

A Literature Review on Causes of Delays in Transportation Infrastructure

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Abstract - Infrastructure projects in India are currently worth around \$500 million according to the 11th five year plan. Also a huge number of these projects are getting delayed invariably. According to the MoSPI reports the cost overruns in the on-going projects are larger than the three consecutive fiscal packages announced during 2008-09! This is indicative of the fact that the causes of delays and their implications on the cost and time overruns warrant the need of studying. This study covers the various causes of delays in detail, as well as delays which are caused at various stages of the project. For this study only the transportation infrastructure projects are considered. As a part of data collection, the study includes the random sample of road, railway, and civilian airport and sea ports. Also, the locations of the projects need to be considered for drawing certain conclusions. The study basically carries a qualitative and quantitative assessment of the causes of the delays.

Keywords: Delay Causes, Road Infrastructure, Transportation, Delay Effects, Cost Overrun, Decision Making, Poor Planning & Management.

I. INTRODUCTION

Delays are an integral part of any construction project; they may be insignificant or otherwise. However considering the Indian scenario, the later i.e. the significant delays are almost universally associated with the word 'delay'. Almost every other Infrastructure project in the country gets delayed, barring an odd Hyderabad airport or a Delhi Metro.

India being a rapidly developing country needs an equally rapidly developing infrastructure. The infrastructural development is indeed the backbone of the country's economic progress and constitutes a great extent of the fiscal spending. India is no different to this exception and the government has duly increased spending on the infrastructure projects. According to the 11th five year plan, the government has planned a spending to the tune of \$500 billion on

infrastructure projects. This comes to about 7.5% to 8% of the GDP of India.

These are figures which indicate a drive towards infrastructure projects of far greater size and complexity on a never seen before scale. The number of mega-projects i.e. projects costing over Rs.1000 crores have grown exponentially. However all is not rosy, as the figures show. With increasing size have come increased problems.

Hence there is a need of concentrating on the causes of the delays. The various types of delays, caused in the various stages of work need to be studied. There has been a great deal of study in this respect. However, an in depth study about the various causes of delays occurring at the different stages of the project life cycle has seldom been carried out. This thesis thus aims at carrying out a quantitative study of the various causes of delays and trying to rank them in general based on some identified parameters.

II. STUDY OBJECTIVES

The main objectives of the study basically to answer the following questions:

1. To identify the causes of delays in infrastructure construction in India.
2. To study the differences in perceptions of the three major parties in any constructions, namely, i.e. owners, contractors and consultants.
3. To know the aim to develop a broad knowledge of the primary causes of delays in road construction projects.
4. To find the critical path of project, any changes or disruptions to the original schedule.

III. LITERATURE REVIEW

Mohammad Al-Mohammad (January 2018 attempts towards reviewing past literature on causes of delay in different types of construction. The most common methods adopted by researchers for causes of delay identification were presented. Time is one of the keys by which project success can be measured. However, delay in construction projects remains a common occurrence.

Ram Singh, special article Economic and political Weekly (2010) concluded on, "Delays and Cost Overruns in Infrastructure Projects: Extent, Causes and Remedies". He found that, delays are one of the crucial causes behind the cost overruns. Bigger projects have experienced much higher cost overruns compared to smaller ones. Compared to other sectors, projects in road, railways, urban-development sectors, as well as those in civil aviation, shipping and ports, and power sectors have experienced much longer delays. Analysis shows that, due to imperfect techniques and contractual incompleteness some delays and cost overruns are inevitable. However, delays are too frequent and too large to be accounted for by imperfect techniques, contractual incompleteness and inflationary fluctuations.

Flyvbjerg, Holm and Buhl (2002, 2003, and 2004) have shown that infrastructure projects often suffer from cost overruns. Merewitz (1973), Kain (1990), Pickrell (1990), Skamris and Flyvbjerg (1997), among others, have also come out with similar findings. In addition, there are numerous case studies depicting the extent and gravity of delays and cost overruns. However, these empirical works do not explain why delays and cost overruns occur. But, the theoretical literature on the subject offers several explanations

Ubaid discussed the performance of contractors as one of the major causes of delay. Thirteen (13) major measures were considered. These measures are related to contractor resources and capabilities. Study concluded that lack of experience, poor estimation practices, bad decisions in regulating company's policy, and national slump in the economy are the severe factors.

IV. RESEARCH METHODOLOGY

The would primarily consist studying the various causes of delays and their relative degree of importance. Hence we have conducted a fair deal of literature review and studied a number of projects which have got delayed. Further data collection was also done with the help of a questionnaire. The problem identification was also based on the mini thesis which we conducted earlier.

We aimed to basically have a better understanding of the causes of delays which occur in the transportation infrastructure projects. Further the main problem of the study was identified as the ranking of the various causes of the delays. This ranking would be on a relative basis to clearly understand which causes are more significant and which are not so significant.

V. DATA COLLECTION

5.1 For the purpose of literature review, we have carried out a survey of 40 infrastructure projects, which are in various stages of completion. These projects basically belong to the aforementioned transport infrastructure sector. This study involves the collection of information regarding each project on the following basis:

1. The type of project, i.e. to which sector it belongs.
2. The size of the project in terms of its cost.
3. The location of the project.
4. The quantum of time overruns and cost overruns involved before or during the execution of the work.
5. The causes attributed to the delays.

This study generated two results, while the frequency and intensity of each cause of delay were identified. Repetition ranks the cause of delay in the number of countries in which the delay was mentioned in the comprehensive data gathered. One of the main findings is that the frequency of a delay does not always imply importance. According to the results of the homology in the assessment of the impact of the causes of delay, the lack of experience of the construction manager and the inadequate planning and scheduling and influence on people's land alongside the road construction project (expropriation for the construction of the project) have a more significant

impact than the frequent changes to the design (which was listed as the most frequent cause of delay). Below is the list of the most important causes of delay:

This section discusses the results obtained in the previous section. First, we discuss the severest and most frequent causes of delay within each group. Second, we discuss the most frequent effects of delay

Causes related to owner

- Interference in work by owner: interference in work was ranked as the first severest cause related to owner. According to conditions of contract, the owner has the right to suspend any part of work if it is required to restudy or redesign the project to make the necessary modifications. If interference by owner will frequent without reason it may obstruct the work of contractor, and causes delay for the project.

- Delay in decision making: The results indicated that delay in decision making is the second severest cause related to owner. Slowness of owner in making decisions may hold back some of project activities, and delay in settlement of contractor's claims by the owner, such as approval of new work items, prices and additional costs for changes in design. This may obstruct the progress of work and subject the project for delay.

- Delay in progress payments by owner: the results shows that progress payment is third severest cause related to owner. This may occur due to unavailable financial resources to other projects. Without providing the budget, the project remains only in papers without execution.

Causes related to contractor

- Ineffective construction method implemented by contractor: this was ranked as the first severest cause related to contractor. Contractors may fail to come out with a practical work program at the initial work stage. This failure is interrelated with lack of effective methods of construction and insufficient contractor's experience towards the projects. Improper planning at Extremely Severe Very Severe Severe International Journal of Scientific and Research Publications, Volume 5, Issue 6, June 2015 7 ISSN 2250-3153 www.ijsrp.org the initial stages of a project causes delays at various stages.

- Shortage of materials: The contractor obligates himself to provide the required equipment and materials to execute the project within the time schedule. Shortage or unavailability of the required equipment and materials may obstruct the progress of work and may subject the project for delay.

- Payment problems between contractor and his employees: Some contractors encountered reduction in their financial resources due to the "Credit Crunch", the global financial crisis. Cash requirement for procurement of materials and other expenses could lead the contractor into a very critical situation which may obstruct the progress of work and postpone the project completion time.

Causes related to consultant

- Results showed that there are three severe causes related to consultant, these are: Delay in solving design problems, Major change of design during construction by consultant, Bad project cost estimation. It can be observed that these causes are related to insufficient experience of the consultant's staff. When consultant makes fundamental changes in design, the contractor may face difficulties in construction or in finance because these changes weren't planned. Moreover, when projects' costs are under-estimated, it may be suspended by the owner due to his inability to finance additional costs. Additionally, delay in approvals by consultant could delay the progress of work and may cause delay in completion time of the project.

Causes related to services and utilities

- All causes related to services and utilities were ranked as frequent and severe, which indicates the importance of this group. Utilities are unidentified or incorrectly located is ranked as the first most frequent and severest cause in this group. This may result from unavailability of designs and exact location maps. Unclear or undefined positions of services networks in drawings can subject the project to delay; because the schedule will be changed and the newly discovered pipe or cable is required to be moved or diverted temporarily which requires additional time and money.

Causes related to Government regulations

- Difficulties in obtaining work permits: Among the severest problems related to Government regulations which affect the progress of public road projects is the issuance of work permits. The contractor must obtain work permits from all concerned Government authorities. Each of these authorities has its own regulations and rules in issuing work permits. Contractor may face difficulties in obtaining these permits causing delay for the project.

- Tendering system requirement of selecting the lowest bidder: It is important to reconsider the governmental strategies that encourage the selection of the lowest bidding contractors and to improve the routine procedures and requirements that are required for obtaining work permits.

- Land acquisition: Land acquisition is a sensitive issue so humane, systematic and transparent approach need to be adopted for early and peaceful acquisition. Land acquisition must take place in a manner that fully protects the interests of land-owners and also of those whose livelihoods depend on the land being acquired. So an adequate compensation package which shall include reasonable compensation for land and resettlement and rehabilitation measures to assuage the sufferings of the affected persons and projects.

Causes related to external environment

- Traffic diversion: Traffic diversion is found to be the first severest and most frequent cause related to external environment. Improving the performance of an intersection by constructing a flyover and / or subway involves working at already used highway. If this highway is linking between important regions in the country, it is difficult to close it until the construction finishes. Congestions in this highway are required to be diverted for temporary ways and this may obstruct the progress of work and causes delay for the project.

- Hot weather effect on construction activities: The climate in Bahrain is very hot, where the temperature may exceed 49 °C in summer which makes the construction very difficult. The weather may affect the productivity of labours and equipment, which may delay the progress of work.

- Scarcity of materials in the market: The factor “scarcity of materials in the market” was Ranked third.

Construction projects are physical projects, and the timely availability of Materials is very important.

Delay effects

Results indicated that the four most frequent effects of delay are:

- Cost overrun
- Time overrun
- Disruption of traffic movement
- Dispute

When the project is subjected to delay, it will exceed the specified period which means waste of time that may be used in other profit making projects. As well as that, delay causes cost overrun because time is money. The contractor will pay more for overhead, labours and machinery. On the other hand, owner’s money will be tied up with this delayed project. Moreover, closing main roads for development and construction will disrupt traffic movement. Additionally, roads provide links that connect the road users to other areas that may include recreational and investment projects. So delay in road projects may lead to delay in these investment projects that depend on them.

5.2 Case Study

There are number of sites in Pune where the infrastructure project has been delay Hence for our project we have considered swargate flyover as our first case study.

- Name of site - Swargate flyover
- Location - Swargate to panchami
- Consultant - S. N. Bhoje and Associates
- Start Date - 10 June 2013
- Stipulate Date - 9 Dec. 2015
- Name of builder Pune Municipal Corporation (PMC)
- Client – MSRDC
- Delay time - 6-8 months tentatively
- Contractor - NCC Ltd.
- Project will require 30 months for completion.
- Total cost of project - 126 crore.
- Type of survey - Traffic count, Topographic survey



Fig. 01 (Source – Captured Self) A photo of Swargate Flyover

The Pune Municipal Corporation has finally started construction work on the four lane flyover from Swargate to Panchami. The new flyover when completed is expected to reduce congestion on the busy road of swargate junction. The flyover that is being built at the swargate junction is divided into three parts (sarashaug, hadapsar, katraj).

Now one lane from Swargate to Panchami has been completed. The constructions of the remaining routes are in process. It will take at least nine months tentatively to complete the flyover. So the actual delay of this project is six months tentatively.

5.2.1 Causes of delay of swargate flyover

1) Non-availability of land -Available width of road = 24 m Actual width of road needed

2) Non-availability of funds -The flyover was supposed to be built upto big bazaar having a total cost of 160 crore. But because of no enough funds available with the PMO the flyover is being limited to Panchami only having cost of 126 crore.

3) Delay in permission from consulting agencies - The permission related to traffic is given by the Assistant Commissioner of Police because of that there was four month delay for the permission at the Laxmi Narayan junction.

4) Concreting work during night-Because of heavy, dense traffic and pedestrians at the junction concreting work could not be done during the day time. Hence all concreting work was during the night time. Working hours was reduced because of this and it caused delay of flyover.

5) Miscellaneous delay -The problems related to utility are often faced by contractor. Either they have to change the design or remove the utility (Ep Electric pole, water pipes, bus stand, hanners),

5.3 Effects of delays

- Penalty has been levied on contractor
- Escalation to the contractor given by the owner
- Huge Traffic congestion and inconvenience caused for the public



Fig. 02 (Source: PMC) This photo is showing the Traffic Congestion

VI. CONCLUSION AND RECOMMENDATIONS

• The first step in reducing the delays in highway construction project is to understand the root causes of the delay. The results provide a listing of root causes and issues that are directly responsible for most infrastructure construction project delays.

• This study aims to investigate the important causes of delay in transportation infrastructure projects. The literature is reviewed thoroughly and a questionnaire which contains sixty four possible causes of construction delays in transportation infrastructure projects is formed. The results revealed that the problem of construction delays in transportation infrastructure projects is frequent and notable. The top five important causes of construction delays in *transportation infrastructure projects* are mainly Land Acquisition, Environmental Impact of the project, financial closure, Change orders by the client, Poor site management and supervision by contractor

The major causes related to the owner,

- i.e. PMO, Interference by the agency during execution operation,

- Delay in decision making by the consulting agencies,
- Delay in progress payments by PMO. The main problems related to consultants are due to lack of funds.
- Delay causes related to services and utilities are the most critical factors as indicated by the high values of their severity means.
- Moreover, cost and time overruns and disruption of traffic movement were the most frequent effects of delay.
- To conclude this study on causes of delays in transportation infrastructure projects in India has revealed a complex landscape of challenges that contribute to project delays and cost overruns. Key findings include inadequate funding allocation, bureaucratic inefficiencies, land acquisition hurdles, and regulatory complexities as primary factors behind project delays. These delays have far-reaching implications, including increased project costs, reduced economic competitiveness, and compromised safety and inconvenience to users.

To address these challenges and improve project delivery, several recommendations are proposed. These include enhancing funding mechanisms and budget allocation processes, streamlining regulatory procedures, improving coordination among stakeholders, investing in skilled project management personnel, and leveraging technology for better project monitoring and control.

General Recommendations

1. As there is a penalty applied to those contractors who fail to deliver projects on time, it is also important to maintain incentives for those who deliver projects ahead, within budget and with super quality.
2. The Indian construction industry lacks the research and development and the government should encourage and support such strategies.
3. It is recommended to establish of a governmental authority which concerns with developing the Omani construction industry and tackles the obstacles that are facing it.

4. It is important to reconsider the governmental strategies that encourage the selection of the lowest bidding contractors and to improve the routine procedures and requirements that are required for obtaining work permits.

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