

# Evaluation of The Factors Influencing Time And Cost Overrun In Construction Projects

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**Abstract-** Construction industry is considered as one of the most important and second largest industries in India after agriculture. It is well known that most construction projects in India, especially in Tamil Nadu are exposed to time and cost overrun or both. Time cost schedule is a crucial task in construction project management. This phenomenon may affect the progress of construction industry in Tamil Nadu as well as may expose many institutions of construction to be destroyed. For instance; it can materially help to identify the expected financial requirements. It is also an important tool for the time control process. Construction project time schedule is greatly affected by many uncertain but predictable factors. This research lists the main factors affecting time and cost overrun and discusses their influence on schedule performance. The main factors are analyzed using Statistical Package for the Social Science (SPSS 16.0). From the analysis planning and scheduling deficiencies, financial unavailability, quality of materials, rain / inclement weather effect, inaccurate time estimates, design changes by owner found to be most critical factors.

## I. INTRODUCTION

This thesis aims to identify the various factors influencing duration in construction based on type of projects. Normally the main goals of any successful construction project management system are to complete the project on time, within the planned budget, and with the required quality limits. The three goals are inter-related where each of them is affecting, and being affected by, the others. In order to meet the time deadline of a project, an accurate scheduling should be done. Due to the unique nature of construction projects, time contingency and project uncertainty are essential for accurate scheduling, which should be flexible enough to accommodate changes without negatively affecting the overall duration of the project. It is essential to allocate a contingency value to both cost and time. Yet, there are situations where there could be delays in activities that result in a delay in the overall project duration. These delays will consequently have a negative impact on the quality and budget of the project.

Therefore, estimating time contingency is seen as a major factor for achieving success in construction projects. Although several industrial sectors developed and used software for estimating time and cost contingencies in order to minimize delays and over budget, yet limited efforts are reported in the literature in the area of predicting time contingency in the construction sector.

## 1.2 PROJECT SUCCESS AND FAILURE

A successful project must be on time, on budget, and deliver quality (features and functions) as promised. Anything less will be either a failed project or a challenged project. The disturbing conclusion from this Standish report is that only 16.2% of projects were successful by all measures, and that of the 70% of projects that were not successful, Over 52 percent were partial failures and 31% were complete failures.

The top 5 factors found in successful projects are:

- User Involvement.
- Executive Management Support.
- Clear Statement of Requirements.
- Proper Planning.
- Realistic Expectations.

These were the elements that were most often pointed to as major contributors to project success. These elements alone could not guarantee a success project. But if these are done well, a project will have a much higher probability of success. The time cost overrun is the main effect of a failure project.

## 1.3 TIME AND COST OVERRUNS

One of the main objectives and policies of any public or private sectors dealing with the execution of projects is to upgrade projects performance, through reduction of costs, completion of projects within their assigned budget and time constraints, and improve quality. Construction industry is suffering from many problems which affect time, cost and quality.

Along with the peak progress in construction this industry faces severe problems too like cost and time overruns. The main factors affecting the cost and time overruns in each area can change depending on the cultural and behavioral aspects. In order to improve the situation, there is a need to pay more attention to the financial issues in the local construction industry, and there is a need for better communication and co-ordination with international funding agencies.

There is also an urgent need to develop human resources in the construction industry in India. Delay of project and cost overruns in Tamil nadu is one of most important problems at construction management field, also research and studies in this field in Tamil Nadu are very few compared to worthy expected results. Despite the importance and the significance of the construction sector in Tamil Nadu, it is noted that the parties of project (owner, consultant, and contractor) don't give the time and cost overruns the importance at the evaluation at the end of project.

### 1.3.1 Cost overrun

A cost overrun, also known as a cost increase or budget overrun, involves unexpected costs incurred in excess of budgeted amounts due to an underestimation of the actual cost during budgeting. Cost overrun should be distinguished from cost escalation, which is used to express an anticipated growth in a budgeted cost due to factors such as inflation.

Cost overrun is common in infrastructure, building, and technology projects. Many major construction projects have incurred cost overruns; cost estimates used to decide whether important transportation infrastructure should be built can mislead grossly and systematically. Many major construction projects have incurred cost overruns; cost estimates used to decide whether important transportation infrastructure should be built can mislead grossly and systematically.

### 1.3.2 Time overrun

Time is money to owners, builders, and users of the constructed facility. Delays in upgrading facilities translate into operating at below optimum efficiency resulting in higher user cost. Delays in constructing or rehabilitating infrastructure negatively affect businesses and the public at large. Time implications from the constructor's bonding capacity and ability to bid more work (opportunity cost). Inefficient time management results in higher labour and equipment costs.

There is an increase in the number of construction projects experiencing extensive delays leading to exceeding the initial time and cost budget. The construction process can be divided into three important phases, i.e. project conception, project design and project construction. Usually, the vast majority of project delays occur during the 'construction' phase, where many unforeseen factors are always involved. To the owner, delay means loss of revenue through non availability of production facilities and rentable space or a dependence on present facilities. In some cases, delay causes higher overhead costs to the contractor because of longer work period, higher material costs through inflation, and due to labour cost increases. Delays are usually accompanied by cost overruns. Cost and schedule overruns occur due to wide range of factors. If project costs or schedules exceed their planned targets, client satisfaction would be compromised.

When projects are delayed, they are either extended or accelerated and therefore, incur additional cost. The normal practices usually allow a percentage of the project cost as a contingency allowance in the contract price and this allowance is usually based on judgment. Even though the contract parties agree upon the extra time and cost associated with delay, in many cases there are problems between the owner and contractor as to whether the contractor is entitled to claim the extra cost.

Therefore, delays in construction projects cause dissatisfaction to all parties involved and the main role of the project manager is to make sure that projects are completed within the budgeted time and cost. In order to avoid the time cost overrun in construction projects great care should be given in,

- Planning
- Scheduling
- Responsibility

### 1.3.3 Good Planning

The first indicator, Good Planning, requires excellent forward planning, which includes detailed planning of the process implementation stages, task time lines, fall-back positions, and replanning. Notice that initial planning is not enough. Projects often take wrong turns, or initial solutions prove unfounded. The project manager who does not prepare to re-plan, or has not considered and planned fall back positions when initial plans fail, will often find that the project first stalls, and then fails. We must remember that project management is not a straight line process, but an iterative process that requires agile rethinking as the known environment changes before your eyes.

### 1.3.4 Responsible Team Members

This requires that all team members have a clear understanding of their roles and duties in the project. They must understand how expectations vs. achievements will be measured and graded. It is left to the project manager to properly implement the communication of these responsibilities, to provide feedback, and to assure all understand that for which they will be held accountable.

### 1.3.5 Schedule

This requires the continual monitoring and measurement of time, milestones, people, and equipment schedules. Properly done schedule control will also give the first hint that initial planning may not be going according to schedule. If you pick up on these hints, you have an opportunity to implement a fallback position and/or re-plan to get back on track.

The same paper finds two attributes that appeared equally for projects that succeeded or failed. These two were: Use of Consultants, and Well Qualified Personnel. Equal numbers of successful and failed projects used consultants, and the same was true for well-qualified personnel. It is perhaps disappointing that these two attributes did not portend project success.

For scheduling the day to day activities and the resources which are required to complete this activities the project management software's were used. Most commonly the project management software's such as primavera, sure tracking etc. are used.

## 1.4 RESEARCH PROBLEM

Project finishing on time and absence of cost overruns are considered the most important factors of successful projects, which help to decrease problems for all parties and give new chances to construct other related projects. It also helps to increase the profits and development of construction industry in Tamil Nadu. Most construction projects in Tamil Nadu are exposed to delay to the extent that it may extend to double the period of time specified for that project, causing loss of project's profit, increasing cost and leading to technical and managerial problems among project's parties. Cost overruns are also considered as another big problem, which hinders project's progress, since it decreases the contractor profit leading to huge losses leaving the project in a big trouble.

## 1.5 NEED FOR THE PROJECT

Time schedule is one of the most important tasks in construction project management. For instance, it is the base for the project time control. The importance of planning was specified in general as follows: First, to offset uncertainty and change; Second, to focus attention on objectives; Third, to gain economical operation; Fourth, to facilitate control. It has also an important role in cash flow prediction and resources management. One of the major functions of time schedule is the prediction of the expected project completion time. The reliability of such prediction is greatly affected by many uncertain but predictable factors. So, a certain time contingency should be added to the scheduled completion time to arrive at a more reliable prediction of duration.

The time contingency is the amount of time added to the base estimated duration to achieve a specific confidence level or allow for changes where experience shows obligation. An accurate estimating of time contingency is seen as a major factor for achieving a successful completion of the construction projects. Although several industrial sectors developed and used software for estimating time and cost contingencies in order to minimize delays and over budget, yet limited efforts are reported in the literature in the area of predicting time contingency in the construction sector.

This shortage of time and cost overruns control may be as a result of;

- Lack of knowledge and awareness about project performance;
- The distribution of delay and cost overruns responsibilities among the three parties (contractors, consultants and owners);
- The belief that the political conditions are the main reason of this problem.
- The problem of projects delay and cost overruns can nearly be noticed in every project at Tamil Nadu indicating that this problem didn't receive enough.
- Attention by both researches and responsible authorities.

## 1.6 OBJECTIVE OF THE PROJECT

The objective of this paper is to identify the main factors affecting time contingency based on a comprehensive survey among a collected samples of construction experts in Indian construction experts. In addition, a neural networks model was developed in order to help project planner to have a more reliable prediction for the amount of time contingency that should be added to the scheduled completion time.

The main objective of this research is to,

- To find out the factors affecting construction duration activity.
- Analyzing the most probable factor from the collected data Using SPSS.
- Combining the contingency value to the base estimate.

## II. LITERATURE REVIEW

### 2.1. GENERAL

One of the most important problems in the construction industry is time and cost overruns. Time and cost overruns occur in every construction project and the magnitude of these delays and cost overruns varies considerably from project to project. So it is essential to define the actual causes of time and cost overruns in order to minimize and avoid the delays and increasing cost in any construction project. This chapter reviews literature concerning the major issues of time and cost overruns in order to recognize the related information regard those issues.

This literature survey is based on factors affecting construction duration and construction duration estimation models. In the first section, the factors affecting construction durations are discussed. Then the types of models for estimating construction durations are defined. In the last part, the examples of modelling type and their comparisons are presented. There are many definitions of construction duration, but the most apt one has been given by,

**Aftab Hameed Memon et al., (2013)**, Controlling time and cost overrun of construction projects is very crucial in achieving successful completion of any projects. Unfortunately, construction industry today is facing a major risk in achieving completion of project within estimated time and cost. This risk is caused by various factors. Aiming to treat this problem, this study presents a framework for web-based expert and decision support system in order to assess the risk level of causative factors of time and cost overrun on project success throughout the lifecycle of construction process.

It will be integrated with project schedule to estimate the consequences of these factors and forecast the loss of time and cost if the risk factors are not controlled. This will be achieving by implanting the technique of neural network. The program will also be able to suggest the corrective actions in order to control the identified risk factors. Finally, various reports can be generated in presenting the associated problems of the factors and their relative impact of project performance.

**Desai Megha et al., (2013)**, Delays are unique one in every of the largest issues construction companies are facing today. Delays will result in several negative effects like law suits between house owners and contractors, exaggerated prices, loss of productivity and revenue, and contract termination. Albeit varied studies are thought of into the causes touching delays, these studies rarely discuss common and general causes of delays in construction comes.

Thus, comprehensive study on these delays is important. Present study works on identification of causes of delay in residential construction projects in Indian context. Literature review and structured interviews were carried out on construction projects in central Gujarat region of India. The paper presents the framework of causes of delays in residential construction projects. Total 59 causes were identified under 9 major groups.

An approach is suggested to carry out ranking of these causes by two different techniques: Relative importance index and Importance index based on degree of severity and degree of frequency. It is hoped that the findings of the paper will help the stakeholders to act on critical causes and further try to reduce delay of their projects.

**Divya.R1 et al., (2015)**, the construction industry is one of the main sectors that provide important ingredients for the development of an economy. The construction is the tool through which a society achieves its goals of urban and rural development .However it is becoming more complex because of the sophistication of the construction process itself and the large number of parties involved in the construction process, i.e., clients, users, designers, regulators, contractors, suppliers, subcontractors, and consultants. Modern construction projects are characterized by new standards, advanced technologies, multiparty participation, and frequent owner-desired changes. Coupled with this state are inherent uncertainties and complexities in the physical, financial, and economic environment in which most projects are performed.

Such conditions have made completing projects on schedule and on budget a difficult task to accomplish, often leading to claims on cost compensations and time extensions. This eventually leads to delay in the completion of the project. Delay could be defined as the time over run either beyond completion date specified in a contract or beyond the date that parties agree upon for delivery of a project. It is slipping over its planned schedule and is considered as common problem in construction projects. The objective of this study is to identify the major causes of construction delays, its effects, and minimizing delays in construction projects. This study is

carried out based on literature reviews and questionnaire survey.

**Dr. K. Subramanian *et al.*, (2013)**, Time overruns and Cost overruns has been considered as a major issue in many Indian construction projects. The successful execution of construction projects and keeping them within prescribed schedule and cost is very important for effective time performance and cost performance. This research work is carried out on studying significant factors causing Time overruns and Cost overruns in Indian construction projects.

A valid questionnaire for the survey was developed based on factors for time overruns and factors for cost overruns identified from literature review. These factors are grouped into 12 categories for time overruns and 8 categories for cost overruns and distributed to Contractors, Consultants, and Owners of Indian construction Industry. The data from the questionnaire was analyzed statistically. Relative important index method was used to found out the most significant factors affecting Time and Cost overruns. The result accomplished from the survey revealed that the major cause for time overruns are material market rate, contract modification, and high level of quality requirement and the major cause for cost overruns are high transportation cost, change in material specification, and escalation of materials price. The study findings highlight the significant factors and some recommendations are given to control time and cost overruns in Indian construction Industry.

**Dr. Peter Smitha (2014)**, This paper examines the global issues and challenges facing the project cost management profession. This relates to professionals in the fields of quantity surveying, cost engineering, project controls and project managers providing cost management services. As a profession that is not widely recognized in society compared to professional disciplines such as engineers and architects, the project cost management profession faces many challenges in creating greater awareness of the value that they provide for projects. The global construction industry is littered with many examples of high profile projects that have experienced significant time and cost overruns and this is merely a reflection of similar problems at all project levels. However, these high profile projects attract considerable attention in the wider community and highlight the need for more effective cost management and project controls.

The paper is based on a literature review of global project cost management issues and research undertaken through professional cost management associations that include the International Cost Engineering Council, the Pacific Association of Quantity Surveyors, the African Association of

Quantity Surveyors, the International Project Management Association, the Association for the Advancement of Cost Engineering, the China Engineering Cost Association and the Royal Institution of Chartered Surveyors.

The research identifies the need for global recognition of the profession and the development of global professional standards and certification programs. The paper culminates with a series of recommendations and strategies for the profession that includes formal recognition through global organisations such as the United Nations, the World Bank, the World Trade Organisation and the International Management Fund, the development of ISO cost management standards, formal recognition under the global Central Product Classification (CPC) scheme, development of a project cost management certification program for the European region and raising of global professional standards particularly in developing countries and countries where the profession is not traditionally recognised.

**Jose Ramon San Cristoba (2014)**, The construction sector represents one of the most dynamic and complex industrial environments where conflicts among builders and owners are very common particularly in a bidding or claiming situation where owners, builders and contractors pursue their own interests at the expense of the others, leading to conflict or cooperation. The time required to complete the project is usually greater than the time specified in the contract and, because of the overriding importance of time for both the owner and the contractor, delays are the source of frequent disputes and claims among owners, clients and consultants, leading to lawsuits.

There is a general consent between theorists that Game theory provides, by its very nature, the appropriate tools for the analysis and eventual solution of conflicts of any kind. The course of a conflict as well as its resolution depends on the decisions made by the various factors involved. Each party, when considering its decisions, should take into account the decisions made by all the other parties. Game theory is a natural tool that can be used in such interactive situations where the results of the interaction depend on all the players' decisions. Despite the extensive literature devoted to the delay is acknowledged as one of the most common, costly, and risky problems, and the source of frequent disputes and claims among owners, clients and consultants leading to lawsuits.

Such situations usually involve questioning the facts, causal factors, contract interpretations and quantum of the claims. Since the ability to make a claim is very much based on what the contract says about delays, contractual documentation needs to reflect the particular nature of each

project in order to prevent disputes and claims. This paper proposes a method based on game theory and applies it to a road building project, in order to identify the activities that are responsible for the delay of the project and divide the costs among them. Using the model presented in this paper, a wide variety of project situations can be modelled and placed as contractual obligations. The number of variables, equations, and inequalities needed to model these real-life situations will depend on the complexity of the problem.

**K. L. Ravisankar *et al.*, (2014)**, The Construction industry of India is an important indicator of the development, as it creates investment opportunities across various related sectors. The construction industry has contributed an estimated 670,778 crores to the national gross domestic product (GDP) in 2011-12 (a share of around 8%).

Delay in construction projects is considered one of the most common problems causing a multitude of negative effects on the construction projects. Construction delays can be minimized only when their cause are identified. The objective of this study was to identify the major causes of construction delays. A literature review was conducted to compile a list of delay causes in construction industry. The data for this study will be gathering through a detailed questionnaire survey. The questionnaire consists of total factors of seventeen group were contributed to the causes of construction delay based on literature review.

In that seventeen groups have been consist of total 50 factors for delay. The questionnaire form is forwarded to various construction industries through email and in personal. Based on the questionnaire survey the overall results indicated that the most important causes are:

(1) Shortage of unskilled & skilled labor; (2) Design changes by owner or his agent during construction; (3) Fluctuation of prices; (4) High waiting time for availability of work teams; (5) Rework due to errors; these are all the top five delay factors which affect construction project.

**Ketki S. Kamble (2013)**, Construction activities are the most competitive and it involves higher risk with minimum profitability due to competition. Construction of any infrastructural work involves complex management skills related to manpower, materials, plant, machineries, new technologies etc. It also involves many agencies interdependent on each other like the planners, structural and functional designers including various types of specialized engineers and it also includes support of financial institutions, insurers, contractors and specialized contractors. As there are

prevailing labour bye laws it needs special care of their well beings.

In such kind of complex and intense framework some disputes is quite natural between the agencies involved in such activities which further results in claims management as the unsettled dispute finally leads to financial claims. Higher incidences of disputes are generally reported from the construction contract. Even if there is an appropriate understanding of construction contract clauses from the agencies in the agreement yet claims seems to be a major crisis in the construction sector.

The research reported in this paper aims in identifying the major factors responsible of project delay that may give rise to claims for delay damages. The in this paper research mainly highlights on finding the major components of claims with perspective of contractor for delay damages.

**Megha Desai (2013)**, Delays are unique one in every of the largest issues construction companies are facing today. Delays will result in several negative effects like lawsuits between house owners and contractors, exaggerated prices, loss of productivity and revenue, and contract termination.

Thus, comprehensive study on delays in construction projects is important. Present study works on identification and ranking of causes of delay in residential construction projects in Indian context. This paper identifies the causes of delays in residential construction projects of Indian construction industry. Total 59 causes were identified under 9 major groups. Total 50 respondents comprises of 20 developers, 17 contractors and 13 architects who participated in this field survey. This paper suggests an approach to carry out ranking of causes of delay by two different techniques: Relative importance index and Importance index based on degree of severity and degree of frequency and also discuss about the ranking of thecauses. Results were shows that out of top 10 factors total 5 factors were common in ranking by both methods.

They were original contract duration is too short, shortage of labours, delay in material delivery, low productivity level of labours, delay in progress payments by owner. Moreover, by both methods labour related factors ranked first while external factor was considered having least effect on delay as it is ranked last. All three parties agreed on that labour related factor was most important while external factor was least important. It is hoped that the findings of the paper will help the stakeholders to act on critical causes and further try to reduce delay of their projects.

**Mohamed M. Marzouk (2014)**, Construction delays are common problems in civil engineering projects in Egypt. These problems occur frequently during project life-time leading to disputes and litigation. Therefore, it is essential to study and analyze causes of construction delays. This research presents a list of construction delay causes retrieved from literature. The feedback of construction experts was obtained through interviews.

Subsequently, a questionnaire survey was prepared. The questionnaire survey was distributed to thirty-three construction experts who represent owners, consultants, and contractor's organizations. Frequency Index, Severity Index, and Importance Index are calculated and according to the highest values of them the top ten delay causes of construction projects in Egypt are determined. A case study is analyzed and compared to the most important delay causes in the research. This paper analyzed causes of construction delays in Egypt.

The feedback of construction experts was obtained through interviews and questionnaire surveys. Frequency Index, Severity Index, and Importance Index are calculated and according to the highest values of them the top ten delay causes of construction projects in Egypt are determined. Statistical analysis is carried out using analysis of variance ANOVA method to test delay causes, obtained from the survey.

The most important delay causes groups of construction projects in Egypt are prioritized according to their significance to five levels Very High, High, Medium, Low, and Very Low. The survey results were discussed. Finally, recommendations have been made to construction projects' parties to accomplish delay reduction in construction projects. Statistical analysis is carried out using analysis of variance ANOVA method to test delay causes, obtained from the survey. The test results reveal good correlation between groups while there is significant difference between them for some delay causes and finally roadmap for prioritizing delay causes groups is presented.

**Mr. Salim S. Mulla et al., (2015)**, The Construction industry is one of the key economic industries in India and is the main motivating force in Indian national economy. But, it suffers from a number of problems that affect time, cost and quality performances. Successful management of construction projects is based on three major factors i.e. time, cost and quality. The successful completion of construction projects within the specified time has become the most valuable and challenging task for the Managers, Architects, Engineers and Contractors. How to achieve this task is a problem, which should be solved.

The overall objective of this study is to identify the factors responsible for overruns in time and cost of the construction project and suggest the suitable remedial solutions. Poor planning, implementation and management are the main reasons for time and cost overruns in construction projects in India. Since most of the reasons are well known and can be controlled if a proper arrangement is made.

**Muhammed Mufazzal Hossen et al., (2015)**, in this study, Nuclear Power Plant (NPP) construction schedule delay risk assessment methodology is developed and the construction delay risk is assessed for turnkey international NPP projects. Three levels of delay factors were selected through literature review and discussions with nuclear industry experts.

A questionnaire survey was conducted on the basis of an analytic hierarchy process (AHP) and Relative Importance Index (RII) methods and the schedule delay risk is assessed qualitatively and quantitatively by severity and frequency of occurrence of delay factors.

This study assigns four main delay factors to the first level: main contractor, utility, regulatory authority, and financial and country factor. The second and the third levels are designed with 12 sub-factors and 32 sub-sub-factors, respectively. This study finds the top five most important sub-sub-factors, which are as follows: policy changes, political instability and public intervention; uncompromising regulatory criteria and licensing documents conflicting with existing regulations; robust design document review procedures; redesign due to errors in design and design changes; and worldwide shortage of qualified and experienced nuclear specific equipment manufacturers. The proposed combined AHP-RII methodology is capable of assessing delay risk effectively and efficiently. Decision makers can apply risk informed decision making to avoid unexpected construction delays of NPPs.

**N. Hamzaha et al., (2011)**, Delay can be defined as time overrun or extension of time to complete the project. Construction delay is something that cannot be avoided especially in government agencies in Malaysia. Therefore delay is a situation when the actual progress of a construction project is slower than the planned schedule or late completion of the projects. The causes of delay are taken from the past literature review. There are two main types of delay: excusable delay and non-excusable delay. The literature reviews are summarized and the delay framework is constructed based on the literature review summary in context of public higher learning institution.

**PranitSathe (2015)**, not all the projects finish on time any within given budget. Delays and changes occur during construction that impact the schedule, consequently impacting the project in its completion. Delay of a construction project is defined as late completion of the project as compared to the planned schedule. Delays in construction projects are quite expensive; sometimes they may result in severe damages to the involved parties. The time and cost for performance of a project are usually important to the employer and contractor.

Time overruns always contributed as expensive to all parties. Delays are unique one in every of the largest issues construction companies are facing today. Delays will result in several negative effects like lawsuits between house owners and contractors, exaggerated prices, loss of productivity and revenue, and contract termination.

Thus, comprehensive study on delays in construction projects is important. The aim of this study is to discuss the most common existing delay analysis techniques as well as review the issue that are often missed in the analysis and required improvement need. The scope of this study involves investigating the techniques application thoroughly with the view to developing appropriate frame work for improving their proper uses, in order to help reduce frequent delay claims resolution difficulties.

**Ramanathan Chidambaram et al., (2010)**, nowadays projects are more complicated involving huge contract values, participants from multi-discipline, more specialized works, tighter schedule, stringent quality standards, etc. Ultimately, cost and time are the two key parameters that plays significant role in a project success. The study focuses on multiple Design and Build (D&B) project which has complicated risk and is governed by fixed contract sum (Lump sum). As such, there is no such specific study to address this problem faced in Malaysia construction industry.

Qualitative research was applied at three stages of projects for time delay and two aspects for cost overrun. This paper presents one aspect each for time delay and cost overrun. This benefits the industry in managing projects proactively with appropriate risk response plan to the respective region.

**RemonFayek Aziz Alexandria Engineering Journal (2013)**, Time is one of the major considerations throughout project management life cycle and can be regarded as one of the most important parameters of a project and the driving force of project success. Time delay is a very frequent phenomenon and is almost associated with nearly all constructing projects.

However, little effort has been made to curtail the phenomenon, this research work attempts to identify, investigate, and rank factors perceived to affect delays in the Egyptian construction projects with respect to their relative importance so as to proffer possible ways of coping with this phenomenon. To achieve this objective, researcher invited practitioners and experts, comprising a statistically representative sample to participate in a structured questionnaire survey. Brain storming was taken into consideration, through which a number of delay factors were identified in construction projects.

Totally, ninety-nine (99) factors were short-listed to be made part of the questionnaire survey and were identified and categorized into nine (9) 24major categories. The survey was conducted with experts and representatives from private, public, and local general construction firms. The data were analyzed using Relative Importance Index (RII), ranking and simple percentages. Ranking of factors and categories was demonstrated according to their importance level on delay, especially after 25/1/2011 (Egyptian revolution).

According to the case study results, the most contributing factors and categories (those need attention) to delays were discussed, and some recommendations were made in order to minimize and control delays in construction projects. Also, this paper can serve as a guide for all construction parties with effective management in construction projects to achieve a competitive level of quality and a time effective project.

**S. ShujaaSafdarGardeziaet al., (2013)**, the delays in the construction industry are a global phenomenon and are considered as one of the most persistent problems throughout the world. The construction industry of Pakistan is also no exception to it.

The key controlling features of time, cost, quality and safety for a project are adversely affected by the impacts of such delays. The delays in construction industry have many after effects among which the main are time extension, cost overrun, disputes, arbitrations and litigations. The main purpose of this study is to identify the delays that result in time extension factors for project completion. Earlier studies have mostly emphasized on the major causes or the effects of project delays.

This study investigates the factors contributing in time extensions in construction project according to key participants of the projects i.e. contractors, consultants and the clients. In this regards, the time extension data of almost 50 projects have been consulted to identify the significant factors



contributing in time extensions for completion of the projects. From the data, the 27 key factors were identified which have significant contributions in time extensions.

Based upon these factors, a questionnaire has been developed and distributed among professional working in the construction industry for their response to assess the contributions of these factors in the time extension grants in construction industry of Pakistan. The study revealed that domestic issues of the country are the major factors resulting in the delayed completion of the projects.

**Towhid Pourroostam et al., (2012)**, Delays are one of the biggest problems in construction projects in developing countries, as they cause a negative effect on the projects. Delays can be minimized only when their causes are identified. The aim of this paper is to identify the main causes and effects of delay in Iranian construction projects. The literature related to the field of causes and effects of delay in construction projects has been reviewed over the last decade. A questionnaire survey was conducted to solicit the causes and effect of delay from consultants and contractors' viewpoint. This study identified 10 most important causes of delay from a list of 28 different causes of delay and 6 different effects of delay.

The elements of this list have been identified on the basis of literature review over the last decade. The perspective of contractors and consultants has been analysed to rank the causes of delays based on their Relative Importance Index.

The 10 most causes of delay were: (1) delay in progress payment by client, (2) change orders by client during construction, (3) poor site management, (4) slowness in decision making process by client, (5) financial difficulties by contractors, (6) late in reviewing and approving design documents by client, (7) problems with subcontractors, (8) ineffective planning and scheduling of project by contractor, (9) mistakes and discrepancies in design documents, and (10) bad weather. Six major effects of delay were: (1) time overrun, (2) cost overrun, (3) disputes, (4) total abandonment (5) arbitration, and (6) litigation. The paper predicts some future trends and suggests certain areas in which future research on construction projects should be focused.

**Trefor P. Williams (2014)**, They discuss how text describing a construction project can be combined with numerical data to produce a prediction of the level of cost overrun using data mining classification algorithms. Modeling results found that a stacking model that combined the results from several classifiers produced the best results.

With the development of text mining algorithms that allow the extraction of information from the text, it may be possible to find indications of the projects' nature and likelihood to experience cost overruns. Text mining can be defined as the automatic discovery of previously unknown information from unstructured text data. Text mining involves extracting information of interest from text documents and then the use of data mining to discover new associations among the extracted information. The stacking ensemble model had an average accuracy of 43.72% for five model runs. The model performed best in predicting projects completed with large cost overruns and projects near the original low bid amount. It was found that a stacking model that used only numerical data produced predictions with lower precision and recall.

A potential application of this research is as an aid in budgeting sufficient funds to complete a construction project. Additionally, during the planning stages of a project the research can be used to identify a project that requires increased scrutiny during construction to avoid cost overruns.

**Ying-Mei Cheng (2013)**, Construction cost overrun is a common problem in construction industries. The objective of this research is to extract the key cost-influencing factors with new concepts and methods to help control the expenditure. Hence, this research adopts the Modified Delphi Method (MDM) with 2 groups and 2 rounds and Kawakita Jiro method (KJ) to consolidate the experts' opinions and identify and rank the key factors that affect project costs.

The Delphi method is suitable for extracting usable data from personal experiences which can be transformed into empirical data. The KJ method is a qualitative technique developed by Kawakita Jiro. It adopts the bottom-up sorting process and is very useful for classifying data. Ninety cost-influencing factors are collected from literary review and interviews with experts with practical cost control experiences in the construction companies (Group 1). The KJ method is used to consolidate these factors into 4 categories and down to a total of 42 factors. 2 rounds of questionnaires are then conducted to filter the key factors.

In order to verify views of those in the first group, Group 1 consists of experienced experts from the public sectors, consulting firms and construction companies as a comparison. Results of the analysis indicate that there are 16 key cost-influencing factors. Severity Index computation was then adopted to rank these key cost-influencing factors. The study renders that clearly defined scope of project in the contract and cost control are the major determinants for cost overrun.

### III. METHODOLOGY

#### 3.1 GENERAL

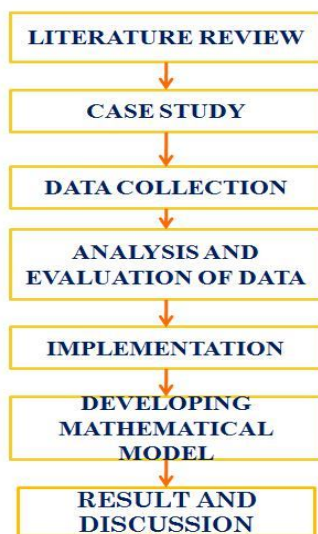
This describes the methodology of this project, the main topics included in this project are, It outlines the steps carried out in the following chapters in terms of fieldwork, analysis of dated, and deriving a conclusion. Factors that affect time contingency were identified through literature review as shown,

##### 3.1.1 Literature review

Collection of literatures and study of literature were done in this step. By studying these literatures it is able to understand various concept and methods followed in this concept.

##### 3.1.2 Case study

By conducting case studies of delayed project, the factors which are responsible for the time cost overrun in construction projects are identified.



##### 3.1.3 Data collection

In order to collect the data a questionnaire survey is conducted. The factors should identify the time cost overrun in the construction projects.

##### 3.1.3.1 Questionnaire Design

It has been assembled around of factors which affect the time and cost overruns in engineering projects in various

places around India and at intervals of time, but not all of these factors are consistent The selected factors commensurate with questionnaire content, the nature of construction projects and problem

##### 3.1.3.2 Questionnaire Content

The questionnaire includes the related factors of time and cost overruns at construction projects .Factors influencing time overruns and factors influencing cost overruns are included.

##### 3.1.4 Analysis and evaluation of data

In order to be able to select the appropriate method of analysis, the level of measurement must be understood.. In this research, ordinal scales were used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement to the degree of influence (0, 2, 3, 4) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities.

##### 3.1.5 Implementation

Analysis of questionnaire data's and data entry to statistical packages for social sciences was done in this step.

##### 3.1.6 Developing mathematical model

A mathematical model was going to develop using beta distribution equation.

##### 3.1.7 Results and discussions

The factors influencing time cost overrun is analyze and evaluated.

### IV. QUESTIONNAIRE SURVEY

#### 4.1 GENERAL

A questionnaire was designed and constructed to survey the situation and reliability of time cost overrun in construction projects.

NAME	<b>VIJAYAN.S</b>
DESIGNATION	<b>OWNER</b>
NO. OF YEARS EXPERIENCE	<b>8 Years</b>
NAME OF THE CONSTRUCTION	<b>VRP BUILDERS</b>
LOCATION	<b>ERODE</b>
ADDRESS	<b>5/1139-A, LAKSHMI NAGAR</b>
TELEPHONE	<b>9965233000</b>
EMAIL ID	<b>vijicivil@gmail.com</b>
GENERAL :	
Sl No.	
1	Site area. Panchayath <input type="checkbox"/> Municipality <input checked="" type="checkbox"/> Corporation <input type="checkbox"/>
2	Project sector. Public <input type="checkbox"/> co-operative <input type="checkbox"/> private <input checked="" type="checkbox"/>
3	Level of success of the project. High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
4	Project completion is done with in the time and estimated cost. High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
HUMAN RESOURCE RELATED	
5	Payment to Labours. High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
6	The skill of Contractors and workers High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>

16	Speed of decision making High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
17	Site clearance difficulties High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
18	Poor site management and supervision High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
19	Shortage of Technical, managerial and supervisory personnel High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input checked="" type="checkbox"/>
20	Slow to give instructions High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input checked="" type="checkbox"/>
21	Client initiated variations High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
22	Unstable management structure and style of contractor High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
23	Cash problems during construction High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
MONEY RELATED	
24	Financial unavailability High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>

7	Sufficient number of Staffs High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
8	Unrealistic owner requirement High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
9	The contractors past history was good High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
10	The experience of labours and clients. High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
11	Labour Supply for requirement High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
12	contractor relationship with owner and client High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
13	Any violations done by the contractor in ethical values to make more profit High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
14	waiting time for approval of offset and poor inspection High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
15	Regular owner interference in the site High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>

25	Funding efficiency High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
MATERIAL RELATED	
26	Material Shortage High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
27	Change in type & Spec. High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
28	Material Procurement High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
30	Delivery of material High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
31	Damage in storage while needed at site High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
32	Delay in special manufacturer from foreign country (Imported ) High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input checked="" type="checkbox"/>
33	Quality of materials High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
34	Escalation in prices High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>

35	Difficulty in obtaining at official current prices High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
EQUIPMENT RELATED	
36	Lack of acquiring new equipments High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
37	Equipment and tools shortage High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
38	Failure High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
39	Poor productivity High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
40	Slow supply High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
41	Unskilled operators High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input checked="" type="checkbox"/>
ENVIRONMENT RELATED FACTORS	
42	Hot weather effect on construction activity High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
43	Rain / inclement weather effect on construction High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>

52	Mistakes in soil investigation High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
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**V. SCOPE OF THE FUTURE PROJECT**

The project on the topic Time and Cost Overrun of Construction. Various aspects of the time and cost overrun were studied and listed. The questionnaires to conduct survey in different projects and case studies were prepared. The main factors of time and cost overrun are listed as contractor’s factors, client factors and owner related factors. The rest of the project is the questionnaire surveying, Case studies and ranking the findings as per importance index method. This research has identified and, based on the quantified relative importance indices, determined the influence ranks of 52 questions.

- To analysis the factors affecting time and cost overruns.
- To correct date from various people.
- To study the impact of time and cost overrun.
- To understand the ways to avoid cost and time overruns in the project.

44	Social and cultural factor High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
45	Insufficient available utilities on site High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>
OTHERS	
46	Design changes by owner High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input checked="" type="checkbox"/>
47	Planning and scheduling deficiencies High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
48	Inaccurate time estimates High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input checked="" type="checkbox"/>
49	Preparation of schedule networks and revisions by consultant during construction High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
50	Lack of database in estimating activity duration and resources High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> negligible <input type="checkbox"/>
51	Poor judgment and experience of involved people in estimating time and resources High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input checked="" type="checkbox"/> negligible <input type="checkbox"/>

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