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CAUSES OF DELAYS IN TRANSPORTATION INFRASTRUCTURE AND ITS REMEDIAL MEASURES

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Abstract: Delays in road building projects are a big concern for construction professionals for a number of reasons. The inability to complete projects on time and on budget is a chronic problem around the world. The aim of this research is to identify the top ten reasons for road construction project delays in the Pune region. There are two sections to the analysis. First, we gathered information on the most common delays in road construction projects. Second, they looked at the magnitude of each cause of project delays. Given the existence of the data, the researchers used a quasi-meta-analysis to process the data in order to be more precise in their methodology. Half of the constructions projects have similar causes of delay, and based on the severity findings, 50% of the constructions listed the top ten primary causes of delay in road construction projects. The strength findings are used in this analysis. According to the results of the homologation, the lack of expertise of the construction manager, insufficient preparation, scheduling, and effect on people's land adjacent to the road construction project have more significant impacts than frequent design changes, which were identified as the most common cause of delay.

Keywords: Developing Countries; Untimed Completion; Construction Delay; Road Project

I INTRODUCTION

Construction industry plays an important role within the economic process of a rustic through the multiple effects of the opposite sectors of economy. Construction is defined as a creation, renovation, repair and demolition of immobile structures and alteration of natural topography. It is somewhat just like the process to satisfy the desired demand of homeowners like modification of arrange specifications and resources within the project schedule, cost and quality.

Due to the unique nature of construction project, knowledge gained in coming up with, scheduling and dominant construction method is seldom unfold. This results in value of in-efficiency that is being incurred as a requiring cost. By taking the expenditure of construction industry, the Project Management profession became much valuable in order to create positive the project goes in an exceedingly right track to complete with success. The project management acts as a critical path in construction project, where it contains the information of coming up with, scheduling, controlling and implementing the things. Developing good construction

arrange is vital path in construction management. A plan acts as a basis for developing budget and schedule of the work.

A project is now thought of as a cluster of activates interrelated, which could embody a task of specialist and specialized work victimization latest information and talented men out there to be order taken in most systematic manners. The” most systematic manner” involves adoption of techniques are applied to Project Management.

After the agricultural industry, the construction industry is considered as the second highest grossing industry India that contributes to the estimation of 308 billion rupees to the national GDP in the year 2011-2012. This industry is considered as the important developmental indicator of the investment opportunities in the related sector that ultimately ensure the overall improvement. In India, the industry is fragmented in nature and involved in construction across the segments. It also contributes to the development of the small and medium size organizations and carries out the work in the respective fields. In addition, it has been found that the construction industry is labour intensive in nature and it provides job to more than 35 million people in the country.

However, the construction sector of India has been facing problem regarding various internal and external environment pressures. These issues result in the restriction in the flow of construction work. Government action issues are associated with the development of transparency in the legislation and regulation that initially create an obstacle to starting the project. In addition, the market pressure restricts the better performances regarding the progression of the construction work. Internal restrictions are associated with institutional initiatives. Lack of the initiatives did not provide the necessary support to the construction industry. Operational inefficiency between the pressure groups and informed employees to work in collaboration results in the creation of deterioration of the environment. Furthermore, the occurrence of the obstacles mainly results in the delay of the completion of the construction project.

The major concern of the issues in this research is associated with identification of the reasons that are responsible for the delaying nature of the construction process. It has been found that there are some kinds of delay issues are associated with the project. It is essential for the researcher to indicate the delay reasons and find out the impact of the delay on the Indian construction industry. Moreover, it is not possible to determine all kind of issues by the project managers during the progression of the construction as some of the issues arise in an unexpected manner. The research issue is associated with collect the evidence and factors via extensive research and information collection from several case studies.

The research issue is serious because it is not easy to collect the reasons for the delay in the major construction project of India. However, the nature of the delay in the work is different for different projects. In some cases, it is associated with anon-excusable delay that completely highlights the negligence of the contractor and poor site management or breakdown of the equipment. Moreover, some delays are associated with concurrent delays that are associated with more than one type of delays. Therefore, the researcher may have face difficulties in the collection of the information by providing anequal concentration in every study.

The research will cover a vast area of the issues prominent in the construction industry results in the delay of the work. This research will shed light on different delay issues can be raised from the construction progression. Moreover, it will help the learner to gain knowledge about the kind of delays can be occurred from the construction. In addition, the research outcome can develop awareness in government and towards the project managers to consider the occurrence of the delay to restrict the extension of the construction for a long period. In addition, the research work will help the construction project manager and contractor to

understand the areas that contribute to the enhancement of the costs related to construction. Moreover, it helps to develop a proper way of risk management that can reduce the occurrence of project delay risks.

II LITERATURE SURVEY

Delays are one of the main complications facing by the building production. The interruptions in building plans have weighty economic and public effect to all parties involved in the projects. Construction interruption is a main difficulty facing by the building industry. In most construction projects, there are delays and their impact level varies from plan to project ranging since a few days to years. It is regularly understood that the building interruption is the greatest critical factors affecting to deliver the plan in time, within budget, and expected quality. It can be found rarely that a project was completed within the specified time. There are various negative belongings of delays such as proceedings among owners and contractors, increased costs, loss of productivity and income, and indenture finish. Effects of delays which mainly marks are loss of Interest by the Investor, prohibit by Consultants, unused of Money and Time, Declination of Reputation etc. Delays began by servicers can commonly be official to poor supervisory expertise. Lack of scheduling and a meager accepting of accounting and economic moralities have led to many a contractor's downfall. In this study, most critical factors causing delay and their effects in large residential construction projects in India A project is now thought of as a cluster of activates interrelated, which could embody a task of specialist and specific work oppression modern info and a gifted men out there to be direction taken in most organized protocols.

The primary purpose of roads is to facilitate access and mobility. At the moment, developing countries all over the world are focusing on improving and connecting their road networks. Given that a good road network contributes to the development of the economy and national growth, road projects are being prioritised in their national budget. Without sufficient transportation facilities, the writers would be unable to supply goods and services. As a result, road projects should be completed on time in order to satisfy the immediate needs of stakeholders. Unfortunately, delays in road building projects are a big concern for construction professionals for a number of reasons. It has been identified that the failure to complete projects on schedule and within budget is a chronic problem around the world [1].

While the causes of delays are fairly consistent across developing countries, some factors are unmistakably related to local industries, socioeconomic backgrounds, cultural issues, and project features, such as land disputes and road right-of-way issues. With road building projects already

causing a slew of problems for the city, such as increased traffic and the risk of road accidents, project managers are also dealing with the effects of project failure, profit loss, and public distrust of government-funded projects. As a result, timely completion of a road project is extremely necessary. “, according to Card [2]. The development of scientific knowledge is focused on the systematic construction of one study on top of a foundation of prior research, the accumulation of which brings our understanding to ever-increasing heights.” As a result, the authors will compile the leading causes in order to build a better framework to resolve the current problems faced by the construction sector in the process of developing a road. The method used to perform this research is a universal comparison of different research studies on the causes of road project delays in these countries. The researchers will identify the primary factors that affect the late completion of a road project and, based on a literature review, will suggest validated strategies to resolve the issue. Meanwhile, the research results may be used as a guide for road project implementers, both the government and the contractor, in terms of the precautionary measures that should be taken to prevent project delays.

Road delays are common, according to Battaineh [3]. For new road schemes, the average proportion of actual completion period to planned duration is about 160 percent. Delays have negative effects for all project members. They have an effect on the rise in confrontational relationships, distrust, lawsuits, arbitration, cash-flow problems, and overall anxiety [4]. This is an issue that affects all countries, not only developed ones. The same problems occur in developed countries [5]. The majority of construction project delays, according to Duran's [6] report, were not handled adequately or stringently. It was also easy to see that there was no research at all. Contingency is a common way to back up delays as an upfront tactic. As a result, project completion dates are difficult to predict. The importance of delays in the implementation of construction projects was highlighted in the report. The study's main goal is to suggest preventative steps that will help road project implementers minimise delays in road construction projects based on the findings of an analysis that identified the ten (10) most common reasons for delays in road construction projects in 25 developing countries. Furthermore, this research identifies the risk of delivery delays in road construction projects in these countries. The aim of this research is to gain a better understanding of the primary causes of delays in road construction projects. As a result, it is important to comprehend what a project is and how the writers can bring a project's concept to life.

A project, according to Loftus [7], is a one-time endeavour with a beginning and an end. It produces a one-of-a-kind output, service, or result. The Planning and Definition Stage, the Design Stage, and the Procurement and Construction Stage are the three main phases that must be completed in order for it to be built. The owner decides the primary criteria and establishes the initial budgetary constraints in the first level. The establishment of the large project components such as the scope, the equipment that will be needed, and the primary outcomes anticipated is referred to as the specification of the key specifications. The information gathered for the project's key features would assist the owner in estimating the amount of money needed for the construction. The second stage will be built on this knowledge. Sears and Clough [8] describe the second level, which includes engineering and architectural stages, in conjunction with this project management theory. The preparation of final working designs and specifications for the technical requirements is the primary goal of this process. The engineers and technical staff will plan the key tasks for the project's development during this process. The schedule specifies what will be done, how it will be done, and how it will be accomplished. The aim of scheduling is to break down the project into several smaller pieces, known as activities. The contractors will develop a calendar-date agenda for the scheduling of particular events until the construction schedule is complete.

The third phase, according to Sears and Clough [8], is the distribution phase, during which the main project equipment and materials will be collected. According to the writers, the construction process should be viewed as a procedure for the project's physical development. To complete the project successfully, this task entails setting up supplies, personnel, and construction equipment, as well as resolving workforce concerns. Burke [9] defines a delay as "the occurrence of anything occurring later than scheduled," and he claims that delays can be classified in four ways: "Critical or Non-Critical, Excusable or Non-Excusable, Compensable or Non-Compensable, and Concurrent or Non-Concurrent." The ones that have a significant impact on project completion are known as critical delays. The classification of critical factors varies depending on the project; however, certain factors may influence which activities are classified as critical. The construction equipment specifications, the project's physical limitations, and so on are some of these considerations. Excusable-Non-Excusable Delays is the second category, which applies to delays caused by unforeseeable incidents such as general labour strikes, burning, flooding, weather shifts, and force majeure events. To summarise certain delays for which the contractor can be paid, the third type of delay,

Compensable Delay, introduces delays for which the contractor can be compensated for the occurrence of one determined incident. Returning momentarily to the second type of delay, the third type of delay is often caused by unexpected events.

To avoid conflicts between the contractor and the owner, it's essential to specify which items in the construction contract are non-compensable and which are compensable. Finally, the fourth type of delay, known as Concurrent Delay, occurs when a concurrency conflict emerges not from a desire to identify the project's extreme delays, but rather from a desire to allocate responsibility for losses incurred by critical path delays. Trauner, Manginelli, and Nagata [10] proposed a relationship between the delays in their investigation of the key causes of construction delays. Because of two factors, identifying the primary cause of project construction delays is a vital component of project management. The effective management of delays helps the project's priorities and the allocation for reliabilities to be met. When the contractor is responsible for the delay, the contractor must compensate the damage incurred by the delay, according to Sears and Clough [8]. The contractor must seek extra contract time because the owner is to blame for the delay. Construction delays, according to Faridi and El-Sayegh [11], are the most common problems in the construction industry, affecting project performance in terms of safety, expense, time, and efficiency. As a result, the owner and contractor must make it a priority to define and recognize the most important causes of project delays in order to minimize the extent of their effect on the construction project.

According to an analysis of the factors that cause delays in road construction projects, the most serious problems are human-related. They can be handled and minimised by developing the construction sides' skills [12]. Santoso and Soeng [13] stressed that delays have an effect on not only the project's final completion date, but also its cost and quality. Authorities of utilities must be included in recommendations to reduce delays in road projects at an early stage. Consistent meetings with the authorities are essential for recognising and accommodating their needs during the project's first step. This method allows service authorities to plan their work packages and oversee the procurement of the materials needed for the project. As a result, it is projected to have a minor negative impact on the road project [14]. According to a study by Mahamid [12], construction parties' administrative skills should be improved, a labour incentive system built, and coordination between construction parties should be improved at the early stages of the project to avoid late changes during the construction process. Furthermore, the contract awarding process could be strengthened. To avoid schedule delays in public building programmes, bidders'

resources and skills should be thoroughly investigated. Controlling cost overruns and calculating a reasonable budget are crucial for a successful Social Overhead Capital (SOC) project. Cost overruns can be caused by a variety of factors, including changes in the project scope, construction delays, inaccurate estimation, cost changes, and the absence of an earned value management system [15].

III RESEARCH METHODOLOGY

Research methodology is carefully designed after assessing the extent of the objectives to be fulfilled. The Questionnaire is believed to be the best technique for gathering the required data. The questionnaire has to be designed and distributed to the Government clients that are in charge of executing public projects, companies, contractors and their consultants that are supervising these projects. A questionnaire is developed in order to evaluate the severity and importance of the identified causes. The data collected to determine the most influential factors on project management of the project was done through a survey by explorative questionnaire to the respondents involved in daily activities of construction firms in various regions in the Pune region of India. The questionnaire was designed so that respondents can give the rank to their answers based on their opinions.

The questionnaire is divided into two main parts:

Part 1- is related to general information for both the company and respondent. Owners, contractors and consultants were further requested to answer questions pertaining to their experience in the construction industry and their opinions about the percentage average time delay in projects they experienced.

Part 2- it includes the list of identified causes of delay in construction project. These factors are classified into groups according to the sources of delay.

For each factor or cause two questions are asked:

1. What is the frequency of occurrence for the cause?
2. What is the degree of severity of the cause in project delay?

Further, both frequency of occurrence and severity should be categorized as follows: always, often, sometimes and rarely. Similarly, degree of severity should be categorized as follows: extreme, great, moderate and little. This section of the research, the major concern is associated with the development of the methods and the germane processes for the research that can help the researcher to complete the research study. In this chapter, the various process of the research philosophy, paradigm, approach, and designs have been discussed with proper justification and arguments. Based on the literature findings the researcher has selected the parameters of the research that provide support for the

consideration of the methods has been followed by another researcher. Moreover, throughout the discussion, a proper justification for the selection of the appropriate research strategies has been mentioned and has been thoroughly supported by the researcher. and the flow chart of the project work.

- First we analyze the background study with scope and challenges currently face by construction industry.
- Then analyze current scenario of construction industry.
- Analyze the policy implement by government industry.
- Then find the causes of delays in construction.
- Change the procedure of implementation.
- Finally find the impact as well as analysis after the change.

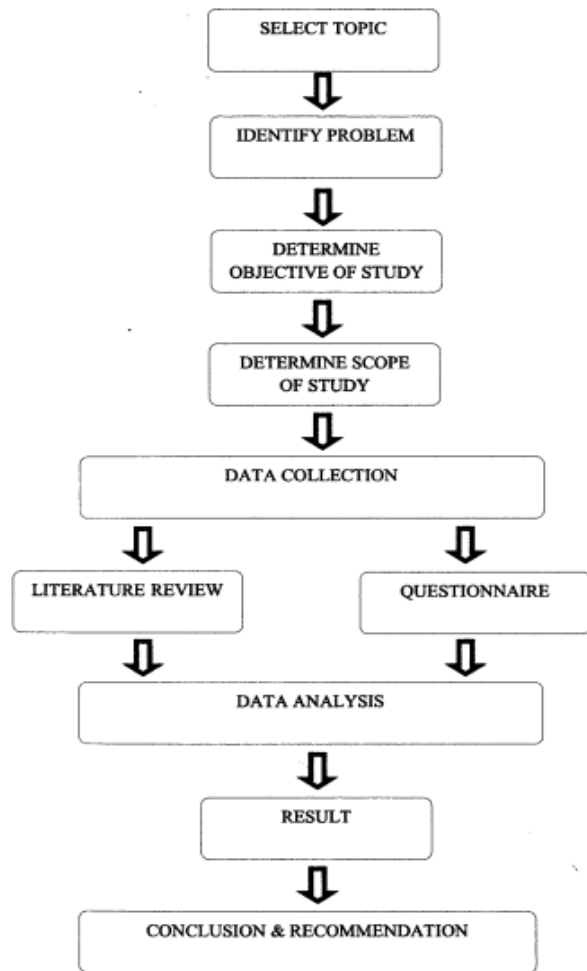


Figure 1: Methodology of Study

The research methodology is a description of how the objectives can be realized. The data collection can be found

through qualitative and quantitative methods. The data collection through these methods will be analyzed and the results will be presented. In this study, a questionnaire was developed to assess the perceptions of consultants and contractors on the relative importance of causes and effects of delays in construction industry in Skudai, Johor. The questionnaire was divided into three parts. The first part requested background information about the respondents. The second part of the questionnaire focused on causes of construction delay. The respondents were asked to indicate their response category on 24 well-organized construction delay factors and some other additional causes from the literature review that is suitable.

The relative importance index, RII, was computed for each cause to identify the most significant causes. The causes were ranked based on RII values. From the ranking assigned to each cause of delays, it was possible to identify the most important factors or causes of delays in Indian construction industry. Base on the ranking, the 10 most important causes of material management by RII approach.

Data Analysis of Delay Analysis in Residential Project

The data analysis is determined to establish the relative importance of various factors that contribute to causes, effects, and minimization if construction delays. Analysis of data consists of the following:

- 1) Calculating the Relative Importance Index (RII)
- 2) Ranking of factors in each category based on the Relative Importance Index (RII)

$$RII = \frac{\sum W}{A+N}$$

Where, RII is the Relative Importance Index,

W = weighting given to each factor by the respondents (ranging from 1 to 4),

A = highest weight (i.e. 4),

N = total number of respondents.

Where W is weighting given to each factor by the respondents (ranging from 1 to 4), A is the highest weight (in this case is 4) and N is the total number of respondents. The RII value is range from 0 to 1 which the higher the value of RII, the more important was the cause and effect of delays. The RII was used to rank the different causes. The RII is then being classified based on the RII classification table as shows in Table 1. The discussion will be made when the RII was classified as most preferred causes and effects of delay only.

The Table 1 shows the causes of delay which is calculated using RII approach. The delay has calculated for consultant as well as contractor. Using the Table 1 we can easily find impact scenario related to factor as well as we can do the ranking also

Table 1 : weight calculation of all parameters caused of delay using RII

Sr No	Causes of delays	Weight
1	Ineffective construction method implemented by contractor	0.78
2	Shortage of materials	0.85
3	Payment problems between contractor and his employees	0.86
4	Improper planning and scheduling of project by contractor	0.83
5	Shortage of manpower	0.80
6	Shortage of equipment	0.79
7	Interference by the owner during execution operation	0.75
8	Delay in decision making by the owner	0.78
9	Budget availability for the project	0.72
10	Lateness in reviewing and approving contract documents by the owner	0.71
11	Suspension of work by owner	0.70
12	Delay in solving design problem	0.82
13	Major change of design during construction by consultant	0.81
14	Bad project cost estimation	0.69
15	Lack of competent person to monitor the progress at site	0.70
16	Delay in performing testing and inspection by consultant	0.68
17	Difficulties in obtaining work permits	0.82
18	Land acquisition	0.86
19	Traffic diversion	0.82
20	Hot weather effect on execution activities	0.80
21	Scarcity of materials in the market	0.74
22	Effect of social and cultural conditions of inhabitants	0.80
23	Political situation and security	0.65
24	Accidents at execution site	0.61

IV CONCLUSION

In this section of the conclusion chapter, the researcher has intended to analyze the qualitative data and develop the appropriate conclusion for the research. The entire discussion related to the findings from the case study and the responses provided by the managers regarding the questionnaires has been aligned with the research. In the next

section, the researcher has described the background of the research and relates the objectives with the findings from the data. Moreover, depending on the conclusion the researcher has suggested some recommendations that can address the delay issues of the research. In addition, the research has also highlighted the future scope of the research.

The first step in reducing the delays is to understand the root causes of the delays. Payment problems between contractor and his employees and Land acquisition are the two most influence factors that generate the delay in road construction. The problem of construction delays in transportation infrastructure is frequent and notable; one of the major hurdle in transportation infrastructure projects is land acquisition which is never easy issue to be solved. As far as effect is concern, most of the respondents feel that it delays result in time overrun. Some of the causes to be addressed are beyond the control of all the project parties such as differing site conditions, social and cultural factors related with projects.

Future Scope

For the future enhancement we can extend the proposed system into different levels these points are below

- The study has done using perceptual data of consultant as well as contractor which may not provide cleared responses, however this can be overcome using multiple methods to collect data in future studies.
- For more accuracy for finding the delay from two different techniques is also next phase of research.
- Consider some other factors in real time construction and influence these factors for different types of delay.
- Predict the accurate cost and time overhead during the construction.

Execute or recommend the new scenario for minimize the delay as well as reduce the cost and time overhead in real time construction

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