Insurable and non-insurable risks in complex project deals: case of the Ghanaian construction industry

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ABSTRACT

Purpose: The aim of this study is to investigate the insurable risks that impacted the operations on complex construction projects in developing countries, using Ghana as a case study.

Methodology: The study employed the use of structured questionnaires to collect relevant information from the top management of construction and insurance firms in Ghana, consisting of 50 industry professionals. The study adopted the chi-squares and independent samples t-test to interpret the responses from the participants.

Findings: The study revealed the major risks that severely impacted the operations on complex construction projects, including; strikes and labour disputes, long waiting time for approval of test samples, damages to property during construction, delay in payment to contractor for work done, poor construction method, pressure to deliver project on an accelerated schedule, labour shortage, permits delayed or take longer than expected, inaccurate materials estimating, change in weather pattern, low productivity of subcontractors, and inadequate contractor experience.

Practical Implication: The study is expected to contribute to raising the awareness of the insurable risks and policies which project participants are exposed to, and this will serve as a decision-making tool in contract formation.

Originality: The study is to assist the management of construction and insurance firms to note the major risk in managing a complex construction project. In addition to knowing the major risks identified, the study investigates the insurable risk by the management of both construction and insurance firms.

Keywords: Complex construction project, construction industry, Ghana, insurable risk, non-insurable risk, risk management.

INTRODUCTION

Construction projects are always unique and risks raised from a number of different sources (Pheng and Chuan, 2006; Oyedele, 2011). Construction projects are inherently complex and dynamic, and involving multiple feedback processes (Uher, 2003). A lot of participants – individuals and organisations are actively involved in the construction project, and their interests may be positively or negatively affected as a result of the project execution or project completion (Project Management Institute, 2008). Different participants with different experience and skills usually have different expectations and interests (Dey and Ogunlana, 2014). This naturally creates problems and confusion for even the most experienced project managers and contractors. Mhetre *et al.* (2016) identified seven types of risks associated with complex projects in the construction sector. These are technical risks, construction risks, physical risks, organizational risks, financial

risks, socio-political risks, and environmental risks. These risks require a lot of risk management and insurance mechanisms to provide the needed solutions through the various insurance typologies. Risk transfer in construction implies the shifting of the financial responsibility of well-defined risks among several participants of the project through defined contract provisions (non-insurance transfers). These liabilities on the project participants are then transferred to insurers using various insurance typologies for a consideration called the insurance premium (Pankaj, 2015). According to Pankaj (2015), good risk management practices enable successful project completion.

The construction industry in Ghana in recent times has seen the increase of complex construction projects, ranging from high rise to massive concrete buildings, complete glazed to semi-glazed and aluminium cladding buildings, massive shopping centres to office complex with gym and swimming pool facilities, but at the same time the industry has equally witnessed project failures with its concomitant fatalities (Osman *et al.,* 2012). Construction insurance, therefore, plays an increasingly important role in guaranteeing the success of projects, with insurers sharing losses resulting from natural disasters and other contingencies. However, insurance sometimes does not receive the attention it deserves because practitioners do not have a clear understanding of risk allocation and the strategy of risk management through insurance (Cheng *et al.,* 2013). Although complex projects are on the rise in Ghana, the few empirical studies have generally focused on construction risk and insurance, without paying specific attention to complex project insurance. Osei-Fosu (2014) studied strategies to improve the risk factors that affect cost estimation in the building construction industry in Ghana. Odonkor (2011) also studied the effect of strategic risk management on project delivery in Ghana. In all, what are the risks affecting complex construction projects in Ghana? Are they insurable or non-insurable? The previous researches on risk management in the construction; Odonkor (2011) and Osei-Fosu (2014) failed to answer. This study fills the research gap by exploring the major construction risk faced on complex construction project. In filling the research gap, the following objectives were achieved: identified the major construction risk in Ghana, and the insurable and non-insurable construction risk in developing countries.

The Concept of Construction Project Complexity

British Standards Institute (2010) defined the project as a unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific objectives within a defined schedule, cost and performance parameters. Baccarini (1996) defined project complexity as "consisting of many varied interrelated parts' and can be operationalized in terms of differentiation and interdependency". Complexity can be understood by the interdependencies in the procedure (task interdependencies, methods), resources (factors of production) and relations (goals, outcomes, expectations) of the construction production. It is implied that the greater components and higher level of interdependence, the higher the complexity (Hagan *et al.,* 2011). Tatikonda and Rosenthal (2000) explained project complexity as the nature, quantity, and extent of organizational subtasks and subtask interactions necessary for a project. The major determinants of complexity are outlined as the level of interdependence, the novelty of

project objectives as that defining project complexity. Eubank and Browning (2004) assert complexity in terms of the dynamic (uncertain nature resulting from likely changes that may occur from the environment of the organization and/or within the project) and structural (organizational and Technological) facets that affect project delivery. Hagan *et al.* (2011) viewed complexity as changeability (similar to dynamic), variety and integration (similar to structural complexity) to capture the environmental features of Enterprise Resource Planning (ERP) implementations.

Ghanaian Construction Insurance Profile

To secure adequate insurance cover in protecting buildings and workers against technical risk is a good practice. It is required for a qualified third-party to provide an independent review of building projects before securing cover from an insurance agency. Insurance policies are provided to serve as a guideline to ensure project is in-lined with the laws of the insurance company. Currently, there has been a reported story on the collapse of a warehouse under construction, where two people died and the survivors got severely injured (The Ghanaian Graphic, 2017). A similar occurrence was said to have been reported in Techiman in the Brong Ahafo, Ghana, where at least a person was killed with the survivors suffering from injuries. This study is purported on identifying the insurable risks among all the construction risks on construction site, especially in a case of complex construction projects in Ghana. Efficient contractors in Ghana usually employ the Contractors All Risks (CAR) Insurance to cater for the risk on sites (The Ghanaian Graphic, 2017). In Ghana, the CAR is known to provide cover for contract works for any damage or loss to the property or material during construction. The Contractors All Risks Insurance typically comprises three forms of insurance namely Employers Liability Insurance, Public Liability Insurance and insurance of Contract Works. In Ghana, the contract works component provides cover for the materials and property under construction, while the public liability covers legal liability for third party property damage, bodily injury and death. Similarly, the employers' liability provides cover for bodily injury and death of workers. The CAR insurance cover can be provided for contractors wishing to provide insurance for new buildings known as speculative building, renovation works or general construction works in Ghana.

Typical Construction Project Risk

Construction projects are characterized as very complex, always unique projects, where risks rise from a number of different sources. These projects are characterized by a continuous decision making due to numerous sources of risk and uncertainty, many of which are not under the direct control of project participants (Baloi and Price, 2003). Construction projects have a bad reputation of failing to meet the deadlines and cost targets (Giezen, 2012). That is why identifying risk factors or sources are extremely important, since it is not necessarily possible to identify single risks. Odeh and Battaineh (2000) studied the most typical reasons for construction delays in Far-East construction projects. According to Artto et al. (2000), risks are divided into pure risks (e.g. hazards and weather conditions), financial risks (e.g. cash flow or credit risk), business risks (almost anything that can happen in a project) and political risks, which refer to the certain political

environment and risks that are caused mostly by extreme conditions, such as, among others, war. Schoder et al. (2013) suggested that risks can be divided either according to their impact or by where the control lies. Thus, these categories can be further divided into business risks, insurable risks, external risks and internal risks, for example bad weather is external risks since it cannot be controlled by a project manager and business risks are those risks that in generally have to be accepted in order to have an opportunity to take advantage of positive outcomes of a risk. Cohen and Palmer (2004) identified risk trends in construction projects by declaring that risks are determined at the very early phases of the project (feasibility and planning) while the impacts are not experienced until the construction and production start-up phases. Their list of typical sources for risks in construction projects are, changes in project scope and requirements; design errors and omissions; inadequately defined roles and responsibilities; insufficient skilled staff; force majeure; and new technology. It is very clear that these lists or categorisations are based on the assumption that risk is something negative and threatens the project. **Table 1** shows the bibliometric analysis of the various risks in complex construction project.

<Insert Table 1 about here>

Challenges in Complex Construction Project

Complex construction project is noted with complex project risk which are difficult to underwrite, price and control (Hendenhain, 2001). Hendenhain (2001) added again that complex project has complex risks, and that insurers need to overcome by drafting, negotiating, and concluding acceptable long-term sectional policies. The Indian Insurance Institute (2015) discovered a number of challenges facing complex projects, consisting inadequate information, design amendments halfway, lack of understanding on project scope, unworkable schedule, delayed issuance of regulatory clearances and different estimates. Other challenges include poor documentation systems at complex construction sites and inadequate claim supporting evidence to insurers. Owusu-Manu et al. (2020) contributed to study by assessing the challenges faced in insuring construction project based on the level of complexity.

Construction Risk Management

Risk management is a process in which decisions are made to either accept a known risk and/or to eliminate or mitigate it (Treceno *et al.,* 2003). However, the question is which party should carry construction risks and at what cost? There are many parties involved in the construction industry, including clients, contractors, subcontractors, insurers, and suppliers. Ward and Chapman (2003) stressed that different parties involved in a project frequently have different perspectives on the risks according to their own background and benefits. Client bodies might be principally concerned with the risk of the project not being finished on time and exceeding the budget which has been allocated; contractors may be focused on making a profit out of their work on the project; and the

workers might well be concerned about the health and safety of their day-to-day working environment and the risk of having accidents and suffering ill health (Helbing, 2013). The study, therefore, addressed risks from the perspective of the contractors and insurers.

Contractors

Contractors have the major responsibility to deal with construction risks. They are responsible for successful risk management of the project (Treceno *et al.,* 2003). A contractor's capability in risk management is one of the key factors to project performance (Wang and Chou, 2003). There has been a trend in construction contracts over the last few years to shift the risks to the contractor (Tsu-Wei and Mei-Su, 2014), by using contract clauses (Mead, 2008). If there is no stipulation about the allocation of a certain risk event condition, the client and the contractor would normally have consensus that such risk should be taken by the contractor, particularly as such risks arise from unexpected disturbance by a third party, such as illegal waste disposal, threats by gangs, and requests for contributions to local community (Wang and Chou, 2003; Lu-Ming *et al.,* 2016). The contract terms and conditions should clearly state the allocation of risks to the various parties. It is not sufficient to have vague conditions where it is unclear who is responsible and could lead to misunderstanding. Such misunderstanding could result in disputes with other parties or even project failure.

Insurers

While contractors are mainly responsible for successful risk management of a project, insurers can provide their expertise to assist the contractors' risk management in recognizing potential risks and reducing the probability of such risks. The willingness of the insurer to write an insurance coverage reflects favourably on the insured's efforts at safety control, health and environment (Schoder *et al*., 2013). Construction risks are usually very complex, hazardous and difficult to assess, price and control. It requires insurers to provide the highest quality service of insurance with the help of training, research and up-to-date engineering knowledge and information technology (Heidenhain, 2001). For projects embracing many new technologies (especially unproven), or require massive control and organizations, they are more likely to suffer loss (insurable or non-insurable) although it is not true for ordinary construction works. However, construction risks, in general, are riskier than property (static) risks. On the other hand, a construction insurers' opportunity lies in the drafting, negotiating, and concluding of bearable long-term, multi-line insurance agreements, sometimes extending over periods in excess of ten years (Luukka and Collan, 2015).

RESEARCH METHODOLOGY

A comprehensive literature review was conducted to analyse the previous works in relation to insurance and risks in the construction industry. The study then adopted quantitative research strategy by the use of questionnaires, and also underpinned by positivistic approach of research epistemology and the objectivism approach of ontology position, as Carson et al. (2001) asserted that positivistic research seeks objectivity and applied consistent rationale and approaches logically to organize research study. The population of the study constituted the construction firms in Ghana, as well as the insurance companies. There were 60 estimated number of construction firms and 27 insurance firms (Ministry of Water, Works and Housing, 2017; National Insurance Commission, 2017). The study adopted purposive and convenience sampling to select and distribute questionnaires to the management of both the construction and insurance firms. In determining the major construction risks in Ghana, mean scores and standard deviations were presented. The mean scores represent the average of the responses, whiles the standard deviations also demonstrate how dispersed the individual scores are around the mean. To ascertain the insurable and non-insurable construction risks, the frequencies and percentages were used. The frequencies and percentages were used because the 54 general construction risk items were to be responded to as Insurable or Non-Insurable, making it categorical. Although it is the insurers who determine which risks could be insured or not, the contractors were also asked to respond to these items to determine their willingness to insure certain risks. The results were presented using a cross-tabulation. Cross-tabulation helped in determining the number (and percentage) of contractors and insurers agreed that certain risks were insurable or not. A chi-square test was further performed to ascertain if the responses were significantly influenced by being in either of the groups (contractors and insurers).

Test for Reliability and Validity

The study adopted the Cronbach's Alpha analysis to measure the reliability and validity of the scale used before the application of statistical tools for further analysis. An alpha value of .70 or greater is accepted and believed to be reliable, as a rule of thumb (Santos,1999; Norušis (2011). From the reliability analysis, the Alpha value to the construction risk (contractors) was .851 and Alpha value for construction risk (insurers) was .902. This then revealed that all the variables measured what they were intended to measure, therefore they are reliable and valid, and further tools can be employed to give an in-depth explanation to the findings.

Major Construction Risk in Ghana

The first objective of this study was to ascertain the major construction risks in Ghana. This was addressed by assessing the level of severity associated with each of the general construction risks listed. Respondents were to respond on a scale of 1 – negligible risk, 2 – minor risk, 3 – moderate risk, 4 – serious risk, and 5- critical risk. An independent-samples t-test was used to ascertain if

there existed any significant difference in the responses from both groups. From the analysis, higher mean scores are an indication of more severity.

<Insert Table 2 about here>

In the construction operation, there are possibilities of a delayed permit from the necessary agencies and authorities. This depending on the duration and the terms of the contract could have an effect on the contractors. From the analysis presented in **Table 2**, contractors had a mean score of 3.8, which was approximately 4 (serious risk). The contractors indicated that the delays in the release of a permit for construction have a serious effect on their operations, which sometimes leads to legal suits because it affects other timelines such as project completion. The insurers, however, had a mean score of 2.64, which was approximately 3 (moderate). The insurers, therefore, considered this delayed permit as a moderate risk. The mean difference was 1.160, which was statistically significant at 5% (t = 3.504, sig. = .001).

In a bid to protect the environment from gross destruction, environmental regulations are sometimes amended or existing ones enforced. This in a way affects the operations of the contractors as it could generate additional cost which probability was not anticipated. The contractors indicated this as a serious risk to their operation (mean was 3.68), whiles the insurers also considered it as a moderate risk (mean was 3.48, approximately 3). The mean difference (.20) was however not statistically significant at 5% (t = .595, sig. = .554).

There are times in construction where contractors are pressured to deliver the project on an accelerated schedule, based on upcoming events like football tournaments. This has a toll on the contractors as they have to engage other resources (like machinery, labour, etc.) to get the work completed within schedule. Rushing through construction could also have some effect on the quality of finished work. Both groups–contractors and insurers – indicated this as a serious risk in construction (mean was 3.88 and 3.56 respectively). The mean difference (.320) was not statistically significant at 5% (t = 1.146, sig. = .258).

The construction sector has lots of different facets that require experts, and that non-availability of such experts could affect smooth construction. The contractors cited this as having a serious effect on their operations (mean was 3.88), as they sometimes have to fall on expatriates to take up such roles which come at a greater cost. The insurers also cited this as a moderate risk in construction operation (mean was 2.8). Mean difference of 1.080 was statistically significant at 5% (t = 2.946, sig. = .005).

In a country like Ghana where it is not uncommon to witness employee strike actions, construction will definitely be affected in one way or the other. The employees at certain construction sites had to lay down their tools at a point, due to wage-related issues. This action could affect project delivery timelines, which comes with its own repercussions. The contractors indicated strike action as a serious risk (mean was 4.16), whiles the insurers deemed it as a moderate risk (mean was 2.96). The mean difference of 1.200 was statistically significant (t = 3.785, sig. = .000).

The productivity trend in an economy could also have some influence on the construction. All things being equal, the more the productivity, the more construction facilities will be demanded in an economy. Having lower productivity and generally slow economic growth could have its toll on the level of construction projects. The contractors cited this as a serious risk (mean was 3.68), whiles insurers indicated it as a moderate risk (mean was .20). The mean difference of .480 was not statistically significant at 5% (t = 1.372, sig. = .177).

Labour relations issues could also influence the construction sector, and both groups (contractors and insurers) cited this as a moderate risk (mean were 3.32 and 2.88 respectively). The mean difference of .480 was not statistically significant at 5% (t = .210, sig. = .440). In every operation, there are some unpredictable occurrences which are difficult to control or prevent. And the construction sector is no exception to that. The contractors cited those unforeseen general conditions as being a serious risk that affects their operation (mean was 3.52), whiles the insurers cited it as a moderate risk (mean was 3.00). The mean difference of .520 was not statistically significant at 5% (t = 1.565, sig. = .125).

The construction of high rising buildings could also come with its own risk. The least structural defect could cause the collapse of the building, leading to loss of lives and properties. Falling objects and workers from higher heights could be experienced when care was not taken. Permits and other requirements for putting up a high rising building were also stringent. The collapse of Melcom building in Accra and other high rising buildings raised lots of eyebrow regarding safety measures imbibed in such constructions. The contractors cited this as a serious risk that affects their operation (mean was 3.76), whiles the insurers cited it as a moderate risk (mean was 3.32). The mean difference of .440 was not statistically significant at 5% (t = 1.625, sig. = .111). The inappropriate foundation could also lead to the collapse of finished and unfinished projects. The contractors cited this as a serious risk that affects their operation (mean was 3.72), whiles the insurers cited it as a moderate risk (mean was 3.36). The mean difference of .360 was not statistically significant at 5% (t = 1.170, sig. = .248).

The architects and the structural engineers put into drawing, proposed projects. Errors in these drawings could have a significant effect on the project outcome. The contractors cited this as a serious risk that affects their operation (mean was 3.56), whiles the insurers cited it as a moderate risk (mean was 2.92). The mean difference of .640 was not statistically significant at 5% (t = 1.901, sig. = .064).

Every location comes with its own challenges and benefits which influence construction. The topology and the nature of soil could even affect the success or otherwise of a project. Other challenges such as squatters and community resistance could also pose some risk to the construction. A joint of police and military force had to come to the aid of the contractors at the Affordable Housing Project at Asokore Mampong, to drive out squatters and also prevent them from any attack. Military officers had to camp at the site to protect the lives and properties of the contractors. The contractors cited this as a serious risk that affects their operation (mean was 3.92), whiles the insurers cited it as a moderate risk (mean was 3.00). The mean difference of .920 was statistically significant at 5% (t = 2.588, sig. = .013).

It is not uncommon to find projects being altered from what was proposed at the start of work. Several factors such as miscalculations, environmental issues, litigations, defects, etc., could result in such alterations. Depending on nature, those variations could have a significant toll on the contract. The contractors cited this as a serious risk that affects their operation (mean was 3.56), whiles the insurers cited it as a moderate risk (mean was 2.92). The mean difference of .640 was statistically significant at 5% (t = 2.174, sig. = .035).

Price fluctuations resulting from inflation could also affect construction. In drawing up the construction budget, provisions are made for inflation. But there are times when the project cost far exceeds the anticipated, usually due to delay in projects, exchange rates, and a sharp rise in inflation of construction inputs. Although the contractors do not bear these costs, it could delay their operations. The contractors cited this as a serious risk that affects their operation (mean was 3.56), whiles the insurers cited it as a moderate risk (mean was 3.12). The mean difference of .440 was not statistically significant at 5% (t = 1.299, sig. = .200).

After the structural and architectural drawings are presented to authorities such as Town and Country Planning for approval, it takes some time for the approval to be given. This, however, posed a moderate risk as indicated by both the contractors and the insurers (with a mean score of 3.44 and 2.92 respectively). The mean difference of .520 was not statistically significant at 5% (t = 1.545, sig. = .129).

The type of client (e.g. public, private, joint venture) also determines the level of some kinds of risk. For example, it is well known in Ghana that, government projects delay in terms of payment. Construction projects like roads are sometimes halted because of the non-payment by the government. This posed a moderate risk as indicated by both the contractors and the insurers (with a mean score of 3.44 and 2.68 respectively). The mean difference of .760 was statistically significant at 5% (t = 2.453, sig. = .018).

Contracts, due to unforeseen happenings could also extend beyond projected. The contractors cited this as a serious risk that affects their operation (mean was 3.52), whiles the insurers cited it as a moderate risk (mean was 2.92). The mean difference of .600 was not statistically significant at 5% (t = 1.896, sig. = .064). Delays in payment to contractors could also delay the entire projects, which also comes with some repercussions. The contractors cited this as a serious risk that affects their operation (mean was 3.92), whiles the insurers cited it as a moderate risk (mean was 3.08). The mean difference of .840 was statistically significant at 5% (t = 2.539, sig. = .014).

There may be moments where the client could fail in giving a clear project expectation, and the contractors also failing to communicate clearly on what they could deliver. This miscommunication could affect the overall success of the project, and the contractors cited this as a serious risk that affects their operation (mean was 3.60), whiles the insurers cited it as a moderate risk (mean was 2.96). The mean difference of .640 was statistically significant at 5% (t = 2.154, sig. = .036).

<Insert Table 3 about here>

From **Table 3**, both contractors and insurers cited the lack of communication between consultants and contractors as a moderate construction risk (mean scores were 3.16 and 3.12 respectively). The mean difference of .040 was not statistically significant at 5% (t = .131, sig. = .896). Every project has teams responsible for a particular part of the contract. Some teams may be responsible for glasswork, some may be responsible for all metal works, others may be responsible for equipment, some may be responsible for structures, others responsible for landscaping, etc. The lack of proper coordination among these groups could affect the overall success of the project. Both contractors and insurers cited this as a moderate construction risk (mean scores were 3.28 and 2.60 respectively). The mean difference of .680 was statistically significant at 5% (t = 2.132, sig. = .038).

The contractors and insurers agreed that the inadequacy of the client's experience posed just a moderate risk to construction (mean scores were 2.92 and 2.64 respectively). The mean difference of .280 was not statistically significant at 5% (t = .769, sig. = .446). Projects are carried out based on established designs (architectural and structural). Delayed in any of this could affect the overall project delivery time. This, the contractors cited as a serious risk to their operation (mean was 3.52), whiles the insurers indicated it as a moderate construction risk (mean score was 3.04). The mean difference of .480 was not statistically significant at 5% (t = 1.555, sig. = .127).

Mistakes and discrepancies in design documents could be very costly to the project, directly and indirectly. The contractors cited this as a serious risk that affects their operation (mean was 3.88), whiles the insurers cited it as a moderate risk (mean was 2.92). The mean difference of .960 was statistically significant at 5% (t = 3.608, sig. = .001). These discrepancies could be as a result of inadequate design team experience, of which the contractors cited as a serious construction risk (mean was 3.84), and insurers cited as a moderate construction risk (mean was 2.96). The mean difference of .880 was statistically significant at 5% (t = 3.679, sig. = .001).

The approval of test sample such as the nature of topology and the nature of construction project, do take some time. The contractors cited it as a serious construction risk (mean was 4.08), and insurers cited as a moderate construction risk (mean was 3.20). The mean difference of .880 was statistically significant at 5% (t = 3.116, sig. = .003). Injury to persons and damage of properties are likely to occur at construction sites, of which the contractors cited as serious construction risks (mean scores were 3.88 and 4.00 respectively), and insurers cited as moderate construction risks (mean scores were 2.88 and 2.52 respectively). The mean difference for both were all statistically significant at 5%.

The contractor's failure to continue the project could result in legal actions by clients and consultants, which sometimes affect the contractors. Contractors may be required to pay some damages. The contractors cited this as a serious construction risk (mean was 3.60), whiles the insurers cited it as a moderate risk (mean was 2.96). The mean difference of .640 was not statistically significant at 5% (t = 1.787, sig. = .081). Contractors do not have control over certain inputs in their industry, but the availability or otherwise of their projects affect their operations (mean scores were 3.56 and 2.88 for contractors and insurers respectively). Since most major

construction projects take months and even years to complete, estimates for materials and other expenditures are made in advance. These estimations are sometimes based on incomplete information, thereby rendering them unrealizable for adoption. This according to the contractors posed a serious construction risk (mean was 3.80), whiles the insurers cited it as a moderate construction risk (mean was 3.08). The mean difference of .720 was statistically significant at 5% (t = 2.110, sig. = .400).

The poor site management and supervision, and inadequate contractor experience could also jeopardize construction success. The contractors cited these as a construction serious risks (mean score was 3.52 and 3.76 respectively). The insurers also them as moderate construction risks (mean score was 3.04 and 3.04 respectively). The mean difference for poor site management was not statistically significant at 5% (t = 1.555, sig. = .127), whiles the mean difference for inexperienced contractors was statistically significant at 5% (t = 2.213, sig. = .032). Both contractors and insurers agree that inadequate managerial skills among the contractors posed a moderate construction risk (mean scores were 3.36 and 2.96 respectively). The mean difference was statistically insignificant at 5%. Both group (contractors and insurers) further cited defective work that must be removed and replaced, as a moderate risk to construction (mean scores were 3.12 each).

For timely project completion, contractors usually subcontract sections of the project to other firms. This may be a peripheral service or even a core part of the project. Since these subcontractors feed the main project, their actions and inactions including delays, affect the overall project success. The contractors cited this as a serious risk that affects their operation (mean was 3.52), whiles the insurers cited it as a moderate risk (mean was 2.92). The mean difference of .600 was not statistically significant at 5% (t = 1.963, sig. = .056). Whiles the contractors believed that shortage of liquidity (funds) posed a moderate construction risk (mean was 3.32), insurers believed it was a serious construction risk (mean was 3.60). The mean difference of -.280 was not statistically significant at 5% (t = -.921, sig. = .362).

<Insert Table 4 about here>

The shortage of plants and equipment, which may be due to numerous breakdowns could also have its toll on the performance of a construction firm. From **Table 4**, the contractors and the insurers cited this as a moderate construction risk, with mean scores of 3.44 and 3.24 respectively. The mean difference of .200 was not statistically significant at 5% (t = .574, sig. = .569). Inaccurate prediction of equipment production output was cited by contractors as a serious construction risk, but insurers considered it as a moderate risk. The mean difference was not statistically significant at 5% (t = 1.024, sig. = .311).

The change in weather patterns influences construction operations. The activities of construction are greatly disrupted during the raining season, causing a halt in operations at some point. Fire outbreaks could also affect the operations of the contractors. The contractors cited these as serious construction risks, with mean scores of 3.80 and 3.64 respectively. The insurers however considered all these as moderate construction risks, with a mean score of 3.16 and 3.24

respectively. The mean difference for both weather and construction were not statistically significant at 5%.

Both the contractors and the insurers considered earthquakes as a minor construction risk in Ghana. This is because the location of the country makes it safe from any devastating earthquakes. The mean scores were 2.40 and 2.32 respectively. The mean difference of .080 was not statistically significant at 5% (t = 1.391, sig. = .171). Extraordinary winds which cause devastating effects such as the pulling down of completed and work-in-progress structures were also cited as moderate construction risk by both contractors and insurers (mean score were 3.24 and 3.36 respectively). This risk was moderate because Ghana does not experience such great wind as the hurricanes experienced in other jurisdictions. Heavy rains destruction construction process was also cited as a moderate risk by both contractors and insurers, with a mean score of 3.32 and 3.40 respectively.

Regulations and enactment regarding construction, awards of contract, environmental regulations, certifications, standards and requirements, etc., all have some effect on the operations on contractors. A change in any of this meant readjustment in the operations of the construction firm. The contractors and the insurers, however, deemed it as a moderate construction risk, with mean scores of 3.08 and 3.16 respectively. The mean difference of -.080 was not statistically significant at 5% (t = -.255, sig. = .800).

A number of the construction input are imported, therefore, the fluctuations in the exchange rate in favour of foreign currencies increase the cost of importation. This also affects inflation in the economy, that is the changes in the price of goods and services (especially those imported). These were all deemed by the contractors as serious construction risks (mean scores were 3.64 and 3.56 respectively). The insurers, however, deemed them as a moderate risk to construction, with mean scores of 3.40 and 3.44 respectively. The mean difference for both exchange rate fluctuations and inflation were not statistically significant at 5%.

Financial problem due to errors in estimation was deemed as serious construction risk by the contractors, but the insurers deemed it as a moderate construction risk (mean scores were 3.72 and 3.20 respectively). The mean difference of .520 was not statistically significant at 5% (t = 1.687, sig. = .098). Not taking enough insurance cover in itself was deemed as a risk in construction. This was because, in the case of an eventually, the contractor must bear the cost. The contractors although acknowledged it was a risk not taking enough insurance cover, they cited it was moderate (mean was 3.04). The insurers, however, cited it as a serious construction risk, with a mean score of 3.68. The mean difference of -.640 was statistically significant at 5% (t = -2.301, sig. = .026).

Thefts and burglaries were sometimes experienced at construction sites, of which the contractors cited as a serious construction risk (mean was 3.60). The insurers cited as a moderate construction risk (mean was 2.80). Materials in transit could also be damaged perhaps through accidents, of which the contractors cited as a serious construction risk (mean was 3.64). The insurers cited as a moderate construction risk (mean was 2.88). The mean differences for both risks were all statistically significant at 5%.

Other serious construction risks identified by contractors were the interference by the client (mean was 3.64), poor construction method (mean was 3.92), and low productivity of subcontractors

(mean was 3.79). The insurers also classified these risks as moderate, that is, the interference by client (mean was 2.88), poor construction method (mean was 3.16), and low productivity of subcontractors (mean was 3.16).

Insurable and Non-insurable Risk

This subsection ascertained the insurable and non-insurable construction risks. The essence was to help determine which of the risks the contractors are more willing to insure. The respondents were asked to respond Insurable or Non-Insurable (dichotomous) to the 54 general insurance risk items. Cross tabulations were presented indicating the frequencies and percentages in each cell. Chi-square was presented to determine if the responses were influenced by being in either of the groups (contractors and insurers).

<Insert Table 5 about here>

The analysis presented in **Table 5** showed that 20% of the contractors agreed that, delayed in permits was insurable. The majority of the contractors (80%) however disagreed this was insurable. The majority of the insurers (84%) also agreed that delayed in permits were uninsurable, with just 16% agreeing. The chi-square was not statistically significant (x^2 = .136, sig. = .713), indicating the responses provided were not based on being a contractor or insurer.

Forty per cent (40%) of the contractors agreed that the risk associated with changes in environmental regulations was insurable, while 60% disagreed. Only 8% of the insurers, however, agreed that this was insurable, with the majority 92% disagreeing. The chi-square was statistically significant (x^2 = 7.018, sig. = .008), indicating the responses significantly differed across the group (contractors or insurers).

Almost half of the contractors (48%) indicated that the pressure to deliver the project on an accelerated schedule was insurable, whiles 52% indicated it was not insurable. Twenty-four per cent (24%) of the insurers indicated this as insurable, whiles 76% indicated it as non-insurable. The chi-square was not statistically significant (x^2 = 3.125, sig. = .077), indicating the responses provided were not based on being a contractor or insurer.

Labour shortage was deemed as insurable by 24% of the contractors, 76% indicated it was not insurable. Similarly, 16% of the insurers indicated it was insurable, while 84% indicated it was uninsurable. The chi-square was not statistically significant (x^2 = .500, sig. = .480), indicating the responses provided were not based on being a contractor or insurer. Labour shortage was cited as insurable by only 24% of the contractors, whiles 76% disagreed. Sixteen per cent (16%) of the insurers also cited labour shortage as insurable, whiles 84% cited it as uninsurable. The chi-square was not statistically significant (x^2 = .500, sig. = .480), indicating the responses provided were not based on being a contractor or insurer.

Thirty-six per cent (36%) of the contractors agreed that strikes and labour disputes were insurable, whiles 64% cited it as uninsurable. Twenty-four per cent (24%) of the insurers agreed that labour dispute was insurable, whiles 76% indicated it was uninsurable. Thirty-two per cent (32%) the contractors cited the risk associated with low productivity as insurance and 68% indicated it was uninsurable. From the insurers sampled, only 12% agreed that the risk associated with low productivity was insurable, and 88% indicated it was not insurable. Other labour relations challenges also had 20% of the contractors stating it was insurable, whiles 80% stated it was uninsurable. Twelve per cent (12%) of the insurers cited labour relations challenges as uninsurable, whiles 88% indicated it was insurable. The chi-square for all these risks was not statistically significant, indicating the responses provided were not based on group one belonged.

Unforeseen general conditions were deemed as insurable by 56% of the contractors, whiles 44% deemed it as uninsurable. The minority 32% of the insurers, however, stated unforeseen conditions were insurable, whiles 68% said it was uninsurable. The proliferation of storey building and its accompanying risks was deemed insurable by 60% of the contractors, whiles 40% stated it was uninsurable. The majority 80% of the insurers agreed that the risk associated with the proliferation of high rising buildings was insurable, 20% stated it was uninsurable. The chi-squares were not statistically significant, indicating the responses provided were not based on being a contractor or insurer.

The risk associated with improper foundation was deemed insurable by 56% of the contractors, whiles 46% deemed it uninsurable. Thirty-six per cent of the insurers agreed that improper foundations during construction were insurable, and the majority 64% indicated it was not insurable. The chi-square was not statistically significant, indicating the responses provided were not based on being a contractor or insurer. Errors in the drawings which could cost the successful completion of the project were considered insurable by 24% of the contractors, whiles 76% were considered it uninsurable. There were 56% of the insurers who indicated that errors in drawing were insurable, while 44% indicated it was uninsurable. The chi-square was statistically significant ($x^2 = 5.333$, sig. = .021), indicating the responses provided were influenced by being a contractor or insurer.

There are times that projects are met with some resistance from key statesmen, opinion leaders, community members, etc. Forty-four per cent of the contractors agreed that this was insurable, whiles 56% disagreed. In a similar vein, 36% of the insurers agreed it was insurable whiles the majority disagreed on its insurability. The risk associated with contract variations was deemed insurable by 48% of the contractors, whiles 52% disagreed. Forty-four per cent of the insurers also agreed that contract variations were insurable, but 56% of them indicated it was not insurable. Fluctuations in the cost of construction due to fluctuating input price were deemed insurable by only 28% of the contractors and 72% of them disagreed. Similarly, 28% of the insurers stated that cost variations were insurable, whiles 72% of them disagreed. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

The nature of clients dealt with also has its own inherent risks. And 44% of the contractors cited the risk associated with the kind of client as insurable, whiles 56% indicated this was not insurable.

The majority (60%) of the insurers, however, indicated this was insurable, while the minority (40%) stated this was not insurable. Unrealistic contract duration was deemed insurable by 24% of the contractors, whiles the majority 76% deemed it uninsurable. Twenty-four per cent of the insurers agreed that risks associated with unrealistic contract duration were insurable, but the majority 76% deemed it uninsurable. Delays are a payment to contractors was deemed insurable by 28% of the contractors and 12% of the insurers. Whiles 72% of the contractors and 88% of the insurers also disagreed delayed payment was insurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

The risk associated with the lack of communication between client and consultants was deemed insurable by 24% of the contractors and just 4% of the insurers. The majority 76% of the contractors and 96% of the insurers, however, disagreed this was insurable. The chi-square was statistically significant (x^2 = 4.153, sig. = .042), indicating the responses provided were significantly influenced by being a contractor or insurer.

<Insert Table 6 about here>

From **Table 6**, Lack of communication between consultants and contractors was deemed insurable by 16% of the contractors and 8% of the insurers. The majority 84% of the contractors and 92% of the insurers deemed this lack of communication uninsurable. The lack of proper communication between project team members has some risk to the success of the project, but only 24% of the contractors and 8% of the insurers deemed it insurable. Seventy-six per cent of the contractors and 92% of the insurers deemed it uninsurable. These lack of proper communication risks had a non-statistically significant chi-square, indicating the responses provided were not based on being a contractor or insurer.

Risks associated with inexperienced clients was deemed insurable by 20% of contractors and 28% of insurers. The majority 80% of the contractors and 72% of the insurers, however, disagreed this was insurable. Sixteen per cent of contractors and 8% of insurers indicated that delays in design information were insurable, whiles 84% of the contractors and 92% of the insurers deemed it non-insurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer. The risks associated with discrepancies in design documents was cited as insurable by 32% each of contractors and insurance, whiles 68% each of contractors and insurers disagreed. The chi-square was statistically significant (x^2 = 1.000, sig. = .000), indicating the responses were greatly influenced by whether the respondents were contractors or insurers.

Inadequate design team experience was considered insurable by only 16% of contractors and 24% of the insurers, while 84% of the contractors and 76% of the insurers disagreed this was insurable. The approval of test samples could delay posing some level of risk to the successful completion of the project. Eight per cent of the contractors and 12% of the insurers considered this insurable, whiles 92% of contractors and 88% of the insurers considered this uninsurable. Injury to persons during construction was likely to occur, of which 76% each of the contractors and insurers

indicated it was insurable. Twenty-four per cent each of however indicated it was not insurable. During construction, damages are likely to be caused to people's property (like houses) or even to the construction material, of 84% of the contractors and 88% of insurers indicated it was insurable. The minority 16% of contractors and 12% of insurers, however, cited this as uninsurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

The risks associated with contractors' failure to enter into a contract was deemed as insurable by 64% of the contractors and 28% of the insurers. It is clear that contractors would want some security for their actions and inactions, but the insurers were not willing to absorb such risk. Thirty-six per cent of the contractors and the majority 72% of the insurers disagreed that failure of contractors to continue a contract was insurable. The chi-square was statistically significant (x^2 = 6.522, sig. = .011), indicating the responses provided were influenced by whether or not the respondent was a contractor.

Shortage of construction material on the market also poses some risk to timely completion of the project, of which 48% of the contractors and 12% of the insurers deemed it insurable. Fifty-two per cent of the contractors and 88% of the insurers considered this uninsurable. The chi-square for this was also statistically significant (x^2 = 7.714, sig. = .005), indicating the responses provided were influenced by being a contractor or insurer.

Inaccurate materials estimations were cited by 36% of the contractors and 32% of the insurers as insurable. Sixty-four per cent of the contractors and 68% of the insurers, however, deemed it uninsurable. Poor site management and supervision were considered by 36% each of contractors and insurers as insurable. Sixty-four per cent each of contractors and insurers classified this risk as uninsurable. Inadequate contractor experience was classified as insurable by only 32% of contractors and 36% of insurers. The majority 68% of the contractors and 64% of the insurers classified this as uninsurable. Risks associated with inadequate managerial skills were deemed as insurable by only 24% of the contractors and 44% of the insurers. Seventy-six per cent of the contractors and 56% of the insurers, however, classified it as uninsurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

The removal of defective work during construction was classified as insurable by 32% of the contractors and 40% of the insurers. The majority 68% of the contractors and 60% of the insurers cited this as uninsurable. Delays in subcontractors work were deemed insurable by 48% of the contractors and 28% of the insurers. A little over half of the contractors (52%) and 72% of the insurers deemed this as uninsurable. The minority 16% of the contractors and 28% of the insurers classified the risk associated with a shortage of funds for the project as insurable, whiles, 84% of contractors and 72% of insurers classified this as uninsurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

<Insert Table 7 about here>

From **Table 7**, Shortage of plants and equipment due to breakdown or unavailable was classified as insurable risk by just 28% of contractors and 12% of insurers. The majority 72% of the contractors and 88% of the insurers were of the opinion that it was not an insurable risk. The inaccurate prediction of equipment production output could also affect the timely delivery of project, of which 28% of contractors and 20% of insurers deemed as uninsurable. The construction risks associated with the changes in weather was deemed insurable by 20% of contractors and 24% of insurers, whiles the majority 80% of contractors and 72% of insurers deemed it uninsurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

Fire outbreaks, on the other hand, were classified by the majority of the as insurable (72% of contractors and 80% of insurers). The minority 28% of contractors and 20% of insurers, however, deemed it uninsurable. The earthquake which is not a major risk in Ghana was however classified as insurable by 72% of contractors and 69% of insurers. The minority 28% of contractors and 40% of insurers, however, deemed this uninsurable. The risks associated with extraordinary winds was classified as insurable by 44% each of contractors and insurers, whiles 56% each also classified it was uninsurable. Heavy downpours causing flood and destruction was deemed insurable by 60% of contractors and 68% of insurers, whiles 40% of contractors and 32% of insurers disagreed this was insurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

Changes in laws and regulations in a nation could also affect the smooth operation of construction projects. However, only 24% of the contractors and 16% of insurers cited this as insurable, while the majority 84% of contractors and 84% of insurers deemed it uninsurable. Macroeconomic factors such as exchange rate fluctuation and inflation also had its toll on the success of the construction sector. Twelve per cent of the contractors and 8% of the insurers indicated exchange rate fluctuations was insurable, whiles 88% of contractors and 92% of insurers cited it as uninsurable. Inflation, which is the fluctuations in consumer price was also classified as insurable by only 16% of the contractors and 12% of the insurers. The majority 84% of contractors and 88% of the insurers classified risk associated with inflation as uninsurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

Errors in estimation during budgeting was classified as insurable by 32% of contractors and 28% of insurers, whiles 68% of contractors and 72% of insurers classified it as uninsurable. Damage to goods-in-transit was considered insurable by 72% of contractors and 76% of insurers, whiles the minority 28% of contractors and 24% of insurers indicated this as uninsurable. The chi-squares for all these risks were not statistically significant at 5%, indicating the responses provided were not based on being a contractor or insurer.

Theft at site and materials in transit was deemed by 56% of contractors and 84% of insurers as insurable, whiles the minority 44% of contractors and 16% of insurers classified this as uninsurable. The chi-square was statistically significant ($x^2 = 4.667$, sig. = .031), indicating the responses provided were greatly influenced by whether or not respondent was a contractor.

The risks associated with client interference was classified as insurable by 60% of the contractors and 32% of the insurers, whiles 40% of contractors and 68% of insurers also disagreed. It is realized from the analysis presented that, contractors would wish to insure the risks associated with clients' interference with work, while the insurers were currently not willing to do that. The chi-square was statistically significant ($x^2 = 3.945$, sig. = .047), indicating the responses provided were greatly influenced by whether or not the respondent was a contractor.

The risks linked to poor construction method was considered as insurable by 48% of the contractors and 40% of the insurers, whiles 52% of the contractors and 60% of insurers deemed it uninsurable. The chi-square was not statistically significant ($x^2 = .325$, sig. = .569), indicating the responses provided were not based on being a contractor or insurer. Finally, the risk associated with low productivity and disappointment from subcontractors was classified as insurable by 48% of contractors and 20% of insurers. Fifty-two per cent of the contractors and 80% of the insurers, however, classified this as uninsurable. The chi-square was statistically significant ($x^2 = 4.367$, sig. = .037), indicating the responses provided were greatly influenced by whether or not the respondent was a contractor.

DISCUSSION

The result of the study presented focused on identifying the major construction risks and the insurable and uninsurable construction risks in developing countries. This study contributed to knowledge by revealing the major risks that severely impacted the operations on complex construction projects, including; strikes and labour disputes, long waiting time for approval of test samples, damages to property during construction, delay in payment to contractor for work done, poor construction method, pressure to deliver project on an accelerated schedule, labour shortage, permits delayed or take longer than expected, inaccurate materials estimating, change in weather pattern, low productivity of subcontractors, and inadequate contractor experience. The study further identified the high number of storeys of buildings with its associated risks, errors in construction drawings, type of client (e.g. public and private clients have some inherent risk like delayed payment), injury to persons, damages to properties during construction, fire, earthquake and heavy rain as the construction insurable risks.

Despite the critical role construction insurance plays in guaranteeing the success of projects, much attention has not been given to it, especially in the construction of complex projects. Practically, the study is expected to contribute to raising the awareness of the insurable risks and policies which project participants are exposed to, and this will serve as a decision-making tool in contract formation. With regards to the theoretical implication of the study, the study builds a base for which other researchers can depend on. Cronbach's Alpha Analysis proved the dependency and reliability of the findings of the study. Delays in permits or approval of the project were found as a significant risk that affects the success (especially the completion timeline) of complex projects in Ghana. The study recommended that the ministries and the agencies responsible for approval must put in more efficient measures to cut off the unnecessary bureaucracies in getting relevant documentations. Macroeconomic factors such as exchange rate fluctuations and inflation

significantly affected the operations of complex project contractors. Estimations are based on current rates and some projections into the future. However, when there is abnormal fluctuation in the exchange rate, for example, the cost of importing materials and equipment for construction becomes more costly than anticipated. The macroeconomic indicators of the nation must, therefore, be put under much control to avoid unnecessary losses to firms. The major constraint in this study was the issue of taking only Ghana as a developing country to generalize the result, even though the result stands to serve as a lesson for other developing countries, as well as developed countries. Also, this study was purely quantitative, thereby limiting the participants to the range of responses they have to choose from. The study again recommends that, conducting a qualitative study like focus group discussion or interview will help members to give out more information, which the researcher had not considered in this study.

CONCLUSION

The study explored the major construction risk faced on the complex construction project as well as identifying the insurable and non-insurable risk. The targeted population of the study constituted the construction firms in Ghana, as well as the insurance companies. The unit of analysis for the study comprised managements of the insurance and construction firms. The study then employed purposive sampling to selected the management of both the construction and insurance firms whilst convenience sampling was then used to select the firms welcoming to respond to the structured questionnaires. The population of the study consisted all construction firms in Ghana, as well as insurance firms. These included 60 estimated number of construction firms and 27 insurance firms. Cronbach's alpha was adopted to determine the reliability of the scale used for the analysis. Based on the findings, it was concluded that in Ghana, the major risks that severely impacted the operations of construction firms were strikes and labour disputes, long waiting time for approval of test samples, damages to the property during construction and delay in payment to the contractor for work done. The study again identified buildings with its associated risks, errors in construction drawings, type of client (e.g. public and private clients have some inherent risk like delayed payment), injury to persons, damages to properties during construction, fire, earthquake and heavy rain as the construction insurable risks. Recommendations were proposed that the ministries and the agencies responsible for approval must put in more efficient measures to cut off the unnecessary bureaucracies in getting some vital documentations, thereby preventing delay risk. Also, the macroeconomic indicators of the nation must, therefore, be put under much control to avoid unnecessary losses to firms. This study was purely quantitative, thereby limiting the participants to the range of responses they have to choose from. The result of the study stands to serve as a lesson for other developing countries, and could be extended to developed countries. The study further made a recommendation that, conducting a qualitative study like focus group discussion or interview will help members to give out more information, which the researcher had not considered in his study.

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Table 1: Bibliometric Analysis of the Various Risks in Complex Construction Project.

No.	Construction Risks	Reference
1	Permits delayed or take longer than expected	Baloi and Price (2003); Cohen and Palmer (2004); Hatch and Cunliffe (2012)
2	Environmental regulations change	Rastogi and Trivedi (2016)
3	Pressure to deliver project on an accelerated schedule	Hatch and Cunliffe, 2012
4	Labor shortage	El-Sayegh et al. (2018)
5	Strikes and labor disputes	Khan and Gul (2017)
6	Low productivity	Giezen (2012)
7	Labor relations	Qu et al. (2018)
8	Unforeseen general conditions	Artto et al. (2000)
9	High number of storeys of buildings	Manukhina and Samosudova (2018)
10	Inappropriate type of foundation	Ward and Chapman (2003)
11	Errors in drawings	Ward and Chapman (2003); Cohen and Palmer (2004);
12	Location and project restriction	Liu et al. (2016)
13	Variations	Ward and Chapman (2003)
14	Fluctuations (changes in cost)	Razzaq et al. (2018)
15	Long waiting time for approval of drawings	Cohen and Palmer (2004)
16	Type of client (e.g. public, private, joint venture)	Boyd and Haugbølle (2017)
17	Unrealistic contract duration	Giezen (2012);
18	Delay in Payment to contractor for work done	Miller and Lessard (2001); Giezen (2012); Hatch and Cunliffe (2012)
19	Lack of communication between client and consultants	Senaratne and Ruwanpura (2016)
20	Lack of communication between consultants and contractors	Senaratne and Ruwanpura (2016)
21	Slow flow of information between project team members	Ogutu and Muturi (2017)
22	Inadequate client experience	Lessing et al. (2017)
23	Delay in design information	Ward and Chapman (2003); Cohen and Palmer (2004); Hatch and Cunliffe, (2012)
24	Mistakes and discrepancies in design documents	Cohen and Palmer (2004)
25	Inadequate design team experience	Cohen and Palmer (2004)

26	Long waiting time for approval of test samples	Cohen and Palmer (2004)
27	Injury to persons	Zhao et al. (2017)
28	Damages to property during construction	Bednarz et al. (2019)
29	Contractor failure to continue the contract	Kikwasi (2016)
30	Shortage of materials in market	Miller and Lessard (2001)
31	Inaccurate materials estimating	Ward and Chapman (2003)
32	Poor site management and supervision	Cohen and Palmer (2004)
33	Inadequate contractor experience	Cohen and Palmer (2004)
34	Inadequate managerial skills	Cohen and Palmer (2004)
35	Defective work that must be removed and replaced	Brogan et al. (2018)
36	Delays in subcontractors work	Hatch and Cunliffe, (2012);
37	Shortage of funds	Artto et al. (2000)
38	Shortage of plant/equipment	Lessing et al. (2017)
39	Inaccurate prediction of equipment production output	Lessing et al. (2017)
40	Weather	Artto et al. (2000); Schoder et al. (2013)
41	Fire	Artto et al. (2000)
42	Earth quake	Artto et al. (2000)
43	Extraordinary wind	Artto et al. (2000)
44	Heavy rain	Artto et al. (2000)
45	Frequent changes in law	Rastogi and Trivedi (2016)
46	Exchange rate fluctuation	Rastogi and Trivedi (2016)
47	Inflation	Li et al. (2017)
48	Financial problem due to errors in Estimation	Artto et al. (2000); Miller and Lessard (2001); Giezen (2012);
49	Insufficient insurance	El-Sayegh et al. (2018)
50	Theft	Singh et al. (2017)
51	Materials damage during transportation	Ward and Chapman (2003);
52	Interference by client	Xiang et al. (2018)
53	Poor construction method	Giezen (2012)
54	Low productivity of subcontractors	Ward and Chapman (2003);

Source: Author's Construct (2019)

Table 2: Level of Severity Associated with Construction Risk (A)

Construction Risks	**Contractors**		**Insurers**		**Mean Diff.**	**T-Statistics**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**		**Value**	**Sig.**
Permits delayed or take longer than expected	3.80	1.080	2.64	1.254	1.160	3.504	.001
Environmental regulations change	3.68	.988	3.48	1.358	.200	.595	.554
Pressure to deliver project on an accelerated schedule	3.88	.833	3.56	1.121	.320	1.146	.258
Labour shortage	3.88	1.201	2.80	1.384	1.080	2.946	.005
Strikes and labour disputes	4.16	.943	2.96	1.274	1.200	3.785	.000
Low productivity	3.68	1.108	3.20	1.354	.480	1.372	.177
Labour relations	3.32	1.282	2.88	1.166	.440	1.269	.210
Unforeseen general conditions	3.52	1.005	3.00	1.323	.520	1.565	.125
High number of storeys of buildings	3.76	1.012	3.32	.900	.440	1.625	.111
Inappropriate type of foundation	3.72	.936	3.36	1.221	.360	1.170	.248
Errors in drawings	3.56	1.003	2.92	1.352	.640	1.901	.064

Location and project restriction	3.92	1.077	3.00	1.414	.920	2.588	.013
Variations	3.56	.961	2.92	1.115	.640	2.174	.035
Fluctuations (changes in cost)	3.56	1.083	3.12	1.301	.440	1.299	.200
Long waiting time for approval of drawings	3.44	1.121	2.92	1.256	.520	1.545	.129
Type of client (e.g. public, private, joint venture)	3.44	1.044	2.68	1.145	.760	2.453	.018
Unrealistic contract duration	3.52	.963	2.92	1.256	.600	1.896	.064
Delay in Payment to contractor for work done	3.92	.812	3.08	1.441	.840	2.539	.014
Lack of communication between client and consultants	3.60	.957	2.96	1.136	.640	2.154	.036

Source: Field Work (2019).

Table 3: Level of Severity Associated with Construction Risk (B)

Construction Risks	**Contractors**		**Insurers**		**Mean Diff.**	**T-Statistics**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**		**Value**	**Sig.**
Lack of communication between consultants and contractors	3.16	1.106	3.12	1.054	.040	.131	.896
Slow flow of information between project team members	3.28	1.061	2.60	1.190	.680	2.132	.038
Inadequate client experience	2.92	1.256	2.64	1.319	.280	.769	.446
Delay in design information	3.52	.963	3.04	1.207	.480	1.555	.127
Mistakes and discrepancies in design documents	3.88	.927	2.92	.954	.960	3.608	.001
Inadequate design team experience	3.84	.800	2.96	.889	.880	3.679	.001
Long waiting time for approval of test samples	4.08	.812	3.20	1.155	.880	3.116	.003
Injury to persons	3.88	.833	2.88	1.054	1.000	3.723	.001
Damages to property during construction	4.00	.707	2.52	1.046	1.480	5.862	.000
Contractor failure to continue the contract	3.60	1.080	2.96	1.428	.640	1.787	.081
Shortage of materials in market	3.56	1.121	2.88	1.166	.680	2.102	.041
Inaccurate materials estimating	3.80	.957	3.08	1.412	.720	2.110	.040
Poor site management and supervision	3.52	1.005	3.04	1.172	.480	1.555	.127
Inadequate contractor experience	3.76	1.052	3.04	1.241	.720	2.213	.032
Inadequate managerial skills	3.36	.860	2.96	1.060	.400	1.465	.150
Defective work that must be removed and replaced	3.12	1.054	3.12	1.269	.000	.000	1.000
Delays in subcontractors work	3.52	.918	2.92	1.222	.600	1.963	.056
Shortage of funds	3.32	.988	3.60	1.155	-.280	-.921	.362

Source: Field Work (2019).

Table 4: Level of Severity Associated with Construction Risk (C)

Construction Risks	Contractors		Insurers		Mean Diff.	T-Statistics	
	Mean	Std. Dev.	Mean	Std. Dev.		Value	Sig.
Shortage of plant/equipment	3.44	1.044	3.24	1.393	.200	.574	.569
Inaccurate prediction of equipment production output	3.56	1.083	3.20	1.384	.360	1.024	.311
Weather	3.80	1.155	3.16	1.214	.640	1.910	.062
Fire	3.64	1.319	3.24	1.128	.400	1.152	.255
Earth quake	2.40	1.118	2.32	1.314	.080	1.391	.171
Extraordinary wind	3.24	1.234	3.36	1.381	-.120	-.324	.747
Heavy rain	3.32	1.314	3.40	1.080	-.080	-.235	.815
Frequent changes in law	3.08	1.077	3.16	1.143	-.080	-.255	.800
Exchange rate fluctuation	3.64	.860	3.40	1.080	.240	.869	.389
Inflation	3.56	.917	3.44	.961	.120	.452	.653
Financial problem due to errors in Estimation	3.72	1.061	3.20	1.118	.520	1.687	.098
Insufficient insurance	3.04	.900	3.68	1.060	-.640	-2.301	.026
Theft	3.60	1.000	2.80	1.080	.800	2.717	.009
Materials damage during transportation	3.64	1.075	2.88	1.236	.760	2.320	.025
Interference by client	3.64	1.150	2.88	1.236	.760	2.251	.029
Poor construction method	3.92	.862	3.16	1.028	.760	2.832	.007
Low productivity of subcontractors	3.79	.977	3.16	1.068	.632	2.162	.036

Source: Field Work (2019)

Table 5: Insurable and Non-Insurable risks (A)

Construction Risks	Response	Contractors		Insurers		Chi-Square	
		N	%	N	%	Value	Sig.
Permits delayed or take longer than expected	Insurable	5	20.0%	4	16.0%	.136	.713
	Non-insurable	20	80.0%	21	84.0%		
Environmental regulations change	Insurable	10	40.0%	2	8.0%	7.018	0.008
	Non-insurable	15	60.0%	23	92.0%		
Pressure to deliver project on an accelerated schedule	Insurable	12	48.0%	6	24.0%	3.125	.077
	Non-insurable	13	52.0%	19	76.0%		
Labour shortage	Insurable	6	24.0%	4	16.0%	.500	.480
	Non-insurable	19	76.0%	21	84.0%		
Strikes and labour disputes	Insurable	9	36.0%	6	24.0%	.857	.355
	Non-insurable	16	64.0%	19	76.0%		
Low productivity	Insurable	8	32.0%	3	12.0%	2.914	.088
	Non-insurable	17	68.0%	22	88.0%		
Labour relations	Insurable	5	20.0%	3	12.0%	.595	.440
	Non-insurable	20	80.0%	22	88.0%		
Unforeseen general conditions	Insurable	14	56.0%	8	32.0%	2.922	.087
	Non-insurable	11	44.0%	17	68.0%		

High number of storeys of buildings	Insurable	15	60.0%	20	80.0%	2.381	.123
	Non-insurable	10	40.0%	5	20.0%		
Inappropriate type of foundation	Insurable	14	56.0%	9	36.0%	2.013	.156
	Non-insurable	11	44.0%	16	64.0%		
Errors in drawings	Insurable	6	24.0%	14	56.0%	5.333	.021
	Non-insurable	19	76.0%	11	44.0%		
Location and project restriction	Insurable	11	44.0%	9	36.0%	.333	.564
	Non-insurable	14	56.0%	16	64.0%		
Variations	Insurable	12	48.0%	11	44.0%	.081	.777
	Non-insurable	13	52.0%	14	56.0%		
Fluctuations (changes in cost)	Insurable	7	28.0%	7	28.0%	.000	1.000
	Non-insurable	18	72.0%	18	72.0%		
Long waiting time for approval of drawings	Insurable	8	32.0%	4	16.0%	1.754	.185
	Non-insurable	17	68.0%	21	84.0%		
Type of client (e.g. public, private, joint venture)	Insurable	11	44.0%	15	60.0%	1.282	.258
	Non-insurable	14	56.0%	10	40.0%		
Unrealistic contract duration	Insurable	6	24.0%	6	24.0%	.000	1.000
	Non-insurable	19	76.0%	19	76.0%		
Delay in Payment to contractor for work done	Insurable	7	28.0%	3	12.0%	2.000	.157
	Non-insurable	18	72.0%	22	88.0%		
Lack of communication between client and consultants	Insurable	6	24.0%	1	4.0%	4.153	.042
	Non-insurable	19	76.0%	24	96.0%		

Source: Field Work (2019)

Table 6: Insurable and Non-Insurable risks (B)

Construction Risks	**Response**	**Contractors**		**Insurers**		**Chi-Square**	
		N	**%**	**N**	**%**	**Value**	**Sig.**
Lack of communication between consultants and contractors	Insurable	4	16.0%	2	8.0%	.758	.384
	Non-insurable	21	84.0%	23	92.0%		
Slow flow of information between project team members	Insurable	6	24.0%	2	8.0%	2.381	.123
	Non-insurable	19	76.0%	23	92.0%		
Inadequate client experience	Insurable	5	20.0%	7	28.0%	.439	.508
	Non-insurable	20	80.0%	18	72.0%		
Delay in design information	Insurable	4	16.0%	2	8.0%	.758	.384
	Non-insurable	21	84.0%	23	92.0%		
Mistakes and discrepancies in design documents	Insurable	8	32.0%	8	32.0%	1.000	.000
	Non-insurable	17	68.0%	17	68.0%		
Inadequate design team experience	Insurable	4	16.0%	6	24.0%	.500	.480
	Non-insurable	21	84.0%	19	76.0%		
Long waiting time for approval of test samples	Insurable	2	8.0%	3	12.0%	.222	.637
	Non-insurable	23	92.0%	22	88.0%		
Injury to persons	Insurable	19	76.0%	19	76.0%	.000	1.000
	Non-insurable	6	24.0%	6	24.0%		
Damages to properties during construction	Insurable	21	84.0%	22	88.0%	.166	.684
	Non-insurable	4	16.0%	3	12.0%		
Contractor failure to continue contract	Insurable	16	64.0%	7	28.0%	6.522	.011
	Non-insurable	9	36.0%	18	72.0%		
Shortage of materials in market	Insurable	12	48.0%	3	12.0%	7.714	.005
	Non-insurable	13	52.0%	22	88.0%		
Inaccurate materials estimating	Insurable	9	36.0%	8	32.0%	.089	.765
	Non-insurable	16	64.0%	17	68.0%		
Poor site management and supervision	Insurable	9	36.0%	9	36.0%	.000	1.000
	Non-insurable	16	64.0%	16	64.0%		

Inadequate contractor experience	Insurable	8	32.0%	9	36.0%	.089	.765
	Non-insurable	17	68.0%	16	64.0%		
Inadequate managerial skills	Insurable	6	24.0%	11	44.0%	2.228	.136
	Non-insurable	19	76.0%	14	56.0%		
Defective work that must be removed and replaced	Insurable	8	32.0%	10	40.0%	.347	.556
	Non-insurable	17	68.0%	15	60.0%		
Delays in subcontractors work	Insurable	12	48.0%	7	28.0%	2.122	.145
	Non-insurable	13	52.0%	18	72.0%		
Shortage of liquidity (cash)	Insurable	4	16.0%	7	28.0%	1.049	.306
	Non-insurable	21	84.0%	18	72.0%		

Source: Field Work (2019)

Table 7: Insurable and Non-Insurable risks (C)

Construction Risks	**Response**	**Contractors**		**Insurers**		**Chi-Square**	
		N	**%**	**N**	**%**	**Value**	**Sig.**
Shortage of plant/equipment	Insurable	7	28.0%	3	12.0%	2.000	.157
	Non-insurable	18	72.0%	22	88.0%		
Inaccurate prediction of equipment production output	Insurable	7	28.0%	5	20.0%	.439	.508
	Non-insurable	18	72.0%	20	80.0%		
Weather	Insurable	5	20.0%	6	24.0%	.117	.733
	Non-insurable	20	80.0%	19	76.0%		
Fire	Insurable	18	72.0%	20	80.0%	.439	.508
	Non-insurable	7	28.0%	5	20.0%		
Earth quake	Insurable	18	72.0%	15	60.0%	.802	.370
	Non-insurable	7	28.0%	10	40.0%		
Extraordinary wind	Insurable	11	44.0%	11	44.0%	.720	.396
	Non-insurable	14	56.0%	14	56.0%		
Heavy rain	Insurable	15	60.0%	17	68.0%	.347	.556
	Non-insurable	10	40.0%	8	32.0%		
Frequent changes in law	Insurable	6	24.0%	4	16.0%	.500	.480
	Non-insurable	19	76.0%	21	84.0%		
Exchange rate fluctuation	Insurable	3	12.0%	2	8.0%	.222	.637
	Non-insurable	22	88.0%	23	92.0%		
Inflation	Insurable	4	16.0%	3	12.0%	.166	.684
	Non-insurable	21	84.0%	22	88.0%		
Financial problem due to errors in estimation	Insurable	8	32.0%	7	28.0%	.095	.758
	Non-insurable	17	68.0%	18	72.0%		
Theft	Insurable	14	56.0%	21	84.0%	4.667	.031
	Non-insurable	11	44.0%	4	16.0%		
Materials damage during transportation	Insurable	18	72.0%	19	76.0%	.104	.747
	Non-insurable	7	28.0%	6	24.0%		
Interference by client	Insurable	15	60.0%	8	32.0%	3.945	.047
	Non-insurable	10	40.0%	17	68.0%		
Poor construction method	Insurable	12	48.0%	10	40.0%	.325	.569
	Non-insurable	13	52.0%	15	60.0%		
Low productivity of subcontractors	Insurable	12	48.0%	5	20.0%	4.367	.037
	Non-insurable	13	52.0%	20	80.0%		

Source: Field Work (2019)