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Quantifying Subcontractor Risk Impact on Construction Project Performance

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ABSTRACT

Delays in the gas unitisation project in Bojonegoro were caused by subcontractors' inability to carry out the job, resulting in the project not meeting its performance goals. This study examines the effects of subcontractor-related communication risks, resource, financial, technical, and management on the execution of construction projects. The quantitative method with survey data was gathered from 39 personnel interacting with subcontractors on an Indonesian gas project to quantify risk influences on performance quality. Structural equation modelling analysis revealed that the R-square value for the monitoring and control variable is 0.582; it may be inferred that technical risk, risk associated with finances, manpower risk, managerial risk, and interpersonal interaction risk account for almost 60% of the variance in management and control. The result also reveals the direct adverse effects of technical and resource risks. Financial and managerial risks exhibited indirect effects through monitoring mechanisms. However, risk impacts were insensitive to motivational factors of subcontractor reputation, experience and competence. By highlighting salient risk drivers of project outcomes, results offer guidance for contractors in subcontractor selection and oversight.

1.0 INTRODUCTION

Risk management in a project includes activities such as planning, identifying, analysing, preparing reactions, putting those reactions into action, and monitoring risks during the project (Whang et al., 2023). According to PMI (2017), the main objective of a project is to finish work items within the agreed-upon timeframe. The specification document details quality and specifications under the Cost Estimate Plan or Cost Budget. Project implementation aims to apply health, safety, and work environment standards consistently. Project risk management focuses on identifying and managing potential risks to ensure they can be effectively controlled. Uncontrolled risks can lead to deviations from the project plan and failure to accomplish the project objectives.

The primary contractor must acknowledge and accept the limitations of any subcontractor, such as financial, resource, technical, managerial, or communication issues, to reduce deviations from the original project goals caused by subcontractor involvement (Moon, 2022). Regular monitoring and control are conducted to minimise deviations from objectives. In terms of the impact that risk management has on the quality of construction performance, the subcontractor company's reputation, competence, and ability play a considerable role. (Aryal et al., 2017).

Contractors often utilise subcontractors in project implementation despite the subcontractors typically having deficiencies in finance, resources, technical skills, management, or communication. The contractor usually accepts these shortcomings to minimise deviations from the project's initial objectives. Regular monitoring and control are essential to mitigate these deviations. Additionally, the subcontractor company's reputation, experience, and competence influence risk management and the quality of construction performance (Moon, 2022). Effective and rigorous control and monitoring of project progress by the contractor's management are crucial in ensuring client or employer satisfaction. A well-managed contractor can fulfil key aspects supporting project success, such as planning, costing, scheduling, monitoring, and implementation (Wijayaningtyas et al., 2022). Success is achieved through practical communication skills among contractors internally and among contractors, sub-contractors, and clients (Fridkin & Kordova, 2022). This activity entails exchanging information between parties to address project issues, encompassing technical and non-technical guidance. Communication can take the shape of vocal, nonverbal, or digital means. Effective, respectful, data-driven, responsible, and beautiful communication fosters cooperation and minimises disagreements between contractors and clients (Martin & Benson, 2021).

Any construction project's success hinges on the selection of reliable subcontractors. Mistakes in this selection process can lead to issues with project goals, such as low quality, project delays, and increased costs (cost overruns) (Fridkin & Kordova, 2022). The Industrial Engineering firm, a multinational contractor working on strategic projects, experienced a discrepancy in subcontractor selection while working on the Jambaran Tiung Biru Gas Unitization project in Bojonegoro, Indonesia, due to subcontractors used by PT. Industrial Engineering is included in the CSR program as outlined in the contracts and regulations of the local government. The principal contractor must support the CSR program by fully embracing all conditions and risks associated with using national and local subcontractors. The chosen subcontractors perform temporary and permanent physical tasks, including temporary office construction, mosques, workshops, storage warehouses, permanent asphalt installations, steel structures, etc. Subcontractor firms' reputation, expertise, and competency significantly impact the efficiency and effectiveness of building projects.

Delays in the gas unitisation project in Bojonegoro were caused by subcontractors' inability to carry out the job, resulting in the project not meeting its performance goals. This research investigates how subcontractor deficiencies in various areas, such as finances, resources, technical, managerial, and communication, affect the overall project performance. By utilising subcontractors, the Industrial Engineering Company can execute high-quality projects and reduce deviations from the original goals as the primary contractor.

2.0 LITERATURE REVIEW

2.1. Contractor Risk Management Toward Project Monitoring and Control and Project Performance Quality

Risks associated with financial conditions, human resources, technology, management, and communication are the five indicators that constitute to risk management, according to Adinyira et al. (2020), as to the findings of Jayasudha et al. (2016), a technical risk is the potential failure to create a product that fully satisfies all specified requirements. Construction-related technical hazards can be monitored from the initial project planning and scheduling phase to the estimation and bidding stages. The primary technical hazards encompass design deficiencies, strategic inadequacies, equipment and system malfunctions, and errors in estimation (Valluru et al., 2020). Financial conditions are crucial for ensuring the well-being of a project throughout its lifecycle. For accurate and organised bookkeeping reports, it is essential to have a healthy cash flow, which refers to a consistent and well-managed flow of funds in and out of the business. It is also important to maintain records detailing how these funds are utilised. These reports play a crucial role in cost management and monitoring the status of projects, enabling tracking of project costs and managing any modifications to the initial cost baseline (Winanda et al., 2017). The cost baseline is maintained consistently throughout the project, an advantage of this technique.

The contractor must assume the risks associated with the availability and efficiency of the resources required for project construction. The lack of available resources, including materials, equipment, and humans, can also impact the overall advancement of a construction project. The construction business is exposed to significant material, equipment, and human resources risks. Subcontractors are commonly associated with the danger of low managerial competency. Following the client's instructions and managing the project effectively are the primary responsibilities of subcontractors, who must be familiar with the project's scope and make good use of available resources. Risks associated with management include ineffectiveness in areas such as human resource management, quality control, cost control, and productivity.

Project management information (PMI, 2017) states that managing project communication entails creating artefacts and implementing plans to ensure everyone gets the necessary information. Organisational behaviour, attitudes of responsibility towards construction production faults, the impact of working relationships between parties in the project, and other concerns on long-term working relationships are known as subcontractor relationship risks (Adinyira et al., 2020).

Implementation of mature and realistic planning is needed to achieve good-quality construction performance. Mubarak (2010) said that project planning and performance are complementary and inseparable in project management. Likewise, according to Behnam et al. (2016), project planning and scheduling are essential to controlling project performance. Apart from that, knowledge and skills in making and reporting plans are needed to control the project schedule, which affects project performance (Haritha et al., 2019).

According to PMI (2017) and Kendrick (2015), A quality construction project is one that efficiently arranges and supervises the endeavour to ensure the following criteria are satisfied: the actual schedule corresponds with the planned schedule, each stage of the construction planning sequence is completed seamlessly, and there are no conflicts among various levels of construction. Precise construction project financing is crucial to determine whether it achieves the margin targets established at its inception (Ahiawodzie, 2021). Accepting the contractor's construction work to the client or owner depends on the quality of the physical construction. According to Khalfan et al. (2022), if the quality of the work does not exceed the customer's standards, the client might refuse the contractor's work results. Based on the results of several studies related to contractor risk management on project monitoring and control, several hypotheses can finally be drawn, as presented in Table 1.

Table 1. Hypotheses Build

Number Hypotheses	Hypotheses	Source
H1	Technical risk positively and significantly influences project monitoring and control	Valluru et al. (2020)
H2	Financial risk positively and significantly influences project monitoring and control	Kendrick (2015), Ahiawodzie (2021)
H3	Human resource risk positively and significantly influences project monitoring and control	Haritha et al. (2019)
H4	Managerial risk positively and significantly influences project monitoring and control	Behnam et al. (2016)
H5	Communication risk positively and significantly influences project monitoring and control	Khalfan et al. (2022)
H6	Technical risk positively and significantly influences project performance quality	Valluru et al. (2020)
H7	Financial risk positively and significantly influences project performance quality	Kendrick (2015), Ahiawodzie (2021)
H8	Human resource risk positively and significantly influences project performance quality	Haritha et al. (2019)
H9	Managerial risk positively and significantly influences project performance quality	Behnam et al. (2016)
H10	Communication risk positively and significantly influences project performance quality	Khalfan et al. (2022)

2.2. Project Monitoring and Control Toward Project Performance Quality

Quality monitoring and control is a structured evaluation and documentation of the results of quality management techniques to assess performance and ensure that project outputs are comprehensive, precise, and fulfil customer expectations. An essential advantage of this approach is to validate that the project deliverables and work adhere to the criteria provided by crucial stakeholders for ultimate approval. Quality monitoring in a standard system that stakeholders have determined to facilitate recording, measurement, validation and authorisation by all related parties. This standard system is the basis on which the quality of construction products during the process has been approved and is worthy of payment.

Meanwhile, quality is one of the three components of the classic performance indicator known as the "Iron Triangle" or "Golden Triangle," evaluated based on project time and cost. Construction projects' quality standards are specified in the contracts from the outset. Additional needs and information can be found in additional papers, such as orders (Yusof & Osmadi, 2019). Thus, a rapid method to assess quality performance in a project is to juxtapose the final output with the specifications specified in the project documentation. This document outlines the skills and expertise of staff, the standard of materials and equipment, quality control procedures, and monitoring project performance outcomes. High-quality performance can lead to benefits such as enhancing the organisation's service delivery, boosting customer happiness, increasing recurring business opportunities, and reducing rework while enhancing construction efficiency (Moradi et al., 2022).

Additionally, cost monitoring and control involve tracking project status to revise project expenses and manage alterations to the cost baseline (Wijayaningtyas et al., 2023). The primary advantage of this technique is the continuous maintenance of a cost baseline throughout the project. Design changes from the initial plan resulted in an addendum to the work contract, increasing the contract duration. Monitoring construction projects not only controls the schedule so that it is on time, but the risk of cost overruns also needs to be taken into account (Li et al., 2017) in scheduling, in addition to ensuring that the construction period takes place following the contract, but also following the requirements that are necessary to make the final project safe, applicable, perfect, and free of any quality faults, and to guarantee that the construction costs are minimized and that economic benefits are achieved without exceeding the budget price of the contract. Thus, based on the explanation above regarding project monitoring and control of project performance quality, a hypothesis can be drawn, namely: H11 - project monitoring and control positively and significantly influence project performance quality

3.0 METHODOLOGY

Using a quantitative methodology, this research is an explanation-based study. The purpose of research that is undertaken to explain the placements of the variables that are being examined and the interactions between study variables is known as explanatory research (Creswell, 2014). This research uses primary data regarding respondents' perceptions of variables related to risk management, subcontractor motivation, and monitoring and control of the quality of project performance, which was obtained from distributing questionnaires to respondents. The population of this study consisted of 39 persons who had direct interactions with subcontractors who were involved in the work of the Jambaran Tiung Biru project, consisting of the Construction Manager, General Superintendent, Area Superintendent, Superintendent, Supervisor, Project Control, Quality Officer, and Procurement. Therefore, the sampling method utilised is non-probability sampling, also known as saturated sampling, in which all members of the population are utilised as a sample numbering 39 individuals.

PLS-SEM provides answers for small sample sizes when the model includes numerous structures and elements, as stated by Hair et al. (2019). The technique enables this by calculating measurements and structural model interactions independently rather than concurrently. It is possible to use PLS-SEM with smaller samples; however, the acceptability of using small sample sizes is contingent upon the features of the population (Rigdon, 2016). In this study, the PLS-EM methodology is utilized as an analytical tool for evaluating hypotheses.

To measure the risk associated with the technical variables (X1), the financial risk (X2), the resource risk (X3), the managerial risk (X4), the communication risk (X5), the monitoring and control (Z), the motivation (W), and the construction performance quality (Y), a "Likert Scale" is utilised. This scale measures the beliefs, opinions, and perceptions of an individual or group of individuals regarding social phenomena. The social phenomena in this research have been precisely determined by the researcher, in the future referred to as research variables. The variables to be measured are described as indicator variables. After that, these indicators are utilised as benchmarks to assemble pieces of the instrument in the shape of statements or inquiries. For quantitative analysis, respondents' answers were scored as follows:

- The answer strongly agree is given a score of 4
- An affirmative answer is given a score of 3
- Disagree answers are given a score of 2
- Answers that strongly disagree are given a score of 1

To determine whether or not the research instruments that were utilised were valid and reliable, a pilot study was carried out. This was done so that the instruments could be utilized for the research. Validity and reliability testing in the pilot study was carried out on 35 respondents who had been involved in an EPC project. Testing the validity of this research instrument uses Convergent Validity by looking at the loading factor of each indicator and Discriminant Validity by looking at the AVE (average variance extracted) value, shown in Table 2. The loading factor results for each indicator used in this research have a loading factor greater than 0.5 and significant (p-value <0.05). The AVE value of each variable is more significant than 0.5. This shows that all the indicators used in this research are valid, and no indicators were discarded. Reliability testing can be done by looking at the Composite reliability and Cronbach's Alpha values in Table 3. All variables used in this study have composite reliability, and Cronbach's Alpha is more significant than 0.7, which shows that the variables in this study are reliable.

Table 2. Validity Test Result

	The initial sample (O)	T statistics (|O/STDEV|)	P-values
X1.1 <- X1	0.786	6.877	0.000
X1.2 <- X1	0.829	10.761	
X1.3 <- X1	0.830	8.993	
X1.4 <- X1	0.890	23.943	
X1.5 <- X1	0.875	16.881	
AVE X1 = 0.710			
X2.1 <- X2	0.792	4.523	0.000
X2.2 <- X2	0.789	4.001	
X2.3 <- X2	0.866	22.264	
X2.4 <- X2	0.873	21.404	
AVE X2 = 0.690			
X3.1 <- X3	0.798	7.529	0.000
X3.2 <- X3	0.818	4.561	
X3.3 <- X3	0.886	5.463	
AVE X3 = 0.697			
X4.1 <- X4	0.887	3.508	0.001
X4.2 <- X4	0.892	3.133	0.002
X4.3 <- X4	0.873	2.861	0.005
X4.4 <- X4	0.811	3.727	0.000
AVE X4 = 0.750			
X5.1 <- X5	0.801	2.904	0.005
X5.2 <- X5	0.793	5.754	0.000
X5.3 <- X5	0.880	19.934	0.000
AVE X5 = 0.681			
Z1 <- Z	0.872	5.161	0.000
Z2 <- Z	0.782	2.777	0.007
Z3 <- Z	0.801	15.285	0.000
AVE Z = 0.672			
W1 <- W	0.896	24.841	0.000
W2 <- W	0.872	11.749	
W3 <- W	0.887	17.165	
AVE W = 0.783			
Y1 <- Y	0.896	17.222	0.000
Y2 <- Y	0.735	6.619	
Y3 <- Y	0.875	12.512	
AVE Y = 0.703			

Table 3. Reliability Test Result

Variables	Composite reliability (rho_c)	Cronbach's alpha
X1	0.924	0.897
X2	0.899	0.851
X3	0.873	0.783
X4	0.923	0.889
X5	0.865	0.784
Z	0.860	0.759
W	0.915	0.863
Y	0.876	0.789

4.0 RESULT AND DISCUSSION

The structural model underwent evaluation utilising multiple methods, such as R-Square to assess the dependent construct, Stone-Geisser Q-Square test to measure predictive relevance, t-test to determine the significance of the structural path parameter coefficient, and the bootstrapping strategy to obtain the results. The adequacy of the model was evaluated using various measures, such as SRMR, precise fit criteria d_ULS and d_G, NFI, and Chi2, as presented in Table 4.

Table 4. Model Fit Results

Measures	Saturated Model	Estimated Model
SRMR	0.094	0.096
d_ULS	3.618	3.766
d_G	4.330	4.459
NFI	614.793	619.810
Chi2	0.629	0.626

It is possible to conclude that technical risk (X1), financial risk (X2), resource risk (X3), management risk (X4), and communication risk (X5) are responsible for 58.2% of the variance in monitoring and control. This conclusion can be reached as a result of the fact that the R-square value for the monitoring and control variable (Z) is 0.582. There is a possibility that the remaining 41.8% is due to external factors outside the study's scope. It has been determined that the quality of construction performance (Y) has an R-square value of 0.922. It is possible to ascribe 92.2% of the variability in construction performance quality to the following factors: technical risk (X1), financial risk (X2), resource risk (X3), management risk (X4), communication risk (X5), monitoring and control (Z), and motivation (W). Other variables outside the study can explain the remaining 7.8%. The q-square test evaluates predictive relevance based on how well the model fits the data and how well its parameters fit the data. This research model has a q-square score of 0.967, which indicates that it is a good model because the Q-square score is closer to one than zero. The results of the PLS analysis, which were depicted in Figure 1 through the correlation between variables and the path of its coefficients, were examined.

Table 5 displays the analysis findings regarding the impact of communication risks, resource, financial, technical, and management on the quality of construction performance. These risks can be viewed directly or indirectly through monitoring and control, with motivation as a moderator. With a path coefficient of -0.496, technical risk substantially impacts the performance quality of building construction. The correlation between rising technical risk and declining construction performance quality is clear. The subcontractors working on Jambaran Tiung Biru projects frequently use subpar implementation techniques, work methods, tools, and pricing estimates and make numerous design changes, which lowers the overall quality of the construction performance. This agrees with the findings of PMI (2017) and Valluru et al. (2020), according to which project execution strategies, specification quality control, work method determination, heavy equipment selection, reasonable cost estimates, and a limited number of design changes directly impact the quality of construction performance in terms of schedule, cost, and quality.

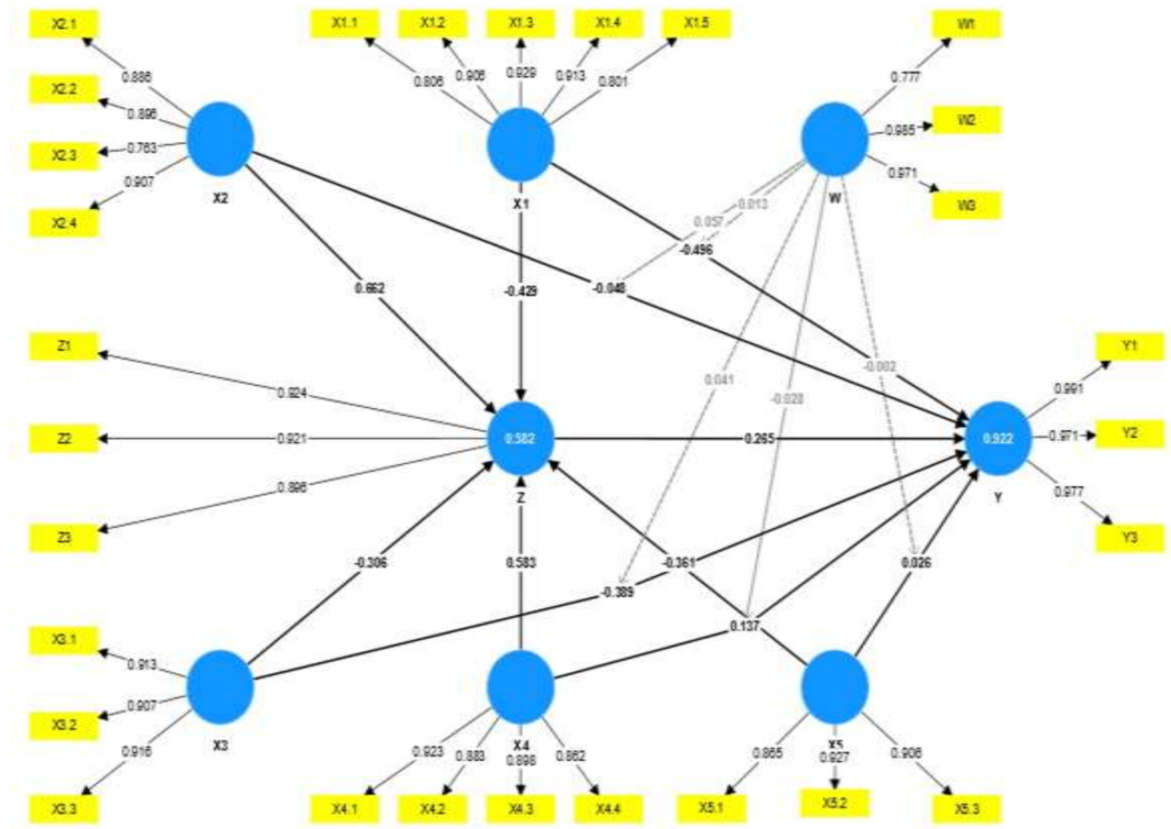

Figure 1. Correlation between variables and indicators.

Table 5. Hypothesis Testing Result

No.	Hypotheses	Path Coefficient	p-value	Results
1.	H1	-0,429	0,074	Not Significant
2.	H2	0,662	0,000	Significant
3.	H3	-0,306	0,121	Not Significant
4.	H4	0,583	0,000	Significant
5.	H5	-0,361	0,178	Not Significant
6.	H6	-0,496	0,009	Significant
7.	H7	-0,048	0,760	Not Significant
8.	H8	-0,389	0,000	Significant
9.	H9	0,137	0,226	Not Significant
10.	H10	0,026	0,884	Not Significant
11.	H11	0,265	0,016	Significant
12.	H12	-0,028	0,897	Not Significant

A path coefficient of -0.114 indicates that technical risk has a low impact on the quality of building construction performance through monitoring and control. This proves that technical risk affects the performance quality of building construction regardless of whether monitoring and control are there or not. The Jambaran Tiung Biru project had several challenges with subcontractors, including incorrect strategy formulation, inconsistency with preset requirements, faults in work technique preparation, and estimation problems. Consistent monitoring and control made it hard to fix these problems. The periodic monitoring and control activities are ineffective in alleviating the influence of technical risk on building performance quality. According to Jayasudha et al. (2016), it poses a technical risk if subcontractors cannot construct items that fulfil the specified specifications. Furthermore, Isikyildiz and Cemil (2020) assert that a contractor's performance is determined by the quality and quantity of work they have accomplished within the specified scope of work. Subcontractors cannot intervene to enhance the ultimate outcomes of construction, specifically the construction efficacy regarding punctuality, quality, and budgetary constraints (Defalgn et al., 2022).

As the path coefficient for financial risk is -0.048, it does not substantially impact the performance quality of building construction. This demonstrates no statistically significant relationship exists between the rise in financial risk and the decline in building performance quality. Nevertheless, the subcontractors need Good quality construction performance even though their economic state was deemed unhealthy. This document from PMI (2017) delineates cost control and project status monitoring techniques to maintain current project costs and manage alterations to the cost baseline. The principal benefit of this strategy is the preservation of a cost baseline throughout the project.

The performance quality of building construction is significantly influenced by financial risk through controlling and monitoring it, as evidenced by a path coefficient of 0.175. In light of this, it may be concluded that the quality of a building's construction performance might be impacted by financial risk, but monitoring and control can mitigate this effect. Cost control and project status monitoring procedures were outlined by PMI (2017) to keep project costs up-to-date and to handle changes to the cost baseline. The key benefit of this method is that it maintains a consistent budget for the project (Vivek & Hanumantha Rao, 2022). According to Issa (2013), there are several financial hazards in the construction industry, including client money not being available, variations in exchange rates, and financial defaults by subcontractors. Periodically monitoring the subcontractor's financial status concerning the correctness of the primary contractor's payments to subcontractors is essential for recovering cash flow that has stagnated and missed early estimations. Failing to do so would harm the continuity of progress. Consider the potential consequences if this risk increases without any intervention. The principal contractor will be adversely affected in that situation due to the problematic outcomes of regional subcontractors regarding monitoring quality and development. In line with the view expressed by Li et al. (2015), the author of the report asserted that if this type of risk is not managed, it may lead to multiple issues, such as contractor's reluctance to fix problems, requesting more funding, intentionally declaring bankruptcy, and increased overtime, among others.

With a path coefficient of 0.057, the influence of financial risk-adjusted by motivation on the quality of building construction performance is insignificant. Evidence like this suggests that intrinsic motivation isn't enough to mitigate the effect of financial risk on building performance quality during construction. The reputational experience and subcontractors' competition intensity are irrelevant to what is required for the Jambaran Tiung Biru project work. Consequently, motivation is incapable of either strengthening or weakening the financial risks associated with the quality of building performance.

The level of performance observed in the construction of buildings is significantly impacted by resource risk, as seen by the path coefficient value of -0.389. The correlation between rising resource risk and declining construction performance quality is evident. There is a strong probability that resources such as insufficient manpower, materials, and preparation will cause work to take longer than expected, produce subpar results, and drive up costs. Work length, quality control, and budget are all impacted by the risks posed by subcontractors in the Jambaran Tiung Biru project. As mentioned by Keshk et al. (2017), It is possible for the progress of a building project to be considerably impacted when appropriate resources are unavailable. Building supplies, machinery, and workers pose numerous potential hazards.

The path coefficient for the relationship between resource risk and the quality of building construction performance as determined by monitoring and control is -0.081, indicating no statistically significant association between the two. The fact that control and monitoring are ineffective in mitigating the effect of resource risk on building performance quality during construction is evident from this. The Jambaran Tiung Biru project frequently encountered subcontractors who lacked sufficient resources, including workload-appropriate personnel, materials, and preparedness for planning. Thus, resource risks can still affect the quality of building performance even with frequent supervision and monitoring. Li et al. (2015) argue that the contractor should bear the responsibility for the risks related to the availability and productivity of the resources required for project construction, as the literature supports. It has been shown that the main contractor cannot do regular checks to ensure the quantity and quality are met.

The quality of building construction performance is not significantly affected by resource risk controlled by motivation, as indicated by a path coefficient of -0.028. This indicates that motivation cannot enhance the influence of resource risk on the quality of building performance. Most subcontractors' reputational experience and intense competition are irrelevant to what is required for Jambaran Tiung Biru project work. So, motivation cannot strengthen or weaken the risk of resources on the quality of construction performance.

The path coefficient is just 0.137. managerial risk has no discernible effect on the efficiency and effectiveness of building construction. This demonstrates that the quality improvement of construction performance is unaffected by an increase in managerial risk (Khairullah et al., 2022). Subcontractors can complete the work within the agreed-upon time frame, quality standard, and budget regardless of poor planning, subpar performance, incompetence, or communication breakdowns (Hwang et al., 2016). According to PMI (2017), an analysis of the project's duration, activities, resource needs, and schedule restrictions is necessary to establish a schedule model for control, monitoring, and execution. The procedure results in a schedule model that details when specific project tasks will be completed. In addition, Szymanski (2017) states in their literature that an effective method for assessing the subcontractor's success in adhering to the planning progress schedule is to evaluate their commitment to executing the points mentioned in the weekly meeting.

Managerial risk has a significant indirect effect on the performance quality of building construction through monitoring and control, as shown by the path coefficient of 0.154. The impact of managerial risk on the performance quality of building construction can be mitigated by monitoring and control. Regular management of the planning line, simple subcontractor managerial in the Jambaran Tiung Biru project, ineptitude on the part of the subcontractor, a lack of quality and work control, and communication can all be reduced via implementing these measures. Performing frequent periodic control and weekly meetings to monitor the consistency of work schedule implementation, as well as the subcontractor's commitment to adopting suggestions technically based on the due date indicated in the meeting minutes, are two methods that can be utilized to accomplish this goal. In their respective studies, Issa (2013), Abdelalim et al. (2022), and Srinivas (2020) have voiced their opinion that it is vital to have competence in managing a construction project from the beginning of the project cycle all the way through to its eventual conclusion. To ensure that the project objectives are reached in terms of quality, time, and money, this skill comprises the capacity to supervise the activities of the project, control the team, manage and predict cash flow, maintain internal and external communication, manage risks, and regulate logistical accuracy. To uphold the planning progress timetable, one criterion for evaluating subcontractor performance is their adherence to the directives outlined in the weekly meeting. This aligns with the assertion of Fisk and Reynolds (2010), who defined a project as a distinct sequence of interconnected activities to achieve certain outcomes within a designated timeframe. Witjaksana et al. (2013) also stated that a project is executed within a specific time frame. It is necessary to carry out activities in a specific order that has been logically planned, and they must be finished within a certain amount of time to achieve performance requirements. According to Zavadskas et al. (2008), To oversee and control these processes, a system that can report and track progress regularly is essential for analysing each step-by-step process.

When tempered by motivation, the impact of managerial risk on the performance quality of building construction is negligible (path coefficient = 0.041). Evidently, the effect of managerial risk on the performance quality of building construction cannot be amplified by motivation. Most subcontractors' reputational experience and intense competition are irrelevant to what is required for Jambaran Tiung Biru project work (Gunduz et al., 2020). Therefore, motivation cannot strengthen or weaken managerial risks to the quality of construction performance.

With a route coefficient of only 0.026, the effect of communication risk on the performance quality of building construction is negligible. This indicates that a higher level of communication risk does not substantially impact improving construction performance quality. Subcontractors must nevertheless do the task by the due date and maintain quality standards without any extra paperwork or attachments, even though there has been a lack of dedication, communication, and efficient organisation and coordination. Both the Project Management Institute (2017) and Candel et al. (2021) describe project communication management as the processes that guarantee the project and its stakeholders will be able to fulfil their information requirements. The production of artefacts and the execution of actions that allow the efficient transmission of information are effective means of accomplishing this objective.

According to a path coefficient of -0.095, the influence of communication risk on the quality of building construction performance through monitoring and control is insignificant. This is demonstrated by the fact that the impact is low. It can be deduced from this that the presence of monitoring and control does not mediate between the influence of risk communication and the level of quality in the performance aspects of building construction. As a result of the Jambaran Tiung Biru project, it was discovered that subcontractors engaged in inefficient communication methods, which impeded the improvement of performance during construction. The practices involved in this project were a lack of commitment, inadequate communication throughout the entirety of the project, and inappropriate management and coordination. Risk communication harms construction performance quality that cannot be reduced by monitoring and control procedures (Skitmore et al., 2020). According to PMI (2017), Project Communication Management comprises the processes that are necessary to guarantee that the information needs of the project and its stakeholders are met. This is accomplished through the production of material objects and the execution of actions that are targeted at creating effective information flow. Therefore, they cannot be rendered efficient using intermittent control measures.

A path coefficient of -0.002 indicates that the influence of communication risk, which is moderated by motivation, on the quality of building construction performance is small. This demonstrates that motivation is not a determining factor in increasing the impact of risk communication on the quality of construction performance. Most subcontractors' reputational experience and intense competition are irrelevant to what is required for Jambaran Tiung Biru project work. Therefore, motivation cannot strengthen or weaken the risk of communication regarding the quality of construction performance.

5.0 CONCLUSION

This timely study suggests contractors should emphasise technical capabilities and resourcing risks as prime subcontractor attributes when assessing project fit. At the same time, financial health and managerial competence require ongoing monitoring. Relationships and past performance seem inadequate to mitigate emerging challenges. A more holistic approach balancing pre-qualification and continuous subcontractor management is recommended to buffer project achievements from potential deficiencies beyond motivation.

This research provides managerial implications that regular monitoring and control activities for technical risks must receive more attention by assisting subcontractors in ensuring the feasibility of preparing plans and ensuring compliance with implemented specifications so that work is completed on time. The subcontractor's financial condition must be monitored regularly to ensure that the subcontractor's cash flow is healthy. Apart from that, an approach and firmness are needed for subcontractors to be able to fulfil their obligations in providing staff appropriate to the workload, ensuring materials are delivered on time, and guiding them in preparing and implementing plans according to the work breakdown schedule.

Subcontractor assistance from the main contractor is needed to share relevant construction management knowledge so that the quality of construction performance is as expected. Verbal and non-verbal communication must be carried out well and professionally between subcontractors and main contractors so that the transfer of information can run properly. All problems and project achievements must be communicated with the main contractor.

The selection of subcontractors is not simply based on an assessment of reputation, experience, and intensity of competition. It is based on assessing technical capabilities, consistency in commitment to providing manpower according to workload, adequate financial capabilities, and managerial capabilities under project needs. This research still has many shortcomings, and it is hoped that further research can improve them, including the number of samples used, the variables used to measure project performance, and the type of construction project.

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