

Dispute Risk Management in Construction Projects through Effective Contract Management

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Abstract

Original Research Article

Disputes are common in construction projects. The consequences of disputes are negative on a project's successful completion. It requires more time, cost, and effort to find a resolution once a dispute occurs. Disputes also affect a project's triple constraints time, cost, and scope. Therefore, disputes are a risk for any construction project. According to many studies, most of the causes of project disputes relate to contract and contractual matters. Therefore, the purpose of this study was to emphasize the importance of effective contract management to prevent or minimize potential construction disputes. The objective was to identify the factors that improve the effectiveness of contract management. This study used secondary data resources by using existing publications from 2018 to 2022. It identified five different factor categories that affect the effectiveness of contract management. This research also identified gaps and areas that need future research.

Keywords: Construction disputes, dispute risks, causes of disputes, construction risks, contract risks.

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INTRODUCTION

The construction industry is one of the sectors that have a great impact on the economy of any nation. Starting from infrastructure development, the construction sector plays a major role in any country's success. It is worth highlighting that successful project delivery is the key to achieving development goals. Therefore effective construction management is vital for successful project delivery. Risk management, on the other hand, plays an important role as part of construction project management due to uncertainties a project can face from its inception stage to completion.

Construction projects are the results of the team effort of many different parties and include experts such as developers, contractors, designers, and consultants. Therefore, the project environment can be complex with a high level of different risks and uncertainties.

Risk management of a construction project is complex due to the uniqueness of each project. Another issue relevant to construction projects is that many subcontractors are working at the same site with their fleet of workers. Due to different skill levels and cultures, these situations can create risks in construction performance (Brockett *et al.*, 2019).

A study done based on the Kuwait construction industry by AlSabah & Refaat (2019) identified two major categories of risks that are country risks and project risks. According to this study, country risks include stability risks, economic risks, regulatory risks, community risks, and environmental risks. Project risks include engineering risks, production risks, monetary risks, and administrative risks (AlSabah & Refaat, 2019).

When different parties work together to achieve a common goal of delivering a successful construction project, the project environment and nature can create different risks due to the individual goals of each party. In a construction project, the client's goal is to achieve the best functionality and quality for his investment while the contractor aims at profits and client satisfaction (Ayhan, 2019). This behavior of construction projects can also create grounds for disputes.

Disputes are common in construction projects due to different reasons including their nature. Such disputes are a risk for successful project delivery and the project team needs to spend their resources, time, cost, and effort to find a resolution.

According to El-Sayegh *et al.*, (2020), most disputes in construction projects arise due to disagreements between the parties to the contract. Lee *et al.*, (2021) highlight contractual issues as one of the causes of construction disputes that have a greater impact on project performance. According to their studies, most of the contractual disputes could have been avoided with better contract management. The same study shows that over the last years, the number of litigation cases due to disputes has been arising in the construction industry (Lee *et al.*, 2021). Disputes need to resolve effectively to prevent losses for the project. The impact of disputes is negative and resource-consuming (El-Sayegh *et al.*, 2020).

Considering the negative impact of disputes on the performance of construction projects and the impact of contract management on potential construction disputes, this paper discusses dispute risk management in construction projects through effective contract management. The objective of this study is to identify the factors that improve the effectiveness of contract management that prevents or mitigate potential construction disputes.

Purpose

The purpose of this study is to emphasize the importance of effective contract management to prevent or minimize potential construction disputes. This research would first identify the contractual matters that cause disputes through an extensive literature review. The research would then focus on identifying the factors that improve effective contract management. The author expects that this research will be helpful to construction industry professionals to minimize potential disputes.

Problem and Hypothesis

Disputes are inevitable in construction projects. Contract claims and contractual misinterpretations are some of the major causes that create contractual disputes which is a risk for successful project completion. In this study, the author didn't focus on any specific country or region to gather data. Instead, the author assumed that disputes occur in construction projects across the globe and contractual matters as one of the major causes of disputes. Therefore, the study focused on effective contract management as one of the success factors to minimize or prevent disputes.

THEORETICAL BACKGROUND

Risks in construction projects

Due to its nature and complexity, construction projects face many risks during each stage of their lifecycle. The likelihood and consequences of project risks can be different. Therefore, risk analysis and risk management are vital factors to consider during project planning (Srinivas, 2019).

Different risks can occur during different stages of construction projects. Risk is defined as the potential that can cause negative or positive outcomes that have an impact on business performance (Lindauer, 2017). However, organizations need to take risks to achieve their goals. Therefore, it is the same with construction projects where identifying potential risks and mitigating those are vital for successful project performance and delivery.

Every project has potential risks that are specific to the project and those are based on the activities to carry out. Therefore, project managers should identify the risks even before the project starts. Once risks are identified, the next step is to identify the strategy to manage those identified risks (Newton, 2016). Successful risk management of construction projects greatly impacts achieving project scope. Risk management includes active preparation to face future potential incidents. Therefore, undermining construction project risks is not a good strategy as risks can impact on final project outcome (Shibani *et al.*, 2022).

There are two important factors to identify in the risk identification and management process. Those are the likelihood of a risk occurring and its consequences once occur (George, 2020). A project manager also needs to understand the difference between project risks and business risks. He needs to know the likelihood of situations that impacts his project plan (Newton, 2016). Therefore, the identification of construction project risks is beneficial for its better performance.

The risk management process includes seven main steps that are risk management planning, risk identification, qualitative risk assessment, quantitative risk assessment, risk response planning, monitoring and controlling of risks, and evaluation of risk response outcome (Srinivas, 2019). Risk identification is beneficial for effective risk management as this step helps in identifying and allocating risks before a problem occurs. Therefore stakeholders can prepare for potential risks that may occur during project implementation (Srinivas, 2019). Figure 1 shows the risk management process.

In recent research by Zhu *et al.*, (2022) on developing a risk assessment model for international construction projects, they identified four levels of individual project risks. Those four levels are nation/region, trans-nation, organization, and construction which affect a construction project (Zhu *et al.*, 2022). Among the different risk levels, construction level risks include health, safety, and environment (HSE) risk, natural risk, design risk, technical risk, human risk, and material risk (Zhu *et al.*, 2022). Considering the organization level, a construction

project may experience risks such as owner risk, partner

risk, contract risk, and internal risk (Zhu *et al.*, 2022).

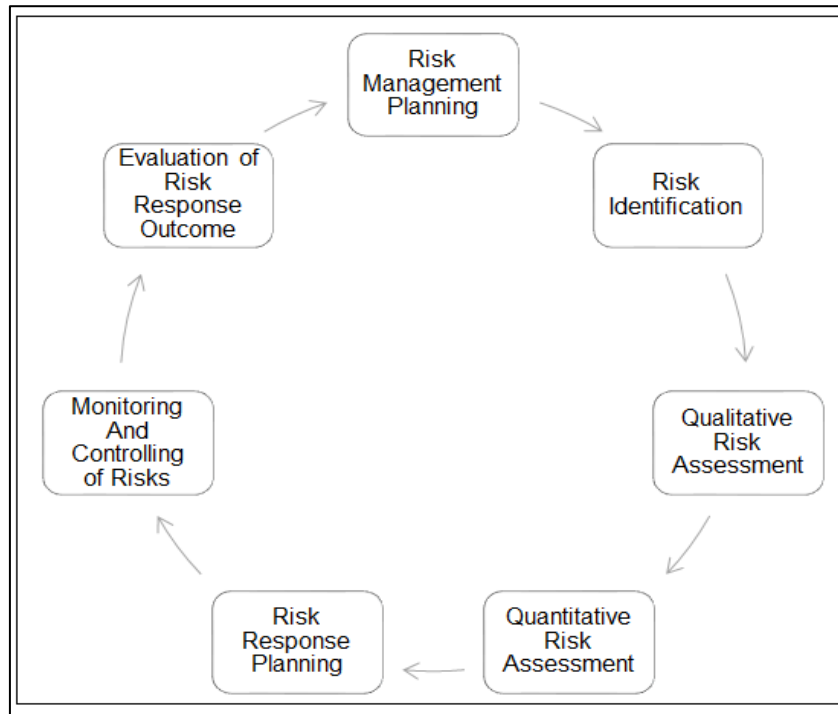


Figure 1: Risk management process
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According to Zhu *et al.*, (2022), nonstandard contracts, different language versions, and vagueness of contract conditions can create contract risks where strong owners, delay in payment, delay in site delivery, nominated subcontractors, engineering changes, unilateral breach of contract and, bankruptcy can impact as owner risk. Poor performance, poor communication, and unilateral breach of contract are other risk events that cause partner risk at the organizational level (Zhu *et al.*, 2022).

All these risk events can impact the performance of a construction project creating delays in delivery and cost overruns from the overall project completion. Therefore, understanding all the possible risks and risky events is vital for project managers and the team to mitigate with a better risk response plan. Figure 2 shows the risk levels for international construction projects.

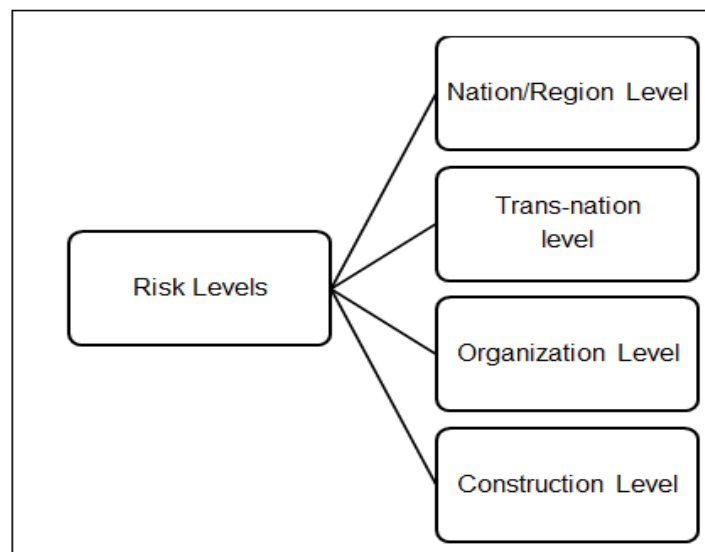


Figure 2: Risk levels for international construction projects
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Risk analysis tools and techniques

Effective risk management enhances project performance and reduces the negative impact of possible threats. Therefore, risk identification and finding risk treatment or management techniques are vital for successful project delivery (Rastogi & Trivedi, 2016). Several tools and techniques are available for project managers to identify risks in construction projects. Below are some tools and techniques available for effective risk identification and analysis.

PESTLE Analysis

PESTLE analysis is a strategic planning tool that is used to analyze the external environment. Although it is a strategic management tool, it is also used in the construction industry to identify how the external environment affects the industry or a project specifically. PESTLE stands for political, economic, social, technological, environmental and legal factors that impact a project (Rastogi & Trivedi, 2016). A project team can use the PESTLE framework to analyze the external risk factors that can impact negatively on construction project performance. Figure 3 shows the PESTLE analysis and the external factors that can create risks.

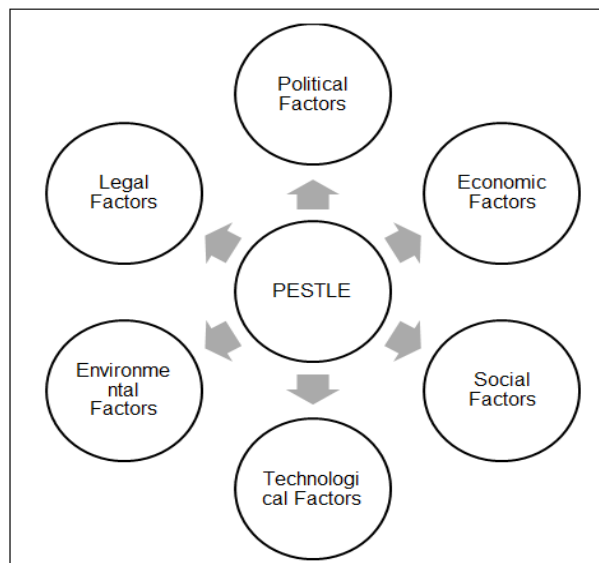


Figure 3: PESTLE Analysis Framework
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SWOT Analysis

SWOT analysis is another risk management tool that can be used for construction projects as well to identify internal and external factors that can impact project performance (Hasina & Fazil, 2021). Project

leaders can use the SWOT analysis tool to identify the Strengths, Weaknesses, Opportunities, and Threats of an organization that can impact negatively on a project. Figure 4 shows the SWOT analysis framework.

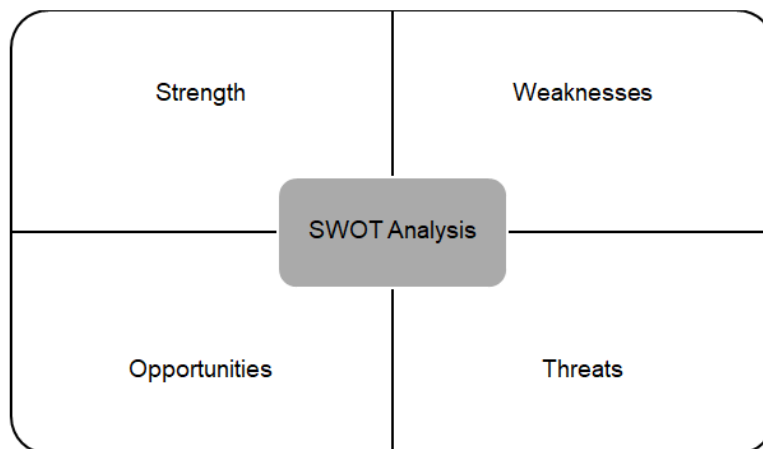


Figure 4: SWOT Analysis Framework
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Ishikawa (Fishbone) Diagram

The Fishbone diagram or Ishikawa diagram is used to identify the causes and effects of possible risks. It is also a suitable tool to identify construction project

risks together with their cause and effect (Oktaviani *et al.*, 2021). Figure 5 shows how the Ishikawa diagram can be used to identify causes and effects of potential risks of a task.

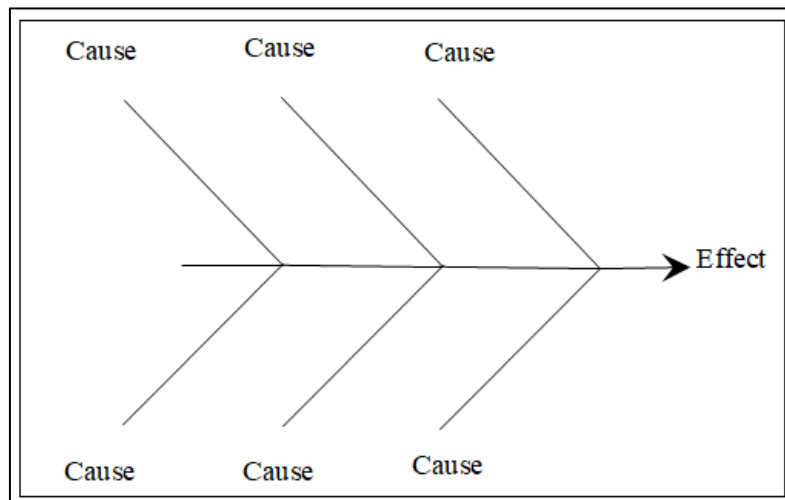


Figure 5: Ishikawa (Fishbone) Diagram

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Construction Disputes

Disputes are common in construction projects due to different reasons. In most projects, the actual site conditions differ from what states in contract documents, which create initial disagreements and arguments. Such causes can create disputes which are a risk for effective construction performance. Sometimes, project arguments and disagreements can lead to major disputes if those are not treated on time. Construction disputes can be varied based on the causes.

Surahyo (2018) identified four different categories of construction disputes which are technical-related, financial, duration and quality-related. The result of construction disputes doesn't help the project to perform well. Instead, the project performance can delay and end up as an unsuccessful project. As mentioned by Duchaussoy (2019), disputes are one of the major factors that prevent successful completion of a construction project.

Construction disputes can impact negatively on relationship between the parties involved in a project. On the other hand, the parties should understand the time, effort and money required for finding a resolution when there is a dispute (Durand, 2019). Due to these reasons and the negative impact of disputes on construction project performance, project leaders need to understand the importance of dispute prevention throughout all the stages of a construction project (Francis & Ramachandra, 2022). Construction disputes are a risk to the project performance and to achieving initially set project goals.

Risks associated with Project Disputes

Potential project risks during project implementation harm performance in terms of project scope, cost, schedule and quality (Newton, 2016). There are one or more causes for project risks and they may or may not happen in future. However, if a risk happens, then there will be one or more impacts on project performance (Newton, 2016).

When a dispute occurs in a construction project, then it requires contractual filing and communication with the relevant parties. In this way, disputes turn into claims. The claims that arise over construction disputes are requests to compensate the damages to any party to the contract (Tanriverdi *et al.*, 2021).

During the project period, some of these claims arise over disputes and are resolved without creating further disputes. However, some claims may end up with negative impacts if the parties are unable to resolve them. In such a scenario, disputes may need judicial intervention or the help of other dispute resolution strategies. Therefore, such construction disputes negatively impact on successful completion of a construction project (Tanriverdi *et al.*, 2021).

Disputes need time for resolving and they are costly. Other than that, disputes can destroy the relationships between parties, especially between the contractor and the employer. Significantly, the completion cost of a project increases together with possible delay (Sabri *et al.*, 2022). Therefore, parties to a construction project need to understand the importance of preventing disputes. If disputes occur,

those should be resolved at the earliest to prevent negative consequences over the project's performance.

Common Causes of Construction Disputes

Most construction projects are complex to handle. Therefore, better project management skills are vital for construction management. On the other hand, there are different groups connected to a project with different goals. This nature of construction projects creates backgrounds and causes for different disputes. If the project team doesn't handle the disputes effectively soon after those arise, it can lead to serious conflicts with a negative impact on project performance (Nguyen & Nguyen, 2020).

Sabri & Torp (2022) identified different causes for disputes in their studies on finding preventive action plans for disputes in construction projects from a Norwegian perspective. Their study revealed a lack of confidence between the contractor and the employer as one of the major causes of construction disputes. Other than that, uneven responsibilities and obligations create grounds for disputes where project award criteria and contracts are other causes of disputes (Sabri & Torp, 2022).

Although numerous reasons cause construction disputes, the most common causes are contract issues, people issues and unforeseen reasons that occur between the stakeholders regarding the contract conditions (Yussof & Zaini, 2022). Some of the contractual matters that cause disputes include poor contract administration, poorly drafted claims, incomplete or failure to substantiate claims, incomplete designs, and errors and omissions in contract documents. Failure to comply with contractual obligations by the parties is another major cause that creates disputes (Yussof & Zaini, 2022).

Hansen (2019) too identified contracts as the major cause of construction disputes. According to him, the quality of contract content, unrealistic expectations of the customer and non-serviceable contract information cause disputes. Other than that, untimely payments are another cause of disputes (Hansen, 2019).

Lack of knowledge of the client, unclear risk allocation, contract type, tender pricing, unrealistic estimations and poor communication are other causes of construction project disputes (Naji *et al.*, 2021). Other causes of construction disputes include the slow response of the client, and errors in design data and design documents (Naji *et al.*, 2021). Project schedule and construction speed, scarcity of capital resources, errors in initial estimates and stakeholder reactions cause disputes (Nguyen & Nguyen, 2020).

According to Nguyen & Nguyen (2020), the quality of project communication and coordination can impact on arising of disputes. Another major dispute

cause is the contractor's professional capacity. On the other hand, the resource limitations of the contractor can impact contractual relations and this can increase tension between the parties. Such situations can cause contract disputes (Nguyen & Nguyen, 2020).

According to Fadhlullah *et al.*, (2019), the corporation between the employer, contractor and designer can cause disputes if the cooperation is inefficient. When there are sub-contractors, the delay of payment by the main contractor can impact performance and eventually this can lead to delay and poor performance of the main contractor. As a result, it can cause disputes regarding project delays (Fadhlullah *et al.*, 2019).

Nguyen & Nguyen (2020) categorized two major categories of construction dispute causes. These two categories are disputes related to construction techniques and disputes related to human behaviour. Figure 6 shows the major categories of construction dispute causes.

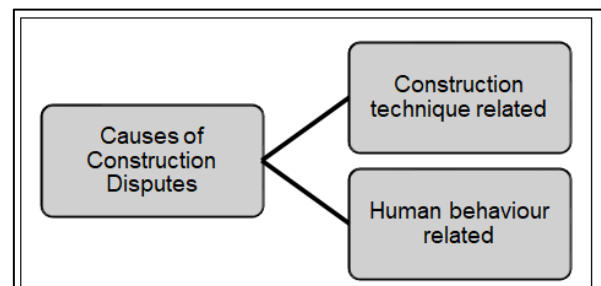


Figure 6: Major categories of construction dispute causes

Note. Figure is done by the author

Other than the above causes, inappropriate team selection can create disputes between the parties that can impact negatively on project performance. Employers' decisions on contract type, project delivery and procurement methods affect the construction performance at a later stage. If the employer does not choose the appropriate contract type and procurement methods, this can create grounds for major disputes during the project implementation stage (Hasanzadeh *et al.*, 2018).

Effects of contract management on disputes

Effective contract management is essential for any construction project to be successful. According to Clark (2021), wise contract management and managing the people are two areas to pay attention to minimize or prevent disputes. The contract document includes obligations of all parties to the contract and hence project leaders should understand the terms and conditions of the contract for successful management of the project. However, misunderstanding, negligence or unawareness of contract obligations are causes of contract disputes (Clark, 2021). Therefore, the understanding of each party's rights and obligations is

important and parties should work to fulfil their obligations. This will help in delivering a successful project by minimizing possible disputes (Clark, 2021).

On the other hand, when there are different opinions and suggestions among the teams, senior management can involve quickly resolving possible disputes (Clark, 2021). Contract documents and agreed terms and conditions are helpful in such situations and therefore, better contract management has a big impact on dispute avoidance of a construction project from the early stages of a project (Clark, 2021).

Many studies have revealed contractual issues as one of the major causes of construction disputes. Therefore, poor contract management is the main cause of disputes. On the other hand, due to the complex nature of construction contract documents, some parties to a contract try to hide important provisions in contract documents for their benefit (Lee *et al.*, 2019). All these reasons show the importance of effective contract management for a successful construction project.

The definition of contract management indicates how this activity can improve the performance of a construction project. Contract management is an

activity that helps in managing a contract agreement properly to control the project work. Therefore, in contract management, the signed contract agreement is used as guidance (Hayati *et al.*, 2019).

How effective contract management can prevent disputes

There are four major activities involved in the Contract Management of a construction project. The four activities are preparation for contracting, development of contract for project guidelines, preparation of the contract for project control and, administration and recording of guidelines as a project controlling tool (Hayati *et al.*, 2019). Figure 7 shows the major contract administration activities.

Mohamed *et al.*, (2014) suggest effective claim management as a means of minimizing construction disputes. According to them, behavioural problems, contractual problems, and operational problems are the three categories that cause disputable claims (Mohamed *et al.*, 2014). These claims are with potential to cause disputes that can impact negatively on project performance. Therefore, effective claim management which is a part of contract management helps in reducing potential disputes

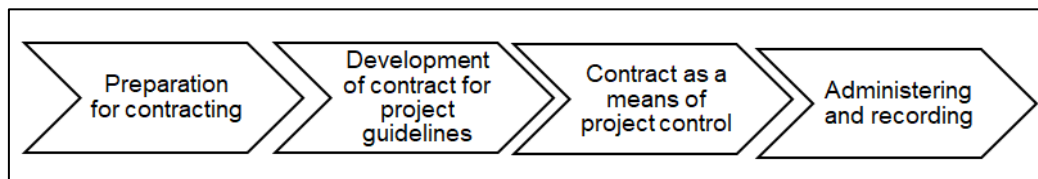


Figure 7: Major contract administration activities

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Lee *et al.*, (2019) identified the importance of knowledge of the legal terms and conditions of the contract. Contract terms and conditions such as liquidated damages, extension of time, payments etc. are quoted in most legal decisions relevant to construction disputes. Therefore, Lee *et al.*, (2019) emphasise the importance of knowing the terms and conditions that affect final litigation decisions.

Their study identified a similar pattern of disputes that occurred within their selected period for the research. That shows a repeated pattern of contractual causes where similar disputes are being repeated even today. Therefore, Lee *et al.*, (2019) suggest the importance of learning from past mistakes and failures to solve current problems that have the potential on creating disputes.

Many researchers emphasize the importance of contract management to minimize potential disputes in construction projects. Most of the recent studies on this topic reveal contractual matters as a major cause of construction disputes highlighting the importance of treating it (Saeb *et al.*, 2019). Due to the use of different

standard contracts, contractual knowledge of these documents is important to understand and manage a contract effectively.

Factors that improve contract management of a construction project

Several studies show the importance of contract management and administration for successful project completion. However, misunderstanding the contract administration team's roles and responsibilities affects overall performance. Poor planning, lack of systems and procedures, lack of understanding of the procurement process and skill gaps of the teams are some of the reasons for failure in contract administration of a construction project.

Lack of monitoring of contract activities and delays in approvals are other causes of contract management failure (Gunduz & Hesham, 2020). Therefore, project teams need to identify the factors that improve contract management and hence the overall success of a construction project.

Construction Project Phases

There are three phases for a construction project. Those phases are namely, the pre-construction phase, construction phase and post-construction phase (Klinger & Susong, 2006). During the preconstruction stage, the main activities are project initiation and project design. Material procurement and construction activities are the main activities during the construction stage of a project until the handing over.

During the post-construction stage, the team should focus on project finalizing activities and handing over (Klinger & Susong, 2006). Once the contractor achieves all the project milestones and final completion, he hands over the project to the owner. After this stage, the owner has the full right to occupy and maintain the handed-over structure. However, the handing over of a project is linked with the owner’s responsibility of completing payments including the release of retention money and the contractor’s responsibility of completing all the works according to the contract scope (Klinger & Susong, 2006).

A well-written contract document includes all the rights and obligations of parties to the contract and hence contract administration is important in all the project phases for the successful completion of a project. Table 1 shows important milestones and obligations of parties to the contract during different phases of a construction project.

The project team needs to complete all the activities included in all three phases of a construction project for successful Final completion. Failure of completing any of the necessary activities can cause the risk of disputes. Therefore, effective contract administration is vital in each phase of a project. The establishment of communication and decision-making processes is vital when a construction project is initiated (Klinger & Susong, 2006). A well-established project control system provides solutions for potential problems that can encounter during the project implementation.

Table 1: Construction project phases and major tasks

Pre-construction phase	Construction phase	Post-construction phase
Planning, budgeting, permitting Preliminary cost estimating Constructability review Value engineering Choosing the contract method Bidding Choosing the contractor and project award	Managing the construction process (Request for information, Manage delay, change order management, claims, dispute resolution etc.) Activities before the construction start (submittals & approvals, shop drawings etc.) Achieve construction milestones (mobilization, ground breaking etc.)	Completion of the project Substantial completion Certificate of occupancy Submission of closeout documents (As-built drawings, warranties etc.) Final completion

Note. Tabulation is done by the author

For a successful project completion, the Contract management team need to ensure that the work is done according to the contract. Mainly, there are four stages of the contract management lifecycle. The stages are planning, organizing, directing or executing, and

control. Therefore, the contract team need to be proactive and monitor the contract regularly in each stage of its lifecycle (Nieman, 2017). Figure 8 shows things that improve contract management activities in each stage of its lifecycle.

Planning	Organizing	Directing/Executing	Control
<ul style="list-style-type: none"> •Identify opportunities •Documentation •Bidding process 	<ul style="list-style-type: none"> •Structuring the activities •Establish communication channels •Integrate contract milestones with project schedule •Establish submission procedures and mechanisms 	<ul style="list-style-type: none"> •Selecting contractors/suppliers and award •Quality control •Monitor & followup deliverables •Evaluate contractor/supplier and close 	<ul style="list-style-type: none"> •Regular progress meetings •Early warning signals for issues •Maintain contract documents •Monitoring & reporting

Figure 8: Activities during stages of Contract Management Lifecycle

Note. Figure is done by the author

METHODOLOGY

For this study, the author studied and analysed existing literature to find out the factors that improve the effectiveness of construction contract management. According to Graulich *et al.*, (2021), a literature review process provides a better understanding and knowledge about existing knowledge on a topic in discussion. Therefore, existing literature provides a solid starting

point for everyone interested in a particular topic. The existing literature serves the purpose of providing information and data around a topic that minimises the requirement of collecting primary data (Paré & Kitsiou, 2017). Further, it is easy to identify future research needs by conducting a literature review. For this literature review, the author followed the below steps in figure 9 to collect and evaluate the existing literature.

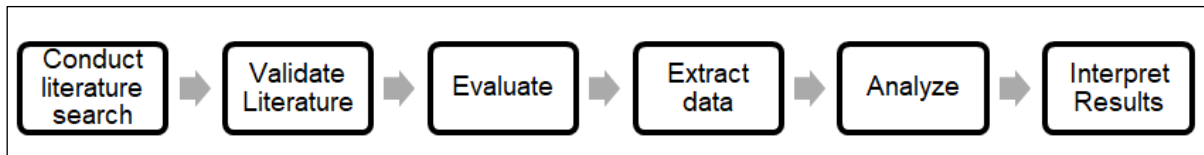


Figure 9: Main Steps of Literature Review Process

Note. Figure is done by the author

The author used Google scholar search engine as the main source to find and study the existing literature that is written around construction disputes and contract administration topics. Other than that, the author also referred to existing literature that is written in topics such as project management and construction risk management. During this literature review, the author also experienced difficulty in finding recent studies on construction disputes and literature that emphasise the importance of effective contract management. Using the Google scholar for existing literature, the author used keywords such as ‘construction disputes’, ‘construction contract management’ and ‘dispute management’ or a mix of these keywords to retrieve existing literature.

Criteria used for selecting existing literature

While the search engines give a huge number of search results, not all literature was analysed for this study. Instead of that, below is the criteria used for choosing the literature for this study.

- Papers published from 2018 to 2022 were used to ensure the secondary data used for this study was the latest research data.
- Only papers in English are analysed.
- The paper needs to discuss the relevant topics such as construction disputes and contract administration.
- Only the papers that were published in scientific journals are included.
- The papers which available with free open access are included.

Following this criterion, the author removed some existing literature from this study due to not following the above requirements.

The first round of searches in these databases showed up around 1,820,000 papers. However, further reading and analysis resulted in 14 pieces of existing literature that are relevant to the paper selection criteria and the study topic of this paper. Author analysed and

studied these 14 papers to collect data to find out the factors that improve the effectiveness of construction contract management.

RESULTS AND FINDINGS

Existing literature shares relevant facts and factors that help in improving the contract administration of construction projects. As discussed throughout this paper, effective contract management helps in minimizing contractual disputes where disputes are a risk for successful project completion. According to Zhao *et al.*, (2018), the differences in management style and organizational response impact contractual complexity.

The research done by Saeed (2018) on Cost and Time Risk Management in Construction Projects identified poor contract management as one of the causes of delay and cost overrun which are also causes of disputes. Further, inadequate planning, poor estimation and changes to the project during construction lead to delays and cost overruns. This can result in poor business performance. Therefore, he suggests providing better construction planning at the beginning of the project to reduce the impact on performance. Improved communication between parties to the contract can significantly impact project control (Saeed, 2018).

According to Zheng (2018), contract management should be the core of project management. The scope of contract management includes the entire implementation of a project. Therefore, construction companies need to cultivate contract management talents. He suggests a few suggestions to improve the contract management system. These include improvement of the laws and regulations of project contract management and improvement of the legal awareness of both parties. He also emphasizes the importance of training and improving contract management talent. Another suggestion is to establish contract management principles to enhance overall contract management methods (Zheng, 2018).

Thamrin & Latief (2018) identified four risk factors that can cause claims and disputes in the end. An unclear contract financing system, uncontrolled budget, project completion delay due to late payments and the risk of violation of regulations due to delay in obtaining a permit are the risk factors that can cause claims and disputes (Thamrin & Latief, 2018). To prevent future disputes due to these risk factors, Thamrin & Latief (2018) suggest implementing a clear financing system, limiting the exchange rate in contracts, owner to make sure that all funding is ready before he appoints the contractor and not to start work until permits are obtained.

Kamble *et al.*, (2019) suggest project leaders focus on improving Record Keeping as it is the key to proper contract management. They further highlight the importance of the study of law because of the effect of knowledge of legal doctrine in reducing the impact of litigation. According to Faraji (2019), smart contracts enhance trust, decentralization and peer to peer and bilateral connections. Further, it supports the requirement for digitalization in the entire construction industry. Smart construction contracts can manage legal issues, funds and other aspects of project contract management.

Hayati *et al.*, (2019) suggest risk-based contract management strategy to minimize disputes on design and build construction projects. Not only design and build construction projects, other projects too can follow some of the suggestions of this study to minimize disputes. According to Hayati *et al.*, (2019), a full review of tender documents is helpful to identify possible errors before they cause disputes in future. Luo *et al.*, (2019) emphasize the importance of effective construction contract management to protect all stakeholders' interests. It helps in decreasing possible delays which is a cause of disputes. Further, Luo *et al.*, (2019) propose a blockchain-based smart construction contract framework for interim payments.

Shaikh *et al.*, (2020) highlight the importance of paying attention to contract claims before it cause disputes. According to their studies, delay claims and extra work claims are more common in construction projects. On the other hand, delay of payment is the major cause of contract claims (Shaikh *et al.*, 2020).

They also suggest paying careful attention in the preparation of contract clauses during the design stage. Further, it is important to clearly mention the clauses for extra work claims and delayed payments.

The client and contractor should work together to resolve issues on claims during their early stage of arising to prevent future disputes (Shaikh *et al.*, 2020).

According to Koc & Pelin (2021), the readability and comprehensibility of contracts are important to minimize possible disputes. They identified conflicting interpretations of clauses that can create readability risks and potential disputes. They suggest improving contract management by reducing readability risks. Readability risks can arise due to the complexity of nouns, ambiguous words or unnecessarily long sentences that lead to various interpretations (Koc & Pelin, 2021).

Lee *et al.*, (2021) emphasize the importance of contract conditions in dispute resolution that are mutually agreed upon. Therefore, an in-depth review of contract conditions is vital. Sabri & Torp (2022) introduced a correction and preventive action plan for construction disputes through their studies from a Norwegian perspective. However, their suggestions are valid for other countries as well. They suggest the development of a method for preparing better tender documents. Training and better communication between the parties, trust building, preventing from awarding of contracts to the lowest bidder and dispute resolution along the way are suggestions for minimizing disputes (Sabri & Torp, 2022).

Further, a previous study by the author revealed communication between the teams in a construction project as a key factor for minimizing disputes. Human factors, technical factors, organizational, cultural and environmental factors impact effective communication between the teams and hence it minimizes or prevents disputes. Therefore, through this study, the author further suggests communication as an important factor for effective contract management to reduce the risks of disputes (Gamage, 2022).

According to the literature reviewed, contract management during all phases of a construction project is important for successful project delivery. On the other hand, most of the common and major causes of construction disputes are due to poor contract management. This study identified several factors that improve the effectiveness of contract management. The author further categorized the identified factors into four major categories that are human factors, technical factors, organizational factors and statutory factors. These four-factor categories are shown in Table 2.

Table 2: Factors that improve the effectiveness of contract management to minimize disputes in construction projects

Factor Category	Factors
Human factors	Providing better construction planning at the beginning of a project Improved communication between parties to the contract Risk based contract management strategy A full review of tender documents Pay attention to contract claims before it cause disputes Pay careful attention in preparation of contract clauses and reduce readability risk of clauses Maintain better communication between the parties and aim on trust building, Improve Record Keeping of the project
Technical factors	Consider Smart contract solutions
Organizational factors	Improvement of the legal awareness of both parties Provide training and improve the contract management talent Establish contract management principles to enhance overall contract management methods Implement a clear financing system Owner to make sure that all funding is ready before he appoints the contractor Do not to start work until permits are obtained Method for preparing better tender documents. Prevent from awarding contracts to the lowest bidder Dispute resolution along the way In-depth review of contract conditions before signing a contract
Statutory factors	Improvement of the laws and regulations of project contract management

Note. Tabulation is done by the author

The identified factors improve the contract management effectiveness. Further, this study also revealed that poor contract management is one of the major causes of construction disputes. Therefore, by addressing these factors effectively, a project team can minimize or prevent possible disputes that negatively impact the project performance. In this way, project leaders can mitigate risks due to contract disputes.

CONCLUSION

The objective of this study was to identify the factors that improve the effectiveness of contract management. Most of the common causes of construction disputes are due to the reasons of poor contract management from its inception stage to the final completion stage. Therefore, identification of the factors that can improve contract management of construction projects can impact positively minimizing disputes. Project leaders can focus on these factors to improve the contract management process and hence reduce potential disputes. This will lead to successful project completion by achieving its goals in terms of scope, time, cost and quality.

Author further categorized the identified factors into four main categories which are human factors, technical factors, organizational factors and statutory factors. While it may need government involvement to change statutory factors, the contract management team of a project can improve the human factors for better contract administration of a project. Although the contract management team can influence organizational factors, the top-level management decisions are important in some cases to implement the identified solutions. Therefore, instead of only human

factors, another category was created for organizational factors.

With the current trend in digital transformation in the construction sector, organizations can consider adopting smart contract solutions to improve contract management to minimize disputes. This is categorized under technological factors.

During this study, it is found that most of the causes for disputes are repeating. These identified factors address the common causes of disputes. Therefore, project leaders and the contract management team can focus on these factors during different phases of a project to improve its contract management process. In this way, the project leaders can plan for successful project completion with minimum disputes.

According to this study, the project team should implement a risk-based contract management strategy throughout all the project phases. Other than that, project leaders should focus on improving legal awareness among the team members. The project owners should implement a clear financing system from the project inception stage to make progress payments on time. For this, owners should make sure that funding is ready before they appoint contractors. Dispute resolution along the way during project performance is another vital step to minimize possible risks due to disputes.

Although factors to improve contract management are identified, there are gaps in this research. The lack of recent studies or articles written on similar topics is one of the major challenges. There

are studies done on construction disputes. However, most of these were focused on identifying the causes of disputes rather than identifying the success factors for minimizing disputes. Therefore, this study suggests the need for future research based on primary data to identify factors that improve the effectiveness of contract management to prevent or mitigate potential disputes.

Most of the reviewed literature is not focused on a specific country or region. Therefore, studies based on a specific country or region will identify specific factors for that region or country that can impact positively on contract management effectiveness and hence fewer disputes.

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