

Article

Knowledge-Driven Claim Governance: A Checklist of Entitlements and Procedures in FIDIC and National Standard Contracts

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Abstract

Claims are a significant cause of delays and increased costs in international construction projects, yet contract provisions on claims remain inconsistent, narrative, and difficult to apply in practice. This study presents a concise, knowledge-driven checklist for effective claim management in major standard forms, including International Federation of Consulting Engineers (FIDIC), the New Engineering Contract (NEC4), the American Institute of Architects (AIA), and Singapore's Public Sector Standard Conditions of Contract (PSSCOC). The research mapped 22 entitlement clauses and 12 procedural clauses, then prioritized items through expert interviews and surveys. The final checklist comprises 16 items selected through transparent criteria (mean scores ≥ 4.0 or above group averages) that address critical risk areas. Application to two complex projects demonstrates that a few key clauses, such as those governing variations and timing requirements for requests, supporting documents, and decisions, account for most claim-related risks. Experts indicate that practical periods for submitting claim requests and proofs, and making decisions, are approximately 31, 65, and 61 days, respectively. The proposed checklist converts fragmented contract requirements into an actionable and auditable tool. It enhances clarity, transparency, and fairness in both pre-award reviews and daily project administration, which supports better risk management and minimizes disputes in global construction projects.

Keywords: project management; claim analysis; claim entitlement; claim procedure; contract management; risk evaluation; knowledge management



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1. Introduction

Risks are an inherent aspect of construction projects, often resulting in delays and increased costs [1]. Overseas construction projects are exposed to elevated delay and cost escalation due to international political shifts and economic downturns. These external exposures are often amplified by weak risk management; strengthening claim management mitigates downstream disputes. Claim management has proven effective in mitigating potential disputes in overseas construction, where conflict rates are rising [2–4]. Since 2017, construction-related disputes have shown a consistent increase, especially in the Middle East and Europe [5]. Reports indicate that the average dispute value in the Middle East has climbed steadily, from \$56.7 million in 2018 to \$90.4 million in 2021. Additionally, contractual challenges in the construction sector have intensified [6,7].

The use of international arbitration for resolving construction disputes has increased steadily since the early 2000s, peaking in 2020 during the COVID-19 pandemic and continuing on an upward trend [8]. In 2014, SIAC recorded 222 new arbitration cases, which grew to 663 by 2023, marking one of the highest figures for the construction industry, aside from the pandemic-driven surge in 2020. Within international arbitration, construction consistently ranks among the top five sectors with the most disputes [9]. The recent global disruptions from COVID-19 and the Russian invasion of Ukraine have further strained international construction projects by affecting supply chains and driving inflation, complicating challenges in managing these long-term international construction projects [10]. Conflicts between parties in construction projects frequently lead to litigation, which can be time-consuming and costly [11]. In international construction, the causes of contract-related disputes have often been due to the unclear definition of the rights and responsibilities between contracting parties [12]. Although construction management has advanced, claim management remains critical to the success of construction contracts, with improvements in claim procedures helping to mitigate conflicts and disputes [13,14]. Additionally, various stakeholders have different interests and perspectives as they seek to maximize their own benefits [15]. Differences in personal experience and knowledge backgrounds among decision-makers often lead to conflicting opinions, making it challenging to agree on the optimal solutions [16]. In the bidding phase, significant differences in risk perception frequently occur among stakeholders, especially since financial investors use contracts to allocate risk [17]. To reduce disputes, contract terms should be carefully reviewed by construction contract management experts [18,19].

For a successful claim outcome, contractors must adhere to the procedures specified in the contract, while employers are responsible for processing claims according to each outlined step [20]. In NEC contracts, managing terms such as clear criteria for time limits and limitations on delayed compensation claims is essential for reducing the risk of disputes in construction projects [21]. Although NEC emphasizes collaboration, disputes can still be challenging to resolve; in some instances, the more structured FIDIC contract has demonstrated a more effective approach to collaborative dispute resolution [22]. To prevent disputes from arising due to unclear or inaccurate contract terms, these terms must be defined with precision [23]. Particularly for small and medium-sized construction companies, managing risk is crucial for informed decision-making, as they face considerable uncertainties in international projects [24]. Furthermore, the specific provisions and dispute-related terms in contracts significantly influence legal outcomes [4]. In summary, effective claim management and dispute minimization require a careful and fair approach to managing contract terms, with a focus on their clarity and impact.

Among the various risks that must be managed to ensure the successful execution of international construction projects, contract management is widely recognized as one of the most critical [25]. In international projects, where both anticipated and unforeseen risk levels are elevated, differentiated risk management for each work category is required [26]. Research related to international construction project risks has primarily focused on analyzing contract-related risks within the existing literature [27], studying risk factors associated with FIDIC Red Book contract terms [25], and identifying key risks within FIDIC Silver Book contract provisions [28]. However, no studies have specifically compared standard contracts to actual international contracts. Additionally, although there are papers comparing FIDIC and NEC, these focus on the overall characteristics of the contracts rather than a detailed comparison of specific clauses [29]. A literature review that separated studies on claim entitlement and claim procedures revealed that research on claim entitlement was primarily focused on identifying risk factors within the international standard contract, FIDIC. However, there is a lack of studies quantitatively analysing claim procedures, and

no studies have conducted a comparative analysis of claim entitlement and procedures across different standard contracts.

In contrast to developed countries, employers in developing countries often have limited experience with large-scale projects, which can lead to delays and financial challenges due to complex economic and environmental factors [30]. Additionally, employers frequently transfer risks to contractors through lumpsum or fixed-price contracts [31]. While some employers apply specific standard contracts or adapt them flexibly, this approach has made it difficult to maintain trust between parties, particularly given the one-off nature, high complexity, and diverse interests in these projects [32]. Moreover, some employers have adopted contract strategies that transferred all risks to contractors while aiming to cut project costs. However, excessively one-sided contracts often result in claims, leading to disputes and litigation, which, in turn, cause significant time and financial losses for both parties [33]. Collaborative partnerships, on the other hand, foster better risk management and improved project outcomes by encouraging cooperation and shared responsibilities among stakeholders [34]. Thus, comparing various standard contracts to identify fair claim provisions and entitlements is essential.

Project delivery method (PDM) selection is a strategic decision that establishes roles, relationships, and, most importantly, allocates risk among project participants, influencing both governance and collaboration [35]. The spectrum extends from traditional Design–Bid–Build to more integrated EPC and Design–Build arrangements, culminating in Integrated Project Delivery (IPD). IPD aligns people, systems, and practices through multiparty agreements and shared risk–reward structures. IPD projects experience fewer disputes and faster change processing. None of the IPD projects encountered claims, and change orders were processed significantly faster than in non-IPD projects [36]. Despite these advantages, IPD adoption remains limited in many international procurement contexts. Industry surveys consistently report that the number of implemented IPD projects remains small [37]. Consequently, large cross-border projects continue to depend on standardized contract forms such as FIDIC, NEC, and AIA, which define rights, obligations, and claim procedures within established legal frameworks [38,39].

This study responds to that prevailing reality. It analyzes claim-related provisions across major standard forms and develops a knowledge-driven tool designed to strengthen fairness, clarity, and dispute prevention within current delivery environments while supporting the gradual transition toward more integrated project delivery models.

Therefore, this study addresses a practical need: enhance fairness and clarity within the standard forms most widely used today (FIDIC, NEC4, AIA, PSSCOC) by systematizing claim-relevant clauses into a reusable checklist that supports both pre-award reviews and project execution.

2. Various Standard Contracts

Construction contracts are distinct from other contract types due to the complexity, uncertainty, extended duration, high costs, and regulatory demands inherent in each project [23,40,41]. For these reasons, Many project owners use standards to simplify and clarify terms for complex projects, such as power plant construction. Standards help ensure that all parties involved are on the same page, reducing misunderstandings and disputes. [33]. Standard construction contracts have a longstanding global history, with origins tracing back to the early 20th century. Each standard contract type is grounded in a unique philosophy and purpose and has undergone thoughtful revisions over time [29,42]. However, comparing different standard contracts remains essential for several reasons.

First, most popular standard contracts, including FIDIC, NEC4, AIA, and PSSCOC, are based on the common law system, which places a strong emphasis on procedural

law [43–45]. In this system, past legal cases influential, and court rulings significantly shape how laws are interpreted and applied [46]. FIDIC, for instance, is widely used internationally and incorporates many elements based on common law, making it less familiar in countries that follow civil law, sometimes leading to disputes in construction contracts [43,45]. Nonetheless, FIDIC has become more widespread due to its ongoing updates, offering parties more flexibility and a more balanced risk allocation. Both FIDIC and NEC are based on common law as they were developed by the Institution of Civil Engineers (ICE) in the UK [22]. Similarly, AIA contracts from the United States and Singapore's PSSCOC also adhere to the common law system [47]. In this legal framework, failure to follow procedure not stated in the contract may limit claims, which is why comparing multiple standard contracts is necessary. For instance, if a project relies solely on one standard contract, any procedural omissions within it could lead to issues with claims, highlighting the importance of such comparisons.

Second, gaps and conflicting elements exist among various standard contracts. For instance, NEC4 emphasizes principles such as good faith, fairness, and mutual cooperation and includes several specific compensation events [22,48,49]. However, NEC lacks certain entitlement clauses, such as 'Contractor to Search,' which is included in FIDIC. Differences also exist in claim time bar provisions across contracts, underscoring the need for careful comparison.

Finally, owners sometimes modify standard contracts in ways that diverge from their original intent [50]. In practice, less experienced owners tend to use standard contracts, while more experienced owners often modify the contracts to satisfy their own interests. For instance, the introduction to the FIDIC Silver Book advises against its use in projects where there is insufficient time to fully investigate unforeseen site conditions or specific owner requirements [51,52]. However, in real-world projects, contracts often require the contractor to bear the risk, even under such conditions. Thus, comparing standard construction contracts provides valuable insights for both parties.

FIDIC and NEC4 are widely used in developing countries such as Eastern Europe and the Middle East, as well as globally [29,33]. AIA is primarily used within the U.S., where common law originated, and it has also recently gained traction in Egypt [42,53]. PSSCOC is widely implemented in Singapore and was developed based on NEC, with options that can be linked to NEC clauses [54,55]. Therefore, comparing various international construction standard contracts and developing a checklist model for claim entitlement and procedure can improve legal clarity and predictability in large construction projects.

2.1. FIDIC

The FIDIC contract, headquartered in Switzerland, is one of the most widely used standard construction contracts internationally [56–58]. It clearly defines the allocation of risks, responsibilities, and obligations in international construction projects and aims to improve project efficiency and reduce costs by providing dispute resolution procedure [29]. Additionally, depending on the contract type, risks between the employer and contractor are reasonably distributed, with various standard forms of FIDIC contracts available [3]. In FIDIC, claims are explicitly detailed in Clause 20: "Employer's and Contractor's Claims," which is more specific compared to other contracts. This clause outlines detailed procedure, including claim entitlement, notice of claim, initial response, contemporary records, and fully detailed claims [52].

2.2. NEC4

Developed in the UK, the NEC contract is widely used in the UK and over 30 other countries for construction, engineering, and service projects [29]. This contract is widely

utilized because it reduces the risk of claims and disputes. Additionally, it encourages a collaborative approach and is designed to flexibly respond to project changes [21]. In NEC4, claims are addressed in Clause 6: “Compensation Events” and Clause 8: “Liabilities and Insurance.” NEC4 uses the term “compensation events” rather than “claims” and specifies 21 concrete reasons for such events [22,48]. Notably, NEC4 allows contractors to claim not only extensions of time but also additional costs, including contractor’s profit, which distinguishes it from FIDIC [49,59].

2.3. AIA

The AIA contract is widely used in the United States, primarily for infrastructure projects. This contract played a role in distributing risks, responsibilities, and remedies among parties, addressing management procedure, and reducing negotiation costs. It also helped form beneficial relationships and strengthen bonds between the contracting parties within the project [53]. Furthermore, the AIA contract has evolved through numerous editions over 125 years, becoming a standard document representing the contractual relationships between construction parties [42]. In AIA, claims are outlined in ARTICLE 14: “Claims and Dispute Resolution.” This article covers the definition of claims, time limits, notice of claims, as well as additional cost claims, additional time claims, and additional time due to adverse weather [60].

2.4. PSSCOC

The PSSCOC is a standard contract used in Singapore, designed by the Building and Construction Authority (BCA) for public sector construction projects [54]. This contract emphasizes efficient project management and fair risk distribution. It can also be used in conjunction with NEC4, linking additional provisions [61]. In PSSCOC, claims are covered under Clause 22: “Claims for Loss and Expense” and Clause 23: “Procedure for Claims.” Clause 22 details situations where claim entitlement arises, while Clause 23 outlines the procedure for claims, including notice of claim, contemporary records, access to documents, and payment of claims [55].

3. Claim Entitlement and Procedure

Disputes and claims are significant challenges in the construction industry, and identifying the causes of disagreements clearly benefits both employers and contractors [62]. Unclear, inadequate, inconsistent, or biased claim entitlement clauses can often be the primary source of disputes [63]. Cheung [63] notes that incomplete contract documents are one of the most critical issues in construction projects, with ambiguities, deficiencies, and inconsistencies in contract terms frequently leading to disputes. Additionally, human factors are considered another issue in contract disputes, such as unreasonable demands from employers, the rejection of contractor requirements, and the inflation of claim amounts by contractors [63].

Lee [4] emphasizes that clearly defined contract terms are essential to prevent conflicts related to contract interpretation. As contract terms in construction projects grow more complex and sophisticated, some parties may exploit ambiguous clauses to benefit themselves [4]. Consequently, it is advantageous for all stakeholders to systematically compare and clarify claim entitlements and procedures that carry a high potential for disagreement. Trust relationships based on experience and authority significantly influence stakeholder opinions and decision-making outcomes [16].

3.1. Research on Claim Entitlement Clauses

Zhi [64] highlighted the importance of a systematic approach to categorizing, identifying, assessing, and responding to risks in international construction projects, though the

study did not specifically classify risk factors within individual contract clauses [64]. H. Besaiso [29] compared the overall characteristics and specific clauses, such as risk allocation and management, and physical and weather condition risks in FIDIC and NEC, but this comparison did not comprehensively cover all risk factors in the detailed clauses of the contracts [29]. Purba [58] classified risks into five categories based on FIDIC and 30 articles on construction contracts from the past 30 years, but this was more about risk identification rather than a detailed classification of contract terms [58]. Hyun [25] identified 15 major contractual risk factors in FIDIC Red Book that should be considered in contracts, but since the Red Book is for construction contracts and not international construction contracts like FIDIC Silver Book, there were differences in the details [25]. Hong [57] identified key risk clauses and assessed their risk levels in overseas construction projects based on the FIDIC Silver Book 2017 edition. However, this study relied on expert surveys rather than including real case studies [57].

3.2. Research on Claim Procedure

Kululunga [6] categorized the claim process into seven stages: claim identification, notification, examination, documentation, presentation, negotiation, and use, assessing contractors' awareness of each stage. However, due to the small size of the respondents' organizations and limited years of work experience, the understanding of the claim process was low, and no meaningful conclusions were drawn [6]. Mirza [65] noted that the best opportunity to prevent claims is during the finalization of bid documents and contract execution, and that an early resolution of issues between parties is always more cost-effective and mutually beneficial. Additionally, Mirza argued that a logical process for claim management involves stages of claim prevention, mitigation, identification, quantification, and resolution, requiring efficient and effective management throughout the project lifecycle [65]. Abougamil [66] described the stages of the claim process as identification, notification, documentation, submission, analysis through review, negotiation, and settlement, emphasizing that these steps require the coordination of various resources. Abougamil introduced a structured claim management model using BIM, which includes steps for initiating, proving, analyzing, and resolving claims. This model emphasizes timely communication, detailed documentation, and the use of analytical tools to support the decision-making process in claim management. However, the study focused more on the usefulness of BIM in the claim process rather than an in-depth analysis of the procedure themselves [66]. In summary, previous research has not compared traditional standard contracts in detail, nor has it comprehensively analysed claim procedures.

Upon reviewing previous studies, it is clear that most research focused on identifying risk factors related to standard contracts for overseas construction projects. Additionally, the studies generally outlined the stages of claim processing rather than detailing critical elements such as the time bar, which is significant in actual claims between parties. Furthermore, most studies focused on FIDIC without comparing it to real-world projects or other contracts. Consequently, there has been no comparative analysis of claim entitlement and procedures across various international contracts. This study, therefore, aims to develop a knowledge-driven, practical checklist model for important claim entitlement clauses and reasonable claim procedure based on standard contracts.

4. Methodology

4.1. Scope and Methodology of the Study

This study focuses on comparing claim entitlement clauses and procedures in widely used standard contracts for overseas construction projects, including the FIDIC contract by the International Federation of Consulting Engineers (Geneva, Switzerland), the NEC4

by the Institution of Civil Engineers (London, UK), the AIA Contract Document by the American Institute of Architects (Washington, DC, USA), and the PSSCOC for Design and Build by the Building and Construction Authority (Singapore).

Various techniques are used in construction contract, such as AHP, MCS, PI, FMEA, surveys, interviews, and case studies. Among these, a mixed-method approach combining quantitative surveys and qualitative case study interviews for analysing the causes of risk has proven effective in reducing claims [67–69]. While analysing standard contracts alone provides objective, quantifiable data, real project case studies are necessary to address potential gaps in applying this data to actual projects.

This study adopts a step-by-step research methodology to develop a checklist for classified claim entitlement and claim procedure (Figure 1). First, the data was compiled by comparing claim entitlement and procedure from standard international construction contracts (FIDIC, NEC4, AIA, PSSCOC). Second, based on the derived clauses, preliminary in-depth interviews were conducted with internal and external researchers, followed by reclassification of the clauses. Third, questionnaires were developed from the reclassified clauses, and surveys were conducted with 40 experts who have worked on numerous projects. Fourth, a second round of in-depth interviews focusing on claim entitlements and procedures was conducted to further refine and propose the checklist evaluation model. Finally, the derived checklist model was validated through evaluations and case studies by two contract experts who worked on two different projects. This allows for the incorporation of their various insights and experiences into the objective data. The following section provides more detailed explanation of the research methodology.

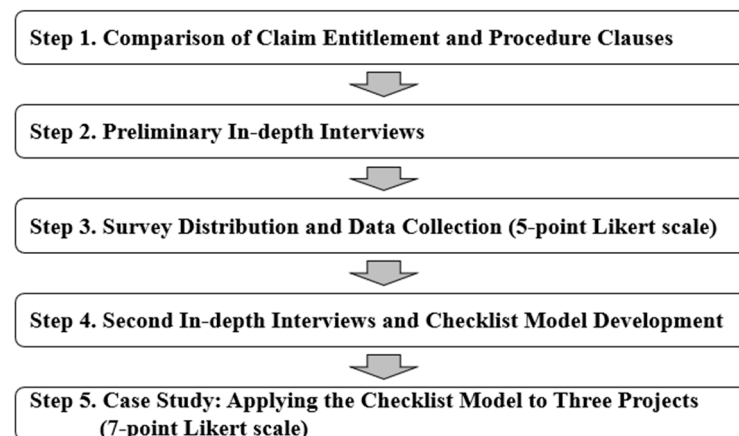


Figure 1. Research Process.

4.2. Detailed Research Methodology

4.2.1. Step 1. Comparison of Claim Entitlement and Procedure Clauses

Claim entitlement clauses and descriptions were compared and organized in a table from four standard international construction contracts. After locating the original wording in each contract, the items were classified and matched using the following logic. As a result, 22 claim entitlement and 12 claim procedure were compared. The first stage of the integrated logic for the four contract types involved an initial comparison. In this stage, clauses outlining authority in the most widely used international contracts, FIDIC and NEC4, were compared first, followed by a comparison of AIA and PSSCOC. The second stage involved the integration of similar clauses. Here, identical or overlapping clauses were combined, while differences affecting cost or project duration were identified and classified. The third stage consisted of preliminary in-depth interviews, incorporating both

quantitative and qualitative analyses. The quantitative analysis was divided into three stages, which will be explained in detail in the next section.

4.2.2. Step 2. Preliminary In-Depth Interviews

Preliminary in-depth interviews were conducted based on the classified entitlement and procedure data for each clause. This stage involved reviews by two internal researchers with over 10 years of international construction experience and two external researchers with over 15 years of experience in international construction contracts. Items that were common or similar across the four standard contracts were quantitatively expressed in three levels: (1) High: mentioned in all four standard contracts, (2) Medium: mentioned in 2–3 contracts, (3) Low: mentioned in only one contract. Low-rated items were excluded for reorganization. After the quantitative analysis, items rated Low underwent additional qualitative evaluation with internal and external researchers to further organize the data. This process allowed the elimination of clauses deemed inappropriate for inclusion in the checklist model.

4.2.3. Step 3. Survey Distribution and Data Collection (5-Point Likert Scale)

After completing the preliminary in-depth interviews, survey questions were developed based on the reclassified data. To provide insights for the survey, Figure 2 includes the clauses and descriptions. The survey was distributed to 40 experts with extensive experience in international construction and contract management. The importance of each clause to the contractor was rated on a five-point Likert scale: 1 = Negligible; 2 = Slightly Important; 3 = Moderately Important; 4 = Very Important; 5 = Extremely Important. These scores were used to identify highly important clauses for developing the checklist model.

B. Evaluation of Claim Entitlement Clauses					Sample
Please rate the standardized claim entitlements on a scale of 1 to 5 for:					
(A) Importance of Clause to Contractor - 1 : Negligible, 2 : Slightly Important, 3 : Moderately Important, 4 : Very Important, 5 : Extremely					
No.	Clause	Description	Classification	Preliminary in-depth interview	(A) Importance of Clause
1	Right of Access to the Site	The Employer provides the Contractor with the right of access and occupancy to the site from the commencement date. If this is not provided, the Contractor can claim (EOT, Cost, Profit).	[F], [N], [P]	Mid	2 : Slightly Important
2	Co-operation	If there are delays and costs caused by unforeseeable events involving the Employer or public authority personnel, the Contractor can claim (EOT, Cost, Profit).	[F], [N], [A], [P]	High	3 : Moderately Important
3	Access Route	If the access route is made unavailable by the Employer or a third party, causing delays and incurring costs, a claim is possible (EOT, Cost)	[F], [N]	Mid	3 : Moderately Important
4	Archaeological and Geological Findings	If archaeological findings are reported to the Employer and instructions are followed while causing delays and costs, a claim can be made (EOT, Cost)	[F], [N]	Mid	3 : Moderately Important
5	Testing by the Contractor	If the Employer requests a test for reasons not attributable to the Contractor, the Contractor is compensated for the incurred inspection costs (EOT, Cost, Profit)	[N], [A], [P]	Mid	3 : Moderately Important
6	Remedial Work	If remedial work is delayed or incurs costs due to the Employer, a claim can be made (EOT, Cost, Profit)	[F], [N], [P]	Mid	3 : Moderately Important
7	Consequences of Employer's Suspension	If the Employer's instruction to suspend the work leads to delays and costs, a claim can be made (EOT, Cost, Profit)	[F], [N], [A], [P]	High	5 : Extremely Important

Figure 2. Sample for evaluation of claim entitlement.

4.2.4. Step 4. Second In-Depth Interviews and Checklist Model Development

This study identified checklist candidate clauses using two transparent, survey-based selection criteria. First, we selected clauses with a mean score of 4.0 or higher, as 4 on the five-point Likert scale represents ‘very important.’ Second, within each group of clauses (entitlement and procedure), we additionally selected clauses whose mean scores exceeded the average of the respective group. Candidate items identified by these criteria were then subject to a second round of expert interviews, which focused on reviewing the clarity of wording, eliminating overlapping items, and confirming that administrative requirements

were met. All interviews were conducted using a structured protocol to ensure consistency and reliability in refining the candidate set.

4.2.5. Step 5. Case Study: Applying the Checklist Model to Two Projects (7-Point LIKERT Scale)

Two contract experts applied the finalized checklist to two completed international projects. These projects included one with minimal disputes and another with some disputes. Two contract experts, each with over 10 years of experience, evaluated the severity to the contractor using the checklist model on a seven-point Likert scale: -3 = Very risky for contractor compared to suggested framework; -2 = Risky for contractor compared to suggested framework; -1 = Slightly risky for contractor compared to suggested framework; 0 = Neutral; $+1$ = Slightly reliable for contractor compared to suggested framework; $+2$ = Reliable for contractor compared to suggested framework; $+3$ = Very reliable for contractor compared to suggested framework. The importance scores from survey and the severity scores from case study were combined to calculate the risk number, allowing for comparisons and validation across the two projects. The total risk evaluation score could be determined by summing the risk numbers.

5. Results

5.1. Survey Profile

An analysis of survey respondents (Table 1) shows that 28% (11 out of 40) identified as owners, while 72% (29 out of 40) were contractors. Additionally, 92% (37 out of 40) of respondents were experts with over 10 years of experience, and the remaining 8% (3 out of 40) had more than 5 years of experience, contributing to the reliability of the survey results. Regarding experience with contracts and claims, 45% (18 out of 40) had more than 5 years of experience, while no respondents had less than 1 year of experience. All respondents had experience in international construction projects. The primary issues respondents identified when encountering claim entitlement and procedure challenges were Ambiguity in Contract Terms 37% (16 out of 40) and Technical Issues and Design Changes 25% (10 out of 40). In particular, 'Ambiguity in Contract Terms' was rated highly regardless of employment position. This suggests that ambiguity in contract terms is recognized as a major issue that can lead to claims during the execution of the project, and that clarifying these terms could help reduce the number of claims.

Table 1. Profile of research participants.

Category	Number	%
Employment		
Owner	11	28%
Contractor	29	72%
	40	100%
Work Period		
Less than 5 years	0	0%
5–10 years	3	8%
10–15 years	23	57%
15–20 years	13	33%
Over 20 years	1	2%
	40	100%

Table 1. *Cont.*

Category	Number	%
Contract/Claims Experience		
None	0	0%
Less than 1 year	0	0%
1–3 years	13	33%
3–5 years	9	22%
Over 5 years	18	45%
	40	100%
Cause of Claim Issues		
Ambiguity in Contract Terms	16	40%
Technical Issues and Design Changes	10	24%
Unequal Conditions Between the Contractor and the Employer	7	18%
Difficulty in Providing Evidence for Problems	7	18%
	40	100%

5.2. Survey Results

Table 2 presents the survey results for all claim entitlement and procedure clauses. The table reports owner and contractor mean scores, respective ranks, pooled means, standard deviations, and *p*-values from the Mann–Whitney U test to support full statistical transparency.

Table 2. Survey results of claim entitlement and claim procedure.

No.	Clause	Owner	Contractor	<i>p</i> -Value	Total	S.D.
1	Right of Access to the Site	3.00 (17)	3.41 (14)	0.47	3.30 (15)	1.11
2	Co-operation	3.45 (10)	3.38 (15)	0.86	3.40 (13)	0.81
3	Access Route	3.18 (13)	3.31 (16)	0.89	3.28 (17)	0.75
4	Archaeological and Geological Findings	3.27 (12)	3.62 (9)	0.41	3.53 (11)	0.85
5	Testing by the Contractor	3.00 (17)	3.15 (18)	0.67	3.28 (17)	0.93
6	Remedial Work	3.09 (15)	3.31 (16)	0.54	3.25 (18)	0.81
7	Consequences of Employer's Suspension	4.45 (2)	4.41 (2)	0.88	4.43 (2)	0.81
8	Prolonged Suspension	4.18 (4)	4.34 (4)	0.46	4.30 (3)	0.52
9	Interference with Tests on Completion	4.27 (3)	3.76 (7)	0.05	3.90 (7)	0.74
10	Delayed Tests	4.09 (5)	3.66 (8)	0.09	3.78 (8)	0.77
11	Failure to Pass Tests after Completion	2.91 (19)	3.10 (19)	0.63	3.05 (20)	0.96
12	Variation	4.55 (1)	4.59 (1)	0.75	4.58 (1)	0.55
13	Adjustments for Changes in Laws	3.91 (6)	4.41 (2)	0.04	4.28 (4)	0.68
14	Delayed Payment	3.45 (10)	4.10 (6)	0.11	3.93 (6)	1.00
15	Termination by Contractor	3.82 (7)	4.31 (5)	0.28	4.18 (5)	0.93

Table 2. Cont.

No.	Clause	Owner	Contractor	<i>p</i> -Value	Total	S.D.
16	Contractor's Obligations After Termination	2.73 (20)	3.62 (9)	0.01	3.38 (14)	0.84
17	Liability for Care of the Works	3.09 (15)	3.03 (20)	0.76	3.05 (20)	0.88
18	Consequences of an Exceptional Event	3.18 (13)	3.62 (9)	0.22	3.50 (12)	0.82
19	Errors in the Employer's Requirements	3.73 (8)	3.59 (12)	0.51	3.63 (9)	0.74
20	Unforeseeable Physical Conditions	3.64 (9)	3.59 (12)	0.80	3.60 (10)	0.90
21	Taking Over of Parts of the Works	2.36 (22)	2.93 (21)	0.11	2.78 (21)	0.89
22	Uncovering of Work	2.55 (21)	2.59 (22)	1.00	2.58 (22)	0.81
No.	Clause	Owner	Contractor	<i>p</i> -value	Mean	SD
1	Burden of Proof in Claims	3.36 (6)	3.31 (6)	0.77	3.33 (6)	0.94
2	Time Bar for Claim Request	4.09 (1)	4.28 (2)	0.51	4.23 (1)	0.80
3	What is the reasonable period for Claim Request (day)	26.73	32.62	0.71	31.0	-
4	Progress and Payment of Work During Claim	3.36 (6)	3.52 (5)	0.57	3.48 (5)	0.96
5	Time Bar for Detailed Proof of Claim	3.91 (2)	4.31 (1)	0.04	4.20 (2)	0.52
6	What is the reasonable period for Detailed Proof (day)	73.82	61.17	0.22	64.7	-
7	Time Bar for Claim Decision	3.55 (3)	3.76 (3)	0.47	3.60 (4)	0.78
8	What is the reasonable period for Claim Decision (day)	62.36	60.69	0.90	61.2	-
9	Contemporary Records	3.45 (4)	3.62 (4)	0.55	3.68 (3)	0.73
10	Access to Supporting Documents	3.45 (4)	2.93 (9)	0.14	3.08 (9)	0.83
11	Claim of continuing effect	2.91 (9)	3.28 (7)	0.15	3.18 (8)	0.68
12	Preventive Action Through Early Warning	3.18 (8)	3.28 (7)	0.73	3.25 (7)	0.67

Statistical analysis showed that, among the 34 assessed clauses, a statistically significant difference between owner and contractor responses appeared only for three clauses. These were Interference with Tests on Completion ($p = 0.05$), Adjustments for Changes in Laws ($p = 0.04$), and Contractor's Obligations After Termination ($p = 0.01$). For the remaining 31 clauses, no meaningful difference was found. The highest ranked clauses were identical for both groups. While differences in perspective may remain in principle, the results indicate that responses were broadly consistent for most clauses. The development of the checklist therefore used pooled mean scores, and the group-specific means and ranks are reported to maintain transparency.

Checklist items were selected using two quantitative criteria: clauses with mean scores of at least 4.0 on the five-point Likert scale, and clauses exceeding the group average, which was 3.59 for entitlement clauses and 3.56 for procedure clauses. Clauses with scores of 4.0 or higher reflect responses classified as very important, and clauses above the group average are considered to have relatively higher priority within each category.

Based on these criteria, five entitlement clauses scored 4.0 or higher, and six additional entitlement clauses exceeded the group average. The highest scoring entitlement clauses included Variation, Consequences of Employer's Suspension, Prolonged Suspension, Adjustments for Changes in Laws, and Termination by Contractor. For procedure clauses, two scored 4.0 or higher, and one surpassed the group average. Among procedure clauses, Time Bar for Claim Request and Time Bar for Detailed Proof of Claim received the highest mean scores. Expert interviews affirmed the statistical selection and further recommended inclusion of Archaeological and Geological Findings and Consequences of an Exceptional Event due to their frequent relevance in international construction projects. In total, fourteen entitlement clauses and four procedure clauses comprise the final checklist.

Responses indicated that 31.0 days was considered appropriate for submitting claim requests, 64.7 days for providing detailed proof, and 61.2 days for rendering claim decisions. Items related to time periods are presented descriptively, without categorical assignment.

5.3. Results on Claim Entitlement

For entitlement, the clauses that met the selection criteria and were retained after interview review include Variation, Consequences of Employer's Suspension, Prolonged Suspension, Adjustments for Changes in Laws, and Termination by Contractor, among others. These items exhibit higher perceived importance in the survey and clear administrative implications in interviews.

(1) Variation:

This was identified as the most crucial provision since it is nearly the only means to modify the project duration and cost before disputes arise. Experts noted in interviews that having clear and specific variation provisions can reduce disputes, underscoring its importance. For instance, NEC4, which emphasizes good faith, fairness, and mutual cooperation, includes "compensation events" that present specific scenarios compared to other standard contracts, benefiting both parties through clarity in variation clauses.

(2) Consequences of Employer's Suspension:

This addresses compensation related to suspension instructions issued by the Employer. In international construction projects, where project durations are long, suspensions may occur due to various external factors. This clause allows for the compensation of costs, such as indirect expenses due to delays, making it a significant provision as identified in expert interviews.

(3) Prolonged Suspension:

This clause provides for time extensions and cost compensation if a suspension continues beyond a specified period. Although termination is an option in cases of extended suspension, interviews revealed a preference for seeking time extensions and compensation through this clause rather than terminating, due to factors like maintaining a positive relationship with the Employer and good faith.

(4) Adjustments for Changes in Laws:

This applies when legal changes after the Effective Date impact the project. Most standard contracts include this provision, and the survey identified it as important. For example, FIDIC offers compensation only for Extensions of Time and Cost, whereas other contracts address these adjustments through variation clauses, indicating differences among standard contracts. Experts expressed that treating this as a variation clause would provide more reliability for contractors.

(5) Termination by Contractor:

This outlines compensation when a prolonged suspension occurs, or the Employer fails to fulfill contractual obligations or faces issues like bankruptcy or insolvency. According to interviews, if Prolonged Suspension occurs, contractors first attempt to claim costs through that clause; only if unsuccessfully they proceed under Termination by Contractor. Experts cautioned that termination could hinder future trust between parties, so it should be used carefully.

Clauses whose mean values exceed the group overall mean include Interference with Tests on Completion, Delayed Tests, Delayed Payment, Unforeseeable Physical Conditions, Errors in the Employer's Requirements, Consequences of an Exceptional Event, and Archaeological and Geological Findings.

5.4. Results on Claim Procedure

For procedure, Time Bar for Claim Request and Time Bar for Detailed Proof consistently met the selection criteria and were confirmed in interviews as critical governance controls. Indicative periods from the survey were approximately 31 days for the initial request, 65 days for detailed proof, and 61 days for the decision. Contemporary Records also ranked highly and underpins substantiation quality.

(1) Time Bar for Claim Request:

This specifies the period in which claims may be submitted. Missing this period nullifies the right to claim, making this the most critical clause according to the survey. Experts agreed that a specific time frame in this clause provides reliability for contractors, with a reasonable period suggested at 30.0 days. Comparing standard contracts, FIDIC allows 28 days, NEC4 56 days (8 weeks), AIA 21 days, and PSSCOC 60 days, aligning closely with FIDIC.

(2) Time Bar for Detailed Proof of Claim:

This requires that detailed evidence, including amounts and explanations, be submitted within a specific timeframe after a claim is made. This was identified as the second most important procedure due to the necessity of detailed information. Experts noted that providing a reasonable period for detailed proof is beneficial to both contractors and Employers, as it allows adequate review time. The suggested period for detailed proof is 64.7 days. FIDIC provides 84 days, NEC4 21 days (3 weeks), AIA 10 days, and PSSCOC 30 days, again aligning closely with FIDIC (Table 3).

Other items include two clauses: Time Bar for Claim Decision and Contemporary Records. However, the time limit for claim decisions was rated less important than other time bar provisions.

5.5. Checklist Development

The checklist utilizes clause-level means to identify high-priority clauses scoring 4.0 or higher and above-average clauses scoring at or above their group overall means (3.59 for entitlement and 3.56 for procedure). This methodology produced fourteen statistically selected items. Owner and contractor means, ranks, and *p* values are recorded to support transparent use in practice. Expert review then added two items that frequently arise in international projects and warrant proactive monitoring, namely 'Archaeological and Geological Findings' and 'Consequences of an Exceptional Event'. These expert additions are flagged as interview-validated rather than survey-selected. The resulting checklist is presented in Table 4 and is intended for prioritization and proactive review rather than project specific quantitative decision-making.

Table 3. Comparison of Time Bar Clauses Among Contracts.

No.	Item	FIDIC	NEC4	AIA A141	PSSCOC
1	Time Bar for Claim Request	Notification within 28 days, failure to notify results in loss of rights	Notification within 8 weeks, failure to notify results in loss of rights	Notification within 21 days, there are no consequences for failing the time bar	Notification within 60 days, there are no consequences for failing the time bar
2	Time Bar for Detailed Proof of Claim	Detailed information must be submitted within 84 days, there are no deadline for failing the time bar	The Contractor shall submit detailed documents within three weeks	If the employer requests additional support documents, the Design-Builder shall respond within 10 days.	Within 30 days of giving notice, the contractor must submit the claim amount and detailed justification.
3	Time Bar for Claim Decision	The employer must notify of any agreements or decisions within 84 days.	The Project Manager shall notify a response within two weeks.	The employer will respond within 10 days during the initial evaluation.	N/A

Table 4. Checklist for Claim Entitlement and Procedure.

No.	Clause	Details of the Suggested Clause	Evaluation
Claim Entitlement			
1	Variation Procedure	Variations ordered by directive result in an extension of time and an adjustment of the contract amount, explicitly stated as a change in the construction amount (EOT, Cost).	
2	Consequences of Employer's Suspension	If the Employer's instruction to suspend the work leads to delays and costs, a claim can be made (EOT, Cost, Profit).	
3	Prolonged Suspension	If the suspension lasts during certain period and the Employer does not issue a notice to resume work, a claim can be made (EOT, Cost, Profit).	
4	Adjustments for Changes in Laws	If changes in laws result in delays and costs to the Contractor, a claim can be made (EOT, Cost).	
5	Termination by Contractor	If, after a certain period following a suspension of work, the Employer fails to fulfill contractual obligations, or is in a state of bankruptcy or insolvency, the Contractor can claim (EOT, Cost, Profit).	
6	Delayed Payment	If the Contractor does not receive payment on time, a claim can be made with the compound interest on the financial costs incurred during the delay period (Cost + Interest).	
7	Interference with Tests on Completion	If the Employer's interference prevents completion tests from being performed, leading to delays and costs, a claim can be made (EOT, Cost, Profit).	
8	Delayed Tests	If tests after completion are delayed due to the Employer's fault, the Contractor can claim costs (Cost, Profit).	
9	Errors in the Employer's Requirements	If there are undetectable errors in the Employer's requirements that result in construction delays or increased costs for the Contractor, the Contractor can claim after notification (EOT, Cost, Profit).	

Table 4. *Cont.*

No.	Clause	Details of the Suggested Clause	Evaluation
10	Unforeseeable Physical Conditions	If the Contractor encounters unforeseeable physical conditions even by an experienced Contractor, the Contractor can claim (EOT, Cost).	
11	Archaeological and Geological Findings	If archaeological and geological findings are reported to the Employer and instructions are followed while causing delays and costs, a claim can be made (EOT, Cost).	
12	Consequences of an Exceptional Event	Exceptional Event includes events beyond the control of any party, cannot be reasonably prepared for, and cannot be reasonably avoided after occurrence. In such cases, a claim can be made (EOT, Cost).	
Claim Procedure			
1	Time Bar for Claim Request	The Contractor loses the right to claim if notification is not made within a specified period. If the Employer fails to respond within a specified period, the claim is considered valid.	
2	Time Bar for Detailed Proof of Claim	After recognizing a claim, it must be submitted within a specific period with detailed information such as contemporary records, construction costs, and time.	
3	Time Bar for Claim Decision	The Employer must notify of any agreements or decisions within a specified period.	
4	Contemporary Records	The Contractor must maintain contemporaneous records as reasonably necessary to support subsequent claims.	

Evaluation criteria: −3: Very risky for contractor, −2: Risky for contractor, −1: Slightly risky for contractor, 0: Neutral, +1: Slightly reliable for contractor, +2: Reliable for contractor, +3: Very reliable for contractor.

6. Case Validation

6.1. Project Profiles

We validated the checklist by applying it to two completed projects. The checklist items were derived from the survey using two criteria—mean ≥ 4.0 or above the group mean within entitlement or procedure—and were refined through interviews. Experts then assessed case severity for each item to compute risk numbers and project-level totals. The case study is conducted using two real-world projects: one international project from the UAE and another international project from Hong Kong. These projects have either been completed or are nearing completion, making the outcomes of claim risks nearly certain. These projects were selected based on their claim risk level, categorized as High and Low. In the case of Project A, most of the construction work was completed without any significant claims between the parties during the project duration. As for Project B, the construction was fully completed, and although many claims arose between the parties, the project was successfully concluded through appropriate adjustments.

This study employs comparative case study methodology to validate the proposed checklist model. This approach effectively tests theoretical models in complex real-world contexts and enables detailed exploration of contextual factors influencing outcomes. Two international construction projects were selected: Project A in the United Arab Emirates and Project B in Hong Kong. Both projects are completed or nearing completion, ensuring well-established claim risk outcomes. The projects were intentionally selected to represent different claim risk levels (low versus high) to test the checklist's diagnostic capability.

While the projects differ in geographical location and facility type, they share critical commonalities that enable comparative analysis for generalization. Both represent large-scale mega-projects executed under Engineering, Procurement, and Construction

(EPC) delivery models. The EPC model concentrates significant design, management, and construction risks on contractors, creating comparable contractual environments where claim governance becomes paramount. Table 5 establishes the basis for validation through detailed project comparison.

Table 5. Comparative Profile of Case Study Projects.

Attribute	Project A	Project B	Justification for Comparability
Location	United Arab Emirates (UAE)	Hong Kong	Both represent mature international construction markets with established common law frameworks aligning with analyzed standard contracts.
Project Type	Power Plant	Infrastructure (e.g., subway, tunnel)	Although different sectors, both require complex engineering coordination and specialized subcontractor management.
Contract Value	>USD 1 Billion	>USD 1 Billion	Mega-project scale ensures high complexity, significant capital investment, and substantial claim potential requiring robust management.
Project Duration	>5 Years	>5 Years	Long-term nature exposes both projects to unforeseen events including legal changes, prolonged suspensions, and economic fluctuations.
Delivery Method	EPC	EPC	EPC model provides standardized risk allocation framework enabling direct contractual and procedural comparisons.
Owner Profile	Experienced Public Entity	Experienced Public–Private Entity	Both owners represent sophisticated clients with substantial experience managing large-scale construction contracts ensuring professional project environments.
Number of Subcontractors	>20	>20	Numerous subcontractor involvement highlights the importance of clear contractual terms and systematic claim procedures.

6.2. Evaluation Results from Case Studies

This section provides the evaluation results, with further details on the key implications for each case to be explained in the next section. The case study method involved requesting construction contract experts with over 10 years of experience to evaluate the checklist model using a 7-point Likert scale based on severity. For example, if the risk for the contractor was high, it was rated as -3 points, and if the contractor was seen as reliable, it was rated as +3 points. Then, the risk number was calculated by multiplying the average importance score from the survey by the severity values from the case study. Through this

process, the risk for each clause was quantified, and the total sum of the quantified risk numbers allowed us to determine the overall risk for each case.

In the case of Case A (Table 6), where the claim risk was low-level at the end of the actual project, the subtotal risk number for the 12 claim entitlement checklist items was calculated as 30.39. In particular, the clauses on Variation (9.11) and Delayed Payment (7.79) were judged to be relatively reliable for the contractor compared to the checklist, resulting in high scores. Additionally, in clauses deemed highly important, the contractor was generally considered slightly reliable. Although some clauses, like Unforeseeable Physical Conditions, were assessed as slightly risky for the contractor compared to the checklist, the overall subtotal risk number was still high. For the four claim procedure checklist items, the subtotal risk number was calculated as 7.93. Time Bar for Claim Request and Time Bar for Claim Decision were slightly more flexible than the checklist model, resulting in a rating of slightly reliable for the contractor.

Table 6. Case A Evaluation Results.

No.	Clause	Mean Importance	Case A			
			Reason of Evaluation		Severity	Risk
Claim Entitlement						
1	Variation	4.55	Employer delays, design changes due to site conditions, and unforeseen issues are broadly recognized.	+2	Reliable for contractor	9.11
2	Consequences of Employer's Suspension	4.42	Suspension due to the employer grants the contractor compensation for termination costs.	+1	Slightly reliable for contractor	4.42
3	Prolonged Suspension	4.32	Prolonged employer-convenience suspensions specify both cost and profit compensation for the contractor.	+1	Slightly reliable for contractor	4.32
4	Adjustments for Changes in Laws	4.26	Delays and costs resulting from changes in laws are compensated as variations.	+1	Slightly reliable for contractor	4.26
5	Termination by Contractor	4.16	Prolonged employer-caused suspension grants the contractor the right to termination cost compensation.	+1	Slightly reliable for contractor	4.16
6	Interference with Tests on Completion	3.95	Compensation is provided when the employer causes unreasonable delays or costs.	0	Neutral	0.00
7	Delayed Payment	3.89	In the event of delayed payment, the contractor is entitled to compensation with a variable interest rate of LIBOR + 2%.	+2	Reliable for contractor	7.79
8	Delayed Tests	3.82	Compensation is provided when the employer causes unreasonable delays or costs.	0	Neutral	0.00
9	Errors in the Employer's Requirements	3.66	Design changes due to unforeseeable characteristics are recognized.	0	Neutral	0.00

Table 6. Cont.

No.	Clause	Mean Importance	Case A			
			Reason of Evaluation		Severity	Risk
10	Unforeseeable Physical Conditions	3.66	Historical weather data is not accepted, which creates difficulties in proving related claims.	−1	Slightly risky for contractor	−3.66
11	Archaeological and Geological Findings	3.55	When not mentioned in the contract, a neutral stance is applied.	0	Neutral	0.00
12	Consequences of an Exceptional Event	3.53	In the case of Force Majeure, EOT is granted, but costs are not compensated.	0	Neutral	0.00
Sub-Total				+7		30.39
Claim Procedure						
1	Time Bar for Claim Request	4.23	The 30-day time bar is advantageous as it allows more time compared to FIDIC and AIA.	+1	Slightly reliable for contractor	4.23
2	Time Bar for Detailed Proof of Claim	4.20	The 30-day time bar is longer than NEC4 or AIA but shorter than FIDIC's 84 days, making it tight in practice.	0	Neutral	0.00
3	Time Bar for Claim Decision	3.70	The 60-day time bar provides the employer with adequate review time and is also favorable for the contractor.	+1	Slightly reliable for contractor	3.70
4	Contemporary Records	3.58	This clause exists and specifies not only the retention of information but also its immediate provision.	0	Neutral	0.00
Sub-Total				+2		7.93
Grand Total				+9		38.32

In Case B (Table 7), where the claim risk was assessed as high, the evaluation of the 12 claim entitlement checklist items resulted in a sub-total risk number of −20.84 points. Specifically, the following items were assessed as slightly risky for the contractor: Variation (−4.55), Prolonged Suspension (−4.32), Adjustments for Changes in Laws (−4.26), Termination by Contractor (−4.16), and Archaeological and Geological Findings (−3.55). For the evaluation of the 4 claim procedure checklist items, the sub-total risk number was calculated as 4.23 points. Notably, the Time Bar for Detailed Proof of Claim was rated as neutral because no specific time period was clearly defined. Further details will be discussed in the next section.

Table 7. Case B Evaluation Results.

No.	Clause	Mean Importance	Case B			
			Reason of Evaluation		Severity	Risk
Claim Entitlement						
1	Variation	4.55	The supervisor’s authority is excessive, there are no detailed procedures, and the period is tight at less than 7 days.	−1	Slightly risky for contractor	−4.55
2	Consequences of Employer’s Suspension	4.42	Compensation is provided for suspensions not caused by the contractor.	0	Neutral	0.00
3	Prolonged Suspension	4.32	There is no provision specifying compensation for delays due to reasons attributable to the employer.	−1	Slightly risky for contractor	−4.32
4	Adjustments for Changes in Laws	4.26	There are no specific clauses regarding changes in laws.	−1	Slightly risky for contractor	−4.26
5	Termination by Contractor	4.16	There is no provision specifying termination due to reasons attributable to the employer.	−1	Slightly risky for contractor	−4.16
6	Interference with Tests on Completion	3.95	Compensation for interference with the Completion Test is not specified, but delays not caused by the Contractor are compensable.	0	Neutral	0.00
7	Delayed Payment	3.89	Payments are made at the lower rate between bank loan interest + 1% and court-decided interest rate−1%.	0	Neutral	0.00
8	Delayed Tests	3.82	Compensation for the Delayed Test is not specifically outlined, but delays not caused by the Contractor are defined as compensable.	0	Neutral	0.00
9	Errors in the Employer’s Requirements	3.66	Compensation is provided only for reasonably foreseeable circumstances.	0	Neutral	0.00
10	Unforeseeable Physical Conditions	3.66	Compensation is provided only for reasonably foreseeable circumstances.	0	Neutral	0.00
11	Archaeological and Geological Findings	3.55	In the case of artifact discovery, costs are compensated, but EOT is not specified.	−1	Slightly risky for contractor	−3.55
12	Consequences of an Exceptional Event	3.53	In the case of Force Majeure, an extension of time (EOT) is granted, but costs are not compensated.	0	Neutral	0.00
Sub-Total				+4		−20.84

Table 7. *Cont.*

No.	Clause	Mean Importance	Case B			
			Reason of Evaluation		Severity	Risk
Claim Procedure						
1	Time Bar for Claim Request	4.23	The general notification period is a written notice to the employer within 28 days.	+1	Slightly reliable for contractor	4.23
2	Time Bar for Detailed Proof of Claim	4.20	When not mentioned in the contract, a neutral stance is applied.	0	Neutral	0.00
3	Time Bar for Claim Decision	3.70	The 30-day time bar imposes a significantly burdensome condition on the employer.	0	Neutral	0.00
4	Contemporary Records	3.58	It is specified that contemporary records must be reasonably maintained.	0	Neutral	0.00
Sub-Total				−1		4.23
Grand Total				+3		−16.62

6.3. Insights from Case Studies

6.3.1. Case A

A more detailed case study was conducted on two projects classified according to actual claim risk. In the case of Case A, the project was found to have a low claim risk upon completion. The evaluation identified two main clauses that contributed to this positive outcome: Variation (9.11) and Delayed Payment (7.79). For Variation, the threshold for the amount that could be claimed was lower compared to the checklist model, and the scope of what could be claimed was broader. Particularly, clauses related to unpredictable subsurface conditions on-site and delays due to natural disasters were judged to be more lenient compared to other EPC contracts. In the Delayed Payment clause, the interest for delayed payments was confirmed to be LIBOR + 2%, making it reliable for the contractor. Since the interest rate is variable, the higher the interest rates, the greater the obligation on the employer to make payments on time, which was deemed beneficial to the contractor.

Additionally, the Consequences of Employer's Suspension clause (4.32) allowed for compensation in the event of a suspension caused by the employer, resulting in a slightly reliable assessment for the contractor. The clauses Adjustments for Changes in Laws (4.26) and Termination by Contractor (4.16) were also rated slightly reliable for the contractor, as each included clearly defined compensation terms. On the downside, the Unforeseeable Physical Conditions clause did not allow the use of historical weather data as evidence. Therefore, contractors would face difficulties proving unforeseeable conditions under the contract terms.

For the Time Bar for Claim Request and Time Bar for Claim Decision, the specified periods were similar to those in the checklist, making them slightly reliable clauses. Notably, the 60-day period for the claim decision was considered generous, giving both the contractor and the employer sufficient time for review, which was seen as beneficial to both parties during the interviews.

In summary, the evaluation of Case A found the contractor to be reliable in terms of claim entitlements and slightly reliable in terms of claim procedures. These findings aligned with interviews conducted with experts involved in the project, confirming that the checklist model was useful.

6.3.2. Case B

In Case B, the project was evaluated as having a high claim risk based on actual performance results. The main factors leading to significant point deductions were Variation (−4.55), Prolonged Suspension (−4.32), Adjustments for Changes in Laws (−4.26), Termination by Contractor (−4.16), and Archaeological and Geological Findings (−3.55).

For Variation (−4.55), the clause stipulated that if the contractor did not object to the employer's verbal instructions within seven days, the instructions would be deemed as written. However, there was no clear mention of a time bar for detailed procedures or adjustments for variation costs. Respondents noted that this led to significant challenges during project execution due to the short objection period and lack of detailed time bar provisions.

In the case of Prolonged Suspension (−4.32), the clause required the contractor to notify the employer after a suspension exceeding 72 days, and the employer was to respond within 28 days. However, there were no provisions for EOT or cost compensation for employer-caused delays, which respondents reported as a significant difficulty during execution due to the employer-favorable terms. Regarding Adjustments for Changes in Laws (−4.26), the absence of a clause addressing changes in laws raised potential claims for delays and additional costs. Although no major legislative changes occurred during execution, respondents emphasized the importance of reviewing this clause.

For Termination by Contractor (−4.16), there was no explicit clause for termination due to employer-related reasons. Additionally, the contract lacked provisions for compensating contractors for work performed before termination, such as interest payments. While no terminations occurred due to the employer's stable financial status, the need for reviewing this clause was highlighted.

For Archaeological and Geological Findings (−3.55), the clause granted ownership to the employer and covered costs but did not provide for EOT. Actual delays occurred due to archaeological discoveries, requiring claims that created difficulties. However, through amicable negotiations with the employer, the variation was resolved, and adequate compensation was secured. Lastly, regarding the Time Bar for Detailed Proof of Claim, the absence of a specified period allowed contractors sufficient preparation time and flexibility in negotiations with the employer, which respondents noted as beneficial.

In summary, the evaluation of Case B showed that the Claim Entitlement provisions were slightly risky for the contractor, while the Claim Procedure provisions were somewhat reliable. Overall, the contract was assessed as slightly risky for the contractor. Interviews with experts involved in the project confirmed similar findings.

The knowledge-driven analysis of the two case studies confirmed that the presented checklist model could help manage claim risk in actual projects. Case A was evaluated as a project with low claim risk, with the Variation (9.11) and Delayed Payment (7.79) clauses working favorably for the contractor. Specifically, the Variation clause provided broad compensation for unpredictable circumstances, and the delayed interest terms were favorable for the contractor. However, in clauses such as Unforeseeable Physical Conditions, the contractor could face significant burdens in proving claims. Case B was evaluated as a project with high-level claim risk, where the short proof period in the Variation clause posed a potential risk of disputes. Interviews with experts from both Case A and Case B provided similar responses. This overall alignment between the expert interviews and the case study results confirmed that the checklist model is effective in evaluating contractor claims for entitlement and procedure.

In the low-risk project, higher-scoring entitlement and procedure items aligned with favorable severities, producing a positive total risk number. In the high-risk project, several checklist items combined higher importance with adverse severities, yielding a negative

total. This contrast illustrates how the checklist connects clause-level priorities, derived from broad expert judgment, with project-specific conditions observed by practitioners.

7. Discussion

This study's comparative analysis focuses on standard contracts (FIDIC, NEC4, AIA, and PSSCOC) rooted in common law systems. However, the impact of differing legal frameworks, particularly the distinction between common law and civil law, requires examination. This distinction critically affects how contractual clauses are interpreted and enforced depending on the governing law.

Common law jurisdictions prioritize freedom of contract, treating explicit contract terms as the complete agreement between parties. Civil law systems rely on codified statutes as the primary legal source. In these jurisdictions, mandatory provisions such as good faith principles can override contractual terms even when not explicitly stated.

This legal divergence creates profound implications when common law-based contracts are applied in civil law jurisdictions [70]. The FIDIC Red Book operates on segregated responsibilities where the employer bears design liability and the contractor handle construction. Under Egyptian civil law, mandatory provisions require the contractor to re-view employer-provided design and assume liability as if they prepared it themselves [71]. This requirement fundamentally modifies the intended risk allocation.

Subsurface risk management demonstrates similar divergence. The FIDIC Emerald Book establishes a Geotechnical Baseline Report as the contractual reference for expected ground conditions. Conditions beyond this baseline qualify as 'Unforeseeable Physical Conditions,' entitling contractors to additional time and cost. Conversely, the Austrian ÖNORM B 2203-1 within a civil law framework pre-classifies ground conditions into 'Tunnelling Classes' with pre-defined remuneration structures [72]. This approach transforms potential disputes into contractual adjustment mechanisms, reflecting civil law preference for codified eventualities.

Procedural clauses such as time bars receive different interpretation across systems. Common law systems enforce strict compliance as conditions precedent to entitlement. Civil law courts may moderate enforcement based on good faith principles or genuine prejudice assessment. These examples demonstrate that applying common law-based standard contracts in civil law countries creates conflicts between contractual text and mandatory legal provisions. Successful international project execution requires thorough understanding of governing law and appropriate contract amendments.

This study developed and validated a systematic checklist for managing claim risks in international construction contracts. The findings contribute to construction contract management knowledge by connecting with existing literature while offering practical applications.

The expert survey results indicated that 'Variation' clauses received the highest mean scores among claim entitlement provisions. This finding aligns with prior studies identifying scope changes as primary dispute causes. Antoniou et al. [27] confirm that design changes and variations significantly impact project cost and schedule performance. Lee et al. [73] highlighted those contractual disputes frequently arise from scope changes. This research empirically demonstrates that establishing clear variation definitions and procedures represents a top priority for dispute prevention.

The study identified procedural clauses such as 'Time Bar for Claim Request' and 'Time Bar for Detailed Proof of Claim' using survey-based quantitative criteria. The selection of these clauses aligns with legal research emphasizing time bar importance. Purba and Yuri [58] emphasized time period specification comparing FIDIC and NEC3 approaches. Strict enforcement prevents dispute escalation by ensuring contemporaneous

issue resolution. The survey results demonstrate that industry experts consistently rate these clauses as significant contributors to claim risk, rather than viewing them as mere administrative requirements.

Survey respondents identified ‘Ambiguity in Contract Terms’ as the leading claim cause. This result supports existing literature where Vilkonis et al. [23] argue that contract quality, particularly clarity and precision, fundamentally mitigates contractor-client conflicts. Ambiguous terms create differing interpretations that become conflict sources. This study advances beyond causal analysis by proposing a tangible solution through systematic identification and evaluation of ambiguous clauses.

8. Conclusions

This study aimed to develop a risk evaluation model for key claim entitlement clauses and reasonable claim procedures in international construction contracts by comparing the four widely used standard contracts: FIDIC, NEC4, AIA, and PSSCOC. The findings from the study demonstrate that the checklist model derived from these contracts is a useful tool for managing risks in construction projects, as shown through the case studies of two real projects. This model highlights critical areas of claim entitlement and procedure, offering practical applications for contractors and employers involved in international construction.

This study set out to develop a comprehensive checklist for evaluating and managing claim entitlement and procedures in international construction. By comparing FIDIC, NEC4, AIA, and PSSCOC, the study identified clauses that materially shape claim posture. Checklist items were identified using two survey-based selection criteria: clauses scoring 4.0 or higher on a five-point scale, and clauses exceeding the group mean (3.59 for entitlement, 3.56 for procedure). Based on these criteria, 10 entitlement clauses and 4 procedure clauses were initially selected. Expert interviews supplemented two additional entitlement items that frequently occur in international projects, resulting in a final checklist of 12 entitlement clauses and 4 procedure clauses.

The checklist, validated on two completed projects, demonstrated practical utility. It directs attention to Variation, Consequences of Employer’s Suspension, and time bars for claim request and detailed proof. The model provides an auditable framework that helps stakeholders identify and address potential claim risks before they escalate into disputes, particularly in complex projects with multiple parties and unclear terms.

The practical implications of this study are significant. The checklist model can be applied in real-world projects to help contractors and employers manage claim risks more effectively. By using this tool, parties can assess the importance of different clauses and identify potential risks before a project begins. This proactive approach will help reduce delays, avoid litigation, and save costs associated with lengthy dispute resolutions. Moreover, the checklist serves as a guide during contract negotiations, ensuring that both parties are aware of their obligations and rights, thereby fostering clearer communication and reducing the likelihood of disputes.

Despite its value, the study has limitations. The expert sample comprises 40 respondents and is skewed toward contractors. We mitigate this by reporting group specific means, ranks, and p values, but the representation of owners should be strengthened. Respondent judgments may reflect personal experience and context, which can introduce bias. Cultural and operational differences across countries were not examined in depth. The case applications focus on clause prioritization based on survey results, and day type items are summarized descriptively. These factors may affect generalizability across legal systems and delivery settings.

Future research will extend the work in three directions. First, we will conduct sensitivity analysis to test the stability of clause means and ranks using bootstrap resampling

and controlled perturbations of respondent-level scores. Second, we will integrate decision-oriented methods such as FMEA, AHP, and Monte Carlo simulation so that the checklist can produce project specific risk ranges and support trade off analysis. Third, we will broaden and balance the expert pool across regions and legal systems and calibrate thresholds to delivery contexts. These steps will enhance representativeness, provide robust evidence, and enable the checklist to serve as a foundation for quantitative decision-making in subsequent studies.

In conclusion, this study has provided a valuable tool for managing claim risks in international construction projects, highlighting the importance of clearly defined contract clauses and procedures. This study contributes a knowledge-driven, auditable checklist that transforms narrative contract guidance into actionable claim governance tools. By recognizing its practical benefits and limitations, future research can continue to develop more comprehensive tools to improve claim management in international construction.

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