

Dispute Resolution Strategies In Construction Projects To Mitigate Impacts On Time Performance – Project Owner's Perspective

Gito Barnado^{1*}, Rully Andhika Karim²

¹ Magister Degree in Civil Engineering Faculty, Universitas Indonesia Jakarta, Indonesia.

² Lecturer in Faculty of Civil Engineering Universitas Indonesia, Jakarta, Central Jakarta 10430, Indonesia.

*Corresponding Author:

Email: gito.barnado@office.ui.ac.id

Abstract.

Disputes in the global construction industry are increasing every year. This is also in line with what is happening in the Indonesian construction industry. PT. XYZ, one of the pulp and paper producers in Indonesia, was the project owner of 128 construction contracts for the company's production facility development services from 2015 to 2021, had experiencing disputes on 45 of those contracts or 35.2% of the total construction contract services. The trend on time taken to resolve those disputes was observed to be 16.38 months on average, which was considered too long. The delay in handling these disputes will result in losses for both the owner and the contractors. The purpose of this study is to analyze the strategy of selecting dispute resolution methods for each identified cause of disputes in the construction industry in Indonesia. This study has identified 13 causes of disputes and 10 dispute resolution methods in Indonesia. A survey questionnaire that using Pair Comparison Analysis has been sent to professionals in the construction industry in Indonesia, questioning about their preference of dispute resolution method for every cause of dispute. The results of the data analysis show that there is a difference process in the dispute resolution methods for each cause of dispute. Although, Negotiation predominantly first ranks in dispute resolution. Meanwhile, for all causes of disputes, all respondents have an agreement that Arbitration and Litigation are the last methods in dispute resolution method in the construction industry in Indonesia.

Keywords: *Disputes; claims; sources of disputes; disputes resolution methods; time taken to resolve disputes, construction industry and Indonesia.*

I. INTRODUCTION

Construction projects are vulnerable to disputes caused by factors such as differing perspectives from the contract, different cultural backgrounds, and the technical standards outlined in the contract [16]. Uncertainty and conflict between both parties can escalate into claims and end in disputes if not resolved [16]. Disputes become one of the main factors that prevent the successful completion of construction projects [16]. Therefore, it is important to address dispute resolutions to complete construction projects according to the desired time, budget, and quality [2]. Based on the Global Construction Disputes report published by Arcadis in 2022, the number of disputes in the global construction industry has shown an increasing trend over the past 5 years. In 2022, the value of disputes in the global construction industry reached 52.6 billion US\$. The trend of increasing dispute cases is also supported by statistical data published by the International Centre for Settlement of Investment Dispute (ICSID). It was reported that in 2020, dispute resolutions through arbitration at ICSID reached 54 cases and in 2021 increased to 66 cases, while in 2022 there was a decrease to 34 cases. This is also similar in Indonesia, based on arbitration registration data from the Indonesian National Arbitration Board (BANI), which shows that from the period 2015 – 2018, there was a 52.5% increase in dispute cases (an addition of 163 dispute cases) compared to the period 2010 – 2014, BANI, 2019. The trend of increasing disputes in the global construction industry is also occurring at PT XYZ, which is the owner of one of the largest pulp and paper producers in Indonesia.

Out of 128 construction contracts for the company's production facility development from 2015 to 2021, there were disputes in 45 construction contracts or 35.2% of the total construction contracts. Meanwhile, the Global Construction Disputes data published by Arcadis, the average time required to resolve dispute cases, which has also shown an increasing trend over the past 5 years, is presented. The average time taken to resolve disputes each year from 2017 to 2021 was 14.8 months (2017), 17 months

(2018), 15 months (2019), 13.4 months (2020), and 15.4 months (2021). This trend is also observed in PT XYZ from 2015 to 2022, where the average time taken to resolve disputes was 16.38 months. Several studies have discussed the causes and resolution methods of disputes in construction projects. [22] stated that in a typical construction project, project sponsors (Owners), Project Managers, Design Engineers (Field Engineers), Main Contractors, Sub-Contractors, and Suppliers are the main stakeholders in the project when disputes arise. El-Sayegh [8] further stated that there are 27 reasons for disagreements, which fall into five categories: Designer-related, Owner-related, Contractor-related, Contractual, and other external causes. In the other hand, the Project Management Body of Knowledge – Construction Extension 2000 Edition, breaks down conflict resolution into four methods and instruments: negotiation, litigation, alternative dispute resolution (ADR), and estimate cost resolution.

From the owner's perspective, the impact of prolonged dispute resolution will lead to a poor relationship between the owner and the contractor, loss of work productivity for project completion, cost and time overruns, especially in terms of the owner's overhead, and the loss of the owner's company's good reputation. [18]. From the contractors' point of view, as a result of the prolonged duration in resolving the disputes, there will be delays in payments from the owners to the contractors/suppliers. These payment delays will have a chain reaction, not only affecting the contractors/suppliers but also financially impacting their subcontractors [23]. Based on the above findings, it is important to develop dispute resolution strategies for construction projects from the owner's perspective to mitigate the impact on time performance. The main objective of this paper consists of three important research questions. The first research question is to identify and categorize the causes of disputes and the methods of dispute resolution that occur in Indonesia based on literature review, which will later be validated by experts in the academic field and professionals in the construction industry in Indonesia. The second research question is to rank the dispute resolution methods based on the causes of disputes themselves, focusing to mitigate the impact of time performance. The third research question is to develop a flow process framework for dispute resolution methods based on the causes of disputes. In this third research question is also to identified the paradigm of estimate duration of each framework's flow process of dispute resolution. Thus, with this framework, it can serve as additional literature for the construction industry in Indonesia in the dispute resolution process.

II. METHODS

To achieve the three main objectives of the research questions, the first step taken was a literature review related to the research object. This method helps researchers identify the variables causing disputes and the variables for dispute resolution methods in the construction industry. The second step is to conduct the survey to the professional stakeholders involved who usually involve in disputes resolution process in Indonesian construction industry. The survey for this study is divided into three phases. Expert validation is the initial step. Five expert respondent who are authorities in Indonesia's construction sector and expert on the disputes resolution had validated the variables found in the literature review at this point. The third step of this is a pilot survey. This study used a closed survey, more precisely a ranking survey, as its survey instrument.

Respondents will rank the disputes resolution method for each dispute-causing variable. The purpose of the pilot survey is to evaluate how well the suggested questionnaire works as the survey tool. In contrast, a sample of the potential respondents who will participate in this study is represented in the pilot survey. Ten respondents participated in the pilot surveys, and the evaluation findings showed that the factors contributing to disputes, dispute resolution methods, and the questionnaire framework on the connection between dispute resolution techniques and dispute causes were all simple to comprehend. The fourth step of the survey is a respondents' survey, which involved 35 respondents. This survey aimed to obtain data on the strongest agreement regarding the relationship between dispute-causing variables and the sequence of dispute resolution methods. Here is the profile of the 35 respondents involved in the third stage of the survey in this study:

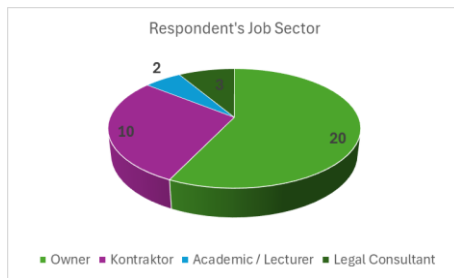


Fig 1. Respondent’s Job Sector

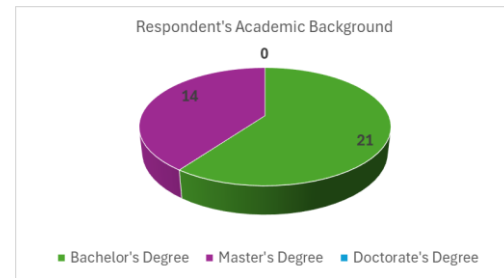


Fig 2. Respondent’s Academic Background

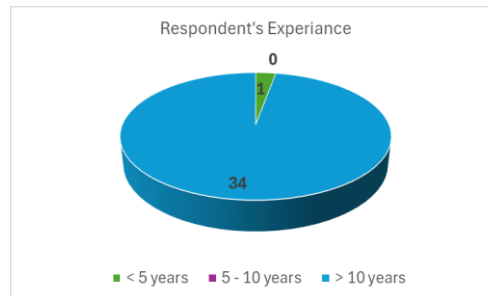


Fig 3. Respondent’s Experience

From the results of this respondent’s survey, data on the ranking of dispute resolution methods for each cause of disputes was obtained. The analysis conducted on the survey results is using Kendall’s Coefficient of Concordance and Spearman rank correlation to determine the strength of the relationship between the sets of respondent paradigm to the cause of disputes variables and the dispute resolution methods through using software 1000mind.com. The Kendall W Concordance Test is a nonparametric test used to examine the consistency of ratings given by a group of subjects towards attributes considered important. The Kendall W Concordance Coefficient tests the degree of closeness or alignment of the relationship among k variables measured at least on an ordinal scale. After conducting the W test, the Kendall Rank correlation coefficient results for each hypothesis are obtained. The nature of the correlation will determine the direction and correlation. The strength of correlation can be categorized in table 1. Meanwhile, the Spearman rank correlation test (ρ) aims to measure the degree of similarity between two ranked concepts. If $\rho = 1$, then the two rankings are identical, and if $\rho = 0$, then the two rankings are unrelated and can be considered random. Values between 1 and 0 indicate a greater or lesser degree of closeness to identical rankings.

Table 1. Interpretation of Value W

W Value	Interpretations	ρ value	Interpretations
0.00 to 0.20	has a weak strength	0.00 to 0.25	very low relationship
0.41 to 0.70	has a strong strength	0.26 to 0.50	fair relationship
0.71 to 0.90	has a very strong strength	0.51 to 0.75	strong relationship
0.91 to 0.99	has an extremely strong strength	0.76 to 0.99	very strong relationship
1.00	has an extremely strong strength	1.00	perfect relationship

III. RESULT AND DISCUSSION

Source of Construction Disputes

Based on the literature review, there are 13 (thirteen) factors that cause disputes. From these 13 (thirteen) causes of disputes, they can be categorized into 5 sub-sections as follows:

Table 2. Variable Causes of Disputes

No. Causes of Disputes	Reference
1 Issue of Contractual Documents	
1.1 Poor Contract Document	[1], [2], [3], [4], [6], [8], [10], [16]
1.2 Late Approval from the municipality/different government authority	[1], [2], [3], [4], [6], [8], [10], [16]

1.3	Ambiguous Contract Document	[1], [2], [3], [4], [6], [8], [10], [16]
2	Issue of Work Design Drawing	
2.1	Change order of project management Procedure	[1], [2], [3], [4], [6], [8], [10], [16]
2.2	Project Design / Technical Issue	[1], [2], [3], [4], [6], [8], [10], [16]
3	Issue with Owners	
3.1	Owner Willingness – Variation Initiated	[1], [2], [3], [4], [6], [8], [10], [16]
3.2	Poor Financing from Owner	[1], [2], [3], [4], [6]
4	Issue with the Contractor	
4.1	Poor Financing from Contractors	[1], [2], [3], [4], [6], [8], [10], [16]
4.2	Contractor Willingness - variation initiated	[1], [2], [3], [4], [6], [8], [10], [16]
4.3	Underestimation and incompetence of contractors	[1], [2], [3], [4], [6], [8], [10], [16]
5	Other Issues	
5.1	Force Majeure	[1], [2], [3], [4], [6], [10], [16]
5.2	Economic Fluctuations	[1], [2], [3], [4], [6], [10], [16]
5.3	Changes in laws and regulations	[1], [2], [3], [4], [6], [10], [16]

1. Contractual Document Issues

The preparation of poor construction contract documents (Poor Contract Document) leads to different interpretations of the same issue, which in turn results in disputes, eventually escalating into claim disputes (dispute of claims) [8]. This occurs when the contractor encounters unknown physical conditions with unusual characteristics that materially differ from those typically encountered in the work at the project site. Contract amendments will be used when parties wish to modify the provisions of the legal agreement already stated in the contract. Sometimes the approval process for amendments to the contract experiences delays (Late Approval from the municipality/different government authority). Additionally, conflicting and inaccurate information in the contract documents becomes a cause of disputes. Therefore, (Ambiguous Contract Document) statements in the contract should not conflict with the scope of work and should be clearly explained between the parties involved in the contract [8].

2. Technical and Drawings document issue

Poor design happens when the design is non-functional, has missing elements, and does not meet the owner's requirements. Inadequate or incomplete technical plans and specifications from the owner can cause delays during the construction phase. Changes in material specifications and the process of approving construction work permits from the owner can take time and lead to disputes over additional costs for new materials, as well as delays due to delivery and procurement difficulties from contractors or suppliers. All of this incurs costs for the owner and contractor, which ultimately leads to disputes (Project Design / Technical Issue [8]). Additionally, the non-standard change management process from the owner will cause the changes in the working drawing design to not proceed smoothly. (Change order of project management procedure) [8].

3. Owner's Issue

One of the most common causes of disputes is the slow decision-making process by the owner, where the owner takes a long time to make decisions, thereby delaying the construction process (Owner Willingness – Variation Initiated). Inadequate initial project planning creates disputes and incurs additional costs for the owner. Therefore, detailed initial planning is necessary to avoid conflicts and extra costs (additional claims). The owner's failure to grant interim awards related to time extensions and compensation to the contractor is a common practice among owners. This can lead to disputes that are harder to resolve with the contractor at the end of the project. Waiting until the end of the project to address disputes makes them more difficult and more expensive to resolve. The owner can request a change order, such as adding to or reducing the previously agreed scope, which can cause disputes because some change orders may result in increased time and costs. On the other hand, if the owner cannot fund the project on time, construction will delay, and the project may be suspended for a certain period until the owner is ready to finance the project (Poor Financing from Owner) [8].

4. Contractor's issues

The lack of funding by the contractor during construction causes delays, work disruptions, and poor quality of subcontractor work (Poor Financing from Contractors). If the contractor lacks resources, delays in the construction process occur, and this can create disputes. Disputes can arise due to low productivity. Additionally, inadequate site investigation by contractors at the early stages of the construction contract can also create disputes (Underestimation and incompetence of contractors). Poorly defined work scope is a type of dispute caused by contractors. Poor site supervision and management by the contractor can cause work accidents and delay the construction process. Site management is a major factor in construction disputes caused by the contractor (Contractor Willingness - variation initiated). Similarly, inappropriate leadership styles from the contractor's construction manager occur when there are incompetent individuals without the proper qualifications in the position of construction manager, resulting in them making wrong decisions during construction. The contractor can be asked to stop the construction process by the owner if the contractor's company is unable to execute the project according to the schedule, cost, and quality targets that have been agreed upon between the contractor and the owner [8].

5. Other Issues (external issue)

The economic instability of a country (Economic Fluctuations) will cause disputes, such as significant changes in material prices. The contractor will try to propose a cost increase due to the rise in that price, while on the other hand, the owner will refuse to accept the proposal because there is no clause for cost increases due to changes in material market prices in the contract [8]. Additionally, unfavorable weather conditions (Force Majeure) can cause delays and increased costs, which will ultimately lead to disputes. Some construction projects may cause traffic congestion due to road closures or noise, especially in areas with schools or hospitals, for example, complaints from the surrounding community. The lack of communication and coordination between parties during construction causes confusion and misunderstandings about the scope of work, leading to social disputes between the parties involved in project [8]. One of the significant sources of disputes is the acquisition of permits and/or approvals from different organizational structures (Changes in laws and regulations). Delays in obtaining approvals and permits from organizations can lead to disputes. Modifications in legislation and regulations can also cause disputes. Each organization has its own laws and regulations that can change. These changes can cause disputes during the construction process [8].

Disputes Resolution Methods in Construction

Based on a literature review, 10 methods for dispute resolution were identified, which can be categorized into 4 categories as follows:

Table 3. Variable Dispute Resolution Methods

No.	Dispute Resolution Method	Reference
1	Negotiation	[8], [9], [10], [11], [12], [13]
2	Alternative Dispute Resolution (ADR)	
	2.1 Arbitration	[8], [9], [10], [11], [12], [13]
	2.2 Disputes Review Board (DRB)	[8], [9], [10], [11], [12], [13]
	2.3 Partnering	[8], [9], [10], [11], [12], [13]
	2.4 Mini-trial	[8], [9], [10], [11], [12], [13]
	2.5 Early Neutral Evaluation (ENE)	[8], [9], [10], [11], [12], [13]
	2.6 Adjudication	[8], [9], [10], [11], [12], [13]
	2.7 Mediation	[8], [9], [10], [11], [12], [13]
3	Litigation	[8], [9], [10], [11], [12], [13]
4	Estimate Cost Resolution	[24]

Negotiation is one of the dispute resolution methods that is also known as a universal dispute resolution method. The goal of resolving disputes using the negotiation method is to ensure they are resolved promptly and efficiently in terms of time management, cost, and maintaining good relationships between the owner organization and the contractor. If it is stipulated that negotiation is unsuccessful, then other methods are available. However, negotiation should remain the primary choice when other methods are used [20].

Arbitration is an adjudicative procedure in which a person or a neutral panel renders a decision based on the application of facts to the law. The arbitrator's decision can be enforced legally if the disputed parties have agreed to bind themselves. In the case of court-mandated arbitration, they express their satisfaction with the decision after the outcome of the agreement is formulated. Arbitration is the traditional and most well-known method among alternative dispute resolution options. Some arbitrations are quick and informal, while others can take a long time compared to court trials. All arbitrations share one characteristic with court trials, namely that the decision is rendered by an adjudicative body after the disputing parties have presented their own versions of the facts. BANI is one of the organizations overseeing the arbitration process in Indonesia, regulated under Law Number 30 of 1999.

Disputes Review Board (DRB). One effective way to resolve construction disputes as issues arise is by forming a Disputes Review Board (DRB) that will hold regular meetings throughout the project to address claim issues. By providing a forum for the exchange of complaints and independent evaluation, the DRB offers a means of claim resolution. Through DRB participation, issues such as contract document interpretation, delays, scheduling, differing site conditions, design changes, and additional scope of work can be resolved without resorting to litigation.

Partnering is usually held before the actual construction begins, facilitated by a neutral advisor. The third-party facilitator is an expert in the construction industry knowledge, which will help both the owner and the contractor [14].

Mini-trial is essentially a structured mediation process, usually initiated with a submission agreement between the parties. Like other private dispute resolution agreements, the specific rules of conduct for a mini-trial are established by the parties' agreement. Like mediation, a minitrial is a private and non-binding resolution procedure. Like arbitration, a minitrial provides psychological satisfaction to the disputing parties. The final product of a minitrial is a non-binding settlement recommendation. In general, the minitrial process can be divided into three phases: preparation for the hearing, conduct of the hearing, and negotiation between management representatives with settlement authority [14].

Early Neutral Evaluation (ENE) is another ADR (Alternative Dispute Resolution) method used to resolve construction disputes at the early stage of litigation. Unless it is a contractual requirement, ENE is generally a court-mandated process that begins three to four months after the filing of the complaint. This is an informal and nonbinding procedure where the court or the parties select a neutral third party (usually a lawyer) experienced in the type of construction or issue being contested. The main purpose of using ENE is to discuss and resolve disputes earlier rather than later, thereby avoiding the need for trial preparation [14].

Adjudication is a method of resolving disputes outside of court. It was initially introduced in the mid-1970s in England. After the Latham Report in 1994, the HGCRA 1996 stated that parties involved in construction contracts could refer any disputes at any time to an independent third party for adjudication. The adjudicator takes appropriate contractual steps to reach a suitable decision and resolve the dispute. Decisions can be reached through agreement, arbitration, or litigation, or based on the final decision of the adjudicator. The purpose of this process is to address contractual breaches that are time-consuming and costly [20].

Mediation is a process of resolving disputes through the facilitation of a neutral third party. Mediation is usually conducted through a series of conferences. The mediator meets privately with the individuals involved in the dispute (ex parte consultation sessions) and gathers the necessary information to encourage a resolution without making a decision.

Litigation is the act of filing a legal lawsuit. It is a traditional form of dispute resolution. This is based on law; a doctrine that requires court proceedings. Primarily, litigation begins with a claim by the defendant. Disputes are adjudicated through a series of documents provided by each party. The court may allow the parties to appoint experts to assist with the case. The court proceeds with the opening statements of the parties, expert examination, witness reports, and closing statements. After the process, the judge will determine the verdict. The party found guilty must comply with the judge's decision within a certain period. The "losing" party can appeal to a higher court; however, this process is time-consuming, expensive, and the outcome can be Win-Lose [20].

Estimate Cost Resolution is the final method that needs to be considered if all other dispute resolution methods cannot solve the dispute. In this method, the parties involved in the dispute, both the owner and the contractor, will recalculate all costs already incurred as well as the costs that will be incurred if the dispute continues. With this calculation of all costs, it will serve as the final consideration to quickly resolve the dispute so that the time and costs incurred by both parties do not increase further [13].

Survey Results

Assessment of sources on construction disputes in Indonesia

Based on the expert validation survey conducted on the causes of disputes, the experts agreed on 13 variables causing disputes in the construction industry in Indonesia which are:

1. Poor Contract Document
2. Late Approval from the municipality/different government authority
3. Ambiguous Contract Documents
4. Change order of project Management Procedure
5. Project Design / Technical Issue
6. Owner Willingness – Variation Initiated
7. Poor Financing from Owner
8. Poor Financing from Contractors
9. Contractor Willingness - Variation Initiated
10. Underestimation and Incompetence of contractors
11. Force Majeure
12. Economic Fluctuations
13. Changes in laws and regulations

Assessment of disputes resolution methods in Indonesian

Based on the validation survey conducted on dispute resolution methods, experts agree that there are 10 dispute resolution methods in the construction industry in Indonesia which are:

1. Negotiation
2. Alternative Dispute Resolution (ADR) – Arbitration
3. Alternative Dispute Resolution (ADR) – Disputes Review Board (DRB)
4. Alternative Dispute Resolution (ADR) – Partnering
5. Alternative Dispute Resolution (ADR) – Mini-trial
6. Alternative Dispute Resolution (ADR) – Early Neutral Evaluation (ENE)
7. Alternative Dispute Resolution (ADR) – Adjudication
8. Alternative Dispute Resolution (ADR) – Mediation
9. Litigation
10. Estimate Cost Resolution

Pair Comparison Analysis for the Assessment of Ranks of disputes resolution methods to the sources of construction disputes to mitigate the impact on time performance

The data obtained from the 35 respondents, which is a result of the differing perspectives of each respondent, were analyzed using Kendall W and Spearman rank correlation (ρ) with the software 1000mind.com. The results of analyses are displayed in Table 4. From the tables below, it is found that the ranking results of dispute resolution methods against the variables causing disputes from the respondents have a strong relationship, indicated by Kendall W > 0.41 and Spearman rank correlation (ρ) > 0.51.

Table 4. Pair Comparison Analysis – Optimisation impact of time

Causes Disputes	Optimization impact to time		Conclusion
	Kendall's W	Spearman rank correlation	
Poor Contract Document	0.618	0.576	strong relationship
Late Approval from the municipality/different government authority	0.568	0.520	strong relationship
Ambiguous Contract Document	0.504	0.448	fair relationship
Change order of project management procedure	0.641	0.601	strong relationship

Project Design / Technical Issue	0.602	0.558	strong relationship
Owner Willingness – Variation Initiated	0.664	0.627	strong relationship
Poor Financing from Owner	0.586	0.540	strong relationship
Poor Financing from Contractors	0.567	0.518	strong relationship
Contractor Willingness - variation initiated	0.656	0.618	strong relationship
Underestimation and incompetence of contractors	0.621	0.579	strong relationship
Force Majeure	0.587	0.542	strong relationship
Economic Fluctuations	0.653	0.614	strong relationship
Changes in laws and regulations	0.599	0.554	strong relationship

Ranking of disputes resolution methods to the sources of construction disputes in terms of optimization of time performance

Based on the survey results conducted with 35 respondents, the ranking of dispute resolution methods for each source of disputes to mitigate the impact on time performance is ranked from the number of respondents who ranked the concept above other concepts. In the survey, the estimate of each duration for each method disputes resolution was also obtained in order to identify the respondent paradigm for the estimate duration of each disputes resolution method. This estimate data is used to estimate the duration of each method before moving to another disputes resolution method. The ranking process including estimate duration of disputes resolution method for each dispute’s causes are shown in the following figures.

Poor Contract Document											Late Approval from the municipality/different government authority												
Negotiation	-	25	26	28	33	33	33	34	34	34	1	Negotiation	-	28	29	30	32	32	34	34	34	1	
ADR - Disputes Review Board (DRB)	10	-	17	19	30	30	33	35	34	33	2.5	Estimate Cost Resolution	7	-	21	25	23	29	32	32	31	33	2
Estimate Cost Resolution	9	18	-	18	23	30	28	31	31	32	2	ADR - Disputes Review Board (DRB)	6	14	-	25	21	27	29	28	33	34	3
ADR - Mediation	7	16	17	-	23	25	26	29	32	34	2.5	ADR - Partnering	5	10	10	-	19	21	21	26	34	34	2
ADR - Partnering	2	5	12	12	-	22	24	24	33	34	2	ADR - Mediation	3	12	14	16	-	23	21	22	30	33	2
ADR - Mini-trial	2	5	5	10	13	-	19	24	31	34	2.5	ADR - Early Neutral Evaluation (ENE)	3	6	8	14	12	-	21	21	30	34	3.5
ADR - Adjudication	2	2	7	9	11	16	-	26	31	34	3	ADR - Mini-trial	1	3	6	14	14	14	-	21	31	32	3
ADR - Early Neutral Evaluation (ENE)	1	0	4	6	11	11	9	-	29	32	2	ADR - Adjudication	1	3	7	9	13	14	14	-	31	32	3
ADR - Arbitration	1	1	4	3	2	4	4	6	-	34	2.5	ADR - Arbitration	3	4	2	1	5	5	4	4	-	34	2
Litigation	1	2	3	1	1	1	1	3	1	-	3.5	Litigation	1	2	1	1	2	1	3	3	1	-	2.5
	Negotiation	ADR - Disputes Review Board (DRB)	Estimate Cost Resolution	ADR - Mediation	ADR - Partnering	ADR - Mini-trial	ADR - Adjudication	ADR - Early Neutral Evaluation (ENE)	ADR - Arbitration	Litigation	Duration (month)		Negotiation	Estimate Cost Resolution	ADR - Disputes Review Board (DRB)	ADR - Partnering	ADR - Mediation	ADR - Early Neutral Evaluation (ENE)	ADR - Mini-trial	ADR - Adjudication	ADR - Arbitration	Litigation	Duration (month)

Ambiguous Contract Document											Change order of project management procedure												
Negotiation	-	28	29	29	32	34	32	34	33	33	1	Negotiation	-	25	31	30	33	34	33	33	35	35	2
Estimate Cost Resolution	7	-	20	23	23	25	29	27	32	33	3	ADR - Mediation	10	-	20	22	25	29	31	31	31	35	3
ADR - Mediation	6	15	-	23	25	24	22	25	29	33	3	Estimate Cost Resolution	4	15	-	22	27	23	28	28	32	35	3
ADR - Disputes Review Board (DRB)	6	12	12	-	22	20	21	22	30	32	4	ADR - Disputes Review Board (DRB)	5	13	13	-	24	20	23	25	33	35	3.5
ADR - Adjudication	3	12	10	13	-	20	18	21	33	33	3	ADR - Partnering	2	10	8	11	-	17	24	22	34	35	3
ADR - Mini-trial	1	10	11	15	15	-	18	18	32	33	4	ADR - Adjudication	1	6	12	15	18	-	22	19	34	35	3
ADR - Partnering	3	6	13	14	17	17	-	17	32	33	4	ADR - Mini-trial	2	4	7	12	11	13	-	20	33	35	3.5
ADR - Early Neutral Evaluation (ENE)	1	8	10	13	14	17	18	-	33	32	3	ADR - Early Neutral Evaluation (ENE)	2	4	7	10	13	16	15	-	33	35	3.5
ADR - Arbitration	2	3	6	5	2	3	3	2	-	32	3	ADR - Arbitration	0	4	3	2	1	1	2	2	-	35	2.5
Litigation	2	2	2	3	2	2	2	3	3	-	3	Litigation	0	0	0	0	0	0	0	0	0	-	3.5
	Negotiation	Estimate Cost Resolution	ADR - Mediation	ADR - Disputes Review Board (DRB)	ADR - Adjudication	ADR - Mini-trial	ADR - Partnering	ADR - Early Neutral Evaluation (ENE)	ADR - Arbitration	Litigation	Duration (month)		Negotiation	ADR - Mediation	Estimate Cost Resolution	ADR - Disputes Review Board (DRB)	ADR - Partnering	ADR - Adjudication	ADR - Mini-trial	ADR - Early Neutral Evaluation (ENE)	ADR - Arbitration	Litigation	Duration (month)

Project Design / Technical Issue											
Negotiation	-	27	29	29	31	33	33	35	34	33	1
ADR - Disputes Review Board (DRB)	8	-	16	19	28	29	32	32	33	34	3.5
Estimate Cost Resolution	6	19	-	20	27	30	28	29	31	33	2.5
ADR - Mediation	6	16	15	-	23	25	28	30	30	33	2.5
ADR - Partnering	4	7	8	12	-	24	24	21	33	33	2.5
ADR - Mini-trial	2	6	5	10	11	-	19	19	33	34	3.5
ADR - Adjudication	2	3	7	7	11	16	-	17	32	34	2.5
ADR - Early Neutral Evaluation (ENE)	0	3	6	5	14	16	18	-	31	33	2.5
ADR - Arbitration	1	2	4	5	2	2	3	4	-	33	3
Litigation	2	1	2	2	2	1	1	2	2	-	2.5
	Negotiation	ADR - Disputes Review Board (DRB)	Estimate Cost Resolution	ADR - Mediation	ADR - Partnering	ADR - Mini-trial	ADR - Adjudication	ADR - Early Neutral Evaluation (ENE)	ADR - Arbitration	Litigation	Duration (month)

Owner Willingness - Variation Initiated											
Negotiation	-	23	29	30	33	33	34	35	34	34	1
Estimate Cost Resolution	12	-	24	25	29	29	32	31	33	35	2
ADR - Disputes Review Board (DRB)	6	11	-	19	29	29	31	30	33	34	2
ADR - Mediation	5	10	16	-	23	29	30	29	32	33	3
ADR - Partnering	2	6	6	12	-	18	17	17	35	35	2
ADR - Early Neutral Evaluation (ENE)	2	6	6	6	17	-	16	20	33	35	2
ADR - Adjudication	1	3	4	5	18	19	-	21	34	33	3
ADR - Mini-trial	0	4	5	6	18	15	14	-	31	34	3
ADR - Arbitration	1	2	2	3	0	2	1	4	-	33	2
Litigation	1	0	1	2	0	0	2	1	2	-	3
	Negotiation	Estimate Cost Resolution	ADR - Disputes Review Board (DRB)	ADR - Mediation	ADR - Partnering	ADR - Early Neutral Evaluation (ENE)	ADR - Adjudication	ADR - Mini-trial	ADR - Arbitration	Litigation	Duration (month)

Poor Financing from Owner											
Negotiation	-	23	22	23	30	29	31	30	33	34	1
Estimate Cost Resolution	12	-	19	22	30	30	29	31	34	35	2
ADR - Mediation	13	16	-	22	26	26	27	27	33	33	3
ADR - Disputes Review Board (DRB)	12	13	13	-	28	29	28	31	32	33	3
ADR - Adjudication	5	5	9	7	-	21	22	25	35	35	3
ADR - Early Neutral Evaluation (ENE)	6	5	9	6	14	-	19	22	34	33	2.5
ADR - Partnering	4	6	8	7	13	16	-	18	32	33	2
ADR - Mini-trial	5	4	8	4	10	13	17	-	32	33	3.5
ADR - Arbitration	2	1	2	3	0	1	3	3	-	34	2.5
Litigation	1	0	2	2	0	2	2	2	1	-	2
	Negotiation	Estimate Cost Resolution	ADR - Mediation	ADR - Disputes Review Board (DRB)	ADR - Adjudication	ADR - Early Neutral Evaluation (ENE)	ADR - Partnering	ADR - Mini-trial	ADR - Arbitration	Litigation	Duration (month)

Poor Financing from Contractors											
Negotiation	-	23	21	19	30	33	32	31	32	34	2
Estimate Cost Resolution	12	-	18	19	28	28	30	30	34	35	2.5
ADR - Mediation	14	17	-	17	26	28	28	30	31	34	2.5
ADR - Disputes Review Board (DRB)	16	16	18	-	25	26	29	27	32	33	3
ADR - Partnering	5	7	9	10	-	20	22	20	32	33	2
ADR - Mini-trial	2	7	7	9	15	-	20	22	33	34	3
ADR - Adjudication	3	5	7	6	13	15	-	19	32	34	3
ADR - Early Neutral Evaluation (ENE)	4	5	5	8	15	13	16	-	32	33	3
ADR - Arbitration	3	1	4	3	3	2	3	3	-	35	2.5
Litigation	1	0	1	2	2	1	1	2	0	-	2.5
	Negotiation	Estimate Cost Resolution	ADR - Mediation	ADR - Disputes Review Board (DRB)	ADR - Partnering	ADR - Mini-trial	ADR - Adjudication	ADR - Early Neutral Evaluation (ENE)	ADR - Arbitration	Litigation	Duration (month)

Contractor Willingness - variation initiated											
Negotiation	-	24	21	26	31	33	32	33	34	33	2
ADR - Mediation	11	-	19	19	30	32	31	32	34	34	2.5
ADR - Disputes Review Board (DRB)	14	16	-	21	28	31	32	31	33	33	3
Estimate Cost Resolution	9	16	14	-	28	30	30	31	35	34	2.5
ADR - Partnering	4	5	7	7	-	19	18	21	34	34	2.5
ADR - Early Neutral Evaluation (ENE)	2	3	4	5	16	-	21	23	33	33	3
ADR - Mini-trial	3	4	3	5	17	14	-	19	32	33	3
ADR - Adjudication	2	3	4	4	14	12	16	-	35	33	3
ADR - Arbitration	1	1	2	0	1	2	3	0	-	33	2.5
Litigation	2	1	2	1	1	2	2	2	2	-	2.5
	Negotiation	ADR - Mediation	ADR - Disputes Review Board (DRB)	Estimate Cost Resolution	ADR - Partnering	ADR - Early Neutral Evaluation (ENE)	ADR - Mini-trial	ADR - Adjudication	ADR - Arbitration	Litigation	Duration (month)

Underestimation and incompetence of contractors											
Negotiation	-	22	22	25	32	33	32	31	34	33	2.5
ADR - Disputes Review Board (DRB)	13	-	16	17	31	32	29	31	33	33	3
ADR - Mediation	13	19	-	16	28	30	30	29	34	33	2.5
Estimate Cost Resolution	10	18	19	-	27	27	31	29	34	34	2.5
ADR - Mini-trial	3	4	7	8	-	18	22	25	33	33	3
ADR - Early Neutral Evaluation (ENE)	2	3	5	8	17	-	18	22	33	33	3
ADR - Adjudication	3	6	5	4	13	17	-	20	34	34	3
ADR - Partnering	4	4	6	6	10	13	15	-	34	33	2
ADR - Arbitration	1	2	1	1	2	2	1	1	-	34	2.5
Litigation	2	2	2	1	2	2	1	2	1	-	2.5
	Negotiation	ADR - Disputes Review Board (DRB)	ADR - Mediation	Estimate Cost Resolution	ADR - Mini-trial	ADR - Early Neutral Evaluation (ENE)	ADR - Adjudication	ADR - Partnering	ADR - Arbitration	Litigation	Duration (month)

Force Majeure											
Negotiation	-	17	21	22	29	28	29	30	33	33	1.5
ADR - Mediation	18	-	17	20	29	30	30	30	34	33	2
Estimate Cost Resolution	14	18	-	18	30	28	31	32	34	33	2
ADR - Disputes Review Board (DRB)	13	15	17	-	28	28	29	29	34	33	2
ADR - Partnering	6	6	5	7	-	18	22	21	34	33	1.5
ADR - Adjudication	7	5	7	7	17	-	15	21	34	34	2
ADR - Mini-trial	6	5	4	6	13	20	-	23	33	33	2
ADR - Early Neutral Evaluation (ENE)	5	5	3	6	14	14	12	-	33	33	2
ADR - Arbitration	2	1	1	1	1	1	2	2	-	34	2.5
Litigation	2	2	2	2	2	1	2	2	1	-	2.5
	Negotiation	ADR - Mediation	Estimate Cost Resolution	ADR - Disputes Review Board (DRB)	ADR - Partnering	ADR - Adjudication	ADR - Mini-trial	ADR - Early Neutral Evaluation (ENE)	ADR - Arbitration	Litigation	Duration (month)

Economic Fluctuations											
ADR - Mediation	-	18	21	24	32	35	33	34	34	35	2
Negotiation	17	-	20	22	28	31	30	32	34	35	1.5
Estimate Cost Resolution	14	15	-	21	28	29	28	30	34	35	2
ADR - Disputes Review Board (DRB)	11	13	14	-	23	27	27	26	33	34	1.5
ADR - Partnering	3	7	7	12	-	18	24	25	34	34	2
ADR - Early Neutral Evaluation (ENE)	0	4	6	8	17	-	21	17	34	34	2
ADR - Mini-trial	2	5	7	8	11	14	-	19	32	34	2
ADR - Adjudication	1	3	5	9	10	18	16	-	33	35	2
ADR - Arbitration	1	1	1	2	1	1	3	2	-	34	2.5
Litigation	0	0	0	1	1	1	1	0	1	-	2.5
	ADR - Mediation	Negotiation	Estimate Cost Resolution	ADR - Disputes Review Board (DRB)	ADR - Partnering	ADR - Early Neutral Evaluation (ENE)	ADR - Mini-trial	ADR - Adjudication	ADR - Arbitration	Litigation	Duration (month)

Changes in laws and regulations											
Negotiation	-	20	19	23	33	31	33	29	33	34	2
Estimate Cost Resolution	15	-	20	21	29	31	29	32	33	33	2
ADR - Disputes Review Board (DRB)	16	15	-	16	29	28	30	29	33	33	2
ADR - Mediation	12	14	19	-	23	27	27	27	33	34	2
ADR - Partnering	2	6	6	12	-	15	19	20	34	35	1.5
ADR - Early Neutral Evaluation (ENE)	4	4	7	8	20	-	16	20	34	34	2.5
ADR - Adjudication	2	6	5	8	16	19	-	20	32	34	2.5
ADR - Mini-trial	6	3	6	8	15	15	15	-	35	35	2.5
ADR - Arbitration	2	2	2	2	1	1	3	0	-	35	2.5
Litigation	1	2	2	1	0	1	1	0	0	-	2.5
	Negotiation	Estimate Cost Resolution	ADR - Disputes Review Board (DRB)	ADR - Mediation	ADR - Partnering	ADR - Early Neutral Evaluation (ENE)	ADR - Adjudication	ADR - Mini-trial	ADR - Arbitration	Litigation	Duration (month)

Fig 4. Pair Comparison Analysis

Based on the aforementioned data, it was found that the dispute resolution methods for disputes caused by contractual document issues (Poor Contract Document, Late Approval from the municipality/different government authority, and Ambiguous Contract Document) indicates that Negotiation is the dominant dispute resolution method with a target resolution within 2 months. Next, it is followed by the Dispute Review Board (DRB) method with an estimated resolution target of 2 months. The third dispute resolution method is Estimate Cost Resolution with a target duration of 2 months. Next, it is followed by the Partnering method (4 months), Early Neutral Evaluation (4 months), Mini-trial (3 months), Adjudication. (2 months). Additionally, in the group of disputes caused by contractual document issues, it was found that the dispute resolution methods through Arbitration and Litigation always rank 9th and 10th in the order of dispute resolution processes, with each having an estimated target resolution duration of 2 months. From the results of the respondent survey, it was found that the order of dispute resolution methods for the causes of disputes in the group of work drawing document issues (Change order of project management procedure and Project Design / Technical Issue) shows that Negotiation is the dominant dispute resolution method with a maximum estimated duration of 1 month. This is followed by the dispute resolution method through Mediation with an estimated target resolution duration of 3 months. The third dispute resolution method is Estimate Cost Resolution with a maximum target resolution duration of 3 months.

This is followed by the dispute resolution methods through the Dispute Review Board (3 months), Partnering (5.5 months), Adjudication (4 months), Early Neutral Evaluation (4 months), and Mini-trial (4 months). The dispute resolution methods of Arbitration and Litigation consistently rank 9th and 10th in the dispute resolution processes, each with an estimated target resolution duration of 2.5 months. From the results of the respondent survey, it was found that the order of dispute resolution methods for the causes of disputes in the owner issue group (Owner Willingness – Variation Initiated and Poor Financing from Owner) revealed that Negotiation is the dominant dispute resolution method with an estimated target resolution time of 1 month. This is followed by the Mediation method with a target resolution time of 3 months. The third dispute resolution method is Estimate Cost Resolution with an estimated target resolution duration of 2 months. This is followed by the Disputes Review Board method (2 months), Partnering (2 months), Mini-trial (2 months), Adjudication (3 months), and Early Neutral Evaluation (2.5 months). Additionally, it was found that the dispute resolution methods through Arbitration and Litigation consistently ranked 9th and 10th in dispute resolution, with maximum durations of 2 months and 2.5 months, respectively. From the survey results, it was found that the dispute resolution methods for the causes of disputes in the contractor issue group (Poor Financing from Contractors, Contractor Willingness - variation initiated, and Underestimation and incompetence of contractors) revealed that Negotiation is the dominant dispute resolution method with a maximum estimated dispute resolution target of 2 months, followed by the Disputes Review Board (DRB) method with a maximum dispute resolution target of 3 months. T

The third dispute resolution method is Estimate Cost Resolution with an estimated duration target of 2.5 months. This is followed by Mediation (2.5 months), Adjudication (3 months), Partnering (2 months), Early Neutral Evaluation (3 months), and Mini-trial (3 months). Additionally, it was found that the dispute resolution methods through Arbitration and Litigation consistently ranked 9th and 10th in dispute resolution, each with an estimated duration target of 2.5 months. From the results of the respondent survey, it was found that the dispute resolution methods in the group of other external issues (Force Majeure, Economic Fluctuations, Changes in laws and regulations) revealed that Negotiation is the dominant dispute resolution method with an estimated target resolution time of 2 months. This is followed by the Disputes Review Board (DRB) method with a maximum estimated target resolution time of 2 months. The third dispute resolution method is Mediation with an estimated target resolution time of 2 months. This is followed by the Estimate Cost Resolution method (2 months), Mini-trial (2 months), Partnering (1.5 months), Early Neutral Evaluation (2 months), and Adjudication. (2 bulan). Additionally, in the group of disputes caused by issues with working drawings, it was found that the methods of dispute resolution through Arbitration and Litigation consistently ranked 9th and 10th in dispute resolution, each with an estimated target resolution time of 2.5 months.

IV. CONCLUSION

Conflicts are common in Indonesia's construction sector. There are 13 causes of disputes identified and validated by professional construction stakeholder in Indonesia. These are segregated by 5 category which are Contractual Document Issue (Poor Contract Document, Late Approval from the municipality/different government authority, and Ambiguous Contract Document), Work Design Drawings (Change order of project management procedure and Project Design / Technical Issue), Owner's Issue (Owner Willingness – Variation Initiated and Poor Financing from Owner), Contractor's Issue (Poor Financing from Contractors, Contractor Willingness - variation initiated, and Underestimation and incompetence of contractors), and Other External Issue (Force Majeure, Economic Fluctuations, and Changes in laws and regulations).

Ten dispute resolution techniques were identified and validated also by professional construction stakeholder in Indonesia. These are Negotiation, Alternative Disputes Resolution (Arbitration, Dispute Review Board, Partnering, Mini-trials, Early neutral evaluation, Adjudication, and Mediation), Litigation, and Estimate Cost Resolution. This study develops a flow process paradigm for dispute resolution to mitigate impacts to time performance. Different rankings of dispute resolution methods for each dispute's causes were also derived from the study's findings. It will help Indonesian construction Industry to prepare the suitable process of disputes resolution method for each dispute's causes.

REFERENCES

- [1] Al-Humaidi, H. M. (2014). Arbitration in Kuwait: Study of Current Practices and Suggestions for Improvements. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, 6(1), 03013001. [https://doi.org/10.1061/\(ASCE\)LA.1943-4170.0000128](https://doi.org/10.1061/(ASCE)LA.1943-4170.0000128) "An Overview Of Dispute Resolution Procedures In Road Projects With Reference To The Fidic Form Of Contract And Suggestions For Improvements" † Pr A B I N Ch A N D R A Gu P T A * A N D Kr I S H N A N Ve N K A T A R A M A N **. (n.d.).
- [2] Cakmak, E., & Cakmak, P. I. (2014a). An Analysis of Causes of Disputes in the Construction Industry Using Analytical Network Process. *Procedia - Social and Behavioral Sciences*, 109, 183–187. <https://doi.org/10.1016/j.sbspro.2013.12.441>
- [3] Chan, E. H. W., Henry, S., Suen, C. H., & Chan, C. K. L. (n.d.). *MAUT-Based Dispute Resolution Selection Model Prototype for International Construction Projects*. <https://doi.org/10.1061/ASCE0733-93642006132:5444>
- [4] Chong, H. Y., & Zin, R. M. (2012). Selection of dispute resolution methods: Factor analysis approach. *Engineering, Construction and Architectural Management*, 19(4), 428–443. <https://doi.org/10.1108/09699981211237120>
- [5] Corby, S. (n.d.). *Public Sector Disputes and Third Party Intervention Evaluating the role of legislation in disability employment gaps View project Analysing Disability Discrimination Employment Tribunal Cases View project*. <https://www.researchgate.net/publication/228397279>

- [6] Dangrochiya, N., Rathod, H., & Professor, A. (n.d.). *A REVIEW ON CAUSES OF DISPUTES IN CONSTRUCTION INDUSTRY*. www.ijaresm.net
- [7] E, D. J., & J, G. M. (1995). Are Contract Disputes Predictable? *Journal of Construction Engineering and Management*, 121(4), 355–363. [https://doi.org/10.1061/\(ASCE\)0733-9364\(1995\)121:4\(355\)](https://doi.org/10.1061/(ASCE)0733-9364(1995)121:4(355))
- [8] El-Sayegh, S., Ahmad, I., Aljanabi, M., Herzallah, R., Metry, S., & El-Ashwal, O. (2020a). Construction disputes in the UAE: Causes and resolution methods. *Buildings*, 10(10). <https://doi.org/10.3390/BUILDINGS10100171>
- [9] Elziny, A. A., Mohamadien, M. A., Ibrahim, H. M., & Abdel Fattah, M. K. (2016). An expert system to manage dispute resolutions in construction projects in Egypt. *Ain Shams Engineering Journal*, 7(1), 57–71. <https://doi.org/10.1016/j.asej.2015.05.002>
- [10] Gould, N. (2004). *Dispute Resolution In The Construction Industry: An Overview*.
- [11] Hall, J. M. (2002). Ineffective communication: Common causes of construction disputes. *Alliance's Advisory Council Legal Notes*, 13(2).
- [12] Illankoon, I. M. C. S., Tam, V. W. Y., Le, K. N., & Ranadewa, K. A. T. O. (2022). Causes of disputes, factors affecting dispute resolution and effective alternative dispute resolution for Sri Lankan construction industry. *International Journal of Construction Management*, 22(2), 218–228. <https://doi.org/10.1080/15623599.2019.1616415>
- [13] Institute of Electrical and Electronics Engineers., IEEE Technology Management Council. Hong Kong Chapter., IEEE Technology Management Council. Singapore Chapter., & IEEE Singapore Section. (2009). *IEEM 2009 : 8 to 11 December, Hong Kong : the IEEE International Conference on Industrial Engineering and Engineering Management*. IEEE.
- [14] J Harmon, K. M. (2003a). *Resolution Of Construction Disputes: A Review of Current Methodologies Leadership and Management in Engineering* (Vol. 3, Issue 4).
- [15] *Jurnal 12 - The art of Negotiation in the Construction Contract Disputes*. (n.d.).
- [16] Liu, J., Li, H., Skitmore, M., & Zhang, Y. (2019a). Experience mining based on case-based reasoning for dispute settlement of international construction projects. *Automation in Construction*, 97, 181–191. <https://doi.org/10.1016/j.autcon.2018.11.006>
- [17] London, K. (2004). *Dispute Avoidance and Resolution A Literature Review*. www.construction-innovation.info
- [18] Mashwama, N., Thwala, W. D., & Aigbavboa, C. O. (2019). *The Impact of Construction Dispute on Projects in the Mpumalanga Province of South Africa*. 454–462. <https://doi.org/10.3311/ccc2019-063>
- [19] Radulescu, C. Z., Balog, A., Bajenaru, L., & Radulescu, D. M. (n.d.). *Multi-Criteria Decision Making Software Products-A Comparison and Ranking in Terms of Usability and Functionality*. <http://www.orms-today.org/surveys/das/das.html>
- [20] Safinia, S. (2014). A Review on Dispute Resolution Methods in UK Construction Industry. *International Journal of Construction Engineering and Management*, 3(4), 105–108. <https://doi.org/10.5923/j.ijcem.20140304.01>
- [21] Soni, S., Pandey, M., & Agrawal, S. (2017). Conflicts and Disputes in Construction Projects: An Overview. *International Journal of Engineering Research and Applications*, 07(06), 40–42. <https://doi.org/10.9790/9622-0706074042>
- [22] Thompson, R. M., Vorster, M. C., Beliveau, Y. J., & De La Garza, J. M. (1998). *Efforts To Manage Disputes In The Construction Industry: A Comparison Of The New Engineering Contract And The Dispute Review Board Master of Science In Civil Engineering*.
- [23] Zakaria, Z., Ismail, S., & Yusof, A. (2013). Cause and Impact of Dispute and Delay the Closing of Final Account in Malaysia Construction Industry. *Journal of Southeast Asian Research*, 1–12. <https://doi.org/10.5171/2012.975385>
- [24] PMBOK Construction Extension 2000 Edition.