

Literature Review

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Omar Sabri*, Ola Lædre, Amund Bruland

A structured literature review on construction conflict prevention and resolution: A modified approach for engineering

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Abstract: In the face of several uncertainties in the construction industry, conflicts and disputes seem inevitable. The aim of this systematic literature review of methodologies for prevention and resolution of conflicts was to develop an updated guidance for conflict management in the construction industry. To achieve this, we developed a novel tool termed Modified Reporting Items for Structured Reviews in Engineering and Technology (MORISE) that considered a modified tool from the original literature review method Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Three databases, ScienceDirect, Scopus, and American Society for Civil Engineers (ASCE), were searched and 61 articles were shortlisted. In terms of frequency of reasons cited as causes for disputes, payment regimes and delays rank first, followed by written agreement interpretation and changes in projects. Acceptable approaches to resolution of disputes include negotiation, arbitration, facilitation, and dispute resolution boards. This study were able to make a clear distinction between methodologies adopted by various researchers for the prevention and resolution of conflicts and show that in addition to prevention of conflicts, there are comprehensive and suitable techniques to resolve conflicts, which can be adopted in practice.

Keywords: construction conflicts, prevention, resolution, literature review, MORISE, arbitration, negotiation

1 Introduction

Infrastructure construction requires a variety of abilities and competencies. In this highly competitive setting, disputes can arise for numerous reasons, such as the magnitude or complications of work, deprivation of coordination among the contracted parties due to improperly prepared or implemented documents, insufficient planning, financial constraints, and differences in resolving on-site related complications (Bröchner et al. 2002). Since construction conflicts significantly impact cost and time, contractors and owners should promote effective conflict management in their union (Ren and Anumba 2003). It has been noted that the dynamic nature of the construction contracts determines the tactics in standard conflicts (Mohamed et al. 2014). The aforementioned factors can disrupt a project and lead to complex arbitration or litigation, increased costs, and a collapse in the relationships and communication among parties. Therefore, the effective delivery of a project necessitates the full cooperation of all parties involved, so that time, resources, budgets, and objectives of a project can be met.

The goal of this systematic literature review that focused on contemporary construction conflict prevention and resolution was to identify an effective methodology that can manage difficult conflicts in construction projects and that can address the shortcomings of current approaches. Since it is essential to consider the dispute resolution process as a whole and discuss the processes in which multiple methods effectively combine into a single approach, different dispute resolution choices available to the construction industry were compared in this study. Methodologies for preventing and resolving disputes in the construction industry identified in seven highly renowned studies are shown in Table 1.

Disputes and disagreements in construction can be avoided if the risks and duties of the parties are openly defined in explicit terms (Table 1). Identifying the reasons leading to conflicts in construction and establishing

*Corresponding author: Omar Sabri, Norges teknisk-naturvitenskapelige universitet Fakultet for ingeniørvitenskap, Trondheim, Norway, E-mail: omar.sabri@ntnu.no

Ola Lædre, Amund Bruland, Norges teknisk-naturvitenskapelige universitet Fakultet for ingeniørvitenskap, Trondheim, Norway

Tab. 1: Construction conflict prevention and construction conflict resolution strategies.

Author	Contribution to construction conflict	
	Prevention	Resolution
Leung et al. (2002)	Effective and reasonable conflict prevention enhances team productivity and creativity, which helps overcome obstacles. A manager needs to build a relationship between conflict and satisfaction levels. Determining the best stage of conflict is key to a successful project because it provides a stimulus.	Positive interaction between participants of the project is essential to prevent negative conflict or to enable its resolution at least. Conflicts are stimulated in multiple tasks at a predetermined level to eliminate obstacles, leading to high participant satisfaction. Excessive task conflict should be prevented in the decision process.
Wang et al. (2005)	Goal setting is a major task that helps prevent negative conflict. The most appropriate method for construction, cultural, and legal issues in arbitration after the negotiation is to resolve disputes.	No universal formula exists to resolve conflicts except that the parties should respect each other to gain the contract's trust.
Harmon (2009)	Parties should oblige to work in good faith. A focus on DRBs helps reduce the cost of construction.	New claims and orders expedite the resolution of issues. Daily and hourly payments save cost and time, resolve problems, and eradicate conflicts.
Fenn and Gameson (1992)	Improvement in training and education of construction panels prevents conflicts.	Less-conflictual attitudes of parties and technical education overcome obstacles to the resolution of conflicts.
Udechukwu et al. (2018)	The role of technology is very crucial for the prevention of construction conflicts.	The rule of law is considered the most moderate method to eliminate conflicts.
Kanishka et al. (2019)	Conflict arises at pre-contract stages and, therefore, should be resolved at that stage to avoid later problems.	Observation of pre-contract practice may eliminate conflicts in construction plans.
Hemanth et al. (2019)	Keeping a proper check on the contract document helps eliminate disputes.	Categorization of reason, which helps in recognizing the root problems of the obstacle, provides a suitable solution. Litigation is helpful in the resolution of conflicts.

DRBs, dispute review boards.

preventative steps is essential to decrease the probability of such disputes (Boateng et al. 2015). For example, Fenn and Gameson (1992) stated that improvements in the training and education of construction workers prevent conflicts. Effective and affordable conflict management enhances the productivity and durability of this cooperation while also assisting in overcoming obstacles (Leung et al. 2002).

Referencing the terms and conditions of an agreement between parties can identify problem areas that require attention, minimizing disputes. This indicates that within the construction project, conflicts arise because all players are not in equal contact. To some extent, the causes of conflicts are known to those involved in construction projects. Yet, it is not easy to overcome them unless there is a transparent process to control obstacles ahead of the actual project. Therefore, a systematic taxonomy of the cause of disputes is needed (Elziny et al. 2016).

If the persons governing the contract possess an understanding of various issues that may be concealed by a contractor during construction, then avoidance of

disputes is possible (Jagannathan and Delhi 2020). The reasons for disputes do not need a legal explanation before being resolved (Essex 1996). There is no clear-cut dispute prevention strategy that can be given for each dispute in a construction project. Conflicts differ and seldom qualify for the dispute prevention or resolution mechanism facilitated in the contract. Negotiations in construction contracts are usually inefficient obligations to the range of scholarly backgrounds of the negotiating alliance. Negotiations involve multiple variables, complex connections and must deal with scarce information of the negotiating project participants (Apt and Witzel 2009).

The primary causes of disputes in a construction project are uncertainties in contracts and unreasonable distribution of risks between participants of the project (Alaloul et al. 2019). Goodman (2012) stated that such disputes can be reduced if the risks and tasks of the parties are rigorously outlined in clear terms to avoid any misconception. Disputes can be avoided by investing in the education of administrators of a construction contract (Adnan et al. 2012). Moreover, a thorough understanding of the

written agreement enables the development of a harmonious relationship between the contractor, the owner, and other participants of the construction project, including others such as related consultants, subcontractors, and insurance financiers (Lee et al. 2016). These stakeholders should accept possible solutions or choices that might not be mentioned in the construction contract, such as using a reservation of rights or mitigation agreement, which allows them to approve a temporary resolution without preconception and accede to resolve the dispute later. Due to the improbability of the claim and its significance (Brower 2005), stakeholders in a construction project may desire to consider the usage of a reservation of rights or mitigation agreement for disputes that do not qualify for resolution at the initial stage. This study aimed to understand the strategies of construction dispute prevention and other mechanisms of resolving existing disputes.

Possessing correct personality traits that can be applied to a suitable phase of negotiating dispute

resolution at the initial stages is ideal (Hemanth et al. 2019). One such trait is the skill for conducting effective negotiations, which needs effective conveying power. As previously indicated (Sternberg and Lubart 1991), issues and conflicts at different levels of the construction industry are a result of misapprehension.

Studies on conflict resolution mostly focus on the management of disputes instead of evasion, either specifically by supporting the adoption of organization systems and techniques or implicitly by referring to approaches that might be used as a construction conflict management strategy. In addition to some changes in technical substance in education and coaching for construction, personnel is also considered important (Fenn and Gameson 1992). A general summary of various studies on conflicts, disputes, and their prevention and resolution is presented in Table 2.

Different types of conflicts should be considered before developing strategies to resolve them. As such,

Tab. 2: Summary of theoretical research on prevention and resolution of construction disputes.

Author	Methodology	Research contribution
Liu et al. (2019)	A practical method for making settlement of dispute for international construction projects grounded on CBR and validates the CBR model in certain dispute cases	The dispute settlement approach improves the theoretical framework and also relies on the case study method
Jagannathan and Delhi (2020)	Objective and analytical research	Direction for the construction industry to reduce the adoption of litigation to solve disputes
Zhu et al. (2020)	Measurement theory	Five ways to manage conflicts and reduce disputes – the quality of construction, fairness perception, conflict prevention, acceptable resolution result, and post-conflict influence
Lee et al. (2016)	Application of the theory of planned behavior	An alternative dispute resolution (ADR) method is suggested to mitigate conflicts
O'Connor et al. (1993)	Utilization of hierarchal decomposition	Creative management of conflict and change can provide benefits to eliminate construction disputes
Stipanowich (1997)	SOI	The AAA has commenced some reforms to the dispute resolution process that minimize conflicts
Li et al. (2012)	A framework with a questionnaire survey and multiple interviews with several respondents	Policy and decision-makers need to struggle for resolving at least the common conflicts that arise throughout the lifecycle of main projects
Eyad and Ali (2014)	Qualitative research	Executing possible measures as early as possible to evade conflicts in the partnership
Akiner (2014)	Theoretical framework	Analyzing multicultural or multinational presentations in construction projects can be a somber tool for the avoidance of disputes between the involved parties
Gardiner and Simmons (1992)	ARD	Avoiding disputes through the application of documentation policies and cooperative communication between parties is considered worthy of avoiding and resolving disputes
Alaloul et al. (2019)	Questionnaire survey to gather data	Conflict is perhaps not a context-based effect on project presentation, and comprehending it helps in its resolution

(Continued)

Tab. 2: Continued

Author	Methodology	Research contribution
Essex (1996)	Survey	Escrow bid documents, DRBs, and partnerships help in the prevention and resolution of conflicts in construction projects
Brower (2005)	The theoretical model, along with an organized questionnaire survey	Contractual elasticity (term and process elasticity) are interrelated and eliminated disputes by expressively and definitely affecting the accomplishment of construction projects
Hosseini et al. (2017)	Qualitative research	Disputes can be resolved or at least avoided when construction project owners go through the deficit of the transactional agreement models when executing a problematic project with tentative scope
Arditi and Pattanakitchamroo (2006)	Questionnaire survey	Claims can be prevented through rigorous reviews of policies and specifications and by necessitating greater project planning work on the part of the contractor
Wu et al. (2018)	Application of the theory of conflict management	Develop trust relations between project crews based on equivalent collaboration to take benefit of the positive effects of project conflict and to resolve the negative effects of procedure and correlation conflicts
John (1987)	Survey	Owners and contractors should retain suitable levels of employment during claim disputes
Zhu and Cheung (2020)	Case study	Incentivization in governing the slits in risks and control among manager, contractor, and involved parties during project construction
Apt and Witzel (2009)	Measurement theory	Five proportions in the administration of quality of conflict: fairness perception, effective resolution result, procedure, conflict prevention, post-conflict influence, and integrated resolution.
Tazelaar and Snijders (2010)	Questionnaire survey	Dispute Resolution Board Foundation model helps eliminate disputes
Bröchner et al. (2002)	Theoretical approach	An open doubt of elitism and tough occupations has been conveyed as a propensity for two construction parties to resolve disputes without mentioning it to impartial third parties
Mohamed et al. (2014)	Questionnaire survey	Behavioral, contractual, and operational matters to avoid altering claims into disputes
Akintoye et al. (2015)	Web-based system	The web-based system serves as a communication platform among owners, contractors, and planners to help resolve conflicts
Alpkokin and Capar (2019)	Questionnaire survey	ADR has been established in the worldwide construction division to reduce disputes and prevent litigation; an alternate solution is the DRB
Charkhakan and Heravi (2019)	Application of risk management theory	Healthy association between causes of conflict, factors, construction project parties, and consistency between project participants and conflict help avoid disputes
You et al. (2018)	Application of pattern classification theory	Suitable behavior of similar construction parties helps avoid conflicts
Elziny et al. (2016)	Application of TCE approach	A healthy association between uncertainty and the supplier's positive attitude helps overcome disputes
Hamimah et al. (2012)	Application of planned behavior theory	A well-drafted contract may be essential but not adequate to stimulate friendly resolution of disputes between contract participants. Factors affecting conflicts should be understood well
Junying and Martin (2019)	Utilization of the ITA framework	Working productive groups and examples of good behavior help eliminate conflicts

(Continued)

Tab. 2: Continued

Author	Methodology	Research contribution
Adnan et al. (2012)	Questionnaire method	Evaluation of literature throws light on the significance of dealing with the people and their attitude to make construction tasks less prone to litigation
Malak et al. (2020)	Application of the analytical framework	Corporate office, high competency, and qualification of parties avoid and resolve conflicts

AAA, American Arbitration Association; ARD, Alternative methods of resolving disputes; CBR, case-based reasoning; DRBs, dispute review boards; ITA, International tunneling association; SOI, settlement-oriented interventions; TCE, transaction cost economics.

there is a relationship between the associated conflicts that occur due to social mismatches among the many participants, methodologies-related conflicts that arise due to the approach to the construction projects, and distribution of means and task/project-related conflicts that occur due to disagreements among different members concerning tasks to be performed (Gorse 2003).

Disputes consume time, are costly and unpleasant (Ren and Anumba 2003), destroy relationships between owner and contractor that have been carefully built up over a long period of time, and significantly increase the price of a project, often making it ineffective or unachievable, or nullifying any edges. Disputes should be prevented, and if they do occur, they must be resolved as early as possible to save the relationships and control construction costs (Jergeas and Hartman 1994). Grasping the details of a particular task in construction projects helps avoid disputes (Khatiri et al. 2004). Conflicts throughout the project lifespan should be fixed initially, without external interference, and many disputes are handled by internal negotiations. Failure of negotiations implies that construction contracts provide several choices to the parties.

The nature of conflicts is always different, with multinational construction contracts being more complex than local contracts (Akintoye et al. 2015). The former is difficult to resolve because they are based on foreign laws. However, the management of construction projects is governed by domestic laws rather than international laws. Many disputes arose in the 1960s, 1970s, and mid-1980s that involved separating the comparative positions of contractors and owners. The latter did not agree to accept the possibility of other site conditions, which were unfamiliar to both parties at the time of the contract (Brower 2005). Therefore, completing construction tasks requires a project team participant's effort toward a mutual objective (Boateng et al. 2015).

Compared to similar contracts, construction conflicts are not as frequently resolved (Bröchner et al. 2002), because of the long-term nature of projects that bear significant risks of additional conflicts and disputes. Systematic assessments

of high-impact studies that can be applied in the case of construction conflicts, their resolution, and prevention should generally have the following elements (Gorse 2003):

- Establish the extent of development in current research toward revealing a specific issue.
- Identify correlations, inconsistencies, gaps, and irregularities in the literature, and reveal causes for these (e.g., by recommending a replacement conceptualization or notion that accounts for the discrepancy).
- Formulate common themes and statements along with overarching conceptualizations (instead of merely summarizing opinions) (Sternberg 1991).
- Touch upon, assess, extend, or develop the current model.
- Provide implications for observation and strategy creation.
- Define guidelines for future analyses (Siddaway 2019).

Since a systematic review is analytical in its claim and nature, it can handle broader queries than single empirical studies (Leary 1997), which is reflected in the permissibility of alternative analysis styles at the highest of the hierarchy of evidence when systematically reviewing construction conflict prevention and resolution.

A theoretical framework that incorporates suitable conflict prevention and resolution strategies for the most common and frequently occurring conflicts in construction projects is currently lacking. Recently, a comprehensive review of literature on construction project risk analysis showed that the literature lacks a comprehensive risk assessment framework that accounts for different types of impact of the risk on different project objectives simultaneously. With this in mind, a new tool was developed to aid systematic literature review that was fine-tuned for the field of engineering. A properly structured literature review promotes the development of constructive conflict management strategies (Gehrmann and Gunnarsson 2019) and is necessary to improve our understanding of construction conflicts by connecting research in theory

and providing strategies to avoid in practice, thereby creating development policies that lead to the implementation of previous analyses of construction conflicts.

The present study examined whether there is research literature support for avoidance, management, and resolution of disputes by establishing less-conflictual attitudes and whether a dispute evasion strategy will resolve dispute-causing differences between stakeholders of construction projects through multiple identified approaches.

2 Methodology

Studies published between January 2000 and July 2020 and housed in three internationally accessible electronic databases were searched to identify contemporary studies in preventing and resolving conflicts in construction and infrastructure projects. The study period restriction was applied in the beginning and modified according to the need of the study. Three databases – Scopus, American Society for Civil Engineers (ASCE), and ScienceDirect – were chosen for their reliability and relevance to the study area, construction conflict prevention, and resolution.

A hierarchical search strategy was used wherein publications from Scandinavia were ranked first, followed

by research case studies from Europe, the US, and the rest of the world. Prior to deciding the combination of search terms used across all three databases, several were tested as search strings (Table 3). Several factors affected the shortlisting and selection of articles, of which relevance was the most important, followed by duplication or repetition, geographical factors, and environment of the contract culture. The iterative development of the search string noticed repetition while using 11 expressions. Among the geographical factors, the priority given to Scandinavia can be justified, because in Norway, the culture is more Western European, which in many cases can be compared to other Northern or Western European cultures. Publications on conflicts in Asia, North America, Africa, and Latin America were included to cover various construction cultures.

Of the three databases, the hits obtained from Scopus when the search was restricted to engineering and engineering management publications were highly relevant to achieving the goals of this study. The ASCE database includes the Journal of Infrastructure Systems, which is highly relevant to this study, its scope being limited to roads and tunnels. The search hits yielded articles and references that mainly dealt with infrastructure conflicts and disputes. Articles included in error at the early stages of

Tab. 3: Iterative development of the search string.

Search number	Addition to the search string (Scopus search format)	ScienceDirect	Scopus	ASCE
1	TITLE-ABS-KEY (“dispute” AND avoidance AND “construction”)	2069 (12)	69 (11)	1865 (34)
2	OR TITLE-ABS-KEY (“conflict” AND avoidance AND “construction”)	10211 (17)	43 (13)	4497 (17)
3	OR TITLE-ABS-KEY (“dispute” AND prevention AND “construction”)	3539 (4)	57 (22)	1418 (14)
4	OR TITLE-ABS-KEY (“conflict” AND prevention AND “construction”)	20132 (23)	91 (19)	3567 (9)
5	OR TITLE-ABS-KEY (“dispute” AND “avoidance” AND roads OR tunnels)	139 (1)	4 (1)	6 (0)
6	OR TITLE-ABS-KEY (“conflict” AND “prevention” AND roads OR tunnels)	968 (0)	237 (3)	15 (0)
7	OR TITLE-ABS-KEY (“dispute” AND “resolve” AND construction)	9172 (19)	106 (8)	2342 (8)
8	OR TITLE-ABS-KEY (“conflict” AND “resolve” AND construction)	37073 (29)	117 (6)	3679 (3)
9	OR TITLE-ABS-KEY (“conflict” AND “resolution” AND “construction”)	35171 (14)	290 (12)	3680 (6)
10	OR TITLE-ABS-KEY (“dispute” AND “resolution” AND construction)	7709 (9)	589 (10)	2342 (4)
11	OR TITLE-ABS-KEY (“claims” AND “construction”)	175367 (18)	2446 (15)	6757 (21)

the search is often inevitable due to the vast number and mixture of references in the databases used, especially by the Science Direct database, which includes multiple sciences, and therefore, corrections were made. Initial data were retrieved from January 2000 and July 2020, but for including pioneering results, such as R, J, Essex, an article about disputes in construction projects published prior to 2000, relevant and innovative results, and a wider search was conducted.

A reiterative search process was adopted wherein some articles and references were disapproved, and another search process was conducted to ensure the quality and relevance of the hits. A comprehensive search process to ascertain the quality and relevance within the document was conducted for every shortlisted article and reference. For clarity, relevance, and significance, specific articles were included, and on the contrary, despite the Norwegian University of Science and Technology having one of the most generous access policies, in some cases, articles, book chapters, or the entire book was inaccessible and therefore excluded.

The iterative improvement of the search string in three databases from 2000 to 2020 with the search expression in bold and digits in parentheses indicating the coverage of relevant publications is shown in Table 3.

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is used to report systematic reviews in health research. The process involves imposing the work of two researchers on the same topic with a third referee to resolve conflicts. Since PRISMA may not work as effectively in engineering as it does in medicine, a new approach termed “Modified Reporting Items for Structured reviews in Engineering and Technology” or MORISE (Figure 2) was developed in this study to address the limitations and challenges of systematic reviews in the engineering sector. PRISMA comprises identification, screening, eligibility, and inclusion, while in MORISE, the process comprises designation (10 years, timespan) (title, abstract, and keywords), refining (title, abstracts, and keywords), qualification (content), adaptation (content), and addition (title, abstract, keywords and content; no time limit). More explanations about the MORISE method will follow in the coming sections.

3 Results and discussion

Three well-known databases – ASCE, Scopus, and ScienceDirect – were identified for the purpose of this research, which focused primarily on recently published

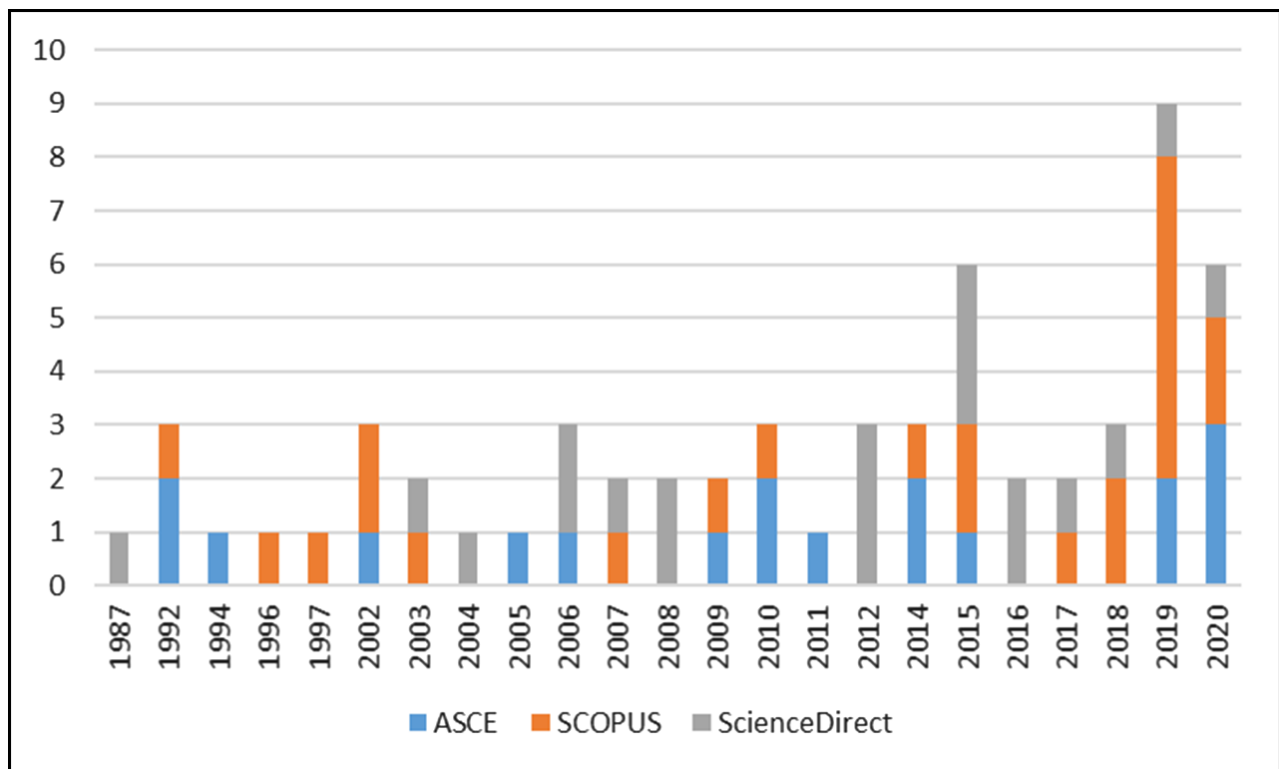


Fig. 1: Selected articles for this literature review by database and publication year. ASCE, American Society for Civil Engineers.

studies. A total of 61 publications were shortlisted, as shown in Figure 1.

For the first time, to the best of our knowledge, a systematic review of the literature using a new approach specific for engineering, MORISE, was developed in this study. According to MORISE, studies were first separated by titles, then by abstract, and lastly by complete text to progressively eliminate studies not meeting the inclusion criteria. There were 502 hits, of which 447 records were refined by titles, finally yielding 138 studies after 309 records were excluded based on reading the abstracts. The full-length manuscripts of these 138 studies were read to determine if they met the inclusion criteria and evaluate quality. Finally, 40 articles were identified and endorsed. MORISE entailed removing any time limitation and examining full-length articles and records in the last step before the final adaptation was made. Following a widening of the time span, an additional 21 studies were included,

yielding a total of 61 publications that were identified for this systematic review. The results of the literature review study from designation to endorsement are shown in Figure 2.

Within the last decade, the focus has been on reducing construction disputes, with conflicts being the leading source. This manuscript aimed to use a systematic review of the literature to discuss construction disputes such as policies and mechanisms by focusing on strategies and methodologies that eliminate construction conflicts.

Disputes are a matter of fact in practice and can occur in any construction project. Indeed, effective and reasonable disagreement enhances the productivity and creative thinking of the team members, which avoids obstacles (Liu et al. 2019). Therefore, the contract manager must build a relationship between contention and the satisfaction level. There is no single and precise way to deal with conflicts. Sometimes minor problems grow into serious disputes,

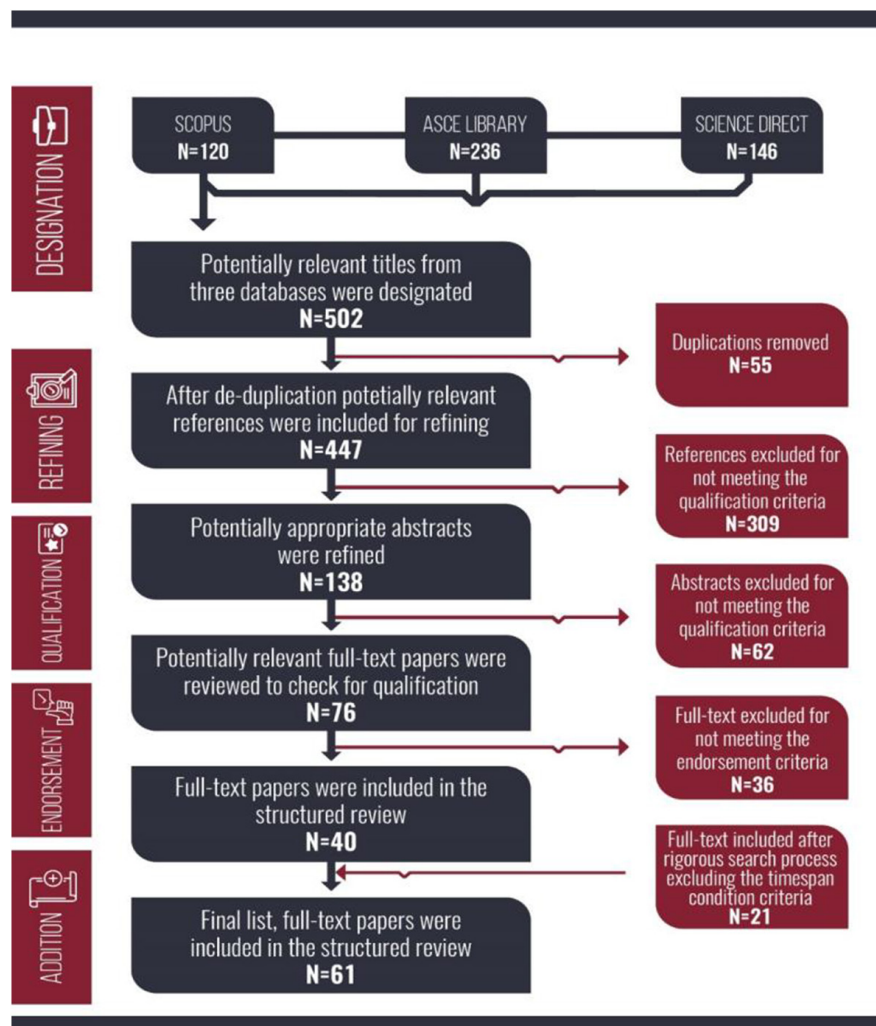


Fig. 2: The MORISE flow diagram for database search and literature selection. MORISE, Modified Reporting Items for Structured Reviews in Engineering and Technology.

with unpleasant results for project participants (Boateng et al. 2015). Disputes and conflicts in contracts distract valuable resources and delay construction projects that should be finished on schedule and within a financial plan while maintaining standards, often increasing the budget, taking time to resolve, and often destroying relationships built over the years (Leung et al. 2002). The emphasis, therefore, is on the need to avoid disputes. Since dispute prevention is a comprehensive process, a better understanding of how conflicts can be prevented is achieved by separating the systematic literature related to the prevention and resolution of construction conflicts, despite many researchers combining the two for ease of studying.

Historically, most disputes in construction projects had risen when subsurface situations were incongruent from those specified in the contract or probably by the parties (Gardiner and Simmons 1992). In terms of frequency of reasons cited as causes for disputes, payment regimes and delays rank first, followed by written agreement interpretation and changes in projects (Essex 1996). Categorizing the reasons helps recognize the depth of the matter and offers an appropriate solution, thereby minimizing the time needed for an answer and reducing the burden on the judiciary. A dispute prevention system prevents construction project claims from turning into disputes. Conflict prevention methodology is adopted before the occurrence of a dispute once it is enclosed within the contract.

The economic success of a construction project is achieved when stakeholders make an effort to anticipate, persevere, and discuss the construction claims or disputes (Cserháti and Szabó 2014). To realize this inexpensively, the contractor should attend pre-contract meetings and highlight issues, prepare a sensible program, make a thorough assessment of the project, send questionnaires for clarification within the tender document, and ensure the completion date is observed among all identified practices through surveys for the tender (Hwang and Low 2012). Kanishka et al. (2019) noted that conflicts arise at pre-stages and should be resolved at the pre-contract stage to avoid subsequent issues. A perusal of pre-contract is therefore recommended to eliminate conflicts in construction plans (Goodman 2012).

There are many ways to prevent conflicts, among which goal setting is one of the main tools to stop negative conflicts. An overview of research on conflict prevention in construction projects is provided in Table 4. Table 4 shows 17 articles identified in this systematic review that were shortlisted further from the original 61 articles that were endorsed in this study. These 17 articles are considered because they gather significant contributions to the theme of prevention of disputes in construction projects and summarize almost what already exists in the other 61 articles chosen earlier. Table 4 includes methodologies adopted and contributions to the theme of prevention of conflicts. Various research methodologies used to prevent

Tab. 4: Summary of research on the prevention of construction conflicts.

Authors	Methodologies	Contribution in dispute prevention
Ojiako et al. (2018)	ODR	Helped identified four factors: demographics, ADR culture, personal culture, and layout and design issues – all of which combined provide a suitable study framework for examining the many interrelated risks to ODR effectiveness.
Jones (2006)	Dispute resolution process	Conflicts may be avoided through traditional dispute resolution procedures like litigation and arbitration. These approaches are also useful for preventing construction-related disputes in the first place.
Leung et al. (2002)	Case study	Appropriate level of conflicts enhances team productivity and creativity, which prevent obstacles; managers need to build a relationship between conflict and satisfaction; determining the best stage of conflict is the key to a successful project because it provides a stimulus; goal setting is one of the major tasks that helps prevent negative conflict
Chaphalkar et al. (2015)	Case Study	A set of neural model systems; both MLP and GFF were used in this study. The system worked impartially and did not favor any of the disputing parties. Thus, the decision-maker was free from prejudice.
Lee et al. (2016)	Theory of Planned Behavior	ADR selection and usage may be linked to a number of different characteristics. TPB's attitude construct may be used to reclassify the inherent benefits and advantages of ADR, dispute complexity, transactional costs, and current project risks.

(Continued)

Tab. 4: Continued

Authors	Methodologies	Contribution in dispute prevention
Yousefi et al. (2010)	Attitude-based negotiation methodology	Negotiation techniques could be acquired via observation and experience to avoid disputes. Therefore, the management must create a negotiation support system with the assistance of negotiation to prevent conflicts due to multiple attitudes.
Ren and Anumba (2002)	Mixed-method approach	Provides ease of negotiation among diverse participants in the construction task
Akintoye et al. (2015)	Web-based system	To minimize disagreement, payment delays and short-term partnerships should be avoided; unfair payment practices should be abolished.
Kalyan and Prakash (2019)	Development of an Expert System	Categorization of causes aids in determining the root cause of the issue and developing an appropriate remedy.
Mohammadi and Birgonul (2016)	RII approach	Potential legal hazards associated with sustainable development assist in avoiding future conflict risks; professional development of construction professionals reduces the degree of all disputes.
Boateng et al. (2015)	Qualitative study	Conflicts are avoided via the use of analytical networks; projects should be classified to minimize the potential of conflict, and project owners and financiers must establish a good relationship.
Arditi and Pattanakitchamroon (2006)	Qualitative Study	Conflicts are avoided by having a variety of suitable analytical techniques that are both fair and effective; float ownership should be stated in the contract.
Menassa and Mora (2010)	Qualitative study	DRB's efficacy as a preventative approach was shown on roughly 50% of the 810 projects where no disagreements were ever resolved via a formal hearing before a DRB panel.
Gajaman et al. (2019)	Interview-based questionnaire	The contractor should prepare a realistic program, and the work should be correctly identified when pricing. The contractor should send tender questionnaires for clarifications in the tender document and define a completion date as an important practice among all practices identified through a survey.
Chan and Suen (2005)	Interview-based questionnaire	Arbitration after the negotiation is the best way to settle international conflicts in China to avoid construction, cultural, and legal problems.
Tabassi et al. (2019)	Questionnaire survey	Realistic team objectives must be set; otherwise, equity-based, win-win outcomes in relationships may be illusory. An ideal of normative mutuality in relationships can never be achieved by the members of the temporary organization and the project's team.
Alaloul et al. (2019)	Questionnaire survey	Assisting the parties in the development of effective conflict prevention methods, this DRB provided value.

ADR, Alternative dispute resolution; DRBs, Dispute Review Boards; GFF, general feedforward; ODR, online dispute resolution; RII, Relative Importance Index.

conflicts in construction projects point to complex associations between the possibilities that become the reason for conflict and various conflict types.

The methodologies adopted by various authors in resolving conflicts are described in Table 5. Occasionally, construction contract participants have legitimate disputes, and various strategies for dispute resolution are utilized. However, there is no best method for resolving disputes that is appropriate for all circumstances. Nevertheless, owners and contractors should have an understanding of the benefits and drawbacks of every technique and

confirm that the contract contains sections devoted to acceptable approaches to the resolution of disputes, which include negotiation, arbitration, facilitation, and DRBs (Safapour and Kermanshachi 2019). Negotiations can be simplified, wherein construction project managers will provide results of the negotiation once attitudes are taken into consideration or planned, which improves typical negotiations by proposing higher negotiation outcomes. While the latter is an approach to resolve a dispute, it is not the only one, and in the event of an unsatisfactory resolution, there is a choice for subsequent proceedings.

Arbitration is quickly gaining acceptance. Written agreements on dispute resolution methodology are useful in resolving construction conflict until the conflict does not arise (Wesam et al. 2019). It might not be the most effective; therefore, elasticity is truly needed (Li and Cheung 2020).

This study is not without limitations. Only a few methodologies and strategies to prevent and resolve conflicts were reviewed. Identifying similar theoretical backgrounds to integrate the same design for a systematic review of the literature using MORISE.

Based on examination of the 17 articles studied as part of this research, it is clear that conflict management is essential. The researchers highlighted the unique features of conflicts and explained the role of stakeholders' participation. There was also a discussion of various conflict case studies, as well as successful conflict management techniques that consider organizational structure. To conclude, Table 6 examines the most effective methods and procedures and their contribution toward preventing and resolving conflicts in large construction projects.

The findings revealed specific program disputes, and their causes and effects were disclosed. Moreover, conflict resolution principles and alternative dispute settlement techniques for the construction industry were proposed. Disparities in authority and interests among multiple stakeholders may lead to conflict. Due to the high number of parties engaged in construction projects, contract agreements could be poorly documented and/or implemented, or inadequate planning could lead to financial issues. In addition, communication problems could lead to arbitration requests. Poor communication between project stakeholders has been linked to construction conflicts. According to experts' predictions, efficient conflict resolution in projects will affect project performance, resource management and design optimization, space management, and the project's objectives. Consequently, scholars have begun to pay more attention to conflict management, which is now recognized as a significant issue in the construction industry's administration.

Tab. 5: Summary of research on the resolution of construction conflicts.

Authors	Methodologies	Contribution in dispute resolution
Ojiako et al. (2018)	ODR	A platform from which to develop a variety of practical recommendations for assessing the possible role of technology-mediated interfaces in resolving disputed claims.
Jones (2006)	Dispute resolution process	The dispute resolution process as a whole discusses the most effective method for the various ADR tools to work together to create an overall conflict settlement procedure.
Leung et al. (2002)	Case study	Conflicts are generated in various activities at a preset level, leading to high participant satisfaction and eliminating barriers due to positive interaction between project participants. inability to make decisions and a high level of task conflict reduce conflict
Chaphalkar et al. (2015)	Case Study	Identified 16 fundamental variables that affect arbitrators' decision-making in settling claims of variance in Indian building contracts
Lee et al. (2016)	Theory of Planned Behavior	By asking disputants about their salient behavioral beliefs about various conflict resolution methods such as mediation, arbitration, and adjudication, it is possible to better understand and explain their differing attitudes toward each other.
Yousefi et al. (2010)	Attitude-based negotiation methodology	Positive attitude of the manager is mandatory for implementation and the best outcome from negotiation.
Ren and Anumba (2002)	Mixed-method approach	Bayesian learning approach is assimilated into negotiation methods to resolve the conflicts in construction projects; multi-agent systems reduce conflict among human ideas.
Akintoye et al. (2015)	Web-based system	The web-based system serves as a communication platform among owners, contractors, and planners to help resolve conflicts.
Kalyan and Prakash (2019)	Development of an Expert System	Alternative solutions to the problem are provided based on its nature and the variables taken into account, including its fault. It helps.
Mohammadi and Birgonul (2016)	RII approach	Failure to achieve third-party certification lost incentives due to certification failure, warranty breach (violation), decertification of projects later in the project life cycle, and the elevated standard of care of various professionals were all identified as risk factors to be taken into account in the evaluation.

(Continued)

Tab. 5: Continued

Boateng et al. (2015)	Qualitative study	Developers may use this method to prioritize risks throughout the project supply network and begin mitigating them in a timely manner before they have major financial and schedule implications for the success of the megaproject.
Arditi and Pattanakitchamroon (2006)	Qualitative Study	Policies and specifications should be thoroughly reviewed to avoid claims, and the contractor’s project planning should be increased.
Menassa and Mora (2010)	Qualitative study	A study comparing the number of disputes resolved as a result of DRB recommendations with those that were heard at a DRB hearing session showed that DRB’s effectiveness as an ADR method was >90%.
Gajaman et al. (2019)	Interview-based questionnaire	Classifies construction techniques and offers a framework for integrating the practices in order to remove the root problems.
Chan and Suen (2005)	Interview-based questionnaire	It was suggested that no universal formula exists to resolve conflicts except that the parties should respect each other to gain the contract’s trust.
Tabassi et al. (2019)	Questionnaire survey	The mediating effects of group coordination were studied in relation to conflict management and group performance.
Alaloul et al. (2019)	Questionnaire survey	Understanding conflict helps in its resolution, even if it does not impact project presentation context-based.

ADR, Alternative dispute resolution; DRBs, dispute review boards; ODR, online dispute resolution; RII, Relative Importance Index.

Tab. 6: Summary of methodologies and their contributions.

Methodologies	Contribution in dispute prevention	Contribution in dispute resolution
<ul style="list-style-type: none"> • ODR • Dispute resolution process • Case study approach • Theory of Planned Behavior • Attitude-based negotiation methodology • Mixes-method approach • Web-based system • Expert System • RII • Qualitative study • Interview-based questionnaire • Questionnaire survey 	<ul style="list-style-type: none"> • An examination of the numerous interconnected threats to ODR efficacy is proposed. • It encourages the use of conventional conflict resolution methods such as litigation and arbitration. • Identifying the most productive stage of a dispute is essential for a project’s success. • The impartial system was built using MLP as well as GFF. • Using TPB’s attitude construct, the inherent advantages of ADR, dispute complexity, transaction costs, and existing project risks may all be reclassified in a more useful manner. • In order to avoid disputes caused by different attitudes, management should put in place a framework to facilitate negotiations. • Facilitates negotiations among the various building project parties. • When it comes to figuring out the core of a problem, DRB’s effectiveness as a preventive measure has been shown. • Suggested that arbitration is the best method to resolve international disputes when negotiations have failed 	<ul style="list-style-type: none"> • The dispute resolution process as a whole addresses the most effective way for integrating the different ADR tools into a unified framework for resolving conflicts. • Identified 16 critical factors that influence arbitrators’ decision-making when resolving variance claims • It is said that a manager’s positive attitude is required for implementation and the best result from negotiation. • A web-based system may serve as a platform for communication between owners, contractors, and planners, assisting in resolving disputes. • Encourages careful examination of policies and requirements • Provides a framework for combining practices in order to address the underlying issues • The mediating effects of group coordination on conflict resolution and group performance were investigated. • Understanding conflict helps in its resolution, even if it has no context-dependent effect on the presentation of the project.

ADR, Alternative dispute resolution; DRBs, dispute review boards; GFF, general feedforward; ODR, online dispute resolution; RII, Relative Importance Index.

4 Conclusion

Using MORISE, we were able to make a clear distinction between methodologies adopted by various researchers

for the prevention and resolution of conflicts and show that in addition to prevention of conflicts, there are comprehensive and suitable reasons to resolve conflicts, which can be adapted in practice. While it is not possible

to rely on a single methodology to resolve construction conflicts, a reorientation of some earlier methodologies and educational programs is needed. To prevent or resolve conflicts, there is a need for a proper understanding of the sensitivity of the problem. Without comprehending the obstacle, it is impossible to propose a reasonable method to overcome it. Therefore, the methodology depends on the tricky nature of the problem.

Healthy relations and trust between the construction owner and the contractor as well as other stakeholders help identify and overcome all obstacles that can occur in any project. All stakeholders should be clear about the project scope and need to create proper contracts and project documentation that are as unambiguous as possible. Conflicts can be reduced by applying negotiation and arbitration provided by a DRB. On the other hand, despite having several forms in Norway and internationally, it can be considered a good start in preventing and resolving construction projects.

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