other decision-making methods identified in the literature for dispute resolution are (i) model of discrete zero-sum two-person matrix games [12], (ii) the step-wise weight assessment ratio analysis method [13], (iii) the logarithm normalization method in game theory for multi-attribute construction problems solution [13], (iv) the factor analysis approach [14], and (v) the multi-attribute utility theory [15]. These methods are utilized for a decision support system for DRM selection in construction projects.

Previous studies revealed that there is a noticeable gap in guidelines for matching dispute sources with effective prevention measures implying that construction project disputes lead to major issues and established procedures for preventing or minimizing disputes in construction projects are limited [16]. Even though efforts have been made to provide structured guidance, the literature still lacks a clear and practical roadmap in terms of selecting the best DRM depending on the conflict type. This study aims to analyze and compare the advantages of four mostly cited and widely acknowledged DRM methods:(i) negotiation, (ii) mediation, (iii) arbitration, and (iv) litigation while developing a comprehensive framework by utilizing the Choosing-by-Advantages (CBA) method for selecting the most advantageous DRM based on project-specific factors and risks.

CBA is a method and set of decision-making processes that allow organizations, project groups, and individuals to make better choices, focusing on the importance of the advantages when comparing different alternatives [17, 18]. As a new-generation decision-making approach, CBA was mainly utilized in lean construction, and recently its applications have been observed in other areas of built environment-related studies, such as project design, safety, and facilities and maintenance management [19, 20]. Considering the increasing application areas of CBA with its systematic and practical approach, the use of CBA in this study contributes to the body of knowledge with a new application area of construction dispute resolution. The main objectives of this study are;

- To determine essential factors and criteria impacting DRM selection in construction projects.
- To apply CBA for evaluating alternative DRMs.

- To validate the results through interviews and case studies.
- To compare the advantages and drawbacks of alternative DRMs to select the most suitable method.
- To provide contractors with an alternative approach for handling DRMs and continue with the most effective one.

2. Literature Review

This study investigates the literature in four parts. The first part discusses the dispute resolution methods (DRMs), the second part reviews the DRMs in terms of risk matrices, the third part investigates different countries' approaches to DRMs, and the last part reviews the use of CBA in previous studies.

2.1. Dispute resolution methods (DRMs)

Several studies focused their efforts on comprehending the root causes of disputes determining potential fields of improvement and developing strategies to prevent and resolve conflicts [16, 21, 22]. Together with these, numerous approaches for commercial dispute resolution have been developed over the years where the best-known DRMs in civilized societies are (i) negotiation, (ii) mediation, (iii) conciliation, (iv) adjudication, (v) dispute boards, (vi) arbitration, (v) expert procedure, (vi), and (viii) litigation [11, 22, 23]. Arbitration and litigation result in a solution imposed on the disputing parties through a court decision or an arbitration award. In contrast, other methods are more collaborative and allow the parties to influence the resolution of the dispute [24].

Alaloul et al. [25] stated that while negotiation allows a dispute to be resolved promptly and effectively in terms of time management, costs, and preservation of relations between the parties, it is usually non-binding, and the outcome relies greatly on the motives of the individuals involved and their willingness to move past the issues. Mediation is a voluntary and non-binding procedure in which the parties are facilitated in reaching a negotiated settlement. It offers the benefit of all dispute issues being discussed face-to-face between the disputing parties without involving lawyers or intermediaries, which helps the parties retain more control of the resolution process. However, as mediation is non-binding and compliance with the agreement depends on the parties' intentions, the process can be abruptly halted, and all the time and effort invested can be wasted [25].

Conciliation is a procedure that proposes a solution that the parties involved have the option to accept or reject [26]. In the adjudication method, an unbiased adjudicator decides to resolve a contractual dispute among the parties within a certain timeframe, and, if specified in the contract, this decision is binding [27]. The decisions of the dispute adjudication board, which was established to resolve concerns about the inability of arbitration to provide a fast and cost-effective dispute resolution method, are generally advisory and not legally binding.

Arbitration serves as a global non-judicial platform for dispute resolution, is an alternative to litigation, and the outcome determined in arbitration is conclusive and binding [11, 28]. It provides procedural flexibility and allows the parties to choose arbitrators specialized in construction law, thus ensuring the preservation of business relationships, while being less disruptive, time-consuming, and more cost-effective than litigation [21]. Nevertheless, preparing for arbitration can sometimes take more time and incur additional costs due to the potential for unexpected issues arising from the limited discovery process [21]. In expert determinations, the experts selected by the disputing parties make an independent decision based solely on their knowledge, without consultation with the relevant parties, and this decision is usually conclusive and binding [11]. Litigation, on the other hand, is one of the most expensive ways to resolve a dispute, despite its advantages of legal authority and enforcement, transparency, and comprehensive discovery [25]. The costs of litigation often exceed the value of the dispute, resulting in financial loss for all parties to the dispute [28].

This study focuses on construction project risks, which have a huge potential for delays or losses, such as rework, extra costs, and lost days due to accidents and hazards. Therefore, it is essential to categorize those risks in terms of which method could be best used to handle the risks. In this respect, this study uses CBA to identify which DRM could be used in terms of dealing with the most common risks in construction projects. This way, decision makers can select the most suitable DRM with respect to the specific risks. Table 1 serves as an essential tool to reflect the criteria for DRM evaluation, and it links the attributes (the risks) to the CBA method, where a structured approach can improve the accuracy of the selection process.

2.2. Dispute resolution methods – risk matrix

In the study of Gad et al. [11], an analytical framework known as the DRM-Risk matrix is examined, which provides recommendations for selecting a specific DRM based on anticipated project risks. This matrix serves as a valuable tool for international contractors, assisting them in the selection of DRMs during contract formation, considering the specific risks associated with a particular project. Risks encountered in international projects are divided into two categories: (1) Project-specific risks (client-related, organizations' relationship, technical, schedule delay, and cost overrun risks) and (2) External risks (political, legal, economic and financial, environmental, and social risks). The risk factors include excessive demands and variation, lack of communication and poor relationships, schedule delays, cost overruns, and technical, political, legal, economic, and social risks. Table 1 presents construction-related risks in terms of external and internal risks that pose a high potential to cause construction disputes.

2.3. Different countries' approaches to dispute resolution

Many studies examined how different countries handle disputes in construction projects, suggesting ways to improve remedies by analyzing dispute types where there may be an abuse of rights in contractual obligations [88-91] In line with these efforts to enhance dispute resolution strategies. Yaskova and Zaitseva [91] found that the most favorable DRMs are linked to integrated approaches that blend elements of both mediation and arbitration. Alpkokin and Capar [88], referring to the Turkish construction industry, emphasized the need for alternative dispute resolution methods, especially dispute adjudication boards, due to the inability of state courts to effectively resolve disputes between contractors and clients, and contributed to the literature on this issue. El-Sayegh et al. [89] investigated the causes of disputes and the methods preferred to resolve the disputes in the United Arab Emirates. They reported that negotiation is the most effective method of dispute avoidance because of its ease of application. Then, risk allocation, early non-binding neutral evaluation, and partnering were found to be less effective methods compared to negotiation. For amicable settlement, negotiations between senior management and the parties are the usual DRM, which means that parties are more inclined to find amicable solutions than other DRMs, such as litigation. In another study, Tazelaar and Snijders [90] investigated construction transactions in terms of resulting in conflicts. They revealed that 1.6% of construction transactions result in serious conflicts requiring either arbitration, suspension, and /or legal steps based on the data collected from German and Dutch firms. However, they implied that most amicable solutions are preferred in most cases, following the dispute pyramid, where problematic transactions are first discussed with the other party before following the legal steps. The different array of DRMs in diverse countries underscores the need for a more systematic and flexible decision-making framework approach, such as CBA, which can investigate different problems in dynamic contexts in terms of legal, cultural, and contractual.

2.4. Choosing by advantages (CBA)

CBA, developed by Jim Suhr in 1999, is a multicriteria decision-making method and encompasses its terminology with a step-by-step approach [92, 93].

Table 1. Internal and external risks in construction projects

Internal Risks	Explanation	Reference(s)
Construction accidents	Incidents resulting in injury, damage or death at construction sites.	[29, 30]
Delay in time and schedule	Postponement or extension of the planned schedule for the completion of a project.	[31-33]
Cost overruns	Exceeding the planned value of the actual costs of a project.	[34-36]
Amendments in design and design requirements	Changes in the original design and design standards of a project.	[37, 38]
Amendments in contract	Changes to the terms and conditions of an existing contract.	[39-41]
Lack of labor and resources	Situations where an adequate number of workers, materials, equipment or other essential resources are not available.	[42-45]
Poor planning	Inadequate or ineffective preparation and organization in the management of a project.	[45-47]
Poor quality of work	Defective results that occur when required standards or expectations are not met on a project.	[47-49]
Poor communication	Ineffective or unclear exchange of information among team members, stakeholders, or parties.	[50-52]
Lack of trust	The result of problems such as poor communication, past experiences with delays, cost overrun, unmet expectations, or substandard work.	[53, 54]
Contract breaches	A situation where one party fails to fulfill its obligations as specified in the contract.	[55-57]
Poor site management	Ineffective supervision and coordination of activities on a construction site.	[58-60]
Lack of qualified personnel	A shortage of skilled workers and professionals with the necessary expertise, experience, and certifications to fulfill responsibilities with efficiency.	[44, 46, 61]
Delay in payment	A situation where one of the parties fails to make the payments stipulated in the contract on time.	[62-64]
Lack of experience in project management services	Insufficient knowledge or skills to effectively plan, execute, and supervise projects.	[29, 65, 66]
External Risks	**Explanation**	**Reference(s)**
Acts of God	Natural events or disasters beyond human control, such as earthquakes, floods, hurricanes, or other severe weather conditions, which may disrupt or delay construction projects.	[67-69]
Poor weather conditions	Weather conditions that can significantly disrupt or delay construction projects, such as rain, snow, extreme heat, or strong winds.	[70-72]
Amendments in laws and regulations	Modifications, additions, or omissions to existing laws or regulations.	[73, 74]
Inflation and sudden changes in prices	Increases and unexpected spikes in material, labor, and equipment costs over time.	[32, 75, 76]
Exchange rate fluctuations	Changes in value between the two currencies can significantly affect construction projects involving international trade or financing.	[77, 78]

Table 1. Cont'd

Corruption and bribery	Abuse of power for personal gain.	[45, 79, 80]
Unpredicted site conditions	Unexpected situations faced during a construction project.	[75, 81, 82]
Uncertain geological circumstances	Unforeseen ground conditions at a construction site.	[83-85]
War threats and political instability	A situation where conflicts arise between states or within a state and a state cannot provide effective legitimacy.	[86, 87]

It facilitates sound decision-making by comparing the advantages of decision alternatives [94, 95]. In addition, CBA allows decision-makers to differentiate between alternatives and understand the importance of these distinctions; in other words, decisions are based on the advantages of each alternative [96]. CBA enhances collaboration by generating value, optimizing costs, and minimizing waste in construction projects [97]. The significant value of CBA comes from considering cost in the last stage of decision-making to prevent its dominance over other factors [95].

The benefits of using CBA in decision-making have already been mentioned in several studies [17, 93, 96-98]. As a collaborative, visual, and transparent decision-making system, the CBA method fosters collaboration and consensus among stakeholders throughout the decision-making process [97]. The CBA can manage both objective and subjective data in a single decision-making process and helps stakeholders make decisions based on advantages to minimize conflict [93]. Broadly, decision-makers observe that CBA facilitates the involvement of stakeholders from multiple disciplines and enhances decision-making for straightforward issues [17]. It also distinguishes cost and value and ensures a clear and repeatable framework to support the bidding procedure [96]. The CBA approach enables decision-makers to integrate both quantitative and qualitative attributes into the decision-making process, providing transparency and easy implementation [98]. The ease of use and prioritization of CBA makes it a more favorable method for subcontractor selection compared to Analytical Hierarchy Process or Weighting Rating and Calculating (WRC) [99]. CBA's structured and systematic decision-making approach is consistent with lean thinking and provides advantages over traditional methods such as WRC [20].

CBA has been widely used in selecting the best alternatives in various fields. In the construction industry, Devkar et al. [97] applied CBA in a case study involving 23 students split into six groups. Each group, representing roles of client, contractor, or designer, identified alternative solutions to design problems. They then used a weighted scoring system, factoring in 'must-have' and 'want-to-have' criteria for each solution. The total importance of each alternative was quantified and compared graphically, highlighting the advantages versus the costs. Likewise, Arroyo et al. [19] used CBA to select among wall assembly options, El-Kholy [93] applied it to subcontractor selection. Furthermore, Murguia and Brioso [100] used CBA to determine the best construction flow for a residential building project. While CBA is commonly applied in construction decision-making, its use in DRM selection has not been explored in previous research.

3. Research Approach

The research methodology of this study employs the CBA decision-making method to select the most appropriate DRM among a set of alternatives related to construction project risks. Four DRMs—(i) negotiation, (ii) mediation, (iii) arbitration, and (iv) litigation—were identified as potential options. These alternatives were chosen based on a thorough review of previous studies, which consistently recognize them as the most widely used DRMs in the construction industry. In the CBA method, five key elements must be defined: alternatives, factors, criteria, attributes, and advantages. These elements are crucial for making decisions [93]. Alternatives refer to the different options available, such as

various construction methods, materials, designs, or systems. Factors are the components or aspects that play a role in the decision-making process. Criteria are the standards or rules that guide the decision, including 'must' criteria that outline essential conditions each option must meet, and 'want' criteria that reflect preferences of the decision-makers. Attributes describe the features or qualities of each option. Finally, advantages refer to the benefits or improvements that make one option better than another, based on its attributes [95]. The basic steps for CBA are as follows: (1) define alternatives, (2) identify factors, (3) describe must/have criteria for each factor, (4) identify the attributes of each alternative, (5) determine the advantages, (6) assess the Importance of Advantages (IofAs), and (7) assess the financial data [94, 97]. Fig. 1 illustrates the steps and sub-steps of the CBA method.

A set of factors and criteria was identified to select the most effective method for addressing construction project risks. An initial literature review was conducted to identify the main factors and criteria. Then, the factors, criteria, attributes, and advantages were specified through interviews conducted with industry experts. Thirteen interviews were carried out to gather insights on dispute resolution methods (DRMs) and related construction risks. This qualitative approach allowed the researchers to capture expert opinions, which contributed to a more nuanced understanding of what factors are important in selecting DRMs. The data saturation was achieved after a certain number of interviews, where no new themes emerged thereafter. Moreover, the 13 respondents have diverse professional backgrounds (i.e., project managers, claim experts, and contract managers), having worked in a wide array of projects from infrastructure to building sectors across different parts of the world. All attributes, advantages, and the total IofAs for each alternative were reviewed with thirteen industry executives. Their ratings, ranging from 1 to 100, were averaged to calculate the IofAs. Among the advantages, the most important one was identified as the superior advantage and assigned a score of 100. Using this superior advantage as a reference, the weights of the other advantages were determined, and the IofAs were calculated. In the final step, the costs of each alternative were evaluated.

The data collection method for this study is semi-structured interviews, where some questions are predetermined, and others are guided by the flow of the conversation. This approach was deemed appropriate because semi-structured interviews facilitate meaningful interaction between the interviewer and participant. They allow the interviewer to ask follow-up questions based on the participant's responses, while also giving participants the opportunity to share their thoughts freely [101].

A pilot study was conducted with a larger group to discuss the DRMs and potential claims they encounter in their projects. Following this, stratified sampling was employed to select respondents, categorizing them based on their experience level, age, and gender in relation to the DRMs they have used to resolve claims.

A total of thirteen individuals were selected for the interviews, based on their level of experience in claims management, expertise in construction claims, and familiarity with DRMs. During the interviews, the following questions were asked:

- What is your age range?
- How many years of experience do you have in the construction industry and claims management?
- What types of dispute resolution methods have you used to resolve claims?
- How do you approach DRMs when resolving different claims? For example, do you follow any methodology to decide on the most appropriate DRM to adopt?

Additionally, questions regarding the effectiveness of DRMs were asked to understand how DRM selection plays a critical role in resolving specific claims across different construction trades. Thematic analysis was then applied to identify key themes based on the data collected during the interviews. This study used thematic analysis to methodically find, examine, and present patterns in the qualitative data.

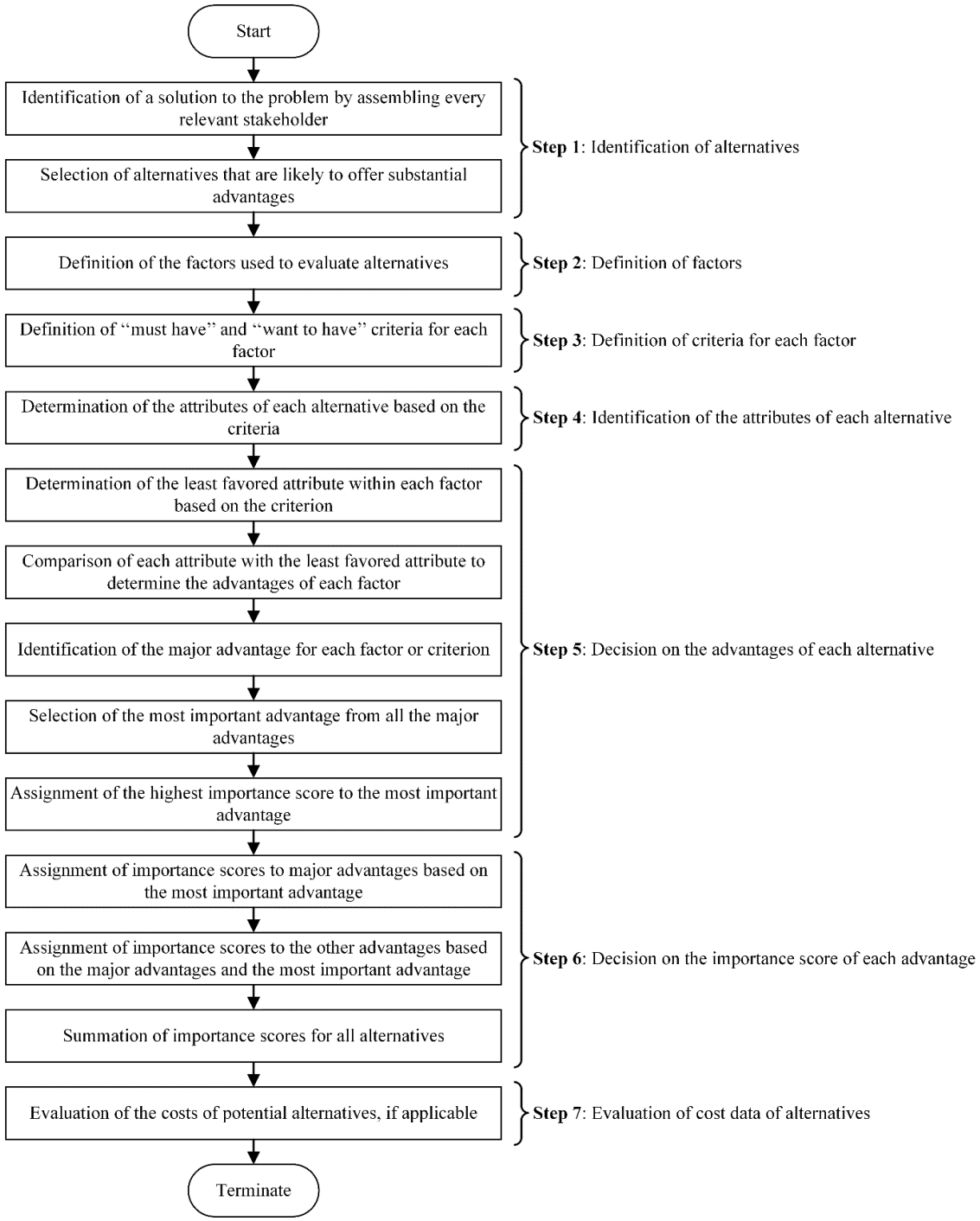

Fig. 1. Choosing by advantages methodology steps

This strategy was especially pertinent since it made it possible to thoroughly examine the viewpoints, experiences, and justifications of participants while choosing dispute resolution techniques. By ensuring that recurrent themes were identified and suitably interpreted, thematic analysis offered a methodical and transparent way to examine qualitative data. The thematic analysis was used to

reveal recurring patterns in terms of validating the CBA criteria and advantages. The data triangulation was achieved by cross-comparing qualitative data with the literature review and by using inter-coder reliability between two independent researchers. The requirement to methodically examine qualitative data while preserving flexibility led to the use of thematic analysis in this investigation. Thematic analysis ensured a thorough investigation of how decision-makers assess conflict resolution choices by enabling both an inductive (data-driven) and deductive (theory-driven) approach, in contrast to other qualitative analysis techniques. It also made it easier to pinpoint the underlying causes of these decisions, which improved the study's value to the field.

4. Discussion of Findings

This study examines and compares the benefits of various DRMs, including negotiation, mediation, arbitration, and litigation, and proposes a comprehensive framework using the CBA approach to identify the most suitable DRM based on project-specific factors and risks. Table 2 presents the alternatives, factors, attributes, advantages, and IofAs for each DRM.

As shown in Table 2, alternative 1, the negotiation method was found to offer more advantages, particularly in reducing the number of claims and minimizing claim resolution costs. It also proved to be highly effective in design management, as it facilitates quicker resolution of design defects and results in fewer design amendments. Furthermore, negotiation was advantageous in construction management and contract management, helping to avoid schedule delays and reducing associated delay costs. In comparison, mediation also emerged as a favorable DRM, especially based on criteria such as fewer design defects and reduced claims. However, arbitration and litigation were found to be less advantageous in terms of resolving claims, avoiding delay costs, and addressing contractual matters.

Previous studies have also highlighted the effectiveness of negotiation in conflict resolution. For instance, Alpkokin and Capar [88] examined dispute data from the Istanbul Metropolitan Municipality between 2005 and 2012, covering 198 transport infrastructure projects awarded through local Public Procurement Contracts, including subways, junctions, tramways, large parking lots, highways, and railways. The study found that the contract price was increased for 113 of these projects, and additional time was granted for 90. It concluded that most of these disputes were resolved through negotiation. The study also emphasized that, in the Turkish construction industry, negotiations involving top management for reaching an amicable solution are the standard procedure for managing disputes. The study conducted by Cevikbas et al. [102] examined the function of pre-contract negotiation in reducing and preventing disputes arising from claims of delay and interruption. According to the research findings, pre-contract negotiation has tremendous potential to reduce and prevent conflicts due to disruptions. Negotiation was mentioned as a very effective method to avoid conflicts in construction projects in several studies. On the other hand, the skills of the negotiator or developing good negotiation techniques were further emphasized to be important as the selection method of dispute resolution.

Similarly, Awwad et al. [103] highlighted that negotiation, as a widely recognized method, serves as an amicable solution and the primary approach for resolving disputes. This method is preferred by most stakeholders due to its low cost and simplicity. Indeed, the results obtained from this study showed that negotiation was used in 95.9% of conflicts and was effective in 86.14% of the cases in the Middle East, based on the responses of a survey study conducted with 177 professionals. The 95.9% rate obtained for negotiation confirms that this method is used at the initial stage of all disputes.

To validate the results, three cases from different construction companies were evaluated. These cases were selected from mega projects, where both project budgets and timelines are critical to their success.

Table 2. Choosing by advantages evaluation

Fact	Criterion	Alternative #1: Negotiation			Alternative #2: Mediation			Alternative #3: Arbitration			Alternative #4: Litigation		
		Attributes	Advantages	IofAs	Attributes	Advantages	IofAs	Attributes	Advantages	IofAs	Attributes	Advantages	IofAs
Claim Management	1a - Number of claims (Less is better)	4	Lower number of claims and lower conflicts among project participants Less number of claims and less communication issues	100	5	Moderately lower number of claims and lower conflicts among project participants Less number of claims and less communication issues	90	6	Relatively lower number of claims and lower conflicts among project participants Less number of claims and less communication issues	80	7	Higher number of claims and higher conflicts among project participants Higher number of claims and more communication issues	70
	1b - Number of resolved claims (Higher is better)	4	Higher number of resolved claims	100	3	Moderately higher number of resolved claims	90	2	Relatively higher number of resolved claims	80	0	Lower number of resolved claims	70
	1c - Claim resolution time (days) (Less is better)	2	Lower claim resolution time	70	4	Moderately lower claim resolution time	60	7	Relatively lower claim resolution time	55	365	Higher claim resolution time	70
	1d - Claim resolution cost (USD) (Less is better)	None	Claim resolution cost is not available	-	None	Claim resolution cost is not available	-	None	Claim resolution cost is not available	-	10,000	Higher claim resolution cost	80

Table 2. Cont'd

Design Management	2a - Number of defects (Less is better)	5	Lower number of defects	60	7	Moderately lower number of defects	50	12	Relatively lower number of defects	50	15	Higher number of defects	40
	2b - Number of resolved defects (Higher is better)	15	Higher number of resolved defects	50	13	Moderately higher number of resolved defects	40	9	Relatively higher number of resolved defects	40	2	Lower number of resolved defects	50
	2c - Defects resolution time (days) (Less is better)	3	Lower defect resolution time	50	5	Moderately lower defect resolution time	40	8	Relatively lower defect resolution time	40	300	Higher defect resolution time	50
	2d- Defects resolution cost (USD) (Less is better)	None	Defect resolution cost is not available	45	None	Defect resolution cost is not available	40	None	Defect resolution cost is not available	40	5000	Higher defect resolution cost	50
	2e - Number of amendments made (Less is better)	4	Lower number of amendments made	75	6	Moderately lower number of amendments made	65	8	Relatively lower number of amendments made	60	10	Higher number of amendments made	60

Table 2. Cont'd

Construction Management	3a - Schedule delay (days) (Less is better)	4	Less schedule delay	80	8	Moderately less schedule delay	70	10	Relatively less schedule delay	70	40	More schedule delay	60
	3b - Cost overrun (USD/day) (Less is better)	1000	Fewer cost overruns during constructio n	90	2000	Moderately fewer cost overruns during construction	80	2500	Relatively few cost overruns during construction	80	10000	More cost overruns during construction	80
	3c - Quality defects (Less is better)	3	Lower number of quality defects	80	4	Moderately lower number of quality defects	75	6	Relatively lower number of quality defects	75	9	Higher number of quality defects	60
	3d - Lack of labour or materials (Less is better)	5	Less labour or materials shortage	50	7	Moderately less labour or materials shortage	45	12	Relatively less labour or materials shortage	40	20	More labour or materials shortage	35
	3e - Constructio n approval delay (days) (Less is better)	5	Lower delay in constructio n approval	75	8	Moderately lower delay in construction approval	70	25	Relatively lower delay in construction approval	70	100	Higher delay in construction approval	60
Contract	4a - Number of amendment s made (Less is better)	4	Lower number of amendment s made	80	5	Moderately lower number of amendments made	60	6	Relatively lower number of amendments made	55	10	Higher number of amendments made	50

Table 2. Cont'd

	4b - Project completion time (days) (Less is better)	350	Shorter project completion time	85	00	Moderately shorter project completion time	65	80	Relatively shorter project completion time	55	770	Longer project completion time	50
	4c - Cost of delay (USD/day) (Less is better)	100	Less amount of delay cost	90	300	Moderately less amount of delay cost	80	700	Relatively less amount of delay cost	80	12000	More amount of delay cost	90
Coordination and Relationship	5a - Lack of experience (years) (Less is better)	1	Less lack of experience	35	1.5	Moderately less lack of experience	30	2	Relatively less lack of experience	30	4	Higher lack of experience	40
	5b - Number of differences between working methods of participants (Less is better)	3	Lower number of differences among working styles	50	5	Moderately lower number of differences among working styles	50	8	Relatively lower number of differences among working styles	50	12	Higher number of differences among working styles	40
	5c - Miscommunication defects (Less is better)	4	Less communication issues	70	6	Moderately less communication issues	70	9	Relatively less communication issues	70	12	More communication issues	50
Total Importance of Advantages (IofAs)				1335			1170			1120			1155

The information regarding the cases was provided by the firms that are listed among the top 400 contractors list of ENR (Engineering News Record) [104]. In the first case, a tunnel construction project, the project controls department reported several claims, primarily related to schedule constraints. They noted that most claims were resolved amicably, while some, due to delays, were addressed through mediation or arbitration. The team used CBA to determine the most effective DRM based on the nature of the claims. As a result, they reported no significant losses, as all claims were resolved before the project's completion, with the majority being settled through negotiation.

The second case involved the construction of a high-rise building, where timely completion and staying under budget were critical for the contractor. The contractor reported claims related to site safety and additional work. According to the general contractor, one of the subcontractors failed to follow safety procedures, leading to incidents that caused work stoppages and resulted in extra costs. While the general contractor attempted to resolve the claims amicably, the subcontractor maintained that they had adhered to the correct procedures. As discussions escalated, the dispute went through mediation and arbitration but remained unresolved, eventually leading to litigation. The general contractor reported a significant financial burden, while the subcontractor lost its reputation and experienced payment delays. The litigation case is still ongoing, and the general contractor expressed that with a well-established strategic plan for claim resolution, the issue could have been resolved through further negotiations, avoiding additional costs and delays.

The third case involved the construction of an industrial facility, which required the participation of several subcontractors. This led to multiple conflicts, primarily revolving around requests for time extensions. The mechanical subcontractors requested an extension, claiming that delays were caused by the general contractor's improper site layout. Several discussions took place between the mechanical subcontractor and the general contractor, and the advantages of various DRMs were assessed using the CBA method. As the conflict remained unresolved at an early stage, the general contractor appointed a mediator to facilitate further discussions. After several rounds of negotiation, the dispute was resolved. The general contractor emphasized the importance of selecting the appropriate DRM for timely conflict resolution, which ultimately saved significant time and costs.

The analysis of the three cases revealed that the appropriate DRM can be determined based on project conditions and requirements. Amicable solutions are preferred, as they typically help avoid time delays and excessive burdens. However, a systematic approach needs to be developed to select the most suitable method in order to prevent conflicts from arising during projects.

5. Conclusion

This study investigated the use of DRMs within the context of construction project risks related to contracts, claims management, design management, and overall construction project management. By utilizing the CBA method, authors systematically compared four widely used DRMs: negotiation, mediation, arbitration, and litigation. Each method was evaluated against a range of project-specific factors, providing insights into the advantages and limitations of each approach.

The findings indicate that negotiation is the most advantageous DRM in construction projects, as it consistently scored highest in terms of IofAs. The negotiation method excels in reducing the number of claims, minimizing claim resolution costs, and enhancing coordination and communication among stakeholders. Its cost-effectiveness and ability to preserve professional relationships make it particularly beneficial for resolving construction disputes at an early stage, preventing project delays and maintaining project momentum. These results align with previous studies that highlight the preference for negotiation as a primary means of conflict resolution, especially in the construction industry, where cost and time efficiency are critical.

Furthermore, this study demonstrates how the CBA method can be used to organize and compare

different DRMs based on both objective and subjective assessments. By focusing on the advantages of each alternative, decision-makers can make more informed choices about the most suitable dispute resolution method, considering the specific context and risks of their projects. Although negotiation is the most favorable method overall, the study also acknowledges that other methods like mediation, arbitration, and litigation may be appropriate in certain circumstances where negotiation alone may not yield satisfactory results.

Despite these valuable contributions, the study also faced some limitations. One notable limitation was the relatively low number of experts involved in the interviews, which may affect the generalizability of the results. Future research could benefit from a larger sample size and a more diverse group of professionals from various regions and sectors within the construction industry. Additionally, the study's focus on the CBA method, while useful, also opens the door for further exploration of other decision-making frameworks that could complement or improve upon the results obtained here.

This study provides a structured tool for project managers in terms of early dispute prevention by identifying the most suitable DRM based on project-specific risks. Moreover, the findings provide a clearer guideline for policymakers since the conclusions encourage the development of standardized contracts in terms of data-driven and transparent DRM selection. Finally, academics can benefit from the findings of this study to revisit their courses and include CBA as a key method in terms of construction dispute management and strategic decision making.

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Author Contributions

Y.E. Akyildiz: Conceptualization, Methodology, Investigation, Writing-Original Draft. E. Sadikoglu: Data curation, Writing-Original Draft, Visualization. S. Demirkesen: Visualization, Writing-Review&Editing, Supervision. C. Zhang: Supervision, Project administration, Resources, Validation. H. Turkoglu: Writing-Reviewing & Editing, Investigation, Formal analysis, Visualization. A. Damci: Writing-Reviewing & Editing, Supervision, Resources, Methodology. D. Besiktepe: Writing-Reviewing & Editing, Supervision, Validation. U.K. Pal: Methodology, Writing-Reviewing & Editing, Investigation, Visualization.

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Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Ethics Committee Permission

The authors declared that all participants were fully informed consent for inclusion before they participated in the study, and the study meets national and international guidelines.

Conflict of Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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