



Research article

Evaluation of insurance policies in the Saudi Arabian construction contracts

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ABSTRACT

The construction sector is more complicated and prone to risk than many other industries due to the size of the projects and the financial capital involved. Arranging insurance is the prudent course of action for risk management in the construction sector. There is a lack of clarity in insurance policies for public construction projects in the Kingdom of Saudi Arabia (KSA), which poses additional risks to all involved contracting parties. The aim of this research is to evaluate insurance policies in the KSA's public construction projects to identify the key deficiencies and obstacles and provide a road map for improvement in the insurance sector concerning insurance against financial losses, professional liability, defects' liability, hidden defects, and others. Forty-two contractors and forty-two owners in Saudi Arabia were surveyed, using a questionnaire to gather information for the study about their knowledge of and attitudes regarding risk transfer through insurance (professional liability, defects liability, and hidden defects). The study also covers the selection criteria for insurance policies for projects that potentially shift risk to the construction sector. Ten criteria were also examined as potential sources of liability issues and suggested as potential remedies in KSA. The findings indicate that the duty and liability of engineers and those participating in these projects can be offset by engineers' insurance against professional errors and hidden flaws, and by the construction industry's clear liability policy. Additionally, the research is envisaged to contribute to construction projects' overall quality and safety, ensuring that robust legal and financial safeguards protect all stakeholders.

1. Introduction

Construction projects in the Kingdom of Saudi Arabia (KSA) have faced various challenges, including schedule delays, poor performance, cost overruns, and safety issues [1,2]. These challenges emphasize the importance of and need for insurance coverage to address potential risks and uncertainties in construction projects. While there is no specific requirement for insurance coverage to be within a certain percentage of the construction project's value, it is important to assess the risks involved and obtain appropriate

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coverage. In some cases, contractors may be reluctant to purchase insurance or may only purchase the minimum required by law or contracts. This can leave construction projects inadequately protected against risks. Lack of knowledge about construction insurance and proper subsequent management can also undermine the effectiveness of insurance coverage (Liu et al., 2018). Accordingly, it is essential for contractors to comprehend the risks in their projects and make informed decisions regarding suitable levels of insurance coverage (Myeongssoo, 2014).

The construction industry in Saudi Arabia has shown poor performance over the past three decades, with the government relying on the low bid delivery method and prequalified contractors using the Contractors' Classification System (CCS) [1]. However, this system lacks important practices such as prequalification, bonding, and third-party Insurance [3]. The lack of clarity in insurance policies for public construction projects in Saudi Arabia is a significant issue that needs attention; which is the point of departure of this research.

In many jurisdictions in middle east countries, contractors, as well as design and supervision consultants, are typically held jointly liable for a duration of ten years after the completion of a building. This liability arises in situations where a building experiences complete or partial collapse, or when there is a defect jeopardizing the building's stability and safety. This legal concept is commonly known as "decennial liability". Until recent years, KSA did not enforce decennial liability [4]. This meant that contractors and consultants could conduct their operations within KSA without the threat of no-fault liability. This is just one example of the ambiguity of insurance and liability regulations in KSA construction projects.

The research aims to comprehensively assess insurance policies in public construction projects in KSA, targeting key deficiencies and obstacles. It seeks to provide a detailed roadmap for enhancing the insurance sector, particularly in addressing issues related to financial losses, professional liability, defects liability, hidden defects, and other pertinent factors. The research holds significant merits for the construction industry and its stakeholders in KSA as it offers valuable insights into the landscape of construction-related Insurance that not only enhances the understanding of existing policies but also paves the way for substantial improvements. By pinpointing key issues, this study offers methods for enhancing the insurance sector, aimed at mitigating financial losses and tackling vital elements like professional liability and hidden defects. The research is envisaged to contribute to construction projects' overall quality and safety, ensuring that robust legal and financial safeguards protect all stakeholders.

2. Literature review

Construction projects are particularly vulnerable to a vast array of risks and hazards. According to Bunni [5], and Babbu (2014), some of the inherent characteristics of construction projects are: the time required to complete a project is relatively long; human resource requirements are diverse and change over time and from phase to phase; projects are geographically dispersed and sometimes located in isolated regions of difficult terrain; a large, diverse pool of workers is required. All these factors make projects sensitive to an extremely large matrix of hazards and risks. According to Flanagan and Norman [6], Tar and Carr (2000), and Baker [7], the construction business is more vulnerable to risk and uncertainty than many other industries. The management of project objectives, such as timely completion, spending within the allocated budget, and achieving the required performance, is positively impacted by risk management [8]. In a nutshell, managing the project's risks entails managing the project itself. Planning, assessment (identification and analysis), handling, and monitoring are a few associated risk tasks included in Kerzner's [9] study on the topic.

An insurance contract is said to be "Based upon good faith between the parties." Therefore, the insured must fully disclose all material information that is known ([10]; Ogwueleka, 2018). From the aforementioned, risk management encompasses more than just insurance, although insurance plays a significant role in the risk management process. In reality, risk reduction strategies other than insurance are a last resort [11]. According to McNamee [12] and Sherif et al. [13], risk management practices in the past were primarily concerned with hazard insurance and likely loss. Today, however, it emphasizes the big-picture concerns of general management. Li et al. [14] presented a study that examines the safety risks associated with new construction, decoration, repair, and maintenance projects in order to offer guidance to policymakers, safety personnel, and builders. In addition, this research is needed to rate and compare new skyscraper constructions with existing renovation, maintenance, and repair projects.

Decennial liability is a strict obligation applied to construction projects where the contractor and/or the design consultant will be held liable for any negligence or breach of the contract. Therefore, there must be compensation to the owner or the employer when there is any defective work in the built structures. The liability is typical and will last for ten years after the project's completion [15]. Law in Saudi Arabia is based on the Islamic religion. On the other hand, most Middle Eastern countries have established civil codes setting out the general principles which apply to commercial dealings and explaining when parties will be liable to each other for civil negligence or breach of contracts (i.e., torts). However, Saudi Arabia has a comprehensive government tenders and procurement law (GTPL) that codifies the process for appointing contractors on government projects and the liabilities that come with it. In Saudi Arabia, decennial liability is governed by the government tenders and procurement law. However, this government tenders and procurement law only applies to government contracts, as its name implies. There are many different features of decennial liability under the government tenders and procurement law.

Construction contracts usually include a defects' liability period during which the contractor is responsible for repairing or rectifying defects in the works. The period usually commences upon practical completion of the works and runs for a specified time frame. Under a construction contract, one of the contractor's primary obligations is to carry out and complete the works to the standard set out. The defects' liability period is intended to complement this liability by setting out how and when the contractor must remedy defective work, which becomes apparent during the defects' liability period. A defects' liability clause will set out the length of the defects' liability period, the scope of the defects the contractor is obliged to remedy, and any part of the contract sum retained by the employer as surety for the performance of the remedial work. Typically, the defects' liability period starts on the completion of the works, which in many contracts will be signaled by the employer's representative issuing a practical completion certificate. The actual

period will vary depending on the nature of the contract; for straightforward building projects, it is usually six or twelve months (Pain, 2018).

3. Research methodology

The paper’s research methodology (see Fig. 1) is gleaned from a structured questionnaire to capture insights on three key areas depicting a quantitative scheme: Professional Liability Insurance for Engineers, Defects Liability in Construction, and Insurance Against Hidden Defects in Construction Projects. The questionnaire was vetted through a preliminary pilot study with experts in the construction sector, ensuring comprehensiveness and relevance. This quantitative scheme emerges by interrogating two primary groups: owners and contractors within the Saudi Arabian construction sector.

3.1. Questionnaire survey design

The questionnaire survey is structured into three primary sections, each focusing on different aspects of insurance in the construction industry: Professional Liability Insurance for Engineers, Defects Liability in Construction, and Insurance Against Hidden Defects in Construction Projects [16–19]. Table 1 displays discussion points in the survey’s section one, which evaluates the understanding, perceptions, and impacts of professional liability insurance for engineers in the construction sector. These points are developed through an analytical assessment of the insurance’s role in scenarios incorporating mistakes or omissions during work. The focus is on how this insurance serves as a defense against allegations of negligence, including issues of expectations and satisfaction, as well as against claims of misrepresentation and incorrect advice. Essentially, the insurance is intended to cover professionals offering advice or providing direct services.

Section two’s set of survey points focuses on defects liability insurance. This section seeks detailed quantitative insights into the commonly held belief that builders, typically contractors or subcontractors, are responsible for defects arising from failure to adhere to design specifications or recognized industry standards. The survey aims to understand the extent of this accountability, particularly in

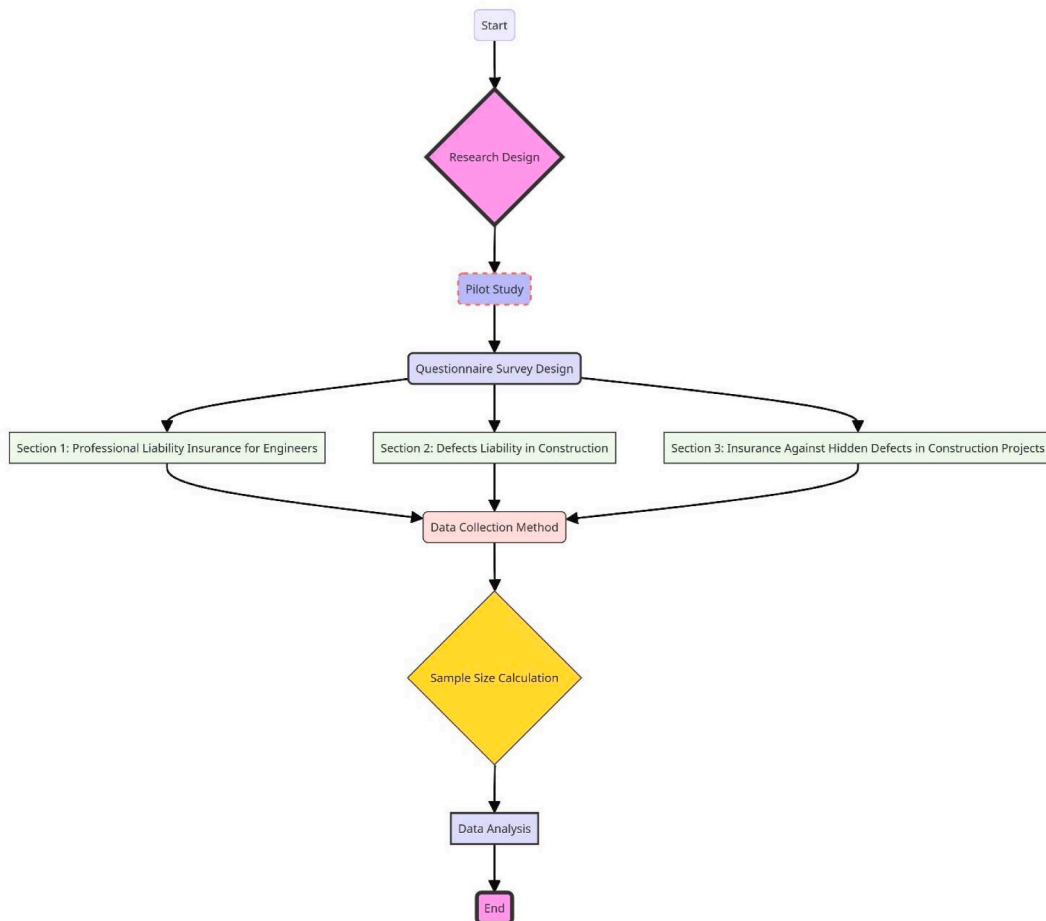


Fig. 1. Proposed research Methodology.

Table 1
Professional liability insurance for individual engineer's survey.

| N | Description |
|-------|--|
| PE 1 | What is the extent of your knowledge regarding the Individual engineer's insurance against professional errors system and the details about it |
| PE 2 | The impact of the Individual engineer's insurance against professional errors system on the quality of the project |
| PE 3 | The role of Individual engineer's insurance against professional errors in increasing the efficiency of the construction sector |
| PE 4 | Professional insurance contributes to the engineer's development in relation to the profession and its workers |
| PE 5 | The professional Insurance of the Contractor Engineer is much more important than the Consultant Engineer |
| PE 6 | Most professional mistakes result from poor engineering design or supervision |
| PE 7 | Insurance shall be compulsory for all designer engineers and supervisors |
| PE 8 | Most of the professional mistakes are due to the weakness of the engineering staff in Saudi projects |
| PE 9 | Professional insurance for engineers comes as a precaution to avoid any problems that may arise in the future. |
| PE 10 | The benefit of professional insurance often lies in (works errors or mistakes) |
| PE 11 | (Failure to do what was promised) |
| PE 12 | (Undelivered or uncompleted works) |
| PE 13 | (Actual or alleged negligence) |
| PE 14 | (Misrepresentation) |

cases incorporating physical damage or the risk of collapse in newly constructed properties due to poor design, engineering, workmanship, or materials in critical structural components like foundations, columns, walls, floors, beams, roofs, and land improvements. These aspects form a crucial part of defects liability insurance coverage. Table 2 in the survey details these points related to defects liability insurance.

The third section in the survey focuses on insurance against hidden defects in construction projects. This insurance protects various stakeholders, including owner-builders, homeowners, commercial and residential builders, developers, and body corporates. It comes into play when a structural flaw is discovered post-completion of the building. Hidden defects might include damaged internal walls, unnoticeable leaking roofs, or electrical problems. In this section, the survey examines situations where this insurance might cover claims. For example, suppose a subcontractor supplied or installed defective material leading to property damage, and this damage either occurs or is discovered during the policy's coverage period. The builder's general liability insurance policy might cover these hidden construction defect claims in that case. Furthermore, the builder's insurance provider must defend the builder in any related lawsuit in cases where the policy potentially covers the homeowner's claim.

An additional point of discussion is the role of builders as "additional insured" on their subcontractor's general liability insurance policies. This can provide builders with eligibility for compensation in cases involving building defects. These quantitative perspectives are detailed in Table 3 of the survey, aiming to provide a comprehensive understanding of the insurance coverage for hidden defects in construction projects and its implications for various parties involved in the building process.

To promote a nuanced analysis of the data procured from the survey, the authors adopted a quantitative 5-point Likert scale, encompassing a spectrum from 'strongly agree' (denoted as 5) to 'strongly disagree' (denoted as 1). After this categorization, the amassed data were transmuted into percentile distributions, thereby elucidating the perspectives and stances of owners and contractors within the ambit of the Saudi Arabian market. Concurrently, an intricate agreement scale was contrived to delineate the trends of concurrence amongst these cohorts. In this scale, the 'strongly agree' parameter was emblematic of absolute concurrence (100 %), whereas 'strongly disagree' symbolized the lower point of agreement (0 %), with a meticulous classification of all intervening factors. This methodological approach was pivotal in unearthing latent areas of discord and charting the directection for impending research endeavors.

3.2. Pilot survey

The research undertook a preliminary pilot study to realize the specified objectives delineated in this study. This initiative

Table 2
Defects Liability in construction survey.

| N | Description |
|------|---|
| DL1 | Lack of clarity regarding the Defects Liability in Saudi projects' contracts. |
| DL2 | Defects Liability is usually limited to a period of 12 months, starting from the date of the initial delivery of the project. |
| DL3 | The existence of a unified formula for Defects Liability within project contracts in Saudi Arabia. |
| DL4 | Most of the building defects lie in design deficiencies. |
| DL5 | Most of the building defects lie in physical deficiencies. |
| DL6 | Most of the construction defects lie in specification problems. |
| DL7 | Most of the construction defects lie in the implementation deficiencies. |
| DL8 | Most of the construction defects in the manufacture of the material. |
| DL9 | There is a clause in the contracts explaining how to assess damages resulting from defects in construction. |
| DL10 | Defects in construction are identified by referring to the Saudi Specifications and Standards in Construction. |
| DL11 | If defects occur during the time of implementation, the contractor must repair those defects for which he is responsible regarding any additional cost. In addition, the contractor will be responsible if the need to address these defects will result in delaying the project. |
| DL12 | Materials, goods, and workmanship must be in accordance with the standards described in the contract to the architect's satisfaction. |

Table 3
Survey design for Factors affecting the insurance against hidden defects in construction.

| N | Description |
|-----|---|
| F1 | Not having insurance against hidden defects in the building elements is one of the most cause of disputes related to liability? |
| F2 | One of the reasons for liability disputes is the selection of the owner as an unclassified contractor or registered from the Saudi Contractors Authority (SCA)? |
| F3 | The owner has Insufficient knowledge about the insured elements in the insurance policy, may rise disputes in liability. |
| F4 | The difference in the actual cost of the insured building with the estimated cost in the insurance policy, may rise disputes in liability. |
| F5 | Delay in informing the insurance company about the defects found |
| F6 | Omission of the Insured to, for undertake the repair or replacement the defects within the period agreed in writing with the insurer after compensation. |
| F7 | Delay in issuance of the Occupancy Certificate after completing of contractor work. |
| F8 | The owner has Insufficient knowledge about the covered cost for insured elements in the insurance policy, may rise disputes in liability. |
| F9 | Confused Defects committed by the contractor and what the insurer should covered in defects |
| F10 | After KSA has made decennial liability insurance mandatory, the disputes related to liability will reduce |

evaluated the questionnaire’s comprehensiveness, efficacy, and internal coherence. This procedural step was enacted after the questionnaire’s constituent sections assemblage. As Saunders et al. [20] reported, the minimum sample size for a pilot study is ten participants. In alignment with this directive, a meticulously pilot survey was disseminated to a select of ten experts, encompassing individuals with considerable tenure in the construction realm and academicians boasting more than twenty years of experience. Accordingly, their pivotal tasks comprise 1) the meticulous examination and interpretation of the survey questions; 2) the identification and flagging of potentially ambiguous or problematic questions; 3) the verification of the questionnaire’s sequential and thematic aggregation, and 4) the provision of constructive and critical feedback. The constructive recommendations from these experts were thoughtfully included, leading to changes in some of the questions.

3.3. Research population sample size

The authors conducted several site visits to appraise the interest and willingness of potential respondents to partake, drawing on their expertise and perspectives to broaden the study’s reach to more professionals in the same domain. Direct discussions with key owners and contractors enriched the survey, improving engagement with industry experts and the reliability of our results. The survey was allotted digitally through a Google form to contractors and construction industry owners, as an electronic format may anticipate higher response rates. The survey’s sample size was thoughtfully opted to represent a balanced mix of parties involved in construction, focusing on owners and contractors.

The authors adopted specific formulas for calculating both finite and infinite sample sizes to discern the appropriate number of survey participants. The first formula, Equation (1), calculates the finite sample size by considering the variability and clarity of responses from a knowledgeable group [21]. In this equation, ‘SS’ stands for the infinite sample size, ‘Z’ denotes the probability of achieving a representative sample, ‘P’ is the proportion of respondents choosing a specific option in the questionnaire, and ‘C’ is the confidence interval expressed as a decimal. Conversely, as Godden [21] outlined, Equation (2) is employed to ascertain the infinite sample size. In this context, ‘SS’ represents the finite sample size, while ‘Pop’ indicates the total population adjusted by the number of involved personnel.

$$SS = \frac{(Z)^2 * P * (1 - P)}{(C)^2} \tag{1}$$

$$New\ SS = \frac{SS}{\left(1 + \frac{SS-1}{Pop}\right)} \tag{2}$$

Prior to determining the optimal sample size, three critical factors must be considered: the confidence level (Z), the margin of error or confidence interval (C), and the proportion of respondents selecting a particular option in the survey (P). In this study, Equation (1) is based on a 90 % confidence level, allowing for a margin of error of 10 %, as accepted in the research. This implies that the chosen parameters for Equation (1) include a 90 % confidence level and a 10 % confidence interval. In other words, there’s a 90 % likelihood that the accurate population answers will fall within a 10 % range of the survey outcomes. Godden [21] indicates that with a 90 % confidence level, the Z value is 1.645. For the P value in this research, 30 % was employed, based on estimates from prior research initiatives [22,23]. Apropos to the C value, which exhibits the confidence interval, most earlier research opts for a 10 % margin of error. The confidence interval denotes the precision and certainty of the estimate, as noted by Ndesaulwa et al. [22], Clifton et al. [23], and Patricia et al. [24]. Consequently, the sample size for both finite and infinite respondents was calculated using Equations (1) and (2), as shown below:

Infinite population sample size = $\frac{1.645^2 * 0.30 * 0.70}{0.1^2} = 57$ respondents.

Finite population sample size = $\frac{57}{\left(1 + \frac{57-1}{2000}\right)} = 55$ respondents.

In light of the calculations ascertained from Equations (1) and (2), the research identified a cohort of 75 contractor respondents and 80 owner respondents to engage in and complete the survey. From this delineated sample, 60 contractors and 60 owners participated

actively, depicting approximately 80 % and 75 % response rates of their target populations. These levels of participation are deemed adequate, aligning well with the established research objectives, and are in concordance with the standards proposed by Godden [21].

4. Results and discussion

4.1. Survey data

The conducted quantitative survey encompassed the perspectives of 120 professionals, evenly distributed with 50 % participation from owners and 50 % from contractors, assuring a balanced representation. A notable knowledge gap was observed concerning professional insurance: only 17.86 % of owners and 13.1 % of contractors portrayed familiarity with this concept. Furthermore, 32 % of the total respondents – 27.3 % of owners and 4.7 % of contractors – exhibited a comprehensive understanding of professional insurance, highlighting its limited prevalence and recognition in the sector.

Interestingly, while not a requirement for projects, professional insurance emerged as a significant factor in the survey responses. Most respondents acknowledged the profound influence of individual engineers’ insurance against professional errors on the quality and efficiency of project execution. This insight underscores professional insurance’s critical role, particularly for contractors, who reportedly experience a higher error rate than consulting engineers. This questionnaire survey underscores the pivotal role of professional insurance in improving project quality and efficiency, suggesting a need for greater awareness and understanding of its benefits within the construction sector.

This study targets to elucidate the prevalent causes of liability issues within the Kingdom of Saudi Arabia (KSA) by examining various factors contributing to liability conflicts. The ensuing results, which have significant implications for liability insurance, are

Table 4
Analysis of the survey data using statistical methods.

| Question Code | Owner | | | | | Contractor | | | | |
|---|-------|------|------|------|------|------------|------|------|------|------|
| | SA | A | N | D | SD | SA | A | N | D | SD |
| Professional liability insurance for individual engineers | | | | | | | | | | |
| PE 1 | 36 % | 2 % | 7 % | 0 % | 55 % | 26 % | 21 % | 29 % | 14 % | 10 % |
| PE 2 | 38 % | 19 % | 14 % | 21 % | 7 % | 48 % | 26 % | 24 % | 0 % | 2 % |
| PE 3 | 45 % | 21 % | 10 % | 21 % | 2 % | 40 % | 29 % | 24 % | 7 % | 0 % |
| PE 4 | 45 % | 24 % | 10 % | 12 % | 10 % | 36 % | 38 % | 24 % | 0 % | 2 % |
| PE 5 | 36 % | 24 % | 17 % | 14 % | 10 % | 45 % | 5 % | 17 % | 21 % | 12 % |
| PE 6 | 36 % | 14 % | 29 % | 12 % | 10 % | 17 % | 19 % | 33 % | 26 % | 5 % |
| PE 7 | 40 % | 12 % | 26 % | 14 % | 7 % | 21 % | 38 % | 31 % | 5 % | 5 % |
| PE 8 | 43 % | 19 % | 10 % | 17 % | 12 % | 52 % | 24 % | 21 % | 0 % | 2 % |
| PE 9 | 45 % | 17 % | 21 % | 10 % | 7 % | 21 % | 31 % | 21 % | 19 % | 7 % |
| PE 10 | 60 % | 10 % | 7 % | 14 % | 10 % | 52 % | 26 % | 21 % | 0 % | 0 % |
| PE 11 | 12 % | 31 % | 26 % | 26 % | 5 % | 38 % | 29 % | 21 % | 12 % | 0 % |
| PE 12 | 19 % | 24 % | 14 % | 26 % | 17 % | 21 % | 10 % | 43 % | 21 % | 5 % |
| PE 13 | 24 % | 21 % | 21 % | 17 % | 17 % | 14 % | 29 % | 38 % | 10 % | 10 % |
| PE 14 | 31 % | 19 % | 17 % | 21 % | 12 % | 17 % | 31 % | 33 % | 12 % | 7 % |
| Trend | 36 % | 18 % | 16 % | 16 % | 13 % | 32 % | 25 % | 27 % | 11 % | 5 % |
| Defects’ liability in construction questionnaire | | | | | | | | | | |
| DL1 | 33 % | 14 % | 21 % | 14 % | 17 % | 43 % | 33 % | 21 % | 0 % | 2 % |
| DL2 | 29 % | 14 % | 36 % | 10 % | 12 % | 21 % | 24 % | 24 % | 26 % | 5 % |
| DL3 | 36 % | 17 % | 24 % | 14 % | 10 % | 31 % | 29 % | 26 % | 12 % | 2 % |
| DL4 | 36 % | 19 % | 24 % | 10 % | 12 % | 36 % | 17 % | 26 % | 21 % | 0 % |
| DL5 | 33 % | 24 % | 26 % | 12 % | 5 % | 31 % | 38 % | 14 % | 14 % | 2 % |
| DL6 | 33 % | 21 % | 19 % | 14 % | 12 % | 14 % | 21 % | 24 % | 36 % | 5 % |
| DL7 | 29 % | 24 % | 14 % | 17 % | 17 % | 26 % | 33 % | 26 % | 12 % | 2 % |
| DL8 | 38 % | 24 % | 14 % | 14 % | 10 % | 36 % | 29 % | 19 % | 17 % | 0 % |
| DL9 | 40 % | 17 % | 21 % | 14 % | 7 % | 43 % | 31 % | 14 % | 10 % | 2 % |
| DL10 | 38 % | 24 % | 14 % | 5 % | 19 % | 57 % | 21 % | 12 % | 10 % | 0 % |
| DL11 | 24 % | 43 % | 7 % | 7 % | 19 % | 24 % | 52 % | 19 % | 5 % | 0 % |
| DL12 | 29 % | 26 % | 19 % | 5 % | 21 % | 43 % | 17 % | 24 % | 17 % | 0 % |
| Trend | 33 % | 22 % | 20 % | 11 % | 13 % | 34 % | 29 % | 21 % | 15 % | 2 % |
| Insurance against hidden defects in construction questionnaire | | | | | | | | | | |
| F1 | 55 % | 21 % | 5 % | 14 % | 5 % | 50 % | 36 % | 12 % | 0 % | 2 % |
| F2 | 52 % | 17 % | 14 % | 7 % | 10 % | 45 % | 26 % | 14 % | 12 % | 2 % |
| F3 | 50 % | 19 % | 10 % | 17 % | 5 % | 40 % | 36 % | 24 % | 0 % | 0 % |
| F4 | 40 % | 26 % | 10 % | 14 % | 10 % | 33 % | 55 % | 10 % | 2 % | 0 % |
| F5 | 40 % | 29 % | 14 % | 14 % | 2 % | 38 % | 26 % | 33 % | 2 % | 0 % |
| F6 | 38 % | 33 % | 10 % | 7 % | 12 % | 31 % | 40 % | 17 % | 10 % | 2 % |
| F7 | 36 % | 33 % | 12 % | 7 % | 12 % | 33 % | 36 % | 26 % | 2 % | 2 % |
| F8 | 29 % | 33 % | 12 % | 21 % | 5 % | 26 % | 45 % | 26 % | 0 % | 2 % |
| F9 | 31 % | 24 % | 26 % | 10 % | 10 % | 38 % | 45 % | 17 % | 0 % | 0 % |
| F10 | 26 % | 31 % | 17 % | 12 % | 14 % | 36 % | 38 % | 21 % | 0 % | 5 % |
| Trend | 40 % | 26 % | 13 % | 12 % | 8 % | 37 % | 38 % | 20 % | 3 % | 2 % |

presented in Table 4, outlining the statistical examination of interviewees' perspectives on diverse topics, offering foundational guidance for developing liability insurance. The examination unearths a notable discrepancy in attitudes towards concealed defects and defects' liability. While concealed defects are a common source of disputes, there is a heightened demand for insurance coverage against them. This insight is instrumental in shaping future insurance strategies for construction projects.

Moreover, the data spotlights a discernible divergence in the viewpoints of owners and contractors. Owners generally exhibit a more substantial bias towards insurance's importance than contractors. Additionally, the prevalence of neutral responses among contractors underscores the necessity for further dialogue to elucidate the benefits of insurance. Although both parties (owners and contractors) acknowledge the significance of insurance, owners reveal a higher degree of trust in its efficacy. These findings point to a crucial requisite for tailored insurance solutions in the KSA construction sector, considering distinct stakeholders' varying perceptions and requirements.

This study broadens beyond the individual analysis of owners and contractors to display a thorough evaluation of their collective viewpoints, rendering the overarching sentiment regarding the role of insurance in the Saudi Arabian construction market. The aggregated findings are detailed in Table 5, unveiling a general inclination towards recognizing the importance of insurance despite variability in responses among different participants. One key area of consensus among interviewees is insurance for individual engineers, particularly to address job-related mistakes or errors. Furthermore, respondents agreed that Saudi Construction Specifications and Standards could serve as a benchmark for identifying defects' liability insurance deficiencies.

A substantial outcome is a widespread agreement on the consequences of the unavailability of insurance for concealed defects. The dearth of such insurance has led to considerable disputes and complications in construction projects. Notably, the variation in opinions is least pronounced in the context of insurance for hidden defects, indicating a shared experience of adverse impacts due to its absence. To mitigate prevalent issues and enhance project outcomes, these outcomes underscore an essential requisite for more robust insurance

Table 5

Analysis of the data using statistical techniques.

| Question Code | | Owner and Contractor | | | | |
|--|-------|----------------------|-------|---------|----------|-------------------|
| | | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree |
| Individual engineer's insurance questionnaire | | | | | | |
| 1 | PE 1 | 31 % | 12 % | 18 % | 7 % | 32 % |
| 2 | PE 2 | 43 % | 23 % | 19 % | 11 % | 5 % |
| 3 | PE 3 | 43 % | 25 % | 17 % | 14 % | 1 % |
| 4 | PE 4 | 40 % | 31 % | 17 % | 6 % | 6 % |
| 5 | PE 5 | 40 % | 14 % | 17 % | 18 % | 11 % |
| 6 | PE 6 | 26 % | 17 % | 31 % | 19 % | 7 % |
| 7 | PE 7 | 31 % | 25 % | 29 % | 10 % | 6 % |
| 8 | PE 8 | 48 % | 21 % | 15 % | 8 % | 7 % |
| 9 | PE 9 | 33 % | 24 % | 21 % | 14 % | 7 % |
| 10 | PE 10 | 56 % | 18 % | 14 % | 7 % | 5 % |
| 11 | PE 11 | 25 % | 30 % | 24 % | 19 % | 2 % |
| 12 | PE 12 | 20 % | 17 % | 29 % | 24 % | 11 % |
| 13 | PE 13 | 19 % | 25 % | 30 % | 13 % | 13 % |
| 14 | PE 14 | 24 % | 25 % | 25 % | 17 % | 10 % |
| | Trend | 34 % | 22 % | 22 % | 13 % | 9 % |
| Defects' liability in construction questionnaire | | | | | | |
| 1 | DL1 | 38 % | 24 % | 21 % | 7 % | 10 % |
| 2 | DL2 | 25 % | 19 % | 30 % | 18 % | 8 % |
| 3 | DL3 | 33 % | 23 % | 25 % | 13 % | 6 % |
| 4 | DL4 | 36 % | 18 % | 25 % | 15 % | 6 % |
| 5 | DL5 | 32 % | 31 % | 20 % | 13 % | 4 % |
| 6 | DL6 | 24 % | 21 % | 21 % | 25 % | 8 % |
| 7 | DL7 | 27 % | 29 % | 20 % | 14 % | 10 % |
| 8 | DL8 | 37 % | 26 % | 17 % | 15 % | 5 % |
| 9 | DL9 | 42 % | 24 % | 18 % | 12 % | 5 % |
| 10 | DL10 | 48 % | 23 % | 13 % | 7 % | 10 % |
| 11 | DL11 | 24 % | 48 % | 13 % | 6 % | 10 % |
| 12 | DL12 | 36 % | 21 % | 21 % | 11 % | 11 % |
| | Trend | 33 % | 25 % | 20 % | 13 % | 8 % |
| Insurance against hidden defects in construction questionnaire | | | | | | |
| 1 | F1 | 52 % | 29 % | 8 % | 7 % | 4 % |
| 2 | F2 | 49 % | 21 % | 14 % | 10 % | 6 % |
| 3 | F3 | 45 % | 27 % | 17 % | 8 % | 2 % |
| 4 | F4 | 37 % | 40 % | 10 % | 8 % | 5 % |
| 5 | F5 | 39 % | 27 % | 24 % | 8 % | 1 % |
| 6 | F6 | 35 % | 37 % | 13 % | 8 % | 7 % |
| 7 | F7 | 35 % | 35 % | 19 % | 5 % | 7 % |
| 8 | F8 | 27 % | 39 % | 19 % | 11 % | 4 % |
| 9 | F9 | 35 % | 35 % | 21 % | 5 % | 5 % |
| 10 | F10 | 31 % | 35 % | 19 % | 6 % | 10 % |
| | Trend | 38 % | 33 % | 16 % | 8 % | 5 % |

coverage in the construction sector, particularly in areas like individual engineer’s liability and hidden defects.

4.2. Individual engineer’s insurance

The initial dataset analysis unveiled that owners exhibit less concern apropos to the presence of insurance professionals on their teams. This observation can be incorporated into the typical practice among owners of subcontracting required resources from contractors, with heightened spotlights on financial assets and potential losses. The findings indicate a notable variance in risk perception among owners and contractors; contractors appear more inclined to tolerate losses attributable to insufficient insurance coverage. This tolerance is reflected in how professional insurance impacts the development of engineering knowledge and professional competence. In the context of Saudi Arabian construction projects, the main source of professional errors is the inadequacy of engineering personnel.

Consequently, professional insurance for engineers emerges as a preventive strategy to circumvent future complications. This phenomenon underscores the imperative for targeted education and training of individual engineers in the nuances of insurance and its implementations. Fig. 2 elucidates the comparative stances of owners and contractors regarding professional liability insurance for individual engineers. It is evident that owners support the utilization and rationale behind such insurance. In contrast, contractors prioritize profitability and risk mitigation, focusing on reducing their responsibility and shortening project durations.

4.3. Defects’ liability in construction

In the realm of defects’ liability within the construction sector, the examination indicates that owners and contractors largely concur on several key aspects. However, divergences emerge, particularly regarding the belief that most building defects stem from inadequate design and that construction flaws are predominantly due to subpar material manufacturing. The methodology for assessing damages resulting from building defects is typically outlined in contractual clauses. Contractors acknowledge that these factors substantially influence project insurance. Given the construction industry’s nature, it is imperative to give weight to the contractors’ viewpoints on these matters. Often, they bear the responsibility for material manufacturing and contract formulation. Hence, these insights demand that both parties consider such factors in crafting defects’ liability insurance policies.

The data further unveils that owners possess limited experience with developmental resources, a concern more pronounced for contractors, especially concerning financial implications, revenue, and losses. Fig. 3 portrays the comparative perspectives of owners and contractors on the essence and implementation of such insurance. While there is a higher overall agreement among owners, contractors exhibit notable dissent concerning managing materials, goods, and workmanship due to the inherently nonlinear progression of construction projects.

4.4. Insurance against hidden defects in construction

In the context of insurance against hidden defects in construction projects, analysis portrays a consensus between owners and contractors on multiple aspects. However, notable exceptions encompass the discrepancy between the actual and insured estimated costs of buildings, potentially leading to liability disputes and a dearth of awareness among owners about the specific costs covered under insurance policies. This divergence in understanding underscores the critical requisite for enhanced communication between owners and contractors regarding insurance in this domain. The gap in knowledge, particularly from the owners’ perspective, can precipitate conflicts, underscoring the urgency of bridging this divide. Addressing these issues by engaging more qualified personnel from the owners’ side can facilitate better alignment with contractors’ expectations, potentially yielding substantial cost efficiencies and schedule improvements for the project.

Fig. 4 showcases the comparative analysis of owners’ and contractors’ viewpoints in the final survey. Contrary to the defects’ liability in construction, the disparity in opinions here is less pronounced. Both parties demonstrate a strong alignment in recognizing

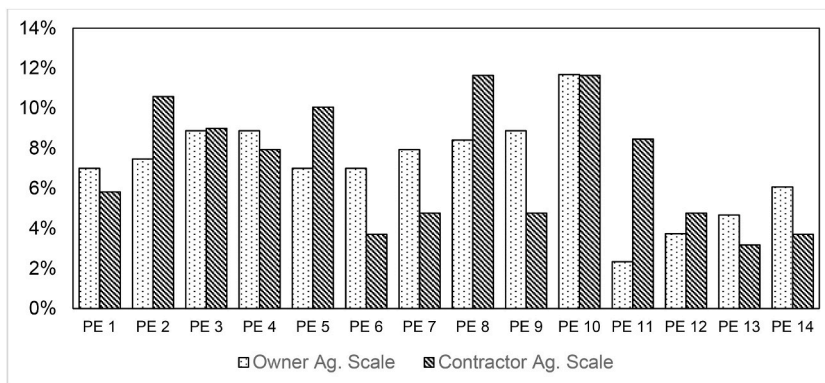


Fig. 2. Comparison between owner and contractor agreement regarding professional liability insurance.

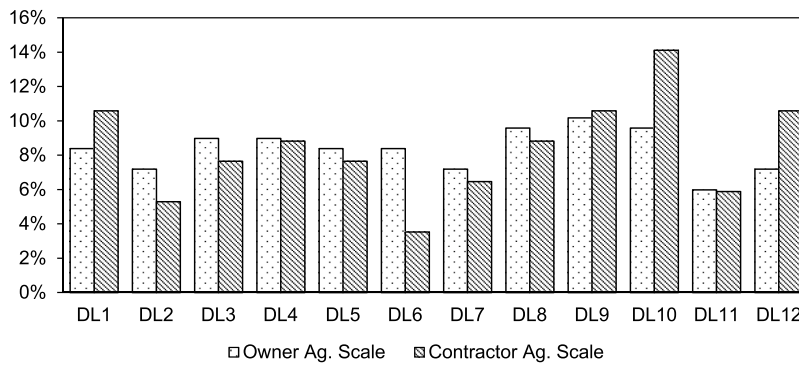


Fig. 3. Comparison between owner and contractor agreement regarding defects' liability in construction.

the paramount of insurance against hidden defects in construction. This consensus likely stems from the understanding that such defects can significantly impact end users, leading to considerable repercussions for owners and contractors regarding client satisfaction and potential losses.

Table 6 displays a comprehensive comparative examination of the perspectives of owners and contractors, highlighting notable differences across various aspects. The data unveils substantial statistical disparities in multiple vital domains: 1) Knowledge of individual engineers' insurance: owners are less familiar with insurance against individual engineers' professional errors than neutral contractors. This suggests a higher prevalence of professionally insured individuals in the field; 2) Attribution of professional mistakes: owners are more inclined to believe that most professional errors arise from poor engineering design or supervision, a view not shared by the more neutral contractors. This perspective likely stems from owners' frequent encounters with such errors; 3) Issues of undelivered work, negligence, and misrepresentation: owners expressed more definitive opinions on these issues, whereas contractors maintained neutrality. This disparity underscores the essence of enhanced risk planning and preparation through contractors' insurance; 4) Defects' liability period: the standard liability period of 12 months from the initial project delivery was met with neutrality from owners, but apparent disagreement from contractors who perceive this duration as lengthy and costly, and 5) Construction defects and specification problems: owners strongly agree that most construction defects are attributable to specification concerns, reflecting their expectation of precise project specifications; conversely, contractors disagree, attributing defects to various on-site factors like material preparation, negotiations, and manpower efficiency. These findings present a requisite for more aligned understanding and communication among owners and contractors, particularly in domains such as specification clarity and the efficacious management of construction defects.

The study's findings align with existing literature on insurance in the construction sector, emphasizing the importance of insurance coverage for mitigating liability issues and addressing stakeholder perspectives. Specifically, the data reveals a heightened demand for insurance against concealed defects, reflecting common themes in previous research. Additionally, the study highlights differences in attitudes between owners and contractors, echoing prior findings on varying risk perceptions. The comparative analysis further supports these findings by identifying substantial disparities in opinions on insurance and liability. Overall, the study contributes to the literature by providing empirical evidence and insights that reinforce key themes and findings in insurance literature related to construction projects.

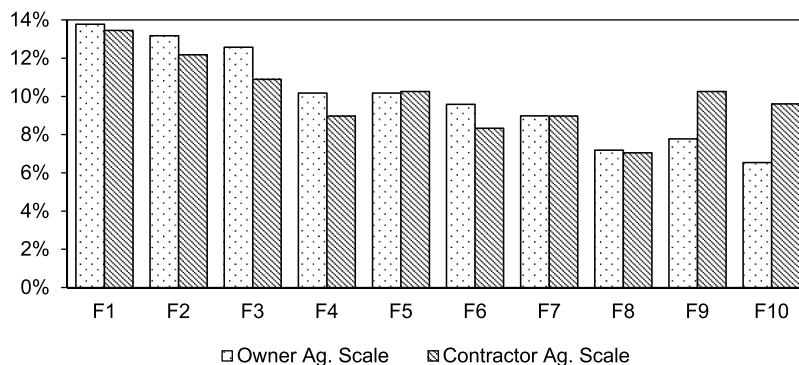


Fig. 4. Comparison between owners' and contractors' regarding insurance against hidden defects.

Table 6
Comparison between the owners' and contractors' opinions.

| # | Professional liability insurance for individual engineers | | Defects' liability in construction questionnaire | | Insurance against hidden defects in construction questionnaire | | | | |
|----|---|-------------------|--|------------|--|----------------|-----|----------------|----------------|
| | Owner | Contractor | Owner | Contractor | Owner | Contractor | | | |
| 1 | PE 1 | Strongly Disagree | Neutral | DL1 | Strongly agree | Strongly agree | F1 | Strongly agree | Strongly agree |
| 2 | PE 2 | Strongly agree | Strongly agree | DL2 | Neutral | Disagree | F2 | Strongly agree | Strongly agree |
| 3 | PE 3 | Strongly agree | Strongly agree | DL3 | Strongly agree | Strongly agree | F3 | Strongly agree | Strongly agree |
| 4 | PE 4 | Strongly agree | Agree | DL4 | Strongly agree | Strongly agree | F4 | Strongly agree | Agree |
| 5 | PE 5 | Strongly agree | Strongly agree | DL5 | Strongly agree | Agree | F5 | Strongly agree | Strongly agree |
| 6 | PE 6 | Strongly agree | Neutral | DL6 | Strongly agree | Disagree | F6 | Strongly agree | Agree |
| 7 | PE 7 | Strongly agree | Agree | DL7 | Strongly agree | Agree | F7 | Strongly agree | Agree |
| 8 | PE 8 | Strongly agree | Strongly agree | DL8 | Strongly agree | Strongly agree | F8 | Agree | Agree |
| 9 | PE 9 | Strongly agree | Agree | DL9 | Strongly agree | Strongly agree | F9 | Strongly agree | Agree |
| 10 | PE 10 | Strongly agree | Strongly agree | DL10 | Strongly agree | Strongly agree | F10 | Strongly agree | Agree |
| 11 | PE 11 | Agree | Strongly agree | DL11 | Agree | Agree | | | |
| 12 | PE 12 | Disagree | Neutral | DL12 | Strongly agree | Strongly agree | | | |
| 13 | PE 13 | Strongly agree | Neutral | | | | | | |
| 14 | PE 14 | Strongly agree | Neutral | | | | | | |

5. Conclusion and recommendation

This research initiative develops and adopts a quantitative survey comprising three distinct question sets: professional liability insurance for individual engineers, defects' liability in construction, and insurance against hidden defects in construction. The primary objective is to assess the necessity of insurance in construction projects quantitatively. A targeted survey of respondents from both the owners' and contractors' sectors reveals that the absence of insurance disproportionately impacts contractors. The literature review renders varied opinions on this insurance's essentiality, implementation, and distinct attributes. This research contributes a detailed roadmap and conceptual framework addressing the specific requirements and challenges of insurance applicants in Saudi Arabia. Key insights from this study involve.

- Contractors are more likely than owners to sustain losses attributable to inadequate insurance, as evidenced by the influence of professional insurance on engineers' industry knowledge and expertise.
- Owners prioritize financial resources and potential losses over the expertise of insurance specialists, regularly banking on contractors for necessary resources.
- There is a consensus between owners and contractors that most structural defects originate from poor design while manufacturing flaws predominantly cause construction defects.
- A notable gap exists between the actual cost of insured buildings and the estimated cost of insurance policies, potentially leading to liability disputes.
- Owners may lack cognizance of the coverage details for insured elements in policies, levitating the risk of insurance disputes.
- The study highlights the critical need for enhanced communication between owners and contractors regarding the various insurance types discussed.

The research thoroughly challenges engineering insurance in KSA's construction projects, exploring the perks of insurance against professional errors, hidden defects, and the clarification of liability in the construction sector. This approach is anticipated to mitigate the responsibility and liability of engineers and other project participants, thereby elevating productivity, lessening insurance liability claims, and assuring high-quality project execution in KSA. This study exhibits an initial foray into broader research, proposing applying this methodology in different countries for comparative analysis with KSA. Future research should explore additional factors that could enhance the progression of construction projects in KSA, including adopting incorporated project delivery contracts, automation of resources, and predictive models. Examining how these factors could be integrated with the types of insurance discussed in this study is also recommended.

Regardless of the novel approach of the presented research, some limitations arise, including 1) The size and diversity of the sample might limit the analysis. Future studies could benefit from a broader demographic to enhance the generalizability of the findings; 2) The focus on the KSA's construction sector might limit the applicability of the results to other regions. Accordingly, comparative studies in various geographic contexts could be beneficial, and 3) The reliance on survey-based data might provide biases or limitations in capturing the complexity of insurance dynamics in construction projects.

Ethics and consent

The research study conducted did not require ethics approval as the survey did not involve testing on human subjects. Survey participants served as experts providing their opinions, and their role did not entail undergoing any testing. Prior to responding to the survey, explicit consent was obtained from the experts, aligning with the regulations of the lead author's institution, King Saud University.

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CRedit authorship contribution statement

Fahad K. Alqahtani: Funding acquisition, Conceptualization. **Mohammed Alsaud:** Writing – original draft, Formal analysis. **Sultan Al-Dossary:** Investigation, Formal analysis. **Mohamed Sherif:** Validation, Methodology. **Ibrahim S. Abotaleb:** Project administration, Data curation. **Ahmed Gouda Mohamed:** Writing – review & editing, Validation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e31841>.

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