

Factors Causing Time and Cost Overruns of Construction Projects in Malaysia

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Abstract: - Cost overrun is a problem that the construction industry faces in many countries, including Malaysia. It is a significant problem in Malaysia because most Malaysian construction projects have seen cost overruns of between 5 and 10% of the overall contract sum. This study aims to look at the factors that could lead to time and cost overruns in Malaysian construction projects. This study's objective was accomplished by using a quantitative approach to gather data which involved the use of questionnaire surveys. The study employed a stratified random selection method for the collection of information from the contractors working in the Ipoh region who have a current registration with the Pusat Khidmat Kontraktor (PKK) and the Construction Industry Development Board (CIDB) and are mainly based in the city of Ipoh. The results showed that “lack of experiences of project type”, “delays in issuing information to the contractor during projects”, “improvements to standard drawings during construction”, “omissions and errors in the bills of quantities”, and “inaccurate quantity take-off” are the top 5 factors causing time and cost overrun in the city of Ipoh, Malaysia.

Key-Words: - Cost Overrun, Construction Industry, Construction Projects, Ipoh, Malaysia

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1 Introduction

Like in other nations, Malaysia's construction sector is a vital contributor to the expansion of socio-economic development. The primary criterion for project success is meeting the project's deadlines and budget while maintaining the required level of quality. Even though Malaysia has committed so much finances to construction, the sector still faces many difficulties, including expenditures that go over budget, delays in finishing projects on time, construction problems, and an overreliance on foreign labor. Since the 1970s, Malaysia, a nation in the Asian area, has experienced significant economic growth. The construction sector has regularly contributed between 3% and 5% of the country's Gross Domestic Product (GDP), which has been crucial to Malaysia's economic prosperity [1,2]. From the 1970s through the middle of the 1990s, the growth in construction climbed from 6% to 15% [1,3]. In Malaysia, there are 2 major sectors for construction projects which are the public and private sectors, with the Public Works Department (PWD) being in charge of the majority of public sector initiatives. The Construction Industry Development Board (CIDB) is an organization in Malaysia with the primary

responsibility for growing the country's construction industry. It is also involved in project development in both the public and private sectors [2]. Ipoh, a city along the Kinta River, is the capital city of Perak, one of the states in Malaysia; it is almost 180 km north of Kuala Lumpur and 123 km southeast of George Town in neighbouring Penang. Back 20 years ago, most of the projects in Ipoh have never been completed, especially big projects. There are many projects planned and developed before, but many have failed to be completed on time and within cost estimation. For this reason, this study has been initiated to identify the factors causing time and cost overruns of projects that leads to numerous abandoned projects in Ipoh city.

2 Problem Statement

Memon et al. [4] estimated that 89% of Malaysian construction projects have problems with cost overruns. It was shown that the Malaysian construction industry frequently has cost overruns of 5–10%. However, the dearth of prior research on the factors that contribute to cost and time overruns in the Malaysian construction sector necessitates the study of time and cost overruns of building projects in Malaysia. The study by Chan [5] used

Bromilow's model to evaluate the relationship between the times and costs of construction projects within Malaysia. The study concluded that it takes approximately 269 days to complete a RM1 million public sector project contract in Malaysia, with the best predictor of average construction time of $T=269C^{0.32}$. Other studies conducted by [6,7,8,9,10&11] separately investigated the variables that affect construction labor, construction safety, and constructability implementation, respectively. Furthermore, the success factors in the Malaysian building sector have been studied by [5, 9,10&12]. Being that the construction sector contributes significantly to the Malaysian GDP, it has become important to identify the factors that cause time and cost overruns during major projects in Malaysia, as well as the parameters driving these overruns. These influencing factors may originate from any project stakeholder, including owners, contractors, consultants, financial institutions, and governmental bodies. This study relies on a questionnaire survey to provide an evidence-based evaluation of the facts causing cost and time overruns in the Malaysian construction sector (both public and private). When a construction project is completed on schedule, within budget, and with acceptable quality or technical performance, it can be deemed successful [13]. In contrast to instances of projects with a cost overrun, Chimwaso [14] asserts that projects completed within budget are uncommon. In project development, cost and time overruns are important issues that have almost become common occurrences, especially in the building sector among developing nations. Due to this, construction projects become expensive for all parties involved, particularly for clients and contractors. The same is true of time overrun. For contractors, project delays or schedule overruns can have negative effects on costs, profit margins, and reputation. Clients are also impacted by increased costs, professional fees, and diminished incomes caused by late occupancy. According to Ng et al. [15], one of the factors contributing to construction delays is that a good number of project contractors base their bid preparation on the assumption that the client-set duration is reasonable. Hence, this study aims to identify the variables affecting time and cost overruns on construction projects in Ipoh, a city in Malaysia.

3 Literature Review

In a construction project, a time overrun is an extension of the time beyond the time originally agreed during the tender, while a cost overrun is an additional expense above the contractual expense

agreed upon at the tender. Both time and cost overruns have been identified as widespread issues in the global construction sector by numerous earlier studies [16, 17, 18, 19, 20, 21, 22, 23 &24]. Time overruns have been described as delays beyond the anticipated completion dates that can be linked to the contractors [25]; it has been described by Choudry [26] and Chan [5] as the discrepancy between the actual and projected completion times calculated over days. Previous studies have shown that time overruns are common in most of the major civil engineering projects and have become a common problem [27, 17, 28 & 29]. Project completion on schedule is a sign of a successful construction sector [30]. According to Chan & Kumaraswamy [32], the intuition, skill, and experience of the planning engineer are typically what determines how well they can predict the completion time. Mezher & Tawil [32] further stated that time overruns in the building sector in Lebanon are costing the nation money, and there is a need to find more practical solutions to the issue. Regarding the causes of cost overruns, it is well acknowledged by specialists in this field that this issue affects the majority of building projects and is a fairly typical occurrence. Cost overrun, according to Avots [33], is when a project's actual cost or expenditure exceeds its initial budget. Cost overrun is one of the major issues in the construction sector that affects both emerging and industrialized nations, according to Angelo and Reina [34]. Because of how critical this situation is, more research is required to find solutions. The factors that have been identified to contribute to this problem include incorrect or inadequate estimates of the initial costs, increases in project costs, poor planning, fluctuations in the price of raw materials, poor project management, outdated or inappropriate construction tools and techniques, a lack of experience, unforeseen site conditions, errors in design, inadequate funding, poor contract management, measures to control construction costs, high equipment costs, and proper project costing. Flyvberg et al. [35] observed that the cost of 9 out of 10 transportation infrastructure projects is understated, and for all project types, the actual costs are typically 28 % higher than the projected costs. In a study by Elinwa and Joshua [18] on the construction sector in Nigeria, 44% of the participants believed that time overruns mostly happened. Odeck [36] observed that in Norway, cost overruns range from 59 to 183% for the Norwegian Public Roads Administration, and are mostly found on mini projects. According to Aibinu & Jogboro [37], the average cost overrun percentage in

Nigeria's construction industry was 17.34%. Furthermore, Kaming et al. [25] found that cost overruns on high-rise projects in Indonesia were more frequent than time overruns, and as a result, they recommended the need for method studies and the dissemination of the research findings to both large and small firms so that all employees could adopt the most productive working practices. They viewed this as a way to boost workers' productivity without necessarily putting in greater physical effort. Jackson [38] quoted another study by Barrick on the construction industry in the United Kingdom and discovered that over 33% of the clients complained that their projects typically ran over budget. According to Creedy [39], the determination of the presence and impact of the risk factors of cost overrun in a project can assist in controlling costs more effectively; it can also be used to suggest strategies to prevent overruns in the future. The study by Rahman et al. [40] investigated the root causes of cost overruns in large construction projects and discovered that material price fluctuations, cash flow and financial challenges faced by contractors, and poor supervision and site management were the top 3 most important causes of cost overruns. Research by Ali & Kamaruzzaman [41] on residential building projects completed between 2000 and 2009 in Kalang valley with contract values of > RM 5 million revealed that the most significant factor that causes cost overruns was project design errors even though poor or inaccurate original cost estimation contributes to cost overrun. According to Jamaludin et al. [42], the main reasons for cost overruns during the construction stage of building projects were incomplete design drawings and specifications at the tendering stage, fluctuations in material prices, financial challenges faced by the contractors, changes in client requirements, scheduling and monitoring, fluctuations in the cost of plants and machinery, rising labor costs, poor planning, a lack of coordination between the parties, and scrape and rework.

From the aforementioned studies, it can be inferred that more research is still needed to control cost overrun in Malaysian construction projects; such studies must be aimed at identifying the mitigation methods for each important cause of cost overrun. According to Memon et al. [43], cost overruns are mostly caused by several factors which include inexperience, poor design and design delays, unrealistic contract duration and requirements, the relationship between labor and management, late delivery of materials and equipment, insufficient planning and scheduling, poor site

supervision/management, a delay in the preparation and approval of drawings, and mistakes made during construction. According to Azis et al. [44], 71.5% of respondents ranked the material and equipment issue as the main factor that contributes to cost overruns in the construction industry. This is significant because these resources are crucial for boosting the study's efficiency by saving a significant amount of money and time. According to Ismail et al. [45], poor site supervision/management, insufficient planning and scheduling, inexperience, frequent design changes, inaccurate cost and time estimates, cash availability and financial problems faced by contractors, slow flow of information between parties, financial difficulties of the owner, inadequate number of site workers, poor supply of materials, late availability of equipment and materials, poor management, and a change in the scope of the project were all factors that contributed to the failure of projects.

4 Research Method

This study employed a quantitative method through questionnaire surveys for data collection. The questionnaires were distributed to the contractors in the state of Ipoh. The population of this research is made up of building contractors operating in the Ipoh area who have a valid registration with the CIDB and PKK (Pusat Khidmat Kontraktor). PKK divided the construction companies into 6 Classes (A to F) based on their size, executed projects, equipment values, and qualifications of technical staff; Class A designates the largest contractors while Class F designates the smallest. The population of this research includes the construction companies that have valid registration in buildings, roads, water and sewage, electro-mechanics, and public works. The samples were selected randomly from Class A to F construction companies in the Ipoh area. There are 45 questionnaires distributed, but only 30 questionnaires were returned and analyzed. Ipoh city was considered as the study area and the participated contractors' companies in this area participated in the survey as follows: 12 contractors from the middle area of Ipoh city; 10 contractors from the east; 5 contractors from north of Ipoh, and 3 contractors from the south. The questionnaire was designed based on factors that contribute to time and cost overruns in construction projects in various countries globally and at time

intervals. There are two sections of the questionnaire that related to the factors contributing to time and cost overruns in construction projects in Ipoh. These parts also included the (company's profile and factors that contribute to cost and time overruns. The survey questions were presented as multiple-choice questions that must be answered using a four-point Likert Scale (1= strongly disagree, 2=disagree, 3=agree, 4=strongly agree) for the factors that contribute to time and cost overruns in the chosen city.

5 Results

5.1 Descriptive analysis

The types of projects handled by the participating companies include building (43%), mechanical & electrical (23%), and water sewage, and roads (17%). The designation of the respondents was mainly site engineering (37%), whereas only 33% of the respondents were the project manager. Regarding the working experiences, 40% of the participants are having working experience between 5-10 years at construction works, and 36% of them had working experience of more than 10 years. The largest number of respondents was received from the middle area (40%) of the city of Ipoh city. In terms of the cost of projects executed by the organizations, 50% of the participants are involved in project costs ranging from one to two million ringgit per year. The obtained data also showed that 50% of the approached contractors' companies are having 10 to 15 employees, followed by 20% of them with less than 10 employees.

Table 1. Respondents' Background

Details	Percentages (%)
Type of work executed by the respondent's organization	
Buildings	43%
Mechanical and electrical	23%
Roads	17%
Water and sewage	17%
Respondents' designation	
Project manager	33%
Quantity surveyor	17%
Site engineer	37%
Owner of organization	13%
Experience of respondents	

1-3 years	3.3%
3-5 years	20%
5-10 years	40%
More than 10 years	36%
Location of organization	
North of Ipoh	15%
Ipoh City	35%
Middle area	40%
South of Ipoh	9%
Cost of Projects executed by the organization	
Less than one million ringgit	
1-2 million ringgit	
2-3 million ringgit	
Three million ringgit and above	
Number of constant employees	
Less than 10 employees	20%
From 10 to 15 employees	50%
From 15 to 20 employees	16%
More than 20 employees	13%

5.2 Factors causing time and cost overruns

Table (2) presents the results of the relative importance index of the factors causing time and cost overrun of construction projects in Ipoh, Malaysia from the contractors' perspective. There are 41 factors considered as the cause of time and cost overruns which have been presented in Table 2 in descending order; the rank is based on the mean value.

Table 2. Factors causing time and cost overruns

Factors	Mean	Rank
Lack of experiences of project type	1.61	1
Delays in issuing information to the contractor during construction	1.61	1
Contractual claims	1.63	2
Improvements to standard drawings during construction	1.66	3
Omissions and errors in the bills of quantities	1.73	4
Inaccurate quantity take-off	1.77	5
Delays in costing variations and additional works	1.82	6
Lack of experiences of local regulations	1.84	7
Design changes	1.90	8

Unpredictable weather conditions	1.90	8
Lack of cost planning/monitoring during pre & post contract	1.90	8
Delay in preliminary handing over of project	2.00	9
Change in the scope of the project	2.01	10
Lack of experience of technical consultants, collaboration & technology	2.03	11
Changes in owner brief	2.04	12
Re-measurement of provisional works	2.04	12
Delay in construction, supply of raw materials & equipment	2.04	12
Lack of cost reports during construction	2.04	12
Inability of the contractor to be adopted with project environmental	2.05	13
Low communication of donors to compensate any bad results	2.06	14
Donor policy in bidding tender to the lowest price one	2.06	14
Fluctuations in the cost of building materials	2.07	15
Indecision by the supervising team in dealing	2.10	16
Some tendering maneuvers - loading of rates	2.11	17
Inadequate review for drawings and contract documents	2.12	18
Incomplete design at the time of tender	2.13	19
Resources constraint	2.14	20
Delays in decision making	2.14	20
Lack of coordination at design phase	2.16	21
Wrong/inappropriate choice of site	2.19	22
Technical incompetence, poor organizational structure a failure	2.20	23
Over time work hours of supervising engineer	2.21	24
Unsettlement of the local currency in relation to dollar value	2.23	25
Inadequate project preparation, planning and implementation	2.24	26
Increment of material prices due to continuous closures	2.33	27
Long period of the project maintenance period	2.43	28

Bad allocation of workers inside the site	2.47	29
Project materials monopoly by some suppliers	2.49	30
Attracting skillful technicians for work	2.50	31
Labors unrest	2.56	32
Additional work at owner's request	2.81	33

The table showed that the contractors ranked “lack of experience of project type” and “delays in issuing information to the contractor during construction” as the forth with mean value of 1.61. A contractor with less experience in the project cannot manage and plan such projects well. The planning phase of construction projects (work program) must be detailed to avoid cost and time overruns. The contractors with less experience also have no basis and guideline to perform such projects; the project proceeds without proper planning; resources may not be delivered on time, the number of workers may not be enough or there may be unskilled workers on site; most times, the project has to be extended and extra cost may be needed to hire more workers; sometimes, the material might damage even before use. Concerning the factor of delays in issuing information to the contractor during construction, it can be stated that the contractor is tied to the contract duration. The duration has been agreed upon between all parties before awarding the contract. The contractors must prepare the work program to plan the activity on site on daily basis. Each activity might relate to another activity such that the first activity must be completed before the next one can be started. To ensure all the activities can be executed smoothly, contractors need all the documentation, such as drawings, specifications, and bills of quantities as a reference. If any document is not completed or has discrepancies between it, the contractor needs confirmation from the party involved. This information or issue needs to be distributed or solved as soon as possible to avoid delays in site progress as scheduled. This is because the contractor must prepare the resources in time and estimate the actual quantity needed. Contractual claims were ranked the second that can cause cost overruns by the contractors. A claim is prepared by the contractor and payment is prepared

by the quantity surveyor consultant and approved by the client. The contractual claim prepared by the contractor is based on bill quantities and additional work on-site (variation order). The contractor has to prepare all the related documents to approve the claims.

“Improvements to standard drawings during construction” was ranked the third factor causing cost and time overrun. This case might happen if during the design stage and the contract has to be prepared and it is time-consuming. The consultant might not have enough time to prepare all the drawings in detail. This drawing must be improved and provided before executing the project. The bill of quantities for this kind of drawing will be prepared in a lump sum and under provisional item. Because of this problem, might burst the budget and cause cost overruns to the project. The fourth factor that causes time and cost overruns was identified as “omissions and errors in the bills of quantities”; the missing quantity can cause time and cost overruns to the project. The bigger the number of missing items in the quantities, the more the cost added to the project. The consultant and quantity surveyors must be aware of this kind of problem because the contractor may not proceed with the work or claim more than their entitled claim. “Inaccurate quantity take-off” was ranked the fifth factor that cause time and cost overruns. Other factors identified as the cause of time and cost overrun are the delays in costing variations and additional works, lack of experiences of local regulations, design changes, unpredictable weather conditions and lack of cost planning/monitoring during pre & post contract.

4 Conclusion

The most and top ten significant factors causing cost overruns as perceived by the sampled contractors were “Lack of experience of project type” and “Delays in issuing information to the contractor during construction” (1st position), “Contractual claims” (2nd position), “Improvements to standard drawings during construction” (3rd position), “Omission and errors in the bills of quantities” (4th position), “Inaccurate quantity take-off” (5th position), This study adds to the body of knowledge already available regarding the causes of cost overruns in the Malaysian construction sector. Clients, project managers, quantity surveyors, contractors, and other project participants will thus

be informed about the considerations taken into account when planning a project. The outcome of the data analysis showed that 41 factors contribute significantly to cost and time overruns during infrastructure projects.

Time and cost overrun will continue to be happening during the construction process for various known and unknown reasons and they may not be prevented entirely. Therefore, this study recommends that by evolving new technology like Building Information Modelling (BIM) or developing new methods could help in reducing the impact of time and cost overrun factors. Finally, the obtained results of this study provide theoretical support to supplement the time and cost overrun factors within the construction projects and offer some insights into the practice of cost overrun management in the construction industry.

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