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MINIMIZING THE RISK OF COST OVERRUN IN BUILDING CONSTRUCTION PROJECT DURING PRE-CONTRACT STAGE

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Abstract

Cost overruns are a major challenge in Malaysian building construction projects, leading to delays, budget increases, and financial losses. This study investigates pre-contract factors that contribute to cost overruns and evaluates strategies to mitigate these risks. The objectives are to identify key factors, assess their impact, and determine effective mitigation strategies for stakeholders during the pre-contract stage. A quantitative approach was used, employing a structured questionnaire survey of construction firms in Selangor. Data were analyzed using descriptive and inferential statistics. The findings indicate that inaccurate cost estimation, poor planning, contractor inexperience, and financial constraints are the most significant factors influencing cost overruns. Effective strategies include careful contractor selection, risk assessment, pre-contract cost control, detailed planning, and the adoption of Building Information Modeling (BIM). The study provides practical insights for stakeholders to manage pre-contract risks, improve cost control, and enhance project outcomes. It also contributes to the literature by quantitatively validating the impact of pre-contract factors and strategies in Malaysian construction projects.

Keywords: cost overrun, pre-contract stage, risk, building construction project

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INTRODUCTION

The construction industry is a key driver of Malaysia's economy, employing approximately 1.38 million people in 2021 (8.6% of the national workforce) and generating a GDP of RM 13.6 billion in Q3 2022 (Department of Statistics Malaysia, 2022). Despite its economic importance, cost overruns remain a persistent challenge, threatening project success and stakeholder confidence. Atkinson (1999) described project success using the "iron triangle" of time, cost, and quality, where cost represents financial constraints and adherence to budget. Hinze et al. (1992) defined cost overrun as the difference between the original contract sum and the awarded contract sum.

Project costs are typically estimated at contract award; however, design changes, market fluctuations, and logistical challenges often cause budget deviations (ElSahly, Ahmed, & Abdelfatah, 2023). Innovative practices, such as modular construction integrated with Building Information Modeling (BIM), have been shown to reduce costs by 22% and shorten project timelines by 35% (Gómez & Sánchez, 2024). Globally, cost overruns are significant: for example, the China-Indonesia high-speed rail exceeded its budget by US\$1.2 billion (Nikkei, 2023), while in Ghana and Nigeria, 72% and 84% of projects experienced overruns, respectively (Asiedu & Alfen, 2016, as cited in Asiedu & Adaku, 2020; Ameh et al., 2010, as cited in Kamaruddeen et al., 2020). More recently, Hesna et al. (2021) reported that the COVID-19 pandemic further disrupted construction projects, with actual costs heavily affected by variances between market prices and planned budgets.

In Malaysia, cost overruns frequently occur, with projects exceeding budgets by 5–10% of the total contract sum (Kamaruddeen et al., 2020). For instance, the upgrading of the Malaysian Parliament building exceeded RM 100 million, demonstrating the significant financial implications for stakeholders (Rahim, Ibrahim, & Nelson, 2022). Evidence suggests that the majority of cost overruns originate in the pre-contract stage, which includes project inception, feasibility studies, detailed design, tendering, and pre-contract planning (Hackett & Robinson, 2003). Decisions made during this stage, such as contractor selection, project scheduling, and cost estimation, have a direct impact on the likelihood of cost escalation.

Although several strategies, such as risk assessment, pre-contract cost control, comprehensive planning, scope management, BIM adoption, quality monitoring, and effective communication, have been proposed to mitigate cost overruns (Ikechukwu et al., 2017; Abusafiya & Suliman, 2017; Sánchez et al., 2022), there is a lack of quantitative studies evaluating their effectiveness in the Malaysian context. Addressing this gap is critical to provide practical guidance for stakeholders and improve project outcomes.

This study aims to identify the pre-contract factors that contribute to cost overruns in Malaysian building construction projects, evaluate their impact on project costs, and assess strategies that stakeholders can implement to minimize these risks. By achieving these objectives, the study seeks to provide actionable recommendations for construction professionals and contribute to the body of knowledge on cost overrun management.

BACKGROUND

Cost overruns remain a global challenge in the construction industry, including in Malaysia, and occur when actual costs exceed budgeted amounts (Jackson, 2002). Contributing factors include poor contract management, inaccurate cost estimation, design changes, ineffective planning, inadequate communication, weak tender documentation, inflation, and political interference (Ahady et al., 2017; Aljohani et al., 2017; Durdyev, 2020). Other studies have also identified limited innovation, weak financial management, and client-initiated change orders as drivers of cost overruns (Kawmudi et al., 2021; Famiyeh et al., 2017). In Malaysian construction projects, cost overruns are prevalent in both residential and non-residential sectors. Examples include a government building project in Kuala Lumpur, which experienced a 33% overrun due to site conditions, design changes, and permit delays (Mamat & Zainal Abidin, 2018), and a Selangor low-cost housing project that exceeded its RM 15 million budget by 30%, largely because of design changes, material price fluctuations, and labour shortages (Rahim, 2020). Global reviews also confirm the persistence of cost overruns across project types and regions (Sepasgozar et al., 2022), with early project stages such as design and procurement being the most critical points for intervention (Love et al., 2018; Tennakoon et al., 2022). Mahmud et al. (2021) underscored the persistent issue of cost overruns and the urgency for deeper analysis. If left unchecked, cost overruns can become unmanageable for project stakeholders (Odeck, 2018).

According to the World Bank Group and Economic Planning Unit of Malaysia (2021), average industry overruns are estimated at 20–30%. This study, therefore, targets project developers, contractors, and quantity surveying consultants to develop pre-contract strategies that clarify critical factors and support best practices for minimizing cost overruns.

Cost overruns in building construction projects arise from a variety of factors across different stages. Focusing on the pre-contract stage is particularly important, as early interventions can prevent these causes from escalating. Studying strategies to mitigate cost overruns during this stage is crucial for construction stakeholders, as prevention is more effective than remediation. By addressing potential risks before they materialize, practitioners can safeguard organizational profitability, create growth opportunities, and protect

stakeholders' interests. Furthermore, minimizing cost overrun risks supports project execution within budget, ultimately contributing to project success in terms of deliverables, client satisfaction, and return on investment.

PRE-CONTRACT IN THE CONSTRUCTION INDUSTRY

The construction process, from conception through design, contracting, and execution, has become increasingly time- and cost-intensive. The pre-contract stage, or the preparatory phase prior to contract award, is critical in shaping project outcomes and preventing errors that could escalate costs and delays (Ashworth, 2002). Effective management during this stage ensures alignment with client requirements, stakeholder expectations, and project objectives.

According to Hackett and Robinson (2003), the pre-contract stage begins with the initial brief and continues through procurement, detailed design, programming, design team coordination, creation of drawings, specifications, and bills of quantities (BQ), engagement of specialised subcontractors and suppliers, quality assurance measures, and, finally, the request for tenders. The initial brief typically includes a feasibility study, sketch scheme, and preliminary cost estimate. Construction procurement, the framework through which a project is conceived, acquired, or executed, varies depending on the chosen procurement route (Sharif & Morledge, 1996, as cited in Morledge et al., 2021). Each procurement method carries distinct priorities regarding time, cost, and quality, and pre-contract programmes can only be finalised once the procurement approach is determined. This structured preparation lays the foundation for the subsequent design and programming activities, which are essential for aligning project goals with practical execution.

When the sketch scheme is developed into a feasible solution, the detailed design is produced (Hackett & Robinson, 2003). The design team is responsible for creating a solution that meets client requirements, considers the building's expected lifespan, integrates structural and architectural elements, and addresses end-user needs if not fully specified by the client. After submission of final design proposals, the team reviews and adjusts the initial program as necessary, taking into account the chosen procurement method and any financing conditions. Programming activities help organise pre-contract processes in a logical and efficient sequence. Regular design team meetings ensure the integration of updated project information, structural and architectural coordination, expert input, health and safety compliance, and program monitoring. These design and programming processes are critical for identifying potential risks early and minimising costly adjustments during construction.

Drawings and specifications are equally important for conveying the detailed information required for construction. Without clear and precise drawings and specifications, cost estimates may be inaccurate (Hatamleh et al.,

2018). Bills of quantities (BQ) are typically prepared to standardise client and design team specifications, providing a consistent basis for pricing. It is also standard practice for the design team to consult specialist subcontractors or suppliers to obtain quotations for specific works. Additionally, quality assurance ensures that project deliverables meet acceptable standards (Hackett & Robinson, 2003). Together, these measures demonstrate that comprehensive pre-contract planning, including feasibility studies, procurement selection, detailed design, programming, preparation of drawings and specifications, engagement of specialists, and quality assurance, is essential for mitigating risks, controlling costs, and enhancing the likelihood of project success. Table 1 summarises the key pre-contract activities in building construction projects.

Table 1: Summary of Pre-Contract Activities (Author's Compilation)

Pre-contract Activity	Description/Key Points
Initial Brief	Feasibility study, sketch scheme, preliminary cost estimate (Hackett & Robinson, 2003)
Procurement	Selection of the procurement route determines time, cost, and quality priorities
Detail Design	Integration of structural and architectural elements; considers client and end-user requirements
Programming	Organizing pre-contract processes in a logical sequence (Hackett & Robinson, 2003), including scheduling design team meetings, coordinating production information, obtaining statutory approvals, completing legal agreements, negotiating with service providers, incorporating specialized design components, receiving quotes, preparing pre-tender documents and estimates, administering contract documents, briefing site inspectorate, and nominating subcontractors and suppliers.
Design Team Meetings	Reviewing updated project information, coordinating structural and architectural integration, incorporating expert input, ensuring health and safety compliance, and monitoring program progress
Drawings and Specifications	Provides detailed construction information; basis for cost estimation (Hatamleh et al., 2018)
Bills of Quantities	Standardizes specifications for pricing; consults specialist subcontractors/suppliers
Specialist Subcontractors & Suppliers	Obtaining provision and quotations for specific works; ensures accurate cost estimation and resource planning

Pre-contract Activity	Description/Key Points
Quality Assurance	Ensures deliverables meet acceptable standards (Hackett & Robinson, 2003)
Tendering	Request for tenders; finalizing project requirements and documentation

FACTORS OF COST OVERRUN IN CONSTRUCTION PROJECTS

Project cost overruns in construction are generally influenced by financial risks; however, the factors causing cost overruns are often more complex and multifaceted. Table 2 presents a synthesis of common cost overrun factors in construction projects, based on the frequency of their occurrence across the reviewed literature (e.g., Ahady et al., 2017; Aljohani et al., 2017; Durdyev, 2020; Mahmud et al., 2021).

Table 2: Common Cost Overrun Factors in Construction Projects
 (Author's Compilation)

Factors	Sources	Frequency
Client's Financial Difficulty	Lee et al. (2022); Kuware (2021); Durdyev (2020)	3
Contractors' Financial Difficulties	Ahady et al. (2017); Aljohani et al. (2017); Lee et al. (2022); Durdyev (2020); Niazi & Painting (2017)	5
Contractor's Poor Site Management and Supervision	Ahady et al. (2017); Adam et al. (2017); Amini et al. (2023); Lee et al. (2022); Gaurang (2020)	5
Corruption	Babalola et al. (2022); Niazi & Painting (2017)	2
Delayed Payment to Contractors or Consultants	Adam et al. (2017); Aljohani et al. (2017); Niazi & Painting (2017)	3
Frequent Design Change or Frequent Change Order	Adam et al. (2017); Amini et al. (2023); Aljohani et al. (2017); Babalola et al. (2022); Durdyev (2020); Niazi & Painting (2017)	6
Ground or Soil Conditions	Adam et al. (2017); Kuware (2021); Durdyev (2020)	3
Inaccurate Estimation	Amini et al. (2023); Aljohani et al. (2017); Babalola et al. (2022); Durdyev (2020)	4
Inflation	Ahady et al. (2017); Adam et al. (2017); Amini et al. (2023); Kuware (2021); Durdyev (2020); Niazi & Painting (2017)	6

Factors	Sources	Frequency
Insufficient Contractor Experience	Ahady et al. (2017); Amini et al. (2023); Aljohani et al. (2017); Lee et al. (2022); Durdyev (2020)	5
Inappropriate Managerial Skills	Adam et al. (2017); Aljohani et al. (2017)	2
Wrong Planning and Scheduling	Ahady et al. (2017); Adam et al. (2017); Amini et al. (2023); Lee et al. (2022); Gaurang (2020); Durdyev (2020)	6
Information and Communication Barriers	Ahady et al. (2017); Adam et al. (2017); Amini et al. (2023); Kuware (2021); Gaurang (2020); Durdyev (2020)	6
Poor Monitoring and Control	Adam et al. (2017)	1
Poor Tendering Documents	Aljohani et al. (2017); Durdyev (2020); Niazi & Painting (2017)	3
Process Inefficiency	Adam et al. (2017); Gaurang (2020)	2
Incorrect Project Duration	Adam et al. (2017); Babalola et al. (2022)	2
Rework	Adam et al. (2017); Amini et al. (2023); Lee et al. (2022); Kuware (2021)	4
Shortage of Equipment	Adam et al. (2017); Kuware (2021)	2
Weather	Adam et al. (2017); Babalola et al. (2022); Durdyev (2020)	3

The findings indicate that four factors, frequent design changes or change orders, inflation, inaccurate planning and scheduling, and information and communication barriers, consistently rank as the most frequently reported among the twenty identified factors. Contractors play a crucial role from tender submission through project handover; however, many studies also report that cost overruns can result from contractors' financial issues, poor site management, and insufficient expertise (Ahady et al., 2017; Aljohani et al., 2017; Durdyev, 2020).

Cost overruns have significant implications for all construction stakeholders. According to Asiedu and Ameyaw (2020), overruns can lead to project abandonment and delays in construction activities. For clients, overruns reduce returns on investment and may cause financial losses. For contractors, incomplete or delayed projects can damage their reputation and affect future business opportunities. For professionals such as architects, quantity surveyors, and engineers, cost overruns reflect an inability to provide reliable services, potentially undermining client confidence.

Table 3 summarizes the strategies to minimize the risk of cost overruns in construction projects. Among these, proper pre-project planning was the most frequently mentioned strategy. Effective communication was also emphasized across the literature as a key factor for controlling costs (Ahady et al., 2017; Mahmud et al., 2021). Other strategies include the adoption of suitable techniques and tools, such as scheduling software, risk assessment methods, resource management systems, and Building Information Modeling (BIM). Additionally, selecting qualified contractors, appropriate construction methods, and high-quality materials were highlighted as essential tactics. Overall, the most frequently cited strategies focus on project planning, followed by the adoption of tools and techniques, and the management of people.

Table 3: Strategies to Minimize Cost Overruns (Author's Compilation)

	Ikechukwu et al. (2017)	Abusafiya & Suliman (2017)	Durdyev et al. (2017)	Aljohani et al. (2017)	Ahady et al. (2017)	Ullah et al. (2018)	Al-Keim (2017)	Sánchez et al. (2022)
Adopt a suitable project management scheduling tool	/						/	
Staying within the project-planned scope	/							
Proper project activities planning before project execution	/		/			/	/	
Selection of contractors takes account of expertise, financial capability and experience.	/					/		
Effective communication	/			/		/		
Risk Assessment during project estimating		/				/		
Pre-contract cost control		/						
Use mainly local construction material during the selection of the construction methodology and materials			/			/		

	Ikechukwu et al. (2017)	Abusafiya & Suliman (2017)	Durdyev et al. (2017)	Aljohani et al. (2017)	Ahady et al. (2017)	Ullah et al. (2018)	Al-Keim (2017)	Sánchez et al. (2022)
Effective resource management system (human, technical, material)			/	/				
Keep updating material prices and labour rates					/			
Quality Monitoring by consultants and quality professionals					/			
BIM adoption							/	/
Managing and completing the Design Stage before construction							/	

METHODOLOGY

This study employed a quantitative research design to identify strategies that stakeholders can use during the pre-contract stage to minimize cost overruns in Malaysian building construction projects. The research focused on three key objectives: (1) identifying pre-contract factors that contribute to cost overruns, (2) assessing the impact of these factors on project costs, and (3) evaluating strategies to mitigate these risks effectively.

Data was collected using a structured questionnaire survey, developed based on the literature review of pre-contract cost overrun factors. The survey included closed-format questions to ensure consistency and reliability of responses. A pilot study was conducted to validate the questionnaire before it was distributed to respondents.

The survey targeted construction firms in Selangor, Malaysia, which recorded the highest value of construction work at RM 6.9 billion as of the third quarter of 2022 (Department of Statistics Malaysia, 2022). The study focused on building projects, which accounted for 55.5% of total construction work, with 37.7% non-residential and 17.8% residential buildings. The collected data were analysed using descriptive statistics, inferential statistics, and reliability analysis to evaluate the significance and impact of the identified factors and strategies. This methodology ensures the study's findings are quantitative, evidence-based, and directly linked to practical pre-contract decision-making.

ANALYSIS & DISCUSSIONS

The survey findings provide insights into the pre-contract factors contributing to cost overruns and the strategies adopted to minimise these risks.

FACTORS OF THE PRE-CONTRACT STAGE CAUSING COST OVERRUN IN BUILDING CONSTRUCTION PROJECTS

Analysis revealed that inaccurate cost estimation is the most critical factor, often caused by insufficient historical data, unclear project requirements, and market fluctuations. This results in discrepancies in labour, material, and equipment costs, which can lead to disputes and project delays. Similarly, poor planning and scheduling were identified as a major contributor, with inadequate sequencing, resource allocation, and consideration of interdependencies causing cascading delays and cost increases.

Other significant factors include poorly prepared tender documents, leading to miscommunication and inaccurate contractor bids; contractor inexperience, affecting accurate estimation and execution efficiency; and ineffective communication between stakeholders, which can disrupt negotiations and project alignment. Financial difficulties among contractors or clients, frequent design changes, and inefficiencies in project processes also emerged as notable contributors, consistent with prior studies (Adam et al., 2017; Amini et al., 2023; Lee et al., 2022; Kuware, 2021) and confirm that multiple interrelated factors drive cost overruns in the pre-contract stage.

STRATEGIES DURING THE PRE-CONTRACT STAGE TO MINIMIZE THE RISK OF COST OVERRUNS IN BUILDING CONSTRUCTION PROJECTS

Survey results highlighted several effective strategies during the pre-contract stage. Careful contractor selection, based on expertise, experience, and financial stability, was the most frequently cited strategy, ensuring reliable project execution and minimising risk (Ikechukwu et al., 2017; Ullah et al., 2018). Comprehensive risk assessment allowed stakeholders to proactively identify and mitigate potential challenges, while pre-contract cost control and detailed project planning helped develop realistic budgets and optimize resource allocation.

Advanced project management tools, including Building Information Modeling (BIM), scheduling software, and resource management systems, improved coordination, minimized errors, and enhanced productivity (Sánchez et al., 2022; Al-Keim, 2017). Other important strategies included clear scope management, finalised designs before construction, quality monitoring, and effective communication, all of which contribute to reducing cost overruns and improving project outcomes (Abusafiya & Suliman, 2017; Amini et al., 2023).

The results confirm that addressing pre-contract factors proactively is essential for minimizing cost overruns. By combining careful planning, robust risk management, competent contractor selection, and adoption of modern project management tools, stakeholders can improve cost control, ensure timely delivery, and maintain quality standards.

CONCLUSION

This study identifies key pre-contract factors contributing to cost overruns in Malaysian building projects, including inaccurate cost estimation, poor planning, contractor inexperience, and financial constraints. Survey results highlight that careful contractor selection, risk assessment, pre-contract cost control, detailed planning, and BIM adoption are the most effective mitigation strategies. These findings provide practical guidance for stakeholders to manage pre-contract risks, enhance project outcomes, and support informed decision-making. By quantitatively validating the impact of these factors and strategies, the study contributes to the literature on cost overrun management. Future research could expand to other regions and project types to further refine these pre-contract strategies.

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