Influential Time and Cost Factors for Commercial Projects in the Malaysian Construction Industry

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ABSTRACT

Time and cost play an important role in project completion for both developing and developed countries. This study aims to identify the critical factors that influence the time and cost of commercial projects in Malaysia. A detailed questionnaire survey was conducted with industry professionals, and the results were analyzed based on the survey responses. The average index method was used to determine critical factors based on responses from professionals. The critical factors that affect time are poor contract management, client fund shortages, late drawing submissions, land acquisition problems, and inadequate surveying before construction. The critical factors identified for cost are delayed client payments, shortage of skilled workers, design changes, errors in the construction process, and changes in top management. This study raises awareness by identifying critical factors to minimize their impact so that construction can be completed on time and according to the defined budget, and maximize the benefits of future projects.

Keywords-time; cost; experience; construction; critical factors, project; Malaysia

I. INTRODUCTION

The success of a project can be defined by parameters such as the estimated cost and the timeframe. Currently, several projects around the world, especially in developing countries, are not completed on time and according to the defined budget. Time has its own impact on the project, while cost plays a different role by affecting its main objectives. Today, time overruns are one of the most critical issues in the construction industry [1]. Approximately 40% of construction projects experienced time and cost overruns [2]. In [3], it was found that the construction cost is one of the most important criteria defined for the success of a project in Malaysia. The results showed that around 55% of the projects suffered from cost overruns, while, surprisingly, the public sector projects performed better than the private sector. This is a very high percentage compared to other developed countries around the world. Warrens have become one of the major problems in the

Malaysian construction industry. In [4], it was found that 89% of construction projects in Malaysia faced cost overruns. Additionally, it was found that 5 to 10% of the cost-critical factors were repeating patterns in the Malaysian industry, causing budget overruns. In [4], several factors that cause cost overruns in the construction industry were identified, such as poor site and project management, problems in the design of the project, problems related to the machinery and materials needed, and other types of external factors.

II. LITERATURE REVIEW

A. Construction Industry Overview

Construction industry is one of the major industries contributing approximately 10% to the global Gross Domestic Product (GDP). The construction industry operates through a collaborative effort involving architectural engineering and design departments, construction and procurement departments, and production engineering departments. Construction projects can be categorized into several types, including industry-specific, commercial, and residential building projects [5]. The construction industry also employs about 6 to 7% of the global workforce. However, the construction industry is characterized by a high degree of risk, with limited tolerance for delays and cost overruns. Developed countries prioritize this industry to enhance their infrastructure and make it more attractive and technologically advanced. They invest millions of dollars in construction to create unique structures. As a result of these efforts, people are drawn to visit these places, enjoying the impressive infrastructure.

B. Overview of Malaysia's Construction Industry

The construction industry in Malaysia has a prominent position within the country's economic landscape, making a substantial contribution to the GDP. This means that activities related to construction, such as infrastructure development, building construction, and related services, play a vital role in the general economic health of the country. The health and growth of the construction industry are intricately linked to the state of the national economy. When the economy thrives, there is typically a higher demand for construction projects, including commercial and residential buildings, infrastructure development, and other related projects. In contrast, a robust construction sector can also strengthen the broader economy, creating a mutually beneficial relationship between the two [6]. The relationship between the Malaysian construction industry and the building construction sector is of paramount importance. This interconnection is essential for both sectors to function effectively. The building construction sector relies on the broader construction industry for resources, skilled labor, and expertise. In turn, the construction industry benefits from the consistent demand generated by the building sector. This symbiotic relationship strengthens the overall construction ecosystem, and both sectors stimulate economic growth and development.

C. Previous Studies on Construction Delay Cases

1) Time Overrun Factors

Extensive studies have been conducted to identify time overrun factors in various types of construction projects, with a focus on uncovering the most critical factors for time overruns in commercial construction projects. In [6], 33 common factors that contribute to time overruns were identified and further categorized into 8 subgroups. Using the Relative Importance Index (RII), the 5 main causes of time overrun were poor site supervision, delays in decision-making by both clients and contractors, design changes during the execution phase, inadequate site investigation leading to poor ground reality, and subpar site management by the execution staff. In [7], major risk factors were identified, including internal, external, and force majeure factors, which often result in delays and time overruns during the construction phase. In [8], a quantitative approach was employed to identify the most critical factors causing time overruns in construction projects. The results showed that from the contractor's perspective, poor project monitoring and management were major causes, while on the owner's side, financial problems led to construction delays. In [9], 29 direct and 32 indirect dispute causes were identified. Direct disputes resulted in delays due to unrealistic contract durations, poor work quality on-site, lack of skilled labor, and delayed payments from clients and contractors, while indirect disputes caused delays due to poor communication between project parties, inadequate project planning and scheduling, inaccurate project estimation, and lack of experience on the contractor's side. In [10], critical causes of delays were identified, including financial problems faced by contractors, selecting inexperienced contractors for projects, adverse weather conditions, shortage of skilled on-site workers, errors in project time estimation, and design errors, leading to delays in construction projects. Table I shows some previous studies carried out in different countries.

2) Cost Overrun Factors

Several studies have identified factors that cause cost overruns in construction projects. In [16], the factors that contribute to cost overruns of public projects in Ghana were investigated, identifying primary drivers such as inadequate contract planning and supervision, alterations in project specifications, fragile institutional and economic context surrounding the projects, and deficiencies in the efficient collaboration between involved stakeholders. In [17], the causes of budget overruns in construction projects in India were investigated, finding that significant causes of construction delays are design discrepancies, needs for reworks, inadequate site investigations, awarding contracts based on the lowest bid, change in scope, subpar site management by contractors, and fluctuations in material prices and wages. In [18], a comprehensive survey of primary stakeholders involved in government school projects in Ghana was conducted to highlight the underlying causes of budget overruns. Using the RII, this study identified that primary factors contributing to cost overruns included financial challenges on the client's part, delays in disbursing payments for completed work, design alterations, the absence of effective communication plans, inadequate feasibility and project analysis, subpar financial management on-site, and fluctuations in material prices. In [19], factors responsible for cost overruns in construction projects were investigated, showing that the main causes are financial constraints experienced by clients, fluctuations in material prices, design delays, inadequate site

management, and cash flow and payment challenges encountered by contractors. In [20], it was found that approximately 30% of construction projects in Iran experienced a minimum cost overrun of 25%. This highlights the urgency and complexity of cost overruns in this specific context, underscoring the need for further investigation. Notably, the economic similarities between Iran and other developing countries make this study particularly relevant, as its findings are expected to provide valuable insights for researchers. It is worth noting that comparable studies have explored the interconnected factors contributing to cost overruns within the context of Table II.

TABLE I. CRITICAL FACTORS OF TIME DELAYS IN CONSTRUCTION PROJECTS

Study	Country	Findings
[11]	Jordan	Changes in design, severe weather conditions, late delivery of material at the site, variation in the quantity due to poor estimation, and poor economic condition of the country
[12]	Thailand	In developing economies, factors that can cause delays to the project life cycle are material shortages, inadequate planning of the project, change in scope by clients and owners, and poor management from the execution team and contractor
[13]	Ghana	Poor contract management, delays in material procurement, poor project performance from the project team, and increases in the prices of materials used for construction
[14]	Pakistan	Poor site management, inadequate contractor experience for the project, poor communication between project parties in the design and execution phase, prices of materials due to instability in the economy, and design errors
[15]	Saudi Arabia	Identified 56 primary reasons for construction delays, with key factors including delays in obtaining approvals and preparing drawings, design modifications during execution, and strained relationships between the contractor and subcontractor

TABLE II. CRITICAL FACTORS FOR COST OVERRUN IN CONSTRUCTION PROJECTS

Study	Country	Findings
[21]	New Zealand	Incomplete design, inaccurate planning, poor communication, financial problems, price fluctuation, and poor contract management
[22]	Iran	Poor financial management, material price fluctuation, and change in scope
[23]	Vietnam	Additional works, changes in scope, fluctuations of material prices, and construction-work delays
[24]	UAE	Poor cost estimation, financial constraints of the client, and poor selection of procurement method.

III. RESEARCH METHOD

This study aimed to identify the critical factors that cause time and cost overruns in commercial construction projects in Malaysia. The average index technique was used based on the mean value, and the factors were classified according to the responses to the survey. A similar process was adopted for time and cost overrun factors. A survey was used to obtain responses on the subject factors.

IV. DATA COLLECTION AND DATA ANALYSIS

In the first phase, a questionnaire was developed and distributed among 151 professionals who were involved in the construction of commercial projects in the Malaysian construction industry. Once the data were collected through the detailed survey, they were evaluated using the average index to find the most and the least critical factors that cause time and cost overruns in the construction of commercial projects. Figures 1 and 2 and Table III show the results of the survey.

Fig. 1. Qualifications of the survey respondents.

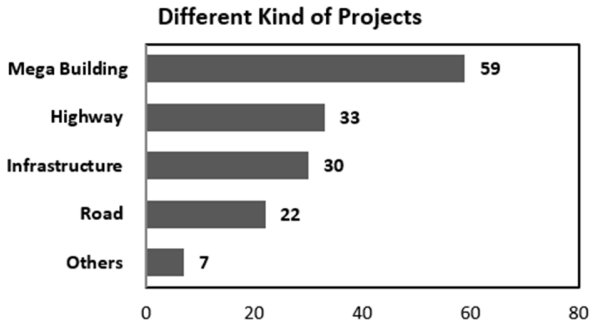

Fig. 2. Details of different kinds of projects in the Malaysian construction sector.

TABLE III. WORK EXPERIENCE OF PARTICIPANTS

Work experience	Frequency	Cumulative percentage %
More than 10 years	33	21.8
More than 15 years	57	59.6
More than 25 years	61	100
Total Respondents	151	100

The factors were evaluated based on the questionnaires, and then the average index was used to find out the mean value of the factors for both time- and cost-related factors. The following equation was used to calculate the average index:

$$Average\ Index = \frac{\sum WP}{\sum W} \quad (1)$$

The critical factors were those with a mean value greater than or equal to 4.0 for both time and cost overruns.

TABLE IV. TIME CRITICAL FACTORS INFLUENCING PROJECT STATUS IN MALAYSIA

	Critical factors	Ranking
1	Poor contract management	4.630
2	Shortage of funds from client	4.535
3	Late submission of drawings	4.481
4	Land acquisition problems	4.410
5	Improper survey before construction	4.351
6	Suspension of construction works	4.291
7	Inexperienced contractor	4.201
8	Poor communication between project parties	4.139
9	Poor site supervision	4.071
10	Delays in decision making	4.001
11	Inadequate planning	4.000

TABLE V. COST CRITICAL FACTORS INFLUENCING PROJECT STATUS IN MALAYSIA

	Critical Factors	Ranking
1	Delays in payment from client	4.621
2	Shortage of skilled workers	4.523
3	Design changes	4.921
4	Errors in construction	4.412
5	Changes in top management	4.377
6	Weather impact	4.208
7	Delays in approval procedures	4.139
8	Site management issues	4.055

V. CONCLUSION

This study successfully identified the most critical factors for both cost and time overruns in commercial projects in the Malaysian construction industry. The average index method was used to obtain the overall scoring and identify both time- and cost-effective parameters. The top five critical factors for time overruns were poor contract management, client funding shortage, late submission of drawings, land acquisition problems, and improper surveys before construction. The top five critical factors for cost overruns were delays in payment from the client side, shortage of skilled workers, design changes, errors in the construction process, and changes in top management. This study plays a key role in informing construction experts to control factors that cause cost and time overruns.

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