

## Effect of Project Duration Decision at the Bidding Process on Cost Overruns of Sri-Lankan Building Projects

Janani Uvasara Kumarathunga<sup>1</sup>, W.M.C.L.K. Wijekoon<sup>1</sup>, Chanuri Kalugala<sup>2</sup>

<sup>1</sup>Department of Quantity Surveying, Sri Lanka Institute of Information Technology Malabe, Sri Lanka

<sup>2</sup>Liverpool John Moores University, United Kingdom

qs20782054@my.sliit.lk, [kumari.j@sliit.lk](mailto:kumari.j@sliit.lk), [chanuri.k@sliit.lk](mailto:chanuri.k@sliit.lk)

### ABSTRACT

Cost overruns are a significant issue in the construction industry, particularly from the standpoint of clients. Many studies have been interested in the unpredictable situations that lead to cost overruns, with the primary goal of pinpointing the precise causative factors. There is a knowledge gap about whether cost overruns could be prevented through effective decision-making at a project's earliest phases. Therefore, the aim of this research was to critically review if the impact of the project duration decision taken at the bidding process could lead to cost overruns of Sri Lankan building projects, and to provide recommendations of preventive measures to be taken. Deductive research approach and qualitative analysis was used to achieve the four main objectives set for this study. The literature review was able to identify the significant causative factors for cost overrun in the construction industry. The analysis of data collected through questionnaire survey and semi-structured interviews revealed that there are several causative factors for cost overrun, that stem from the project duration being excessive or inadequate : Claims and disputes, inadequate planning and scheduling, unrealistic work schedule, expense due to completion delay and extension of time, and difficulty in predicting the future. This study was able to identify that there is a relationship between project duration decision and cost overrun, where if the project duration decided at the bidding process is excessive or inadequate, it will be causative of cost overruns. Finally, this study has provided preventive measures to avoid cost overrun at the bidding process when deciding the project duration.

**KEYWORDS:** *Cost overrun, project duration decision, building construction projects*

### 1 INTRODUCTION

Project efficiency can be determined in terms of how successfully and sustainably project targets are achieved while remaining within the estimated time and budget (Sansoto & Gallage, 2019). Three fundamental criteria are often highlighted with relation to any construction project: Cost, Time and Quality. These criteria which determine the success or failure of projects, have traditionally been referred to as the *iron triangle* of the project management function (Barnes, 1988).

Typically, investors focus highly on the different factors associated with project cost such as return on investment, budget maintenance, profitability etc. (Squires and Greenhalgh, 2012). Therefore, cost management is a function that takes high priority in construction management (Hani, 2014). Phenomena such as cost overrun, albeit being a common occurrence within the industry, have the potential to create excessive wastage and client dissatisfaction if not managed carefully (Zhu et al., 2021). Cost overrun is a major concern in the industry, especially from the perspective of clients (Sindhu Vaardhini et al., 2016). According to Enrica et al. (2021), project cost overrun is the difference between the contract amount agreed upon by the owner and contractor during the signing of the contract and the actual cost of a construction project at completion. The unpredictable circumstances that give rise to this phenomenon has been an interest of many researchers, with high focus on identifying the exact causes of cost overruns and how best to mitigate them.

Past research has identified many causative factors of cost overrun through the use of techniques such as taxonomy formulation etc. (Enrica et al., 2021 ; Malkanthi and Rodrigo, 2021). However, there is a gap in the knowledge of if cost overruns can be avoided through effective decision making at the

most preliminary stages of a project (Cantarelli et al., 2012). This study analyses the impact of the decision of project duration on cost overruns. Typically, in traditional procurement the project duration decision is taken during the bidding process by the client along with the consultant team. The construction contract and entire project schedule that follows this decision, is highly affected by it. This decision, which will be communicated to all the parties through the contract document, sets the timeframe and target for project completion (FIDIC, 2017). If the period decided on is unrealistic, it may affect the project negatively. Therefore, it is worthwhile to analyze how big of an impact this decision has on the ultimate project cost, and to identify if this impact could lead to cost overruns. Thus, the study aims to critically review if the impact of the project duration decision taken during the bidding process could lead to cost overrun, and to provide recommendations of preventive measures to be taken. The scope of this study is limited to Sri Lankan building construction projects following the traditional procurement route. Therefore, the objectives were implemented as i) to inspect and analyze the key causative factors of cost overruns in the construction industry that have been identified to date; ii) to discern the causative factors for cost overrun in Sri Lankan Building projects that occur as a direct or indirect result of excessive or inadequate project periods; iii) to identify if a relationship exists between project duration decision taken at the bidding process and cost overruns; and iv) to provide recommendations of measures to be taken to prevent this particular type of cost overruns that occur as a result of excessive or inadequate project duration decision.

## **2 LITERATURE REVIEW**

### **2.1 Construction Projects and Criticality of Cost**

A construction project is an intricate collection of ideas, labor, material, technology and plant that is brought together to create or renovate structures such as buildings, monuments, and infrastructure (Chang and Swenson, 2019). The sheer amount of different construction material alone, that is needed to produce a structurally sound and serviceable establishment, ensures that construction projects are very often associated with large investments and rigid cost targets. However, due to numerous phenomena including the many risks and uncertainties linked with construction, cost overrun is a frequent occurrence within the industry (Aljohani et al., 2017). Cost overrun has a largely negative impact on construction projects and although this phenomenon is as old as construction itself, there is still vast improvement needed within the industry if cost overrun is to be avoided completely.

### **2.2 The Project Duration Decision of a Construction Project**

For building projects following the traditional procurement route, the decision of the project duration is typically taken by the client (usually along with the consultant team) during the bidding process of the project. Once the project duration is decided, the client can allow the contractor to prepare a realistic, detailed schedule at minimum cost (Mishra, 2012). A key objective of this study is to identify the causative factors that occur as a direct or indirect result of excessive or inadequate project periods. To achieve this, one must call into question, if the decision taken regarding the project duration during the bidding process had been suitable. Although there is a lot of focus on the different causative factors of cost overrun, there is very little attention given to singular factors independently and there is a lack of research analyzing the relationship between cost overrun and the decision taken regarding the duration (Cantarelli et al., 2012). How this decision could impact the project in terms of cost overruns, has not been intensively studied. In a review of the literature surrounding cost overrun, (Aljohani et al., 2017) found that most studies have not identified the project phases in which the respective cost overruns occur. This research is able to discern if there is a relationship between the decision of project duration taken during the bidding process, and cost overruns. Through the study's fourth objective, the gap in knowledge regarding preventive measures to avoid cost overrun due to project duration decision is also addressed.

### **2.3 Factors Causing Cost Overruns**

The primary goal of reviewing existing literature is to identify and compile the body of knowledge that has already been documented about cost overrun. This research focuses on the Sri Lankan

construction industry; therefore, high priority has been given for the studies that are applicable to Sri Lanka. Throughout the years, there are many factors that have been identified as possible causes of cost overrun. To understand these causes better, it is beneficial to examine literature from other South Asian nations in addition to those centered around the Sri Lankan building sector.

Attanayake and Wijekoon, (2012) examined the possible causes of cost overrun in Sri Lankan Road construction projects and came upon 5 main cost overrun factors : Payment delays, Delay in shifting existing utilities, Cost escalation, Frequent design changes during construction, Issues in land acquisition. (Malkanathi and Rodrigo, 2021) identified Lack of coordination between design team and contractor, Delay in providing detailed drawings, Defective designs, Delay in issuing information to the contractor during construction stage, Additional work at owner's request as the main factors of cost overrun in Sri Lankan construction projects. The highest-ranking elements in a study by (Kawmudi and Jayasooriya, 2021) that ranked Limited capacity and experience of the lowest bidder at the time of bidding, Poor preliminary estimations using inaccurate quantity take-offs, Additional expense incurred because of the completion delay, Insufficient early planning as the main causes for cost overruns in Sri Lankan building projects. (Devi and Ananthanarayanan, 2017) observed that the following factors influencing Indian cost overrun in construction projects : Additional works, Unrealistic contract schedule, Disputes on site, Insufficient time to prepare estimate, and Construction delays. In a study by (Ahady et al., 2017), through the use of a quantitative survey among clients, consultants and contractor representatives involved in Afghan building projects, the following were found to be the most crucial sources for cost overrun: Market inflation, Corruption, Fluctuations in the cost of building, Supply shortage of construction material. (Azhar et al., 2008) found that in Pakistan's construction industry, Frequent design changes, Improper planning, Unstable costs of the manufacturing material, and Long periods between designing and time of bidding are among the most critical causative factors of cost overrun. According to a study by (Aljohani et al., 2017) that reviewed the literature from different countries to identify the causes of cost overrun, the following factors are possible causes of overrun : Inadequate project preparation and planning, Unrealistic design development periods, Additional works, Poor project management, Litigation costs. In 2018, the main causes of cost overrun within the UAE construction industry and the available mitigation methods were studied by (Ramabhadran, 2018). His findings proved that the main causes of cost overrun within the UAE construction industry are: Insufficient early planning, Delayed completion, Lack of skilled resources and motivation, Poor productivity. However, a similar study by (Johnson and Babu, 2018) revealed the Design variation, Delay in client's decision making, financial constraints of the client, Poor cost estimation, Following inappropriate procurement methods to be the top five causes of cost variation within the UAE construction industry. Through a study conducted in Iran investigating the causes of delay and cost-overrun in the construction industry, it was found that there were three major factors causing cost overruns (Rezaei and Jalal, 2018). The factors were: Scarcity of labor and skill availability, Domination of the construction industry by foreign firms and aids, Inappropriate nature of contractor policies. A study conducted by (Bekr, 2015) on the factors leading to cost overruns in construction projects in Jordan revealed Schedule delays, Price fluctuations, Design errors, Inadequate planning and scheduling, Frequent design changes to be the most notable causes for cost overrun. (Flyvberg et al., 2018) found that Estimators' lack of experience, Inherent difficulties in predicting the future, Honest mistakes, and Insufficient data are the most common reason behind overruns. A project's size and complexity might make it more difficult to foresee and make decisions accurately, which could lead to a domino effect on how effectively the cost management will be handled later on. It is evident, as numerous studies also acknowledge, that the project decisions made at the preliminary stages of a project are of great importance (Anysz and Buczkowski, 2018; Cantarelli et al., 2012). This is due to the high impact these decisions tend to have on project functions down the line.

## 2.4 Factors Relevant to the Study

Through the review of past literature, it is evident that cost overrun is a significant concern within not only the Sri Lankan construction industry, but in foreign nations as well. Numerous causative factors for cost overrun have been identified and discussed through past research. The aim of this research is to critically review if the impact of the project duration decision taken at the bidding process could lead to cost overrun, and to provide recommendations of preventive measures to be taken in the context of Sri

Lankan building projects. The first objective set to reach this aim has been achieved, with the identification of key causative factors using past literature. However, these factors have significant classifiable differences from each other, in that, several of them could be entirely avoided if the decisions made at the initial stages of the project are made with caution. In order to achieve the aforementioned aim, as well as to move forward with achieving the second objective of the research, the causative factors that are most relevant to the scope of this research study must be selected. The second objective of this research is to discern the causative factors that occur as a direct or indirect result of excessive or inadequate project periods and inefficient project scheduling. In order to achieve this objective using questionnaire survey, the following factors were filtered out as the ones most relevant to the scope of the research:

1. Frequent design changes (Attanayake and Wijekoon, 2012; Malkanthi and Rodrigo, 2021; Azhar et al., 2008; Johnson and Babu, 2018; Bekr, 2015)
2. Difficulty in predicting the future (Flyvberg et al., 2018)
3. Poor labor productivity (Ramabhadran, 2018; Rezaei and Jalal, 2018)
4. Delays in forming a schedule and planning out work (Kawmudi and Jayasooriya, 2021; Azhar et al., 2008; Ramabhadran, 2018)
5. Delays in following the schedule (Aljohani et al., 2017; Devi and Ananthanarayanan, 2017)
6. Inadequate planning and scheduling (Bekr, 2015; Aljohani et al., 2017)
7. Inflation and / or price fluctuations (Attanayake and Wijekoon, 2012; Ahady et al., 2017; Azhar et al., 2008; Bekr, 2015)
8. Additional works (Malkanthi and Rodrigo, 2021; Bekr, 2015; Aljohani et al., 2017; Devi and Ananthanarayanan, 2017)
9. Expenses due to completion delay and extension of time (Kawmudi and Jayasooriya, 2021; Ramabhadran, 2018; Bekr, 2015)
10. Delay in client's decision making (Johnson and Babu, 2018)
11. Mistakes in construction (Flyvberg et al., 2018)
12. Claims and disputes (Aljohani et al., 2017; Devi and Ananthanarayanan, 2017)
13. Unrealistic work schedule (Aljohani et al., 2017; Devi and Ananthanarayanan, 2017)
14. Insufficient time for bidders to prepare tender (Devi and Ananthanarayanan, 2017)
15. Lack of coordination between designer and contractor (Malkanthi and Rodrigo, 2021)

### 3 RESEARCH METHODOLOGY

For this study, the research problem was of whether or not there is an impact of the project duration decision taken during the bidding process, on cost overruns of Sri Lankan building projects. The aim was to critically review if the decision can affect the project so as to cause cost overruns, and if so, to provide the recommendations needed to take preventive measures against it. A literature review was conducted to find and review what factors had already been identified as causes for cost overrun through past research. Through the literature review, the key causative factors of cost overruns were identified and the factors most applicable to Sri Lankan Building projects were analysed further. Upon further analysis, 15 causative factors were selected. Data collection was done through questionnaire surveys and semi-structured interviews containing open-ended questioning. The questionnaire survey was focused on the aforementioned 15 causative factors, to determine if respondents had experienced cost overrun due to project duration decision, and the causes that led to it. The deductive approach was used for this study. Using the deductive approach, it was able to confirm the pre-existing assumption that the project duration decision may have an impact that leads to cost overruns. Qualitative analysis was used to analyse the data collected through the surveys as well as the interviews. Using qualitative analysis, it was possible to observe and interpret the findings to derive the conclusion of whether or not the project duration decision has any impacts that might lead to cost overruns.

Survey candidates were chosen through random sampling of construction industry experts, chosen on the basis of years of experience, knowledge and fields of expertise. The semi-structured interviews were selective sampling. The candidates for the questionnaire surveys and semi-structured interviews were industry professionals of different construction disciplines of at least 5 years of experience and industry experts with over 10 years of experience respectively. The questionnaire survey was shared

among 50 candidates, of which 40 responded. This sample was chosen to get the opinions of professionals from different construction disciplines.

#### 4 DATA COLLECTION AND ANALYSIS

The data for this study was collected through a questionnaire survey as well as through semi-structured interviews. For the questionnaire survey, random sampling was done among construction industry professionals, and 40 responses were recorded. The most common designation among respondents is 'Quantity Surveyor', with 13 out of 40 being from that designation. There were no limitations imposed based on the designation of the respondent, as all the chosen respondents were employed in the construction industry. The study did not limit its participants on the basis of years of experience within the Sri Lankan construction industry, however, high focus was given for the survey to be distributed among those with at least 5 years' experience. Consequently, over 70% of the respondents had over 5 years of industry experience. It was mandatory for the respondents to have been involved in Sri Lankan building construction projects and 87.5% of the respondents met this criterion. The 5 remaining respondents were omitted from data analysis. Findings of the demographic data allowed the suitable candidates to be filtered out prior to the primary data analysis.

Analysis of the primary data was able to uncover the main causative factors of cost overrun that occur as a result of excessive or inadequate project duration decision. This analysis was done by filtering the causative factors identified through literature review into 15 factors relevant to the scope of the research. Those factors were then validated through the questionnaire survey by having respondents rank the likeliness of each causative factor occurring due to project period decision. The findings showed that 5 factors were identified : Inadequate planning and scheduling, Claims and disputes, Unrealistic work schedule, Expense due to completion delay and extension of time, Difficulty in predicting the future. Further analysis also uncovered the solution to the third and main objective of the study. Through the responses to the survey, it was found that cost overrun is a factor that is recognized for its impact within the construction industry. It is evident that decision makers actively work towards avoiding cost overrun at the time of deciding project duration. The survey was also able to establish that a strong relationship exists between project duration decision and cost overruns, as findings show that the impact of excessive or inadequate project duration could result in overruns.

Semi-structured interviews allow interviewees to freely share their thoughts relevant to the theme without imposing restrictions on knowledge sharing. For this study, 3 industry experts were interviewed via zoom, a virtual communication platform. The 1<sup>st</sup> interviewee (hereafter known as 'Interviewee 1') is a Chartered Quantity Surveyor with over 24 years of industry experience, specializing in the areas of cost consultancy and contract administration. The 2<sup>nd</sup> interviewee (hereafter known as 'Interviewee 2') is an engineer with over 20 years of industry experience in project management and civil engineering. The 3<sup>rd</sup> interviewee (hereafter known as 'Interviewee 3') is a Chartered Quantity Surveyor with over 10 years of experience in cost consultancy and quantity surveying. The semi-structured interviews commenced with the interviewer's greetings and introduction of the research study and its aim. This was followed by a round of introductory questioning which set the foundation for the interview. All three interviewees affirmed that they have experienced cost overrun in some building projects they were a part of.

##### 4.1 Excessive or Inadequate Project Duration as a Causative Factor of Cost Overrun

*'The Project Period decision that is taken during the bidding process may have the potential to cause Cost Overrun if the decided project period is excessive or inadequate'. Was this factor considered when deciding on the project duration?'*

Following this question, it must first be noted that the statement was affirmed by all interviewees that when deciding on the duration to be given for the project, cost overrun is a general concern. The findings uncovered through the interviews were as follows :

The answers given by Interviewee 1 revealed that although cost overrun is factor that is a generally considered, the client's preference has a significantly high influence on the project duration, enough to overshadow many of the other general concerns. In certain instances, inappropriately longer project durations had been allowed on the client's request; longer durations tend to expose the project to more risk and uncertainties. It was also evident that it is similarly true for the opposite, where inappropriately

shorter durations are allowed on the client's request, exposing the project to risks that stem from factors such as poor planning, and insufficient time for bidders. A similar point was brought up by Interviewee 3 regarding the client's influence, that the nature of the project and the client's business objectives are two significant factors that sway the project duration decision. It was illustrated further through an example involving a luxury hotel project. At the bidding process, when the duration was being decided, there were several factors considered. Whether or not the duration was sufficient to complete the works had been discussed, among other factors. However, the most influential concern had been regarding the opening day for the hotel. Since the project was to build a hotel, it was imperative that the project was concluded on time for the opening day, because the hotel business in Sri Lanka is seasonal. Due to this factor, there had been a high pressure during the construction stage to finish on time. This example, along with the other views expressed by Interviewee 3 confirmed that the decision regarding the project duration is highly interconnected with the overall project management and could easily influence cost overruns if not taken responsibly. It was affirmed by Interviewee 2 that excessive or inadequate project duration can be a reason, among other reasons, for cost overruns. Furthermore, if an unrealistic timeline is decided for the project, then the contractor may not be able to perform within that timeline, although they may try their level best. Furthermore, the extra effort needed to progress within such a timeline could ultimately lead to the client incurring additional cost. In order to achieve the main objective of this research, the relationship between project duration decision and cost overruns must be identified. These interviews further validate the data that was gathered and analysed through the questionnaire survey. In order to identify if a relationship exists, the interviewees were inquired regarding the impact that project duration decision could have as a causative factor of cost overruns in Sri Lankan building projects. Interviewee 1 expressed that the project duration will impact how much risk the project is exposed to, meaning that if the duration is inappropriately long, the project will be exposed to many uncertainties and risk. Alternatively, if the duration is too low, due to the urgency of work and crashing of program there can be failures that lead to cost overrun. Interviewee 2 restated that the impact will be high, subjected to if the project duration decided during bidding process is unrealistic. Interviewee 3 affirmed that without a doubt, there is an impact as it is a causative factor, however to say if the impact is high or low is difficult without sufficient data.

#### **4.2 Preventive Measures for Cost Overrun Caused by Excessive or Inadequate Project Duration**

The final objective of this study is to provide recommendations to prevent cost overruns that occur as a result of the project duration decision. Upon analysis of the findings, the following recommendations can be given as preventive measures to be taken when deciding the project duration:

Table 4.1 – Summary of Recommendations

<b>1</b>	When deciding project duration at the bidding process, project-specific factors such as type of foundation, number of stories of the building, type of finishes, subsurface conditions of the site etc. must be considered when preparing the initial project plan.
<b>2</b>	A typical project plan is not sufficient; Critical planning must be practiced, especially during the initial project stages, so that each aspect of the project is carefully considered and factored into the plan.
<b>3</b>	Project specifications and material requirements should be compared against the material availability. Prior to work commencement, a solid procurement plan must be prepared to avoid disruptions in the workflow.

4	Must conduct thorough research on the location of the site, site topography, social, historical and cultural aspects of the site etc. The project schedule and work plan must be prepared with due consideration to all these factors to reduce unexpected barriers or interruptions to the workflow. For example, there may be limitations on transportation of logistics to the site, or the number of work-shifts per day should be decided based on the work target, but also based on if night work is allowed in that particular area
5	When preparing the project schedule, as well as the project budget, must account for potential failures, accidents and delays.
6	Project conditions must be evaluated on a macro-picture, with due consideration to all social, economic and environmental aspects. Then, must conduct research on the availability of the resources and technology to fulfill the required tasks.
7	Must have certainty about project funding. Thorough research must be conducted on funding availability, funding mechanism for the project, feasibility, client's return on investment (ROI) etc.
8	Before proceeding to tendering, considerable amount of comprehensive details must be provided for the bidders to make well-informed decisions and judgements when preparing bids.
9	Good coordination must be maintained between project parties, especially during the initial stages of the project

### 4.3 Discussion

Through the data analysis, this study was able to confirm that project duration decision, if excessive or inadequate, can be a causative factor for cost overruns in Sri Lankan building projects. It was also confirmed through expert interviews that there is undoubtedly an impact of project duration decision on cost overruns, subjected to if the duration is excessive or inadequate. The factors identified through the literature review was included in the questionnaire survey to gather data from professionals regarding the practical situation within the industry. Each interviewee was inquired regarding the relationship between project duration decision taken at the bidding process, and cost overrun. Through the collected data, it was revealed that a relationship does exist between project duration decision taken at bidding process, and cost overrun. Semi-structured interviews revealed much insight regarding the common occurrence of this phenomenon within the industry. Interviewees were of the view that there may be factors that are not identified by the consultants during the bidding process, as well as unique circumstances that are not accounted for by the contractors when submitting their bids. Such oversights could potentially lead to cost overruns. Interviewee 2 affirms that while the relationship definitely exists, whether or not it is a linear relationship or totally proportionate relationship cannot be confirmed unless proven through calculated data. It can be concluded that relationship is reciprocal, because having a reasonable project duration is a clear governing factor for avoiding cost overrun. The opinions given by the industry experts confirms that there is a relationship between the project duration during the bidding process, and cost overruns of Sri Lankan building projects.

## 5 CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

This study, conducted on the “Effect of project duration decision at the bidding process on cost overruns of Sri Lankan building projects” revealed that there is a strong relationship between the project duration decision on cost overruns. It was found through literature review, that cost overrun is a fairly common occurrence in the Sri Lankan building construction industry, which, if not managed carefully, can have largely negative impacts on projects. Through the literature review, key causative factors of cost overrun such as “additional works”, “insufficient planning and scheduling”, “corruption”, “supply shortage of construction material”, “additional expense due to completion delay” etc. were identified. Through this analysis, the study was able to achieve its first objective: Inspecting and analyzing the key causative factors of cost overruns in the construction industry that have been identified to date.

The second objective of this study was to discern causative factors that occur due to excessive or inadequate project duration. To achieve this objective, 15 causative factors that were most relevant to the research scope were selected. These 15 factors were included in the questionnaire survey for participants to rate the likeliness of the factors occurring due to the project duration being excessive or inadequate. By analysing the findings of the survey, 6 causative factors were derived : Inadequate planning and scheduling, claims and disputes, unrealistic work schedule, expenses due to completion delay and extension of time, difficulty in predicting the future, and delay in forming a schedule and planning out work. It can be concluded that these factors occur as a result of the project duration decided at the bidding process being excessive or inadequate.

To identify and establish a relationship between project duration decision taken during bidding, and cost overruns, findings from the questionnaire survey and the interviews were used. Through the questionnaire survey, participants were asked to rank the impact of project duration decision as a causative factor of cost overruns. The responses showed that a clear majority of participants believe that project duration decision has a high impact, thereby confirming that a strong relationship exists between project duration decision and cost overruns. This is further confirmed through the semi-structured interviews. Interviews were conducted for 3 industry experts and their opinions were analysed to further validate the findings of the questionnaire survey in achieving objective 3. The industry experts confirmed that a clear relationship exists between project duration and cost overrun; They affirmed that project duration decision could lead to cost overruns, subjected to if the decision is unrealistic i.e., excessive, or inadequate. Thus, the main objective of this study was achieved.

### 5.2 Limitations of the Study

The limitations of this research study were as follows:

- This study was limited to Sri Lankan building construction projects, and the findings may or may not apply equivalently to infrastructure projects.
- This study was limited to projects that followed the traditional procurement path.
- Participants for the questionnaire survey were limited to professionals from the construction industry.
- The questionnaire survey data considered for analysis was limited on the basis of if respondents have worked for a Sri Lankan building project or not.
- The participants for semi-structured interview was limited based on years of experience in the industry; only industry experts with over 10 years of experience were considered.

### 5.3 Further Research Studies

Avenues for further research unfolded through this study are as follows:

- Further research on establishing the scientific relationship between project duration decision and cost overruns through quantitative analysis



- The causative factors chosen from past literature survey for this study were a limited number which were most relevant to the scope of the study. As further research, other causative factors could also be used and tested to discern if they originate due to the project duration decision.
- Further research on developing a scientific model to determine the most suitable project duration for a particular project.

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