

# Theoretical framework of the causes of construction time and cost overruns

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**Abstract.** Any construction practitioner fundamental goal is to complete the projects within estimated duration and budgets, and expected quality targets. However, time and cost overruns are regular and universal phenomenon in construction projects and the construction projects in Malaysia has no exemption from the problems of time overrun and cost overrun. In order to accomplish the successful completion of construction projects on specified time and within planned cost, there are various factors that should be given serious attention so that issues such as time and cost overrun can be addressed. This paper aims to construct a framework for the causes of time overrun and cost overrun in construction projects of Malaysia. Based on the relevant literature review, causative factors of time overrun and cost overrun in Malaysian construction projects are summarized and the theoretical frameworks of the causes of construction time overrun and cost overrun is constructed. The developed frameworks for construction time and cost overruns based on the existing literature will assist the construction practitioners to plan the efficient approaches for achieving successful completion of the projects.

## 1. Introduction

Construction industry performs a fundamental role in the economic growth of any country as it stimulates the development of other industries too [1]. Worldwide large amount of money are spent on construction development works, which provides essential infrastructures and large number of employment opportunities. The input of the construction industry in growth of national economy requires better efficiency in the industry by means of successful project delivery. Timely completion of construction projects within anticipated cost and to the level of quality standards settled by the owner is an index of successful project delivery [2]. Despite the importance of time and cost in construction projects, majority of the construction projects both in developed and developing countries are frequently experiencing the severe issue of time and cost overruns. Many studies are carried out on construction time and cost overruns in various countries such as in United State [3, 4], Nigeria [5, 6], India [7, 8], Australia [9, 10], United kingdom [11], Germany [12], Korea [13] and Kuwait [14].

In Malaysia, construction industry is one of the growing industries contributing in the country's socioeconomic development, though it contributes less than the services, manufacturing and agriculture sectors. Construction projects in Malaysia are suffering from a major problems of delay or time overrun and cost overrun constantly since many years [11]. A study carried out by Shehu et al.



[15] in Malaysia indicated that more than 50% projects experienced the problem of cost overrun while 79.95% of the public sector construction projects and 66.65% of the private sector construction projects were finished after the scheduled time. While, Rahman et al. [16] carried out a study using questionnaire survey amongst construction stakeholders of central and southern region of Peninsular Malaysia, the results of the survey showed that 92% of survey respondents reported that they are facing with the issue of time overrun and 89% of the projects experienced cost overrun. This confirms that time and cost overruns are severe problem in Malaysian construction industry, which needs to be minimized or controlled. For efficient control of the time and cost overruns, the understanding of causative factors of these issues is very essential. Hence, this paper aiming on constructing theoretical frameworks for the causes of time overrun and cost overrun in Malaysian construction projects.

## **2. Construction time and cost overruns**

Time overrun and cost overrun in construction projects can also be called is “slippage of project-schedules” [17]. Time overrun can also be defined as the time increased to finish the construction project after scheduled date which is affected by internal and external causes surrounded the construction project [18].

Cost overrun can also be termed as budget overrun, cost increase, or cost escalation [19]. Cost overrun is a variance between initially estimated or projected cost and final cost at the completion of the project [20]. Final costs are described as the total costs actually spent on construction project as determined at the project completion time while, projected or initial costs is known as the planned or predicted costs at the project approval time [13].

## **3. Objective and research method**

The aim of this study is to construct a theoretical frameworks for the causes of time and cost overruns. The factors influencing time and cost overruns are collected from the previous research studies. During literature review for theoretical frameworks only those research papers are considered which were conducted to study the issues of time overrun and cost overrun in Malaysian construction projects.

## **4. Previous studies on causative factors of time overrun**

In Malaysia, various studies were conducted to figure out the main causes of time overrun in construction projects. Memon [21] examined the major causative factors of time overrun in building construction projects by conducting a questionnaire survey. Results of the survey revealed that most significant causative factors of time overrun were repeated changes in design, modification in the scope of the project, financial problems of client, delays in process of decisions making, unexpected site conditions, delay in the progress of payment by client, shortage of site workers, inaccuracies and errors in design, very slow process of preparation and approval of drawing documents, and incapable subcontractors.

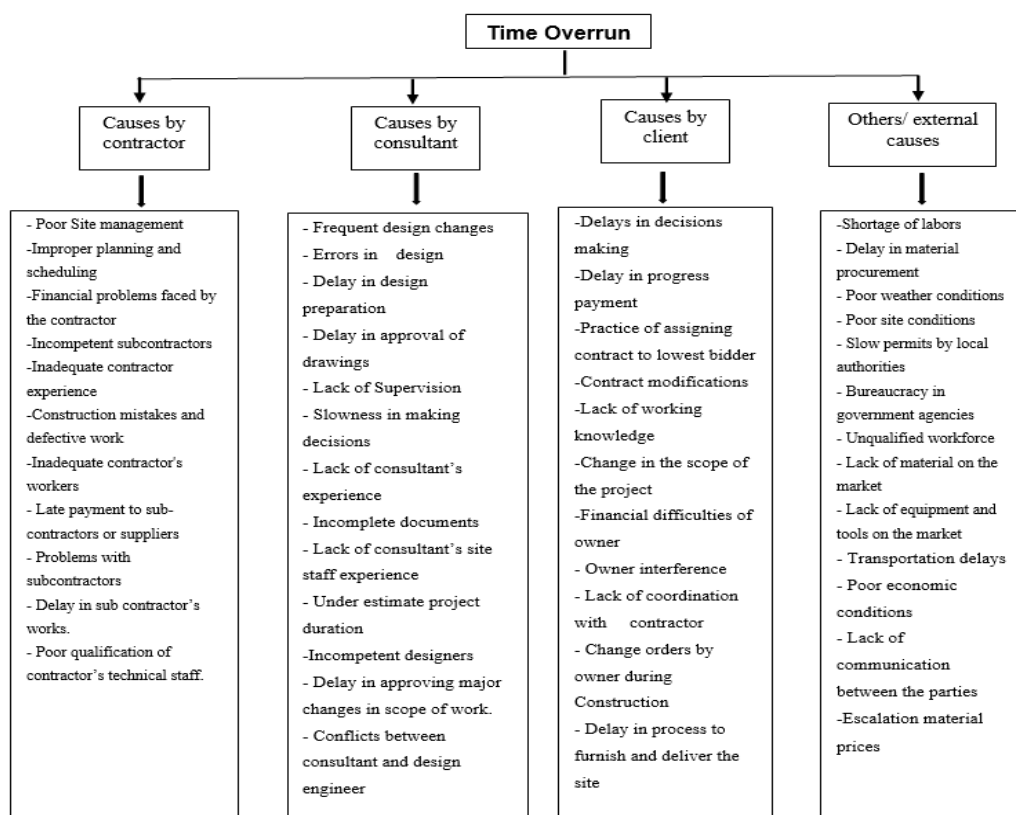
Mydin et al. [22] investigated the influential causes of time overrun in Malaysian private housing projects through a questionnaire survey. Top 10 common and highly severe factors of cost overrun were unpredictable weather conditions, poor management at the site by contractor, incomplete design documents, and lack of contractor’s experience, financial difficulties, slow process of approval of major changes, changes in contract agreement, lack of contractor coordination with other construction stockholders, mistakes in construction, and poor quality works.

A questionnaire survey was performed by Azlan et al. [23] among construction practitioners to determine main factors contributing to time overrun construction projects in state of Kedah, Malaysia. Results of the survey showed that top ten root causes of time overruns as observed by the three key construction parties comprises delay in sub contractor’s work, improper arrangement and scheduling of project, problems in financing project, shortage of labors, delay in process of decision making, slowness in progress payment by owner, delay in material delivery to site, late procurement of materials, escalation in raw material prices, and delay in process of approving major variations in

scope of work. Shehu et al. [24] found out that the main causative factors of time overrun were cash flow and financial problems of contractor, delay in payments by owner, delay in payment from contractor to sub-contractors and materials suppliers, late permits by local government authorities, unproductive planning and scheduling of the project, improper control of the project progress by the contractor, bureaucracy in government organizations and delay in decision making process by the owner.

Ramanathan et al [17] examined the factors that cause time overrun in construction projects and identified that key factors of cost overruns were rain effect on construction activities, shortage of labors, contractors' poor site management and control, unqualified workforce, lack of contractor experience, late progress payments by client, lack of communication and coordination of contractor with other stakeholders, low productivity level of labors, and delay in decision making process by client.

Rahman et al. [25] investigated the causative factors of time overrun or schedule overrun in MARA construction projects from perspective of "project management consultant" and found that dominate factors were poor site management by contractor, lack of contractor experience, lack of site labors, escalation of material prices, practice of awarding contract to lowest bidder, problems with subcontractors, lack of communication among parties, and change management. To identify the factors that affects timely completion of building construction projects, a questionnaire survey was conducted by Alaghbari et al [26] in Klang Valley, Malaysia. The study found that financial problems and lake of coordination among construction parties are main factor initiating time overrun in construction projects. The theoretical frame of the causes construction time overrun is develop from seven scholars research papers [17, 21-26] as shown in figure 1.



**Figure 1.** Theoretical framework for construction time overrun.

### 5. Previous studies on causative factors of cost overrun

A Study conducted by Ali and Kamaruzzaman [27] identified 13 major causes that influenced cost overruns in building construction projects in Klang valley, Malaysia. A questionnaire survey was conducted among construction project manager, quantity surveyor, Civil & Structure Engineer, and other related respondents. The survey discovered that the causes of overrun in budget of building construction projects were attributed to incorrect / poor estimate of original cost, underestimation of construction projects duration, inappropriate planning, contractor poor project management, poor contract management, lack of contractor experience, increase in project costs, fluctuation in cost of heavy machineries, variation in price of materials, unexpected site situations, inadequate funds for project financing, obsolete construction equipments. /unsuitable construction methods, mistakes in design.

Memon et al. [28] determined 15 main factors effecting cost performance in large construction projects of MARA. Based on the project management consultants surveyed the most important cost overrun factors were: financial problems experienced by contractors, inadequate site management, lack of monitoring of work progress by contractor, incapable contractors, unavailability of site labors, indelicate planning and arrangement by contractors, instability in costs of construction materials, practice of allocating contract to lowest bidder, lack of communication and coordination among key construction stakeholders, underestimate project duration, and late material procurement. Further, Memon et al. [29] conducted another study on cost overrun in Malaysian building construction projects. The result of his research specified that the core factors of cost overrun in building construction projects were errors in design, slowdown in design preparation, impractical contract duration, incapable contractor, delay in delivery process of materials & equipments to construction site, poor relationship between top management & labors, delay in preparation of drawings, slowness in approval of drawing documents, insufficient planning and scheduling, and errors during construction process resulting reworks.

A quantitative research carried out by Ramanathan et al. [17] on cost increase in construction projects in Malaysia identified 18 causes of construction cost overrun. The findings of his research showed that the main causes of cost overrun were extension of time, fluctuation in cost of raw materials, design changes, unpredictable weather conditions, insufficient project preparations and planning, delay in delivery of raw materials and equipment to site, lack of cost plan / improper monitoring of pre and post contract stages, monopoly by some suppliers in project materials, deficiency of coordination at design stage, and re-measurement of provisional sum.

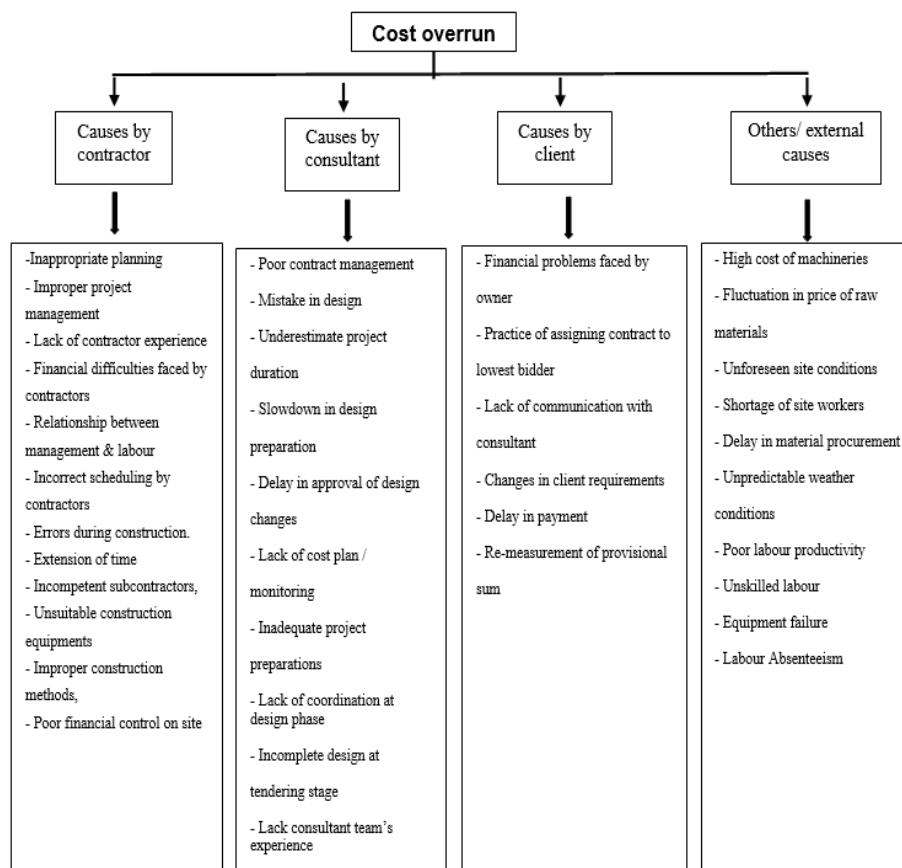
To investigate the factors that contribute to increase in scheduled budget of large construction projects in Malaysia, a study was conducted by Rahman et al. [30]. A questionnaire with 35 common causes of cost overrun was precisely designed from initial investigations. The questionnaire form was directed towards three groups: clients of the large construction projects, consulting offices, and contractors handling large construction projects. The questionnaire form was circulated to a random sample of 150 client firms, 150 contractor firms and 30 consultant personals. The results of the survey revealed the key factors of cost overruns or budget overrun in large construction projects: variation of cost of raw material, ineffective site management and supervision by contractor, lake of contractor experience in handling large construction projects, construction mistake resulting schedule delay, improper planning and scheduling, unskilled subcontractors, errors in design, regular variations in design, , financial difficulties faced of owner, poor financial control on site unavailability of construction materials, inaccurate cost estimate, and underestimate of project duration.

A survey was carried out by Jamaludin et al. [31] on the factors inducing the cost variance during the construction stage amongst the building contractors registered under Class 'A' within the Klang Valley, Malaysia. The results of the survey showed that the important causes of cost increase were imperfect design drawings and specifications at tendering phase, alterations in client requirements, cash flow and financial problems faced by the contractors, fluctuation of material prices, poor planning, scheduling and monitoring, increasing of labour salaries, fluctuation of plant and heavy

machineries cost, lack of coordination and communication among the stakeholders, scrape and rework, lack project team's experience.

Research conducted by Ismail et al. [32] studied risk level of several factors which cause cost overrun throughout the life cycle of a construction project. The study revealed that 6 causes have a high risk on cost overrun, which were ineffective site management & monitoring, unskilled subcontractors, construction mistakes, incomplete design documents at the tendering stage, and late payment.

The theoretical frame of the causes of construction cost overrun is develop from seven scholars research papers [17, 27-32] as presented in the figure 2.



**Figure 2.** Theoretical framework for construction cost overrun.

## 6. Conclusion

The problem of construction cost and time overruns has been remarkable in Malaysian construction projects for many years. There are various causes of construction time and cost overrun that have been determined by various researches. The developed frame work for time overrun results in identification of 48 causative factors for time overrun in construction projects in Malaysia, while the framework for cost overrun showed 38 causes of cost overrun in Malaysian construction projects. There is need of proper depth studies on the problems of time and cost overrun in construction industry, which can identify possible solution and measuring the level of possible solutions to insure the successful completion of construction projects.

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