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Insuring Project Risks: Contractor Expectations versus Insurance Company Policies

Jati Utomo Dwi Hatmoko[1*], Pertiwi Kusuma Astuti[2], Sani Nur Farania[1]

[1]*Department of Civil Engineering, Faculty of Engineering, Universitas Diponegoro, Jl. Prof. Sudarto SH, Tembalang, Semarang 50275, Indonesia*
[2]*Department of Civil Engineering, Faculty of Engineering, Selamat Sri University, Kendal 51351, Indonesia*

Abstract. Risks are inevitable during the construction phase of a project. In particular, contractors may respond to the project risks by accepting, avoiding, mitigating, or transferring the risks to other parties. This study aims to explore the use of insurance as one of the risk response mechanisms by contractors. Data were collected through observation of project documents and semi-structured interviews with contractors from five construction projects and four insurance companies. This research identified 42 risks, which are categorized into three levels: 26% low, 48% moderate, and 26% high. Of these, the contractors expected only 20 risks (48%) to be insured, whereas the insurance companies considered only 19 risks (45%) insurable. The risks were mapped on a four-quadrant matrix based on a combination of contractors' expectations for insuring or not insuring project risks, and the insurance company policies against those risks. The matrix revealed that 12 (29%) risks were ideal (insured-insurable), 7 (17%) were overlooked (uninsured-insurable), 15 (36%) were considered reasonable (uninsured-uninsurable), and 8 (19%) were categorized as critical (insured-uninsurable). These findings serve as a reference for the construction industry stakeholders in decision-making related to project risk management.

Keywords: Construction projects; Contractors; Insurance; Insurance companies; Risks

1. Introduction

The construction industry is commonly associated with greater risks compared to other industries due to its unique characteristics and complexity (El-Sayegh and Mansour, 2015; Liao and Chiang, 2015). Failure to manage risks can adversely affect project performance in terms of cost, quality, and completion time (Famiyeh et al., 2017). Therefore, risks need to be appropriately identified, assessed, monitored and administered to ensure the project's course is maintained (PMI, 2017).

The literature classifies project risks as site-related, natural disaster, human, labor-related, material, construction operations, project environment, health and safety, political and regulatory-related risks, and financial risks (San Santoso et al., 2003; Shehu et al., 2014; Khodeir et al., 2015; El-Sayegh and Mansour, 2015; Jarkas and Haupt, 2015; Hidayatno et al., 2015; Wu et al., 2017; Dang et al., 2017; Famiyeh et al., 2017; Shrestha et al., 2017; Nguyen et al., 2018; Sundoko et al., 2018; Siraj and Fayek, 2019; West et al., 2019; Issa et al., 2020; Adafin et al., 2020).

*Corresponding author's email: jati.hatmoko@ft.undip.ac.id, Tel.: +62-24-7460053; Fax: +62-24-7460053
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Such structured risk classification may contribute to the effectiveness and quality of the risk identification process and create a better understanding of the nature of the risk sources (Bu-Qammaz et al., 2009; Banaitiene and Banaitis, 2012; Lekan et al., 2019). Project stakeholders need to understand and identify risks early to implement an appropriate response strategy to minimize the possibility of negative impacts (Wang et al., 2004). The use of construction insurance is considered an effective way of transferring risks and protecting projects from losses (Wang et al., 2004). Jiang et al. (2019) stated that the success of complex projects is highly dependent on construction insurance.

This study aims to explore the use of insurance as one of the risk response mechanisms by contractors. The objectives are to identify risks and conduct qualitative risk analysis, to investigate contractor expectations on the use of insurance for project risks, to identify policy of the insurance companies against the risks, and to map the gap between contractor expectations and insurance company policy.

2. Research Methods

The study data were obtained through the observation of project documents and semi-structured interviews conducted with contractors of five large-scale construction projects and four insurers in Indonesia. The five projects were the Surakarta City Flood Package-2 (PBS2), the Flood Management of Surakarta Package-3 (PBS3), the Mixed-Use Central Land (PMUCL), the Pasar Johar Cultural Heritage Project (PCBPJ), and the PLTGU Tambak Lorok Project (PPTL). The PBS2 is a civil engineering project to increase the capacity of the Bengawan Solo River from 20- to 50-year return period of flood, with a contract value of IDR 199.5 billion. The PBS3 is also a flood control project rehabilitating an existing rubber dam, normalizing and strengthening critical river cliffs and installing flood gates and flood control pumps in Surakarta, with a project value of IDR 173.1 billion. The PMUCL is a 19-floor mixed-use building project in Semarang, which is intended for hotel, retail, condominium, and apartment with a land area of 6574 m^2 and is worth 294.4 billion. The PCBPJ is a rehabilitation project of a cultural heritage of the Johar traditional market, which was damaged by a fire; the project contract value is IDR 46.9 billion. The PPTL is an engineering, procurement, construction (EPC) project to increase 779 megawatts electricity supply in Central Java. This project is located in Semarang, with a contract value of IDR 4.81 trillion.

The majority of respondents were contractors with managerial positions, including project manager, site manager, and project engineering manager, project control manager, and project administration, with an average work experience of more than 10 years. The insurance companies include PPS, TPS, JT, and AT, with the position of respondents including branch head, technical staff, and insurance analyst, all with more than 10 years of work experience.

The initial risks identified from the literature were mainly within the context of general construction projects. As specific project situations may result in different risks, they were further refined based on the identified risks of the five projects. The wording of the final risks was carefully drafted to represent common risks of the five projects.

The study adopted the risk management framework of the Project Management Body of Knowledge (PMBOK) (PMI, 2017), with frequency matrix and risk impact. The respondents were asked to identify risks and assess their frequency levels using a 5-point Likert scale. The frequency scales are 0.1, 0.3, 0.5, 0.7, 0.9, which indicate the frequency from almost never to almost certain. The impact scales are 0.05, 0.10, 0.20, 0.40, and 0.80, indicating the impact rate from very low to very high. The multiplication of the frequency and impact determines the risk level, which was divided into three levels: low (0.005–0.07), moderate (0.08–0.20), and high (0.21–0.72).

3. Results and Discussion

Table 1 shows the identification of 42 risks from the five projects reviewed. The average value of the frequency of risk events, severity, levels (low, medium, high, extreme), contractor's expectations, and insurance company perspectives are displayed. The risk levels were distributed with the highest percentage being the moderate level (48%), followed by the high (26%) and low risks (26%).

The high-risk level comprised 11 risk factors, with two dominating categories, site and natural disaster. The site risk factors included topography, geological conditions, groundwater level, and delays in land acquisition by the owner. The risk factors associated with natural disasters included floods, landslides, and adverse weather. Approximately 20 risk factors dominated the moderate level, including labor, material, finance, and disaster due to humans. There were four factors in the labor risk category: disputes, strikes, increases in overtime wages, and a rise in labor costs. Risks related to materials comprised four factors: damage during delivery, poor quality, equipment delays, and loss (theft). Furthermore, the financial risk category had four factors, including late payment by the owner, increase in material prices, rise in equipment rental costs, and mismatch of estimated costs. The other categories have one or two risks that were not as dominant. The remaining 11 were low-level risks caused by natural disasters, such as earthquakes and storms. The risk categories caused by human disasters were terrorism, riot/demonstrations, and war. The risks related to construction operations were poor quality of work and delay in solving problems.

3.1. Risk Mapping using the IdOvReC Matrix

Based on the combination of the contractor expectations that certain project risks are insured or not and the insurance company policies, a matrix with four-quadrant combination conditions was generated. The matrix, called the IdOvReC matrix, has the categories ideal, overlooked, reasonable, and critical, shown in Figure 1, with red, yellow, and green text colors indicating high, medium, and low levels of the risks.

1. Quadrant 1: Ideal

Ideal conditions denote when the contractors intend to insure certain project risks and the insurance companies classify them as insurable. The findings from this study indicate that the risks in this quadrant were caused by many natural events. There were 12 risks in this quadrant: earthquake (R5), flood (R6), landslide (R7), storm (R8), lightning (R9), riots or demonstration (R11), terrorism (R12), short-circuit explosion (R13), fire (R14), damage during material delivery (R22), theft (R26), and work accident (R34).

2. Quadrant 2: Overlooked

This quadrant represents condition formed from a combination of risks that are not insured by the contractors, but the risks are classified insurable by the insurance companies. Therefore, this is considered an overlooked opportunity. Most of the risks in this quadrant were related to the local conditions of a particular region, including topographic (R1), geological (R2), groundwater (R3), adverse weather (R10), work disputes (R16), labor strike (R17), and equipment damage due to accident or disaster (R24).

3. Quadrant 3: Reasonable

A reasonable condition occurs from a combination of risks that are not insured by the contractor, and the risks are indeed considered uninsurable by the insurance companies. The 15 risks that dominated this quadrant were mostly under the deliberate control of the contractors: lacking number of workers (R18), an increase in overtime wages (R19), a rise in labor wages (R20), late material delivery (R21), equipment delays (R25), work changes (R27), poor work quality (R29), delay in solving problems (R30), environmental damage (R32), health and safety violation (R35), complicated permission issues (R37), late payment term (R39), increase in material price (R40), increase in rent tool (R41), and mismatch of estimated costs (R42).

4. Quadrant 4: Critical

Critical conditions are formed from a combination of risks that are expected to be insured by the contractors but are considered uninsurable by the insurance companies. The following risks are included in the critical quadrant, i.e.: delays in land acquisition by the owner (R4), war (R15), low material quality (R23), poor productivity and efficiency (R28), difficulty in accessing project (R31), land lease claims (R33), changes in government regulations (R36), and monetary instability (R38).

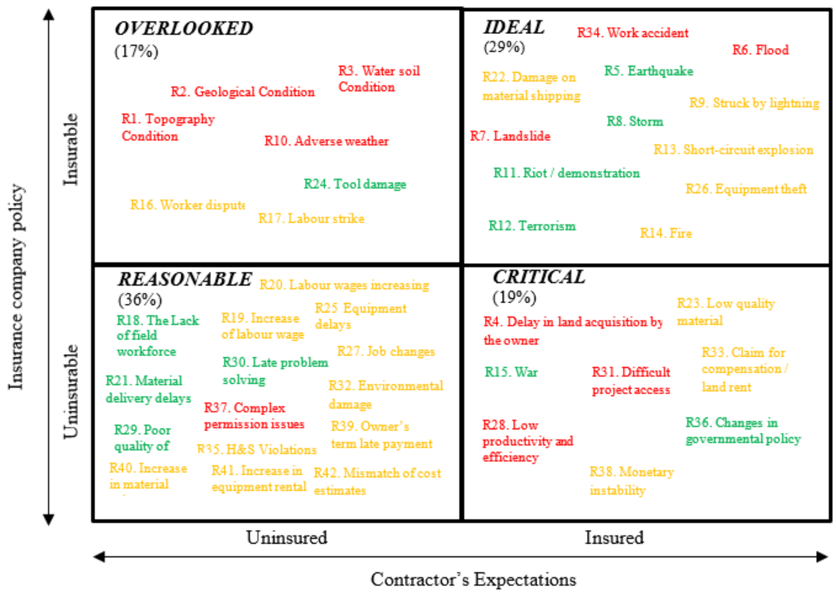

Figure 1 Risk mapping based on contractor's expectations and insurance company policy with the IdOvReC matrix

Figure 1 shows that the majority of risks assessed in this study were in the Reasonable quadrant (36%). The other risks were distributed as ideal (29%), critical (19%), and overlooked (17%). This result indicates that 65% of the risks originating from a combination of reasonable and ideal conditions are well understood and expected to be insured by the contractors. Conversely, 36% of the risks were a combination of the critical and overlooked conditions, indicating a gap between the contractor expectations and insurance company policy. Risks in the critical quadrant need extraordinary attention from the contractors as the insurance companies classify them

Table 1 Qualitative risk analysis, contractor expectations, insurance company policy, and IdOvReC matrix quadrants

Risk categories	Code	Risk factor	Freq	Severity	Risk value	Risk level	Contractor expectations	Insurance company policy	IdOvReC Matrix Quadrant
Site	R1	Topographical conditions	0.74	0.30	0.22	High	Uninsured	*Insurable*	*Overlooked*
	R2	Geological Conditions	0.50	0.47	0.23	High	Uninsured	*Insurable*	*Overlooked*
	R3	Groundwater conditions	0.83	0.47	0.39	High	Uninsured	*Insurable*	*Overlooked*
	R4	Delay in land acquisition by the owner	0.90	0.80	0.72	High	Insured	*Uninsurable*	*Critical*
Natural Disaster	R5	Earthquake	0.20	0.30	0.06	Low	Insured	*Insurable*	*Ideal*
	R6	Flood	0.55	0.50	0.28	High	Insured	*Insurable*	*Ideal*
	R7	Landslide	0.90	0.80	0.72	High	Insured	*Insurable*	*Ideal*
	R8	Storm	0.30	0.15	0.05	Low	Insured	*Insurable*	*Ideal*
	R9	Struck by lightning	0.30	0.50	0.15	Moderate	Insured	*Insurable*	*Ideal*
	R10	Adverse weather	0.55	0.38	0.21	High	Uninsured	*Insurable*	*Overlooked*
Human-caused disaster	R11	Riots / demonstration s	0.30	0.20	0.06	Low	Insured	*Insurable*	*Ideal*
	R12	Terrorism	0.30	0.20	0.06	Low	Insured	*Insurable*	*Ideal*
	R13	Short-circuit explosion	0.50	0.40	0.20	Moderate	Insured	*Insurable*	*Ideal*
	R14	Fire	0.40	0.25	0.10	Moderate	Insured	*Insurable*	*Ideal*
	R15	War	0.30	0.20	0.06	Low	Insured	*Uninsurable*	*Critical*
Work force	R16	Worker disputes	0.55	0.18	0.10	Moderate	Uninsured	*Insurable*	*Overlooked*
	R17	Labor strike	0.37	0.27	0.10	Moderate	Uninsured	*Insurable*	*Overlooked*
	R18	Lack of availability of field workers	0.30	0.20	0.06	Low	Uninsured	*Uninsurable*	*Reasonable*

Risk categories	Code	Risk factor	Freq	Severity	Risk value	Risk level	Contractor expectations	Insurance company policy	IdOvReC Matrix Quadrant
	R19	Increase in overtime wages	0.50	0.20	0.10	Moderate	Uninsured	*Uninsurable*	*Reasonable*
	R20	Increase in labor wages	0.60	0.30	0.18	Moderate	Uninsured	*Uninsurable*	*Reasonable*
Material	R21	Material delivery delays	0.30	0.15	0.05	Low	Uninsured	*Uninsurable*	*Reasonable*
	R22	Damage during material delivery	0.30	0.45	0.14	Moderate	Insured	*Insurable*	*Ideal*
	R23	Low quality material	0.50	0.20	0.10	Moderate	Insured	*Uninsurable*	*Critical*
	R24	Tool damage (due to accident, disaster)	0.30	0.23	0.07	Low	Uninsured	*Insurable*	*Overlooked*
	R25	Equipment delays	0.43	0.20	0.09	Moderate	Uninsured	*Uninsurable*	*Reasonable*
	R26	Loss of equipment (theft)	0.38	0.24	0.09	Moderate	Insured	*Insurable*	*Ideal*
Construction operational	R27	Change Order	0.46	0.26	0.12	Moderate	Uninsured	*Uninsurable*	*Reasonable*
	R28	Low productivity and efficiency	0.70	0.40	0.28	High	Insured	*Uninsurable*	*Critical*
	R29	Poor quality of work	0.30	0.10	0.03	Low	Uninsured	*Uninsurable*	*Reasonable*
	R30	Delay in solving problems	0.30	0.20	0.06	Low	Uninsured	*Uninsurable*	*Reasonable*
Surrounding environment	R31	Difficult access to project sites	0.90	0.50	0.45	High	Insured	*Uninsurable*	*Critical*
	R32	Environmental damage	0.50	0.20	0.10	Moderate	Uninsured	*Uninsurable*	*Reasonable*

Risk categories	Code	Risk factor	Freq	Severity	Risk value	Risk level	Contractor expectations	Insurance company policy	IdOvReC Matrix Quadrant
	R33	Claim for compensation/ land rent	0.50	0.20	0.10	Moderate	Insured	*Uninsurable*	*Critical*
Health and safety risk	R34	Work accident	0.50	0.80	0.40	High	Insured	*Insurable*	*Ideal*
	R35	Health and Safety violations	0.55	0.30	0.17	Moderate	Uninsured	*Uninsurable*	*Reasonable*
Political and regulatory	R36	Changes in government regulations	0.30	0.10	0.03	Low	Insured	*Uninsurable*	*Critical*
	R37	Complex permission issues	0.77	0.47	0.36	High	Uninsured	*Uninsurable*	*Reasonable*
	R38	Monetary instability	0.30	0.40	0.12	Moderate	Insured	*Uninsurable*	*Critical*
Financial	R39	Late payment by the owner	0.50	0.40	0.20	Moderate	Uninsured	*Uninsurable*	*Reasonable*
	R40	Material Price Increase	0.37	0.53	0.20	Moderate	Uninsured	*Uninsurable*	*Reasonable*
	R41	Increase in equipment rental costs	0.30	0.30	0.09	Moderate	Uninsured	*Uninsurable*	*Reasonable*
	R42	Mismatches cost estimates	0.40	0.50	0.20	Moderate	Uninsured	*Uninsurable*	*Reasonable*

as uninsurable; thus, the contractors must bear these risks alone or share them with the clients. The insurable risk status and the gap in the Overlooked quadrant is an opportunity for the contractor to use insurance as a form of protection through the risk transfer mechanism. This research shows that the majority of high-level risks were in the Overlooked quadrant.

3.2. The Gap between Contractor Expectations and Insurance Company Policy

In general, contractors as the main responsible party of a project may have certain expectations that certain risks will be insured. However, gaps tend to arise due to differences in perspective between contractors and insurance companies in addressing the risks. Table 2 shows the distribution of risks based on the expectations of contractors and insurance companies and their distribution according to the level of risks. There was clearly a gap between the contactors' expectations and the insurance companies' policy in responding to the risks identified in the project under study. According to the contractors, out of the 42 identified project risks, 20 (48%) were expected to be insured, of which 8 were medium- (19%), 6 high- (14%), and 6 low-level risks (14%). The other 22 (52%) that were not expected to be uninsured consisted of 12 moderate- (29%), 5 high- (12%), and 5 low-level risks (12%). For the interviewed insurance companies, out of the 42 risks, only 19 (45%) were considered insurable, consisting of 8 high- (19%), 6 moderate- (14%), and 5 low-level risks (12%). The other 23 risks (55%) were considered uninsurable and consisted of 14 moderate- (34%), 3 high- (7%), and 6 low-level risks (14%).

Table 2 The gap between contractor expectations and insurance company policy

		Risk Level		
		Low 11 (26%)	Moderate 20 (48%)	High 11 (26%)
Contractor expectations	20 risks to insure (48%)	6 risks (14%)	8 risks (19%)	6 risks (14%)
	22 risks not to insure (52%)	5 risks (12%)	12 risks (29%)	5 risks (12%)
Insurance Company Policy	19 insurable risks (45%)	5 risks (12%)	6 risks (14%)	8 risks (19%)
	23 uninsurable risks (55%)	6 risks (14%)	14 risks (33%)	3 risks (7%)

The fact that the majority of risk (55%) is uninsurable implies that the contractor must have sufficient capacity to manage the risks associated with the project. Iyer et al. (2020) stated that risk management capabilities of contractors are extremely important for the success of a project. This capacity includes the organization's potential to procure, mobilize, and manage resources to achieve project objectives. The contractor's capacity is very important, particularly in anticipating high-level risks that can threaten the success of the project. Out of the 11 high-level risks identified (26% of the total risks), 6 risks (14%) were insured by the contractors, whereas the remaining 5 risks (12%) were not. By contrast, according to insurance companies, out of these 11 high-level risks, 8 risks (19%) were insurable, and the remaining 3 risks (7%) were uninsurable, thereby producing a gap.

Based on risk management theory, risk responses include accepting, avoiding, mitigating, and transferring risks (PMI, 2017). The use of insurance is an example of risk transfer that can be adopted by contractors. In this context, there is a risk transfer from the contractor to a third party, such as the insurance company. Despite the benefits of using insurance as a form of protection, Owusu-Manu et al. (2020) reported that there are several reasons contractors feel reluctant to insure their projects, including the high cost of premiums, complex policy language, lack of proper coverage, policy exclusions, high insurance demands by insurance companies, lack of knowledge, costs as a guarantor for premiums, incomplete information on insurance policies, lack of effective collaboration between insurance and construction companies, poor quality services, gaps in the legal system, sources of construction insurance premium funding, and insufficient claims compensation by the insurance company.

However, two contractor respondents revealed that not all insured risks were reported to the insurance company when those risks actually occurred. This is due to several underlying reasons, such as: (1) the value of the loss is smaller than the cost of the deductible to be paid by the contractor; (2) the incomplete supporting data for filing the claims, for example, rainfall data, incomplete engineering calculation backups; (3) differences in perception between the contractor and the insurance company related to the conditions for the fulfilment of an event condition to be claimed, such as the existence of an element of material loss, a sudden and unexpected event; (4) the duration for reporting the risk event has expired; (5) the long and complicated insurance claim process, particularly with the involvement of an insurance broker; and (6) lack of communication between the contractor's head office and the project team regarding the engagement with the insurance company, which cause the project team does not file a claim for the risk incurred. All these factors may cause the contractors to lose the benefits of insurance claims. To this end, Halwatura (2015) emphasized that it is important that contractors have sufficient knowledge and expertise to understand insurance policies in detail.

This situation is also experienced in China, where the understanding of risk management and insurance use by contractors is still very limited due to the unfavorable culture (Liu et al., 2007). Liu et al. (2018) reported that subjective norms, such as laws and regulations, contracts, and company policies positively impact contractor willingness to use insurance. Additionally, the attitude of contractors to insurance is influenced by perceptions of risks and previous insurance experience. It is thus recommended that the parties involved in the insurance process are more open and make insurance a means of risk sharing, and not merely fulfilling the clauses of a contract (Halwatura, 2015).

4. Conclusions

This study aims to explore the use of insurance as one of the risk response mechanisms by contractors using five construction projects and four insurance companies as case studies. Of the identified 42 risks in 11 categories, 26% distributed as low-, 48% as moderate-, and 26% as high-level risks, 48% of which the contractors expected to insure, although the insurance companies considered only 45% insurable. To map the identified risks, this study generated an IdOvReC matrix based on a combination of contractor expectations and the insurance company policies.

The results of this study are expected to provide information on the use of insurance in construction projects and the gaps that between what is expected to be insured and what the insurance company may consider insurable. Although the data was obtained from five reviewed projects and the views of four insurance companies, the results are expected to represent the general views of both sides. However, as each project is unique and insurance products continue to evolve according to market dynamics, the real implementation may vary in accordance with the particular construction project or insurance company. Nevertheless, these results can be used as a reference for stakeholders in the construction industry in making decisions related to project risk management. Further research can be done by developing quantitative models of the relationship between the patterns of risk events that occur in projects and the claims in insurance companies. This can help deepen the understanding of the real implementation of construction project insurance.

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