



DISPUTED RISKS IN CONSTRUCTION

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The construction industry is perceived as one of the most crucial fields in risk management studies due to its inherent risks and complexity. Despite the large amount of research presented in this area, experts still prefer relying on their own knowledge and experience to manage project risks. This approach leads to various disputes among construction stakeholders over the ownership of these risks and their mitigation. Such disputes normally affect the project's goals in terms of budget and schedule. Many researchers have addressed risk factors in the construction field; however, none has tackled the disputed risks among construction parties. This research aims at identifying the different disputed risk factors among project stakeholders along with their respective mitigation strategy. It is based on an empirical questionnaire sent to construction practitioners with various expertise. An analysis of the results is conducted using descriptive statistics and one-on-one interviews. This research provides experts with a list of the most disputed risks in construction, along with their mitigation approach. In the end, construction parties will be able to meet the project's goals and steer clear of any delay or cost overrun resulting from the occurrence of disputed risks.

Keywords: Risk management, Risk mitigation, Risk analysis, Construction industry, Owner, Contractor.

1 INTRODUCTION

Risk is defined as an uncertain event that can produce severe consequences on an organization. It can happen in various environments and with diverse characteristics and impacts (Serpell *et al.* 2015). In construction projects, stakeholders usually perceive the risk at an advanced level because of the inherent challenges and tough working conditions faced during construction (Hanna *et al.* 2013). This results in controversies in risk allocation, with each party attempting to transfer it to others, leading to disputes between them.

However, despite having a lot of studies about risk management, experts still prefer using their own knowledge and experience for approaching risks in construction (Jung and Han 2017). This subjective approach in handling risks often leads to conflicts between the different parties in a construction project.

Despite that, the construction management literature agrees on the identification, severity and likelihood of risks in construction; every party still has its own perspective about risk responsibility and sharing. Thus, the aim of this research is to identify disputed risks between construction stakeholders through collecting their different perspectives on risk responsibility and sharing as well as mitigation strategies. This will provide practitioners in the field with a clear idea on the commonly disputed risks in construction and their most adequate mitigation strategies.

2 LITERATURE REVIEW

Research studies tackling risk management can be mainly divided into two categories: risk assessment and risk mitigation. This section will elaborate on these two groups of studies.

Many researchers have addressed risk assessment. Some have tackled this topic using empirical approaches where they surveyed construction experts' opinions through questionnaires or interviews. For example, Konior (2015) calculated a correlation factor that links the likelihood of occurrence and the impact of a risk for different project risks using direct data derived from a survey. Nan *et al.* (2016) analyzed project risks as random variables in order to estimate the probability distributions of the attributes of perceived risk and analyze their criticality. In this article, risk criticality is the significance of the risk, determined by both its probability of occurrence and level of impact. Furthermore, researchers have also used modeling in order to address this topic. For instance, Jannadi and Almishari (2003) developed a model called Risk Assessment Model (RAM) that determines, based on specific input data, the risk score of an activity, and generates a justification factor that gives an estimate of the efficiency of the proposed solution.

On the other hand, risk mitigation has also gained interest among researchers. In these studies, researchers have widely used empirical approaches to assess the appropriate mitigation strategies based on experts' opinions. For example, Abdul-Rahman *et al.* (2012) ranked 57 different risk factors in the Gulf Region, as to their own severity and likelihood of occurrence, and then associated risk responses for every risk factor, as a solution to mitigate it. Albalate *et al.* (2015) studied the different risk mitigation strategies and sharing in Public-Private Partnerships for different countries across the world. He related the country's own economic situation to the company's approach for risk strategies.

Despite the several studies about risk assessment and mitigation, experts still rely on their own experience and knowledge to identify, assess and mitigate risks. In fact, stakeholders do agree on the identification of risks and their magnitude and likelihood in construction but are still in constant dispute over the ownership of a specific risk and who is responsible for mitigating it. This study addresses this issue through surveying construction stakeholders and identifying the main risks that are disputed among them. Also, this study presents mitigation strategies for the same risks, in order to provide practitioners with a complete perspective on the issue of risk management.

3 RESEARCH METHODOLOGY

3.1 Data Collection

To achieve the objective of this paper, an empirical questionnaire was drafted and sent to contractors, developers and architects in the construction field. A literature review was done to gather all the information published on the most important risk factors in the body of knowledge. Hariharan *et al.* (2012), Abd El-Karim *et al.* (2017), Chan *et al.* (2011), Shen *et al.* (2001), Abdul-Rahman *et al.* (2012) and many more scholars have assessed the different construction risk factors. In this study, the risk factors presented by the aforementioned publications were grouped and organized in a way to limit the number of factors in the study in a concise manner, but still cover all the aspects of risk management. Table 1 shows all the risk factors that were used.

Table 1. List of investigated risk factors.

ID	Risk
R1	Change or Ambiguity in Scope of Work: Missing items or insufficient design at tender stage/Intense Competition/tender
R2	methodology (lowest bid)
R3	High complexity of Project (Many uncertainties / Different stakeholders / High expectation of owner)
R4	Ambiguous, incomplete and one-sided contract
R5	Unforeseeable ground conditions
R6	Lack of experience of contracting parties / poor quality of Work
R7	Accidents and safety issues on site
R8	Unsatisfactory performance and frequent change of Subcontractors
R9	Delayed site investigation, handing over and mobilization
R10	Poor planning, estimating and scheduling of critical activities
R11	Delays in solving contractual disputes
R12	Incompetence of Project management / organizational issues: Inflexibility of Project consultant (delays in testing and revising alternative design
R13	etc..)
R14	Poor/rushed Project design and Poor Constructability
R15	Project Finance Problems and Delayed Payments
R16	Political, Governmental, and Regulatory Issues
R17	Resource Price fluctuation, inflation, and changes in Interest Rate
R18	Unfavorable social and weather conditions
R19	Poor quality of material and equipment
R20	Changes in material quality and specification
R21	Delays in Resource Availability / Low productivity of Labor

In addition, a list of mitigation strategies was extracted from the literature and was included in the questionnaire. Chan *et al.* (2012) and Abdul Rahman *et al.* (2012) presented well elaborated risk mitigation strategies which were used in this study as well.

3.2 Design of Empirical Questionnaire

The questionnaire is composed of two parts to specifically address the aim of this research. The first part targets the respondents' professional profile and experience in the field. It is crucial to differentiate between the different backgrounds of the respondents in order to evaluate their response in relation to their expertise. A total of 95 respondents have completed the survey. Table 2 presents the distribution of the respondents based on their field of expertise and type of projects. The results of this research will also be based on a comparison between the respondents based on their type of project experience. The second part is considered the main and most important part of the survey. Respondents were given the list of all the risk factors presented previously where they were asked to choose whether the risk factor is the owner's responsibility, the contractor's or shared. Then, they had to pick one or more mitigation strategies that they deemed adequate to each investigated risk factor.

Table 2. Respondent profile.

Field of Expertise	Percentage	Study Group	Type of Projects	Percentage	Group
Owner/Development Firm	7.37%	Owner Group	Residential	29.32%	G1
Consultancy Firm	48.42%		Commercial and Institutional	26.70%	
Design Firm	12.63%		Highway	9.95%	
Real Estate Agency	1.05%		Construction		
Contracting Firm	26.32%	Contractor Group	Industrial	17.80%	G2
Subcontracting Firm	4.21%		Heavy Construction	16.23%	

4 RESULTS

After gathering all the responses, three analyses were completed in this research. An overall analysis was done for all responses and two others based on the grouping shown in Table 2 for the type of project experience. For all three analyses, each group of answers (Contractor and Owner) are considered separately. The collected responses are summarized, and percentages are calculated for each group. The response with the highest percentage within the same group was considered for that specific risk. If both groups share a different response for the same risk, then it would be considered a disputed risk. Otherwise, that risk would be considered as an agreed upon risk. As for the mitigation part, both groups were considered as one. The mitigation strategy with the highest number of responses is chosen for each risk. Table 3 presents a summary of the descriptive statistics, showing the type of risk (whether disputed or agreed) for all respondents. It also shows the results for each group of projects, along with their corresponding mitigation strategy.

The results obtained in Table 3 were analyzed and discussed during one-on-one interviews with experts in the construction field. The results of this research are interpreted as follows:

- (i) Overall Responses - Both owner and contractor groups agree on the ownership of 17 out of 21 risks. This observation proves that they have a clear agreement on the responsibility and ownership of most risks in construction when asked in an objective setting. However, this is not the case in the field, where they are subjectively involved in construction risks.
- (ii) G1 Responses – Results show that the two groups are in dispute over 4 out of 21 risks. The same interpretation applies as that of the overall responses.
- (iii) G2 Responses – The two study groups within these types of projects show an overall dispute over 7 out of 21 risks. The types of projects within this group are known to be more complex than those within G1 because of the more intricate construction activities and traits involved aside the higher number of stakeholders. When subjected to a complex working environment, project stakeholders tend to be in larger disagreement over risk ownership and responsibility.

Table 3. Risk ownership and mitigation.

Risk ID	G1	G2	Overall	Mitigation
R1	Agreed	Agreed	Disputed	Clearly defined scope of works in client's project brief
R2	Disputed	Agreed	Disputed	Tender interviews and tender briefings to ensure tenderers gain a clear understanding of scope of works involved and necessary obligations to be taken in the project
R3	Agreed	Agreed	Agreed	Right Selection of Project Team
R4	Agreed	Disputed	Agreed	Development of standard contract clauses in connection with project's schemes or methodology
R5	Disputed	Disputed	Agreed	Prompt evaluation and agreement on any variations as they are introduced
R6	Agreed	Agreed	Agreed	Right Selection of Project Team
R7	Agreed	Agreed	Agreed	Adhere to the international occupational health and safety (OH and S) management system specification
R8	Agreed	Agreed	Agreed	Work with familiar subcontractor, supplier or client with thorough background checks
R9	Agreed	Agreed	Agreed	Prompt evaluation and agreement on any variations as they are introduced
R10	Agreed	Agreed	Agreed	Sufficient time given to interested contractors to submit their bids for consideration
R11	Agreed	Agreed	Agreed	Establishment of adjudication committee and meetings to resolve potential disputed issues
R12	Agreed	Disputed	Agreed	Right selection of project team
R13	Agreed	Disputed	Agreed	Right selection of project team
R14	Disputed	Disputed	Disputed	Employing a third party to review the project design in compliance with prevailing building regulations and buildability at tender stage
R15	Agreed	Agreed	Agreed	Insert provision in the contract to allow contractor to suspend work in the event of non-payment
R16	Disputed	Disputed	Agreed	Engage local partner or local manager
R17	Agreed	Agreed	Agreed	Application of price fluctuation clause in the contract
R18	Agreed	Agreed	Agreed	Implementation of relational contracting within the project team
R19	Agreed	Agreed	Agreed	Counter propose materials and equipment that are obtainable in local areas
R20	Agreed	Disputed	Disputed	Adapt and adopt: the standards in accordance to the specifications
R21	Agreed	Agreed	Agreed	Prepare standbys for the equipments according to priority of age, frequency of usage, and the likelihood of failure

5 CONCLUSIONS

The dynamic and complex nature of construction projects reflects high uncertainties and risks which causes construction experts to be in constant dispute over the ownership of these risks.

This paper aims at identifying the risks that are being disputed in the field. A survey was sent out to experts after a comprehensive literature review of the most common risk factors and mitigation strategies. Descriptive statistics and one-on-one interviews were conducted to analyze results of the survey. The study showed that experts tend to share an understanding on risk ownership, but have larger disagreements when subjected to a more complex environment. Furthermore, this paper lists proper mitigation strategies for each risk, as agreed by both parties. That way, experts will get an early chance to agree on the ownership of disputed risks and their mitigation strategies, prior to the start of the project and avoid possible delays that the project may face due to these disputes.

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