RISK FACTORS INFLUENCING THE PLANNING STAGE OF HIGH-RISE RESIDENTIAL BUILDING PROJECTS

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Abstract
The construction process of high-rise residential buildings is complex and often results in cost and time overruns due to various factors, including slow and ineffective decision-making. Effective risk management during the planning stage is crucial to identify, assess, and mitigate potential risks that could impact project outcomes. Most studies have focused on risk management in construction project without clearly separate the stages of pre-construction, post-construction or during construction stage. This paper report on a study to identify key risk factors affecting high-rise residential building projects throughout the planning stage. The research adopted a quantitative method through structured questionnaires distributed to developer's companies that has high-rise residential building project in Malaysia. The research has identified 10 risk factors during the planning stage with 6 factors are considered high likelihood of occurrence. The findings of this study will provide valuable insights into the risk management practices in the planning stage of high-rise residential buildings and contribute to improving project efficiency and reducing uncertainties in the Malaysian construction industry.

Keywords: developer, high-rise residential building, planning stage, risk management

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INTRODUCTION

Malaysia has 366 skyscrapers, including 293 taller than 150 meters, 67 taller than 200 meters, and six taller than 300 meters (B. K., 2024). Tall buildings dominate Malaysia's urban landscape, ranked fourth globally and second in Asia (CTBUH, n.d.). In Malaysia, high-rise residential developments were developed in response to urban population expansion and land shortages (Ahmad et al., 2017). These structures' efficient land use allows for more residential units in less space and higher returns on investment in high-demand regions (Setiadi & Isnaeni, 2018). The residential buildings contribute for 22.6% of construction activity, with the private sector playing an important role (DOSM, 2024).

High-rise residential building construction is a complicated process due to issues such as building type, height, material availability, sustainability, and wind impacts (Mohd Nizam, 2014). Furthermore, legal and regulatory considerations such as land acquisition and building licenses are critical throughout the planning stage (Arief & Latief, 2021; Almeida et al., 2020). Risk management (RM) is critical for identifying and reducing possible hazards during the planning phase in our construction industry (Nazary & Mahure, 2021; Omer, 2019). This is because it provides a framework for systematically addressing risks and improve decision-making (Institute of Risk Management, 2002; Patel et al., 2021). Failure to handle the unmanaged risks can cause time, cost, and quality difficulties, resulting in project delays and budget overruns (Gajewska et al., 2011). Hence, this paper aims to identify key risk factor affecting high-rise residential building focusing on the planning stage.

The paper is organized as follows: First, it begins with literature review regarding risk management, high-rise residential building in Malaysia, and risk factors in construction planning stage. Next, the methodology used in this study i.e. questionnaire survey is explained, followed by the results and discussion of the results. The final part of the paper is the conclusion.

LITERATURE REVIEW

Risk Management Practices in Malaysia

The Institute of Electrical and Electronic Engineers (2001) defines risk as the likelihood of an incident that poses a risk or threatens negative outcomes. Risk management is a process that involves the organization and implementation of project elements and resources, as well as the culture, techniques, and structures that are designed to capitalize on potential opportunities and mitigate the negative consequences. Risk management frameworks aim to meet strategic, operational, reporting, and compliance goals.

Research by Goh et al. (2013), Kang et al. (2015), and Omer (2019) indicates that risk management in Malaysia is still in a developing phase, characterised by inconsistent implementation of

risk management procedures, insufficient knowledge and functionality in risk management, a lack of systematic risk management planning, absence of risk management technology or expertise, prohibitively high initial costs for implementation, and prolonged time requirements that favour experienced workers with moderate educational backgrounds over adherence to risk management protocols. Consequently, the integration of risk management practices into the organisational culture of construction companies remains constrained.

High-rise Residential Building in Malaysia

According to Malaysia's Uniform Building By-Law (UBBL 1984), high-rise residential structures are those that are taller than 18 meters or around 6 floors. These structures are often steel-framed with non-load-bearing brick walls, allowing for contemporary designs that include glass facades and walls. High-rise residential buildings are made up of many dwelling units that share common amenities including covered parking, waste chutes, lifts, a 24-hour security system, swimming pools and gyms. A building management organisation maintains these facilities. Furthermore, UBBL 1984 requires high-rise residential structures to offer natural lighting and ventilation, with defined window and room measurements. Kitchens and other usable rooms must fulfil minimum space and height criteria, and garbage must be disposed of appropriately (UBBL, 1984; Hamid et al., 2020). Kuala Lumpur alone accommodates 81.5% of the total number of high-rise buildings in Malaysia, which half of these buildings are residential buildings. Although the high-rise building in Penang does not exhibit quick development relative to Kuala Lumpur, the construction activity for residential properties in the northern area is the greatest compared to the states of Perak, Kedah, and Perlis (Property Stock Report, 2024; DOSM, 2024).

Planning stage in RIBA Plan 2020

The RIBA Plan of Work is a precedent that was produced by the Royal Institute of British Architects to give a complete framework for the purpose of streamlining the management process in the building design and construction process in the United Kingdom. The most recent edition of the RIBA Plan of Work 2020 (refer Figure 1) has been updated, and a greater emphasis has been placed on enhancing the guidance that relates to the planning process, procurement, and information that is necessary at each stage. The initial four stages of the RIBA Plan of Work 2020 concentrate exclusively on the planning and design aspects of the project. Gibson et al. (2006) assert that pre-project planning encompasses all activities from project initiation to the completion of the detailed design. The project process starts with a concept to fulfill a business requirement and concludes with the decision to go to detailed design. It endorses the principle of concurrent engineering by integrating varied resources for collaborative efforts during initial development, hence enhancing responsiveness to client feedback and minimizing time-consuming revisions and rework (Gibson et al., 2006). Therefore, for this study, all the phases prior to the commencement of construction works in the RIBA Plan of Work 2020 are considered as planning stage, which include Stage 0 Strategic Definition, Stage 1 Preparation and Brief, Stage 2 Concept Design, Stage 3 Spatial Coordination, and Stage 4 Technical Design.

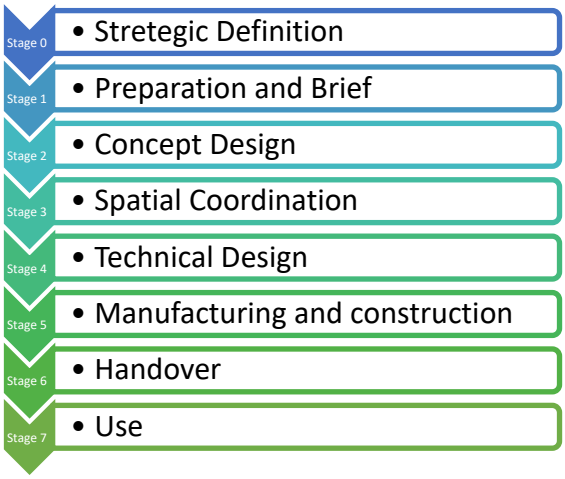

Figure 1: RIBA plan of work 2020

Risk factors in construction planning stage

Financial factors

Financial factors play a critical role. Errors in estimation and changes in bank formalities and regulations are significant factors affecting project prevalence (Kang et al., 2015; Szymański, 2017). Projects often face fund shortages due to improper estimation, poor invoicing, and late payments from clients (Ariffin et al., 2018). Additionally, changes in bank formalities and regulations must be considered before construction work can commence (Adam et al., 2019). Stringent or unfavorable financing arrangements set by financial institutions, along with inadequate marketing of properties and poor cash flow, pose major financial risks influencing the planning of high-rise residential building projects (Kang et al., 2015; Renault & Agumba, 2016).

Technical Factors

Technical risks include design complexity and human resource shortages in both the design team and skilled workers. These risks can stem from errors in design drawings, poor project planning and scheduling, and a lack of skilled labor (Adam et al., 2019). The technical complexity of high-rise residential buildings increases the likelihood of design errors and coordination difficulties among the design team (Theingi et al., 2023). Furthermore, high-rise residential buildings necessitate a high level of technical competency, which heightens the risk of shortages in managerial and technical expertise (Perera et al., 2020; Theingi et al., 2023).

Human Factors

Human factors, as individuals have their own risk perceptions and attitudes towards handling risks (Theingi et al., 2023; Patel & Pitroda, 2021). This aspect has not been fully explored in studying potential risks in the planning stage. Common human factors include poor communication among project participants, insufficient coordination within the project team, and poor planning and management (Rahman et al., 2020). Effective communication is vital in influencing decision-making processes regarding risk management, which leads to the development of approaches to enhance risk awareness and decision-making abilities among project stakeholders (Theingi et al., 2023).

Force Majeure Factors

Force majeure factors, such as natural disasters, riots, and pandemics, can significantly impact construction projects by causing delays and increasing costs (Shakirah, 2023). These uncontrollable events, like floods and inclement weather, can moderately affect the expected profit of projects (Zaini et al., 2011). The COVID-19 pandemic exemplified an unpredictable force majeure event that delayed project progress and heightened overall costs if not anticipated during planning. Such unforeseen events are hardly preventable, unstoppable, and unavoidable, falling beyond the reasonable foresight and control of project stakeholders. Consequently, construction work might come to a halt or face delays due to these issues (Zaini et al., 2011; Almeida et al., 2020; Ogunnusi et al., 2020).

Political Factors

Government regulations significantly impact the planning stage of construction projects, particularly concerning rules, permits, and approvals (Zaini et al., 2011; Theingi et al., 2023). For example, the Construction 4.0 Strategic Plan (2021-2025) mandates the integration of advanced digital technologies into projects, necessitating budget and resource allocation for digital innovation, which can be seen as a political risk during planning (CIDB, 2022; Kang et al., 2015). Delays in obtaining necessary approvals and permits from local authorities can also significantly affect project schedules and budgets (Dian & Dian, 2024). Hence, it is crucial to evaluate political and administrative factors during the planning and implementation phases of construction projects (Zaini et al., 2011; Theingi et al., 2023).

Table 1: The list of risk factors identified from literature

Ref.	Risk factors	References
A	Financial factors	
A1	Underestimate the cost	Kang et al. (2015); Szymański, P. (2017)
A2	Bank loan not approved	Kang et al. (2015); Zaini et al. (2011)
B	Technical factors	
B1	Human resources shortage	Adam et al. (2019)
B2	Designing errors	Theingi et al. (2023)
C	Human factors	
C1	Poor communication	Theingi et al. (2023); Patel & Pitroda (2021)
D	Force majeure factors	
D1	Natural disaster	Zaini et al. (2011); Almeida et al. (2020)
D2	Riot	Zaini et al. (2011); Almeida et al. (2020)
D3	Pandemic	Ogunnusi et al. (2020); Osler, Hoskin & Harcourt LLP, (2024)

E	Political factors	
E1	Laws and regulations	Zaini et al. (2011); Theingi et al. (2023)
E2	Permits and approvals	Zaini et al. (2011); Theingi et al. (2023)

METHODOLOGY

This research study employs a quantitative approach to collect responses from project managers, quantity surveyors, engineers, architects, and other relevant construction practitioners in Malaysia. The methodology is chosen based on the study's goals, nature, research questions, and objectives. Quantitative techniques allow for extensive data collection and analysis, helping to express numerical data in tables or charts (Szymański, P., 2017; Zaini et al., 2011). A survey questionnaire with specific closed-ended questions and a five-point Likert scale were used to gather data on key risk factors.

This study employed non-probability sampling i.e. convenience sampling and snowball sampling. In accordance with this, several criteria were established to identify suitable respondents for the survey. The primary requirement is that participants must have experience related to high-rise residential building projects, particularly during the planning stage. Respondents should possess practical knowledge or relevant experience to construction activities and must hold a position relevant to project planning such as client or owner of the project, project managers, quantity surveyors, architects or engineers.

The risk level of consensus is established by utilising the mean score of 3.0 as a benchmark. A variable has a positive agreement when the mean score exceeds 3.0, while a negative agreement is indicated by a mean score below 3.0 (Haslinda et al., 2018; Zaini et al., 2011). Besides, SD score was calculated to measure the variability of response in the data set and the level of consensus achieved. SD score below 1.0 indicates that a 'high level of consensus' achieved and SD score below 1.5 to 1.00 indicates that a 'reasonable level of consensus' achieved (Mohd Fairullazi, A., 2014).

The researcher successfully obtained 68 responses from 200 invitations that had been extended to potential respondents, resulting in a response rate of 34.0%. The data collection process spanned eight (8) weeks, from 26th March (Wednesday) to 26th May 2025 (Thursday), utilising Google Forms as the survey platform and distributing it via LinkedIn and WhatsApp application.

FINDINGS AND DISCUSSION

Data analysis

Table 2 illustrates the 10 risk elements across five categories of risk factors. For risk under Financial Factors, A1 recorded high likelihood of occurrence with mean score of 3.68. While A2 recorded moderate occurrence. Both A1 and A2 achieved high level of consensus (SD – 1.000) and reasonable level of consensus (SD – 1.093) respectively. For Technical factors, both B1 and B2 recorded high likelihood of occurrence with mean score 3.06 and 3.4 respectively, and they achieved reasonable level of consensus. The Human factor identified a singular risk item in the survey, highlighting the poor communication (C1) within the team during the planning phase of the high-rise residential building. C1 recorded mean score 3.46 which indicates high likelihood of occurrence and achieved high level of consensus (SD – 0.899). The subsequent risk category was Force Majeure factors, which included three risk items identified in the research survey. All three items (D1, D2 and D3) recorded moderate likelihood with mean scores 2.44, 2.01 and 2.35. The level of consensus for all three items are reasonable. For Political factor, two items i.e. E1 and E2 recorded high likelihood of occurrence with mean scores 3.54 and 3.29. Both achieved moderate level of consensus with SD scores 1.055 and 1.014 respectively.

Table 2: Likelihood of risk occurrence during planning stage

		Very Low (0-10%)	Low (11-20%)	Moderate (21-50%)	High (51-80%)	Very High (81-100%)	Mean	SD
A	**Financial Factors**							
A1	Underestimate the Cost	1	9	15	29	14	3.68	1.000
A2	Bank Loan Not Approved	11	15	29	10	3	2.69	1.093
B	**Technical Factors**							
B1	Human Resources Shortage	2	16	29	18	3	3.06	1.164
B2	Designing Errors	3	13	15	28	9	3.40	1.081

C	**Human Factor**							
C1	Poor Communication	2	10	21	25	10	3.46	.899
D	**Force Majeure Factors**							
D1	Natural Disaster	17	19	22	5	5	2.44	1.169
D2	Riot	29	18	14	5	2	2.01	1.085
D3	Pandemic	20	19	17	9	3	2.35	1.147
E	**Political Factors**							
E1	Laws and Regulations	6	9	22	21	10	3.54	1.055
E2	Permits and Approvals	2	11	17	24	14	3.29	1.014

Based on the mean scores, the risks arranged and ranked from high to low: underestimate the cost (3.68), permits and approvals (3.54), poor communication (3.46), designing errors (3.40), laws and regulations (3.29), human resources shortage (3.06), bank loan not approved (2.69), natural disaster (2.44), pandemic (2.35) and riot (2.01).

Discussion

From the listed key risk factors, the data shows the high-risk occurrences in high rise residential projects during planning phases included underestimate cost, permits and approvals, poor communication. This was consistent with the literature by Theingi et al., (2023), these risks were among top three (3) most high-risk occurrences in high-rise residential projects.

Underestimate cost was ranked as the highest risk occurrence in project planning, as it played an important role in the total costs of a project. It carried a lot of variation and uncertainty, as projects were often treated as open systems, rather than close systems (Kang et al, 2015). Yet, as Kang et al. (2015) mentioned, cost could easily be underestimated due to risk, which was not always guaranteed that can be managed appropriately thus adding up to the final costs of the project. In line with the cost, Szymański, P. (2017) claimed that overestimating the costs caused by the costs were too high relative to the investor's financial capability during the preliminary design stage or improper cost plan was initiated. Consistent with the respondent's input, the risks included non-transparency of cost data in the feasibility study, budget allocation within the project, cash flow and financial performance of the contractor(s), and the actual capital available. Thus, underestimate cost should have been mitigated with an effective strategy during the planning stage.

The permits and approvals risk were ranked second in risk occurrence in the project planning. Due to its slow procedural system and limited effectiveness of government involvement in the approval process, permits and approvals-related risk emerged as one of the significant concern risks in the current study (Zaini et al., 2011). As reflected in the respondent's feedback, authorities' approvals had to be considered early, as it could easily take years to obtain approval. As well as one respondent claims the construction industry was driven by politics, thus contemporary political development factors should be considered as well in project planning.

Next, risk of poor communication was ranked third as the high-risk occurrence in the project planning. Poor communication will arise between relevant parties like site and head offices due to lack of coordination, which led to elevated levels of project risk, consistent with the literature by Patel et al., (2021).

Design errors, regulatory frameworks, and human resource shortages were positioned at a moderate level of concern among the surveyed risk factors during project planning. Regarding design-related risks, respondents highlighted issues such as adherence to standard design practices, consultant competency in developing functional designs, and the planner or architect's ability to effectively execute their roles. These perceptions consistent with Theingi et al. (2023), who similarly identified technical inefficiencies, particularly in design coordination and consultant oversight as potential risks. However, Zaini et al. (2011) considered design risks to be more prominent in project planning phase, however the current study suggests a tempered level of concern, possibly indicating improved design protocols or increased stakeholder confidence over time. Legal and regulatory risks were also moderately ranked, despite the breadth of issues cited by respondents ranging from Standard Operating Procedures (SOPs) imposed by authorities and lengthy government approval times, to evolving DOSH guidelines and ESG compliance. Similar to the study result, Theingi et al. (2023) emphasized political and legal risks but associated them with moderate level of significance. In the current study, human resource shortages were identified as a moderate-level concern in project

planning risk rankings. However, this perception presents a nuanced contrast to Adam et al. (2019), who emphasized lack of competent management or human resources resulting second major risk factor which is management risk. Thus, human resource shortages are seen as dynamic and responsive to intervention in project planning.

Proceeding to the items of bank loan not approved, natural disaster, pandemic and riot were ranked last as the least risks in the study. The force majeure factors found in the study were also ranked lowest risk factors occurrence in project planning, consistent with the findings of Zaini et al., (2011). However, it also revealed that the risk of bank loan rejection ranged from highest to the least occurrence in current years, in contrast to the study of Zaini et al., (2011). Based on the respondents' input, there was no specific input regarding the force majeure event, however a significant focus was placed on health, safety and environmental (HSE) issues more, reflecting their importance in project planning.

CONCLUSIONS

The objective, to identify key risk factor affecting high-rise residential building focusing on the planning stage, have been achieved through literature review and questionnaires survey. The top three factors are underestimating the cost, permits and approvals and poor communication. While the bottom three are natural disaster, pandemic and riot. Overall, the findings underscore the importance of strengthening risk management practices by focusing on financial, regulatory, and communication-related risks before construction begins. Early identification and mitigation of these risks can help reduce uncertainty, enhance decision-making, and improve overall project efficiency. Future studies may expand the sample size or examine the effectiveness of current mitigation strategies adopted by developers and propose improved solutions or best practices.

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